6th INTERNATIONAL CONFERENCE ON SUSTAINABLE AGRICULTURE AND ENVIRONMENT

(ICSAE-6)

Selçuk University Campus,
City of Konya, Turkey

Editor:
Dr. Mithat DİREK

Proceeding Book

ISBN: 978-605-184-194-6

October 2019

www.agrienv.com

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İş Merkezi No: 97/24

İskitler – Ankara

Tel: 0 312 341 00 02 – 0 312 341 00 05

Matbaa Sertifika No: 14721
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OCTOBER – 2019

PREFACE

Sustainability is important for human life which reach to clean water, environment, enough food, and satisfactory life. This conference event focus on sustainability for human activities. In that regard, agriculture is based on clean environment and well organization of all production inputs.

Thomas Malthus, 18th-century British philosopher and famous economist, had some ideas about population growth. His population theories were outlined in his book entitled' *An Essay on the Principle of Population'*, first published in 1798. In such book, his theory was populations will continue to grow until growth is ended by disease, famine, war and so on. He developed a model known as Malthusian Growth Model using estimation of population growth. However, this theory is not suitable at present because of advents in genetic studies. All researchers' are working very hard for obtaining greater and various agricultural products. Therefore, these conference series have focused mainly on this mentality and opinions.

We hope, next generations should be worked harder for solving problems in sustainable agriculture and environment.

Organizing committee

Scope of the Conference

The main scope of this symposium is to invite the experts to discuss the projects and applications on sustainable development in agriculture and environment. The main topic areas include interaction between agriculture and environment, social and economic aspects of environment, biology and agriculture, using biology to tackle environmental & agricultural concerns, sustainable development, tropical agriculture, biodiversity, biotechnology, horticulture, plants, animal production, climate change, environment, local ecological knowledge, water management, soil conservation, agriculture social economics, IPM (Integrated pest management), integrated agriculture management, hydraulic structure, maintenance and operation food sovereignty, food security, other related agriculture and environment issue.

Conference Topics

The topics of the conference include, but not limited to, the areas listed below:

Research Field	Topics
Agriculture	General agriculture, agricultural education, biodiversity, plant and animal genetic resources, biotechnology, horticulture, plants, animal production, animal nutrition, natural product research / phytomedicine, rangeland management, crop-livestock farming, soil health, agriculture social economics, integrated pest management, and integrated agriculture management
Environment and Climate change	Environmental Sciences, local ecological knowledge, soil, water, and climate, climate change, structures and environment, ecosystem services and rangelands, agroecology, waste management, biosolids, water and wastewater treatment, maintenance and operation, surface and groundwater resources, and hydraulic structure
Nanotechnology and precision farming	Nanotechnology and agriculture, precision farming and variable rate technology, power and machinery in agriculture, GPS and GIS technology, mathematical modelling in agriculture, renewable energy & energy management, nanomedicines
Food Sciences	Food sovereignty and food security, food quality

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• Dr. Mohamed A. Rahim – Invited Speaker Professor, Director of Germplasm Center Department of Horticulture, Bangladesh Agricultural University, Mymensingh, Bangladesh *Topic: Role of horticultural production on nutritional food security, household income, poverty reduction, biodiversity, sustainable development and environment.*
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CONTENTS

EFFECT OF SOME CHEMICAL AND BIOLOGICAL FUNGICIDES ON MYCELIAL GROWTH AND CONIDIAL GERMINATION OF BOTRYTIS CINEREA, CAUSAL AGENT OF NUT CLUSTER BLIGHT OF HAZELNUT

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ABSTRACT

Hazelnut is one of the most important agricultural products of Turkey. Several fungal diseases are threatening hazelnut. Nut cluster blight caused by Botrytis cinerea is an important disease that affects the yield directly and most of the cultivars grown mainly in Turkey is susceptible the disease. With the purpose of contributing its management, this study was conducted in vitro to determine the effect of some chemical (Fenhexamid, Cyprodinil+Fludioxonil, Pyraclostrobin+Boscalid, Pyrimethanil, Iprodione, İmazalil) and biological fungicides (Bacillus subtilis 1.34 g/l QST 713, B. subtilis Y1336) on mycelial growth and conidial germination of high pathogenic B. cinerea isolates derived from diseased nut clusters of hazelnut. EC_{50} values (µg/ml), the effective concentration for a 50% reduction of mycelial growth were determined in the presence of fungicides. The concentration of fungicide at which the conidia germination showed complete inhibition was considered as minimum inhibitory concentration (MIC) of fungicide. Mycelial colony development was inhibited completely by Pyraclostrobin+Boscalid and Iprodione from 5 µg/ml, by Cyprodinil+Fludioxonil and İmazalil from 10 µg/ml doses. Least EC_{50} value was obtained with Cyprodinil+Fludioxonil against isolate 2. Regarding biological fungicides, while EC_{50} values of Bacillus subtilis Y1336 were high as 64.57 µg/ml and 170.21 µg/ml on isolate 1 and 2, respectively), for Bacillus subtilis 1.34 g/l QST 713 values were 7.51 µg/ml and 6,42 µg/ml. MIC values were 1 µg/ml for Cyprodinil+Fludioxonil, 5 µg/ml for Pyraclostrobin+Boscalid, Iprodione and İmazalil, 10 µg/ml for Fenhexamid, Pyrimethanil and B. subtilis 1,34 g/l QST 713. Conidia germination was observed at all doses of B. subtilis Y1336.

Keywords: *Hazelnut, Botrytis cinerea, fungicides, EC_{50}, MIC, management*

INTRODUCTION

Hazelnut (*Corylus avellana* L.) is one of the most important tree nut crops in Turkey. With the 675 thousand tonnes production quantity Turkey is the first producer and exporter in the World (FAO, 2017). Growing hazelnut is the main economic activity for nearly 400,000 households under the form of family farms, about 2 million people, in the Black Sea Region of Turkey (Tanrıvermiş et al., 2006).

Insect pests, diseases, environmental factors, and faulty growing techniques can be major constraints for hazelnut production varying by countries and years. In Turkey most important hazelnut diseases known for many years are bacterial blight caused by *Xanthomonas campestris* pv. *corylina*, root rot caused by *Armillaria mellea* and *Rosellinia necatrix)*, powdery mildew caused by *Phyllactinia guttata*, branch cancer caused by *Nectria galligena, mosaic disease caused by Apple Mosaic Virus*, nut cluster root caused by *Monilia coryli*, *M. fructigena* and *Botrytis* spp. (Bremer 1948¸Öztürk 1950, İren 1971, Alay vd. 1973, Yürüt et al. 1994, Toros ve Hancıoğlu 1997; Arlı-Sökmen et. al. 2004; Akbaş et al. 2005; Ertunç et al. 2009, Ak et al. 2011). In addition to these important ones, *Phomopsis* sp., *Fusarium* spp., *Trichothecium roseum*, *Pestalotiopsis guepinii*, *Epicoccum* sp. and *Alternaria raphani*, *A. alternata*, *Colletotrichum* spp., Fusicoccum sp. and *Erysiphe corylacearum* were reported as disease agents of hazelnut (Bremer 1948, Öztürk 1950; Yürüt et al. 1994; Karaca and Erper 2001; Sezer and Dolar 2012a, 2012b, 2015, 2018; Sezer et al 2017). Among them, outbreak of an emerging disease, powdery mildew caused by *Erysiphe corylacearum* has been observed on cultivated *C. avellana* in the Black Sea Region recently (Sezer et al. 2017). Before that, in Turkey, it was suggested that nut cluster blight caused by *Botrytis cinerea* was the most important and the most prevalence disease agent for hazelnut fruit clusters in Ordu, Giresun and Trabzon provinces. In a study conducted in 2008 –2009, infected orchards rate with *Botrytis cinerea* was 64.00% in Trabzon, 85.82% in those provinces respectively and most of the cultivars grown mainly in Turkey is susceptible the disease (Sezer and Dolar, 2012a). It causes blightening and rotting of nut clusters and so that affects the yield directly.

With the purpose of contributing its management, this study was conducted in vitro in 2013 to determine the effect of some chemical (Fenhexamid, Cyprodinil+Fludioxonil, Pyraclostrobin+Boscalid, Pyrimethanil,

Iprodione, İmazalil) and biological fungicides (*Bacillus subtilis* 1.34 g/l QST 713 and *B. s*ubtilis Y1336) on mycelial growth and conidial germination of high pathogenic *B. cinerea* isolates derived from diseased nut clusters of hazelnut. EC_{50} values (µg/ml), the effective concentration for a 50% reduction of mycelial growth and minimum inhibitory concentration (MIC) of fungicide were determined in the presence of fungicides.

MATERIAL AND METHOD

Fungicides

Commercial formulation of fungicides were used (Table 1) and all fungicide concentrations are expressed as active ingredient (µg/ml) at the study.

Table 1. Fungicides used in the study

Active ingredient	Trade name	Formulation
Fenhexamid 500 g/l	Teldor SC 500	SC
Cyprodinil+Fludioxonil 37.5%+25%	Switch 62.5 WG	WG
Pyraclostrobin+Boscalid 6.7%+26.7%	Signum WG	WG
Pyrimethanil 300g/l	Mythos 250 ml	SC
Iprodione 50%	Rovral WP 50	WP
İmazalil 500 g/l	Macal 50 EC	EC
Bacillus subtilis 1.34 g/l QST 713	Seranade ASO SC	SC
Bacillus subtilis Y1336	Biobac WP	WP

Isolates and media

Two high virulent *B. cinerea* isolates derived from nut cluster of hazelnut with blighted symptom at previous studies. The isolates were kept on potato dextrose agar slants were stored at 4 °C. Studies of determine the effect on mycelial growth and spore germination were conducted on Minimal Medium (MM) for *B. cinerea* containing per litre: glucose 20 g, asparagine 1,5 g, K_2HPO_4 1 g, $MgSO_47H_2O$ 0,5 g, $FeCl_3$ 0,1 g, yeast extract 1g, difco bacto agar 20 g. After sterilisation, 0,3 g streptomycin sulfate per liter were added the media (Burçak and Delen 2000; Köycü et al. 2012).

Effect of fungicides on mycelial growth

Fungicides were evaluated with respect to mycelial growth at doses of 0.5, 1, 5, 10, 50 and 100 µg active ingredient/ml. Stock solutions of fungicides (20000 µg / ml) with exceptions of Bacillus subtilis 1.34 g / l QST 713 that have the low active ingredient detisity were prepared in sterilized distilled water. Dilutions were made from stock solutions to obtain the desired doses. The final dilution for each dose was obtained by adding fungicide solutions to 100 ml of medium cooled to 45-50 °C. The 4 mm diameter discs of *B. cinerea* taken from the edge of the 24-30 hours old cultures which were developed on MM medium at the dark were placed with the surface mycelium face down on Petri plate containing fungicides or un-amended control. Six replicates were used per treatment. The petri plates were incubated in the dark at 23 °C. Colony diameters were measured after three days incubation (Burçak and Delen 2000). Obtained colony diameters with the minus of 4 mm (the agar disk diameter) were recorded and % inhibition values of fungal development of fungicides were determined according to control using the Abbott formula, inhibition (%) = $[(C – T) / C] \times 100$, where C and D represent mycelial growth diameter in the control and fungicides amended Petri plates, respectively (Abbott 1925). Logarithmic values of inhibition percentage values and fungicide doses were subjected to regression analysis in Minitab package program and 50% inhibition doses (EC_{50}) of fungicides were calculated from the obtained regression equations (Yiğit ve Turhan 1994, Demirci ve Hancıoğlu 2005).

Effect of fungicides on spore germination

In order to determine the effect of fungicides on spore germination, Minimal Medium containing different doses of fungicides were prepared as indicated above section. Inoculations were performed by shaking spores (with the help of a corcep) from mycelial piece taken from the 10-days colonies grown under

the light for abundance sporulation to MM. Afterwards, these petri plates were allowed to incubate for one day at 23 °C and germination rates of spores in each petri plate (counting 100 conidia/petri plate) were determined at the end of the incubation period. It was accepted that if the germination tube tube size was about the twice the size of the spore itself, the conidiospor germinated. After this evaluation, petri dishes were left under the light for seven days and colony developments from germinated conidia were observed. Some conidia was evaluated as non-germinated if the colony development was not observed even though they germinated (Köycü 2007).

RESULTS and DISCUSSION

Least EC_{50} value, $8X10^{-7}$ were obtained with Cyprodinil+Fludioxonil against isolate 2. Second best EC_{50} value, $1.1X10^{-6}$, were obtain with Pyrimethanil against isolate 1. Regarding biological fungicides, while EC_{50} values of *Bacillus subtilis* Y1336 were high as 64.57 µg/ml and 170.21 µg/ml on isolate 1 and 2, respectively. *For Bacillus subtilis* 1.34 g/l QST 713 values were low relatively as 7.51 µg/ml and 6.42 µg/ml, respectively (Table 2).

Table 2. C of Logarithmic values of inhibition percentage values and fungicide doses and EC_{50} values of fungicides

Fungicides	**Isolates**	**Regression equation**	**EC_{50} (µg/ml)**
Fenhexamid 500 g/l	1 2	Log Y=- 5,60 + 0,102 X Log Y = - 3,79 + 0,0814 X	0,316 1,905
Cyprodinil+Fludioxonil 37.5%+25%)	1 2	Log Y = - 9,86 + 0,113 X Log Y = - 13,7 + 0,152 X	0,00006 0,0000008
Pyraclostrobin+Boscalid 6,7%+26,7%	1 2	Log Y = - 3,47 + 0,0478 X Log Y = - 4,91 + 0,0622 X	0,083 0,0158
Pyrimethanil 300g/l	1 2	Log Y = - 13,7 + 0,155 X Log Y = - 3,48 + 0,0518 X	0,0000011 0,1288
Iprodione 50%	1 2	Log Y = - 3,69 + 0,0491 X Log Y = - 3,18 + 0,0433 X	0,058 0,0966
İmazalil 500g/l	1 2	Log Y = - 1,43 + 0,0284 X Log Y = - 1,62 + 0,0315 X	0,977 0,9015
Bacillus subtilis 1,34 g/l QST 713	1 2	Log Y = 0,0205 + 0,0171 X Log Y = - 0,0828 + 0,0178 X	7,5076 6,4151
Bacillus subtilis Y1336	1 2	Log Y = 0,625 + 0,0237 X Log Y = 0,536 + 0,0339 X	64,5654 170,2159

Y: Doses of fungicides (µg/ml), X: % inhibition

MIC values were 1 µg/ml for Cyprodinil+Fludioxonil, 5 µg/ml for Pyraclostrobin+Boscalid, Iprodione and İmazalil, 10 µg/ml for Fenhexamid, Pyrimethanil and from biological fungicides *B. subtilis* 1.34 g/l QST 713. Conidia germination was observed at all doses of *B. subtilis* Y1336 (Table 3).

Regarding EC_{50} values and MIC values *B. cinerea* isolates derived from nut clusters of hazelnut are very sensitive to all chemical fungicides and one of the biological fungicides, *B. subtilis* 1.34 g/l QST 713. This should be taken into account in field studies for control of the disease.

Table 3. Effects of fungicides on spore germination

Fungicides	Izolates	Doses						
		Control	0,5 µg/ml	1 µg/ml	5 µg/ml	10 µg/ml	50 µg/ml	100 µg/ml
		Spore germination rate (%)						
Fenhexamid 500 g/l	1	100	99	79	66	38*	30*	8*
	2	100	99	75	49	39*	34*	38*
Cyprodinil+Fludioxonil 37.5%+25%	1	100	11	1*	0	0	0	0
	2	100	22	11*	0	0	0	0
Pyraclostrobin+Boscalid 6.7%+26.7%	1	100	100	100	25*	0	0	0
	2	100	93	40	16*	0	6*	2*
Pyrimethanil 300g/l	1	100	100	90	30	20*	0	0
	2	100	100	45	45	25*	19*	0
Iprodione 50%	1	100	100	100	0	0	0	0
	2	100	100	100	20*	0	0	0
İmazalil 500g/l	1	100	60	35	25*	0	0	0
	2	100	100	100	0	0	0	0
Bacillus subtilis 1.34 g/l QST 713	1	100	100	100	100	6*	0	0
	2	100	100	100	100	0	0	0
Bacillus subtilis Y1336	1	100	100	100	100	100	100	100
	2	100	100	100	100	100	100	100

*Conidia germinated but no colony devolenment

ACKNOWLEDGMENT

This work was supported by the General Directorate of Agricultural Research and Policies [Project NO: TAGEM-BS-12/10-03/02-21).

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EXPLOITING THE NUTRITIONAL AND COMMERCIAL POTENTIAL OF MINOR FRUITS OF RAWALAKOT, AZAD JAMMU AND KASHMIR

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ABSTRACT

The world is suffering due to the double burden of malnutrition i.e., under-nutrition and over-nutrition which is increasing day by day. Lack of dietary diversity and changing climatic scenarios are paving the way for this severe problem. There could be many solutions to address this acute problem. However, using indigenous minor fruit species could be the cheapest and sustainable solution to tackle this issue locally as well as globally. To understand the existing barriers which are hindering to unlock the full potential of these fruits, the present study was designed. To explore the nutritional potential of some selected minor fruits such as quince, autumn olive, black raspberry and wild olive grown in Rawalakot, were collected and analysed. The selected fruits were analysed for their physical and nutritional composition in order to priorities their edibility for indigenous people. Various samples of selected fruits were collected from different villages of district Poonch. Data was analysed for physical parameters such as, fruit diameter, total weight of fruit, fruit colour, fruit firmness, chemical properties such as vitamin C, total soluble solids, total ash content, titratable acidity, pH and antioxidant properties such as total antioxidants and total phenolics. The results showed that there is a huge potential of these crops to be promoted for commercial scale cultivation. However, further efforts are required to establish certified nurseries, small scale value addition plants and a supply chain system for these fruits.

Keywords: *Indigenous fruits, hidden hunger, micronutrients, sustainable nutrition*

INTRODUCTION

Minor fruit species are generally not known as cash crops due to their unknown and unrecognised importance. Actually, they play an important in most of the rural communities as their farming practices as well as lifestyle strategies are dependent on these indigenous fruit species (Mitra *et al*., 2008). Further, these minor fruit species also provide an additional source of food and nutrition for these rural people (FAO, 2009). The reason for not recognising them as cash crops is that they actually provide a big portion of diet and help in achieving food security for the local communities (Frusciante *et al*., 2000). They are mostly planted alongside major crops as subsistence crops but play a key role as food crops as well as to generate additional income for rural people (FAO, 1988). In most of the case, these minor fruit species are locally grown and are well adapted to the environmental and climatic conditions which is a huge advantage for farmers who can grow them on a relatively low costs (Jaenicke and Lengkeek, 2008; WHO, 2002). They are also grown in farming systems that have been developed in the region. Therefore, they are designed to suit local conditions and for this reason research into these species and the farming systems in which they are produced has the potential to both support food security and nutritional wellbeing of grower households as well as contributing to sustainable economic development.

MATERIALS AND METHODS

Some important characteristics such as (English name, local name, botanical name, family name, and traditional uses) of selected minor fruit species (Autumn olive, Black raspberry, Quince, Wild persimmon, Berberis) were documented during this study. Moreover, physic-chemical analysis were also conducted to record some parameters such as fruit weight (g), total soluble solids (TTS, °Brix), titratable acidity (%),vitamin C (mg/100ml), pH, total antioxidant (activity of $FeSO_4$ $mg^{-1}g$ FW), total flavonoids (mmol of qercentin per 100 g) and total phenols (mg gallic acid per 100 g) using standard methods.

RESULTS AND DISCUSSION

Characteristics of selected minor fruits species

It was noted that these minor fruits species are being used traditionally for various purposes which shows the importance of these crops in local communities. It was also observed that these minor fruits species are not only nutritious but also have good potential to be exploited for value added products in future (Table 1).

The selected minor fruit species also showed appreciable levels of vitamin C, high levels of total antioxidants and total flavonoids. Further, fruits were also a good source of total soluble solids and titratable acids as well (Table 2).

However, still there are considerable barriers which are causing the main hindrance in unlocking the full potential of these species. One of the most important barriers is that these fruits have improper supply chain system and are mostly traded locally in nearby markets. Secondly, a limited research has been conducted to explore the actual potential of these fruit species. Consequently, a limited information and knowledge was available regarding these species which has caused a lack of awareness among communities about the real significance and potential of these indigenous crops.

Further, poor supply chains have blocked the progress made in exploiting these species and it was really difficult for scientists to identify the actual potential of these species. Thus, resultantly even in case of those species which had a lot of commercial potential were missed or ignored by the researchers to be exploited further.

Due to the poorly structured supply chains, even if any specie was commercially exploited by any means, it would have not reached to the local producers for taking any benefits of commercialisation.

CONCLUSIONS

These minor fruit species are popular in local communities and are mostly consumed in areas where they are produced. Very little fruits are being sent to the main urban markets of Rawalakot or Pakistan. Therefore, in this regard a comprehensive research studies are required to supply disease free planting material, to give a detailed plan for managing trees and fruits, to provide indices for maturity, to develop an optimum system for handling, processing and packaging of these fruits after harvest. Thus, a complete value chain approach is needed to rectify these issues and to provide a long term solution for these species, so that all the stakeholders involved in this whole chain are benefitted either through addressing the issue of malnutrition or by earning some good living.

ACKNOWLEDGEMENTS

Authors are highly thankful to the Pakistan Science Foundation (PSF) for providing travel grant facility to attend and present this paper at the 6th International Conference on Sustainable Agriculture and Environment (6th ICSAE), October 03-05, 2019, Konya, Turkey.

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Table 1: Botanical information and local uses of selected minor fruit species

English name	Local name	Botanical name	Family name	Traditional uses
Autumn olive	Ghiani	*Elaeagnus umbellata*	Elaeagnaceae	Traditionally, flowers are used to cure cardiac diseases. Seeds are considered good for cough. Oil extracted from seeds is used to treat affliction of lungs.
Black raspberry	Paghnar	*Rubus occidentalis* L.	Rosaceae	People eat black raspberry to treat stomach pain and bleeding and to prevent cancer.
Quince	Bhaidana	*Cydonia oblonga* Miller	Rosaceae	Quince fruit is considered good as an anti-diabetic agent. Seeds are used in curing cough, bronchitis, constipation, migraine, nausea, common cold and influenza.
Wild persimmon	Amlok	*Diospyros lotus*	Ebenaceae	Amlok is traditionally used to treat diarrhea.
Berberis	Sumbul	*Berberis vulgaris*	Berberidaceae	Leaves are used in treatment of jaundice. Roots are used in the treatment of eye problems.

Table 2: Physico-chemical properties of selected minor fruit species

Fruit name	Fruit weight (g)	TSS (°Brix)	Titratable acidity (%)	Vitamin C (mg/100ml)	pH	Total antioxidant (Activity of $FeSO_4$ $mg^{-1}g$ FW)	Total flavonoids (mmol of qercentin per 100 g)	Total phenols (mg gallic acid per 100 g)
Autumn olive	1.55/10 fruits	19.14	0.56	0.43	3.64	0.31	2.18	-
Black raspberry	0.24	5.32	0.35	0.47	4.12	-	3.80	0.72
Quince	150.8	14.0	0.43	0.40	3.43	1.126	-	0.42
Wild persimmon	12.14	15.32	0.49	0.62	4.56	1.34	4.21	-
Berberis	9.80/10 fruits	12.45	0.67	0.71	4.32	-	3.17	0.56

ECONOMIC ASSESSMENT OF PRECISION AGRICULTURE: A SHORT REVIEW

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ABSTRACT

Precision agricultural is designed to increase whole agricultural production efficiency with low cast effect while avoiding the unwanted effects of chemical loading to the environment. Precision agriculture offers environmental, practical and economic benefits. Precision farming potentially increase yields, reduce investment, decrease pollution, enhance economic efficiency, leading to better control in the production process and more productive work time will result in higher profits. Precision agriculture was adopted a bit slowly because of the equipment replacement cycle problems. The adoption of precision agriculture was also profit-oriented. This short review tries to collect information about the adoption and profitability of the application of some precision agriculture technologies. According to several previous studies, in general, the application of precision agriculture technologies positively increase profitability.

Keywords: *Economic feasibility, precision farming, profitability, sustainability, technology adoption*

INTRODUCTION

Agriculture is a complex system consisting of many concepts and relationships. Agriculture production systems have benefited from the incorporation of technological advances primarily developed for other industries. The industrial age brought mechanization and synthesized fertilizers (also pesticides) to agriculture (Yousefi & Razdari, 2015). However, some of the practices and technologies of agriculture not only bring positive impacts on agricultural production but also have negative impacts, especially on the environment. The environmental impacts of agricultural production have been an increasing concern in terms of its risk on air, soil and water pollutions. This concern had led scientists to deal with the problem of pollution and study the environment-friendly practices and inputs rather than traditional farming and usage of pollutant chemicals in the form of fertilizers, pesticides, growth regulators, etc. Sustainability in agricultural production, which is meant to produce crops and animals while keeping an eye on the balance of nature, has become the widely accepted approach of farming in the western world (Sindir & Tekin, 2002).

Precision agriculture (PA) deals with the study of the application of technology to produce agricultural products to fulfill world-wide food requirement as compare to conventional agricultural method and lower adverse impact on environment. Precision agricultural is an integrated, information and agricultural management system that is based on several technical tools such as global positioning system, geographical information system dan remote sensing. Precision farming is designed to increase whole farm production efficiency with low cast effect while avoiding the unwanted effects of chemical loading to the environment (Goswami et al., 2012).

Precision agriculture (PA) deals with the study of the application of technology to produce agricultural products to fulfill worldwide food requirements as compare to the conventional agricultural method and lower adverse impact on the environment. Precision agricultural is an integrated, information and agricultural management system that is based on several technical tools such as global positioning system, geographical information system dan remote sensing. Precision farming is designed to increase whole farm production efficiency with low cast effect while avoiding the unwanted effects of chemical loading to the environment (Goswami et al., 2012).

Previous reports showed that precision farming has the potential for enhancing farm incomes and exert a positive influence on livelihood security. Precision farming has proved globally its potential to maximize the effectiveness of inputs. It can potentially reduce investment, decrease pollution and enhance economic efficiency, leading to better control in the production process (Franco, 2013). This short review tries to collect brief information about the adoption and profitability of the application of some precision agriculture technologies.

Adoption of Precision Agriculture

Krause and Black (1995) examined the adoption of precision farming by farmers. They reported that even when a decision has been made to adopt some precision farming, the timing of adoption may be delayed by problems in the equipment replacement cycle for the underlying machines on which global positioning systems (GPS), sensors and other electronics are to be installed. They found that some innovators had retrofitted existing machines, but many farmers were reluctant to do so. Lack of experience with electronics, cost of installation service and lack of standardization reduced the cost-effectiveness of retrofits. Many of the practical majority of farmers who care more about profits than being the first with new technology preferred to have factory-installed precision farming equipment. But buying that major machine presented further financial and risk challenges.

Lowenberg-De Boer (1998) observed the trends in precision farming adoption in the United States. He also reported that the adoption of precision farming is uneven not only geographically, but also temporally. According to this observation, the uneven adoption trend contrasts sharply with the rapid, smooth adoption of hybrid maize following its commercial introduction about 80 years ago.

Oriade and Popp (2000) conducted a whole farm planning model of precision agriculture technology where risk was incorporated. They proposed that the adoption of precision farming technologies was profitable in a whole-farm approach. It helps to increase the profit potential and risk-taking the capacity of the farmer. However, the lack of yield data and the interactive effects of production practices necessarily led to overly restrictive assumptions and results.

Khanna (2001) examined the adoption pattern of PF of four different states of the USA and noted that adopters of PF tend to be younger, more educated, full-time farmers and operate larger sized farms. They discovered that the low rates of adoption are due to uncertainty in returns, high fixed costs of investment and information acquisition, and lack of demonstrated effects of these technologies on yields, input-use, and environmental performance.

Norton and Swinton (2001) tried to understand why some farmers adopt precision farming while some others do not. They explained that technology adoption can be examined across time or space. Either way, the pattern of precision farming adoption has been uneven. Despite the rapid growth of global commerce and the widespread availability of equipment for variable rate of technology (VRT) and yield monitoring, adoption rates appear to differ sharply from one country to another, at least based on the informal data availability.

Swinton (2001) studied the adoption of precision agriculture technologies and found it to be uneven, both geographically and temporally. The adoption of precision agriculture technologies has been fastest where labor is costly but land and capital are relatively less costly. The uneven adoption rate in places where it was adopted is tied to normal cycles for replacing the expensive machinery in which many precision agriculture technologies are embodied. Equipment replacement decisions are affected by many factors exogenous to the farm, such as bank interest rates and commodity prices. Adoption is likely to continue in labor-scarce, land abundant countries, with rates of adoption accelerating when commodity prices are high and interest rates low.

Kayrouz (2008) studied the adoption pattern of precision farming in the United Kingdom. He suggested that precision farming was profit-oriented. The most frequently adopted components were grid soil sampling and variable rate of technology application of lime. The study indicated that fertility management practices are most likely to change as a result of PF adoption, as compared to planting and pesticide practices. He opined that farmers who adopt PF are satisfied with their PF system and wanted to continue to adopt additional components.

Profitability of Precision Agriculture

Agricultural producers have increasingly adopted precision agriculture technologies over the past two decades. Agriculture Risk Management Survey (ARMS) data collected and analyzed by USDA showed substantial adoption of various PA technologies, including yield monitoring and mapping, soil sampling and mapping, guidance systems, and variable rate technologies. However, much of the rapid adoption of PA technologies has happened over the past several years during a period of increased farm profitability. Whether the adoption of PA technology drives increased profitability or whether increased profitability drives adoption is an important question (Castle et al., 2017).

Castle (2016) stated that initial analysis focused on differences in profitability between adopters and non-adopters of PA technology by analyzing profitability against the number of PA technologies adopted. Several different measures of profitability or efficiency were analyzed, including net farm income (NFI), net farm income ratio (NFIR), and operating expense ratio (OER). Both ratios are financial ratios calculated as net

farm income and operating expenses respectively over gross farm income. Castle also reported that the adoption of PA significantly increased NFI and OER of the farmers. In conclusion of this study showed that the adoption of PA can lead to profitability increase.

Schimmelpfennig (2016) stated that a treatment-effects model is developed to estimate factors associated with PA technology adoption rates and the impacts of adoption on profits. Labor and machinery used in production and certain farm characteristics, like farm size, are associated with adoption as well as with two profit measures, net returns, and operating profits. The impact of these PA technologies on profits for U.S. corn producers is positive but small. Baio et al. (2017) reported that the use of precision agriculture techniques in cotton crops reduces production costs by 6.6%, increased profitability and operating profit by 3.3% and 7.9% respectively when compared to conventional agriculture. The variable rate application for fertilizer provides 41% of cost reduction with these inputs.

PA is a system, the assessment of PA implementation is not easy to be done since the assessment has to be done to the whole system of PA. However, most of the literature about the economic analysis of PA are limited only for one technology of PA and the results were not always consistent. Several studies about the profitability of some PA technologies are presented in Table 1.

Lowenberg-Deboer (1995) stated that human capital development would include training individuals on how to use, interpret, and maintain PA-related equipment, including computer training and data interpretation. Similarly, the time spent while learning these new technologies, and the costs associated with lost time have not been included in budget analysis. Human development costs also include any workshops or seminars that address training issues. The useful life of equipment should be incorporated into profitability analysis. If the equipment has to be updated or replaced after four years, these costs could substantially affect the partial budget analysis. Generally, returns from PA technologies are higher and more consistent when used with high-value crops. Returns from PA to the production of bulk commodities are low. However, these figures might be confounded by management strategies.

Table 1. The profitability of some PA technologies application

Reference	**Crop**	**PA Technology**	**PA Profitability**
Bauer et al., 2000	Maize	VRT for seeding	Profitable
Sindir & Tekin, 2002	Cotton	VRT for fertilizers	Profitable
Wang et al., 2003	Corn	VRT for N and lime	Profitable
Lu et al., 2005	Corn	VRT for irrigation	Not profitable
Notron et al., 2005	Cotton	VRT for P	Profitable
Mallarino & Wittry, 2006	Soybean	VRT for P & K	Profitable
Velandia et al, 2008	Cotton	VRT for N	Profitable
Ehsani et al., 2009	Citrus	VRT for fertilizers	Profitable
Mitchell, 2009	Unspecified	GPS	Profitable
Ortiz et al., 2013	Peanut	RTK-GPS	Profitable
Schimmelpfennig & Ebel, 2016	Corn	VRT for fertlizers and soil mapping	Profitable
Baio et al., 2017	Cotton	VRT for fertilizers	Profitable
van Evert et al., 2017	Potato	VRT for perticides	Profitable
	Olive	VRT for P, K and lime	Not profitable
Saavoss, 2018	Peanut	GPS and soil mapping	Profitable
		VRT for fertilizers	Not profitable
Tona et al., 2018	Grapevine and apple	Precision spraying	Profitable

Furthermore, Lowenberg-Deboer (1997) also stated that not annualizing the useful lifetime of equipment into budget analyses ignores annual cost fees or equipment, thus potentially underestimating PA profitability. For example, computers or software may be obsolete within five years. Omitting equipment deprecation, the

annual use costs can be relatively high. The author suggests that the benefits of PA have been difficult to measure or generalize since there is still debate amongst researchers as to which appropriate experimental designs are useful for validating yield monitor data, and which models best reflect field variability are still under development. The central factors governing PA profitability and adoption are: (1) whether "an integrated system with site-specific management multiple inputs" exist or is available to a producer (2) the development of better crop response function models, (3) PA-related equipment availability on a mass-level, (4) accumulated experience of producers using a composite of PA technologies.

Baio et al. (2017) reported that profitability and investment analysis indicators demonstrate economic feasibility and return over investment to both production systems (precision agriculture and conventional) over the cotton crop production, however, the use of precision agriculture techniques shows higher economic viability and smaller return over investment time, even having higher initial costs with machines, sensors and maps production.

The assessment of PA implementation also can not be done just for one growing season because some variable costs should be paid. Swinton et al. (2000) reported that combined results of two growing seasons failed to indicate that yields, savings, profitability, or yield stability benefits were produced by site-specific management (SSM) treatments. There was no measurable yield gain from SSM treatments, and SSM profitability (as a gross margin over variable costs) was not statistically different from whole field application strategies. The authors concluded that benefits from SSM will only be realized over time, not two growing seasons.

CONCLUSION AND RECOMENDATION

Precision agricultural is an integrated (information and agricultural management) system that is based on several technical tools such as global positioning system, geographical information system dan remote sensing. Precision farming is designed to increase whole farm production efficiency with low cast effect while avoiding the unwanted effects of chemical loading to the environment. Precision agriculture was adopted a bit slowly because of the equipment replacement cycle problems. The adoption of precision agriculture was also profit-oriented. According to several previous studies, in general, the application of precision agriculture technologies positively increase profitability. However, the study should be done with including the investment cost and also in a longer period (more than two growing seasons) to get an accurate analysis of the economic aspect of precision agricultural technologies application.

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THE POTENTIAL USE OF COVER CROPS FOR PHYTOREMEDIATION PROCESS OF HEAVY METALS CONTAMINATED SOILS

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ABSTRACT

Industrial Revolution resulted in serious environmental pollutions such as heavy metals and other dangerous waste pollution in the soil and water. Heavy metals pollution has become one of the most serious environmental problems. The effects of heavy metals on human health can cause serious diseases and even lead to death. Phytoremediation is one of the bioremediation techniques can be used as an alternative solution for heavy metal remediation process in heavy metal polluted areas. Phytoremediation technology based on the use of metal-accumulating plants. The selection of plant types for phytoremediation becomes an important consideration to make the remediation process more effective and efficient as well as to prevent the plants from being consumed. The use of non-edible and non-commercial fast growing with high biomass plants as remediating plants can be an alternative solution and cover crops that have characteristics that meet with this purpose. This short review tries to give some information about the potential use of cover crops for the heavy metal remediation process from the soils. Previous studies showed that several non-edible plants that can be used as cover crops are potential for phytoremediation process of heavy metals contaminated soils.

***Keywords**: Bioremediation, environmental sustainability, industrial pollution, metal-accumulating plants*

INTRODUCTION

Alongside the Industrial Revolution, many human activities, such as industrial and energy production, mining, electroplating, transportation, etc., resulted in contamination by polluting substances, and many of them are hazardous for the environment and ecosystem as well as harmful for human health. Heavy metals pollution has become one of the most serious environmental problems nowadays. The effects of heavy metals on human health can cause serious diseases and can even lead to death (Jarup, 2003; Jarup & Akesson, 2009).

Heavy metals become a group of pollutants of much concern because of their immutable nature (Alkorta et al., 2004), cannot be degraded naturally and can stay in a long in the environment. The contamination of heavy metals in the soil and water is notoriously hard to remediate (Alkorta et al., 2004) and pose a major environmental and human health problem that still needs an effective and affordable technological solution (Raskin et al., 1997). Bioremediation is an innovative and promising technology available for the removal of heavy metals and recovery of the heavy metals in polluted water and lands (Dixit et al, 2015). Phytoremediation is one of the bioremediation techniques can be used as an alternative solution for heavy metal remediation process in heavy metal polluted areas. Phytoremediation is considered as an emerging technology that utilizes plants and then the associated rhizosphere microorganisms to remove, transform, or contain toxic chemicals located in soils, sediments, groundwater, surface water, and even the atmosphere (Susarla et al., 2002). The phytoremediation of heavy metals is a cost-effective, efficient, environment- and eco-friendly 'green' technology based on the use of metal-accumulating plants to remove toxic metals, including radionuclides as well as organic pollutants from contaminated soils and water (Raskin et al., 1997; Ali et al., 2013).

The phytoremediation process depends on many factors such as heavy metal properties, soil properties and plant species (Laghlimi et al., 2015). The selection of plants to be used as remediating plants is the most important factor affecting the effectivity and efficiency of the phytoremediation process. According to the ideal characteristics to be considered in selecting the remediating plants stated by Lasat (2000) and Ali et al. (2013), cover crops can be selected to be used as remediating plants due to their characteristics. Cover crops are well known to have many advantages such as reducing soil erosion, increasing soil organic matter and improving soil chemical, physical and biological characteristics. The use of cover crops as phytoremediation plants was thought to be more efficient and effective to reduce heavy metals content in the soil as well as can improve soil fertility and productivity simultaneously. This short review tries to give some information about the potential use of cover crops for the heavy metals remediation process from the soils.

The Sources of Heavy Metals and Their Effects on Human Health

The sources of heavy metals in the environment

Heavy metals in the environment come from natural and anthropogenic (human intervention) sources. The most significant natural sources are minerals weathering, erosion and volcanic activity, while anthropogenic sources are mining, smelting, electroplating, the use of pesticides and fertilizers in agriculture, sludge dumping, industrial discharge, atmospheric deposition, etc. (Ali et al., 2013; Dixit et al., 2015; Laghlimi et al., 2015). Furthermore, the anthropogenic sources of several heavy metals in the environment presented in Table 1.

Table 1. Anthropogenic sources of several heavy metals in the environment (Ali et al., 2013)

Heavy Metals	Sources
As	Pesticides and wood preservatives
Cd	Paints and pigments, plastic stabilizers, electroplating of cadmium containing plastics, phosphate fertilizer
Cr	Tanneries, steel industries, fly ash
Cu	Pesticides, fertilizers
Hg	Release from Au-Ag mining and coal combustion, medical waste
Ni	Industrial effluents, kitchen appliances, surgical instruments, steel alloys, automobile batteries
Pb	Aerial emission from combustion of lead petrol, battery manufacture, herbicides and insecticides

Harmful effects of heavy metals on human health

The effects of heavy metals on human health have been known for a long time alongside with the exposure and increase of heavy metals pollution in the environment. The effects of heavy metals on human health can be serious and even lead to death (Jarup, 2003; Jarup & Akesson, 2009). The different heavy metal gives different toxic effects on human health as summarized by Ali et al. (2013) and Dixit et al. (2015) and presented in Table 2.

Table 2. Toxic effects of some heavy metals on human health

Heavy Metal	EPA* Regulatory Limit (ppm)	Toxic Effects
Ag	0.10	Exposure may cause skin and other body tissues to turn gray or blue-gray, breathing problems, lung and throat irritation and stomach pain.
As	0.01	Affects essential cellular processes such as oxidative phosphorylation and ATP synthesis
Ba	2.00	Causes cardiac arrhythmias, respiratory failure, gastrointestinal dysfunction, muscle twitching and elevated blood pressure
Cd	5.00	Carcinogenic, mutagenic, endocrine disruptor, lung damage and fragile bones, affects calcium regulation in biological systems
Cr	0.10	Causes hair loss
Cu	1.30	Causes brain and kidney damage, elevated levels result in liver cirrhosis and chronic anemia, stomach and intestine irritation
Hg	2.00	Causes anxiety, autoimmune diseases, depression, difficulty with balance, irritability, drowsiness, fatigue, hair loss, recurrent infections, insomnia, loss of memory, restlessness, disturbance of vision, tremors, temper outbursts, brain damage, lung and kidney failure
Ni	0.20	Allergic skin diseases such as itching, cancer of the lungs, nose, sinuses, throat through continuous inhalation, immunotoxic, hematotoxic, neurotoxic, genotoxic, reproductive toxic, pulmonary toxic, nephrotoxic, hepatotoxic, hair loss
Pb	15.00	Excess exposure in children causes impaired development, reduced intelligence, short-term memory loss, disabilities in learning and coordination problems, risk of cardiovascular disease, renal problems
Se	50.00	Dietary exposure of around 300 μg per day affects endocrine function, impairment of natural killer cells activity, hepatotoxicity and gastrointestinal disturbances
Zn	0.50	Dizziness, fatigue

*EPA: United State Environmental Protection Agency

Cover Crops and Phytoremediation Process of Heavy Metals

Cover crops

Cover crops are defined as the crops which are planted to be used to cover the ground surface (Sharma et al., 2018). A cover crop is a crop that is grown and unharvested in order to provide ground cover to benefit the soil and/or other crops in a number of ways. Cover crops can be from any family such as grasses, legumes or forbs. However, to be effective, the cover crop must be quick to establish, provide an early canopy cover, be aggressive enough to suppress weeds and possess a dense and deep root system to hold the soil and improve the macroporosity of the soil (Morgan, 2005). Cover crops have benefits that are summarized as follow:

- Reduce runoff and soil erosion,
- Improve soil structure and aggregate stability,
- Increase soil organic matter content,
- Prevent the leaching of available soil nutrients,
- Nutrient sequestration to recycle nutrients and limit surface and groundwater contamination,
- Increase biological diversity and disrupts pest and disease cycles,
- Improve water infiltration, water absorbing capacity and conserve soil moisture,
- Increase residue cover,
- Reduce soil compaction,
- Control weed population,
- Increase beneficial insect population,
- Some cover crops can produce certain biochemical compounds which aid in the liberation of some soil minerals,
- May provide off-season pastures,
- Soil nitrogen accumulation from legume cover crops,
- As a wildlife habitat and landscape aesthetics (Kell & McKee, 1936; Hoorman & Sundermeier, 2017; Roberts et al., 2018).

The potential use of cover crops for phytoremediation process of heavy metals

The effectivity and efficiency of the phytoremediation process depend on many factors such as heavy metal properties (bioviability of the heavy metals in the soil, speciation of the heavy metals), soil properties and plants species used (Ali et al., 2013; Laghlimi et al., 2015). Some considerations for the selection of remediating plants according to Lasat (2000) are the plants have to have high biomass production, from native species and not too palatable to prevent the risk of being consumed and grazed, and has different root system and depth to reach the different depth of contamination. Furthermore, Ali et al. (2013) have summarized the ideal characteristics of the plants to be used for phytoremediation process, they are: have hight growth rate, produce more above-ground biomass, have widely distributed and highly branched root system, more accumulate the target heavy metals from soil, translocate the accumulation heavy metals from roots to shoots, tolerant to the toxic effects of the target heavy metals, adaptive to prevailing environmental and climatic conditions, resistant to pathogens and pests, easy to cultivate and harvest, and repulsive to herbivore to avoid food chain contamination.

Many previous studies reported about plants that high potential to be used as phytoremediation plants for heavy metals. Sumiahadi and Acar (2018) collected information about several plants used for heavy metals phytoremediation from 47 different studies. However, most of the plants in the report are annual, commercial and edible crops. The use of these crops for heavy metals remediation process might be effective with heavy metals hyper-accumulation potential for some crops such as *Brassica juncea* L. (Belimove et al., 2005; Takeda et al., 2006; Singh et al., 2012; Sharma, 2016) and *Solanum nigrum* L. (Wei et al., 2006; Wei et al., 2010; Ji et al., 2011) but not highly efficient economically and practically due to their characteristics as commercial and annual that need to be planted again for continuation of the remediation process after their life cycle end. These crops also mostly highly responsive to suboptimal environmental and climatic conditions. The use of these crops also has a high risk of being harvested and consumed by humans or grazed by animals due to their high palatability.

Cover crops usually have a dense with the different depth root systems, grow faster and can cover the soil fast compared to other crop types. Cover crops can produce a higher amount of biomass and increase soil organic matter (Olson et al., 2010; Higashi et al, 2014; Olson et al., 2014). The use of cover crops also can improve the physical, chemical and biological properties of the soil (Haruna & Nkongolo, 2015; Ali et al., 2018; Nascente & Stone, 2018). Some cover crops can produce chemical compounds that help crops to uptake

the heavy metals and compart them into the root and/or shoot. Cover crops also usually have a high adaptation to a wide range of environmental and climatic conditions. The use of perennial cover crops can be more efficient for a long term process of heavy metals remediation because they do not need to be replanted after harvesting. Harvesting can be done by cutting the above-ground biomass of the plants, then the new shoots will grow and the remediation process will continue. With these reasons, the use of cover crops as phytoremediation plants was thought to be more efficient and effective to reduce heavy metals content in the soil as well as can improve the physical, biological and chemical characteristics of the soil simultaneously. Table 3 presents several potential cover crops for the phytoremediation process of heavy metals according to previous studies.

Table 3. Several potential cover crops to be used for heavy metals phytoremediation.

Plant	Heavy Metal(s)	Reference(s)
Ageratum conyzoides L.	Cd	Hamzah et al., 2016
Atriplex halimus L.	Cd, Ni, Pb and Zn	Manousaki & Kalogerakis, 2009; Amer et al., 2013
Atriplex hortensis	Cd, Cu, Zn, Pb and Ni	Kachout et al., 2009
Atriplex rosea	Cd, Cu, Zn, Pb and Ni	Kachout et al., 2009
Calendula officinalis L.	Cu	Goswami & Das, 2016
Calotropis procera L.	Pb and Cd	D'Souza et al., 2010
Chromolaena odorata	Cd	Hamzah et al., 2016
Chrysopogon aciculatus	Cr, Co, Cd, Cu, Pb, Zn, Ni and Mn	Garba et al., 2016
Cynodon dactylon	Zn, Cu, Cd, Co, Ni and Pb	Soleimani et al., 2009; Rathi et al., 2011; Shehnaz et al., 2019
Cyperus malaccensis Lam.	Cd and Zn	Chayapan et al., 2015
Echinochloa colona	Pb, Zn, Cu and Cd	Shehnaz et al., 2019
Eleusine indica L.	Cd	Hamzah et al., 2016
Euphorbia hirta	Cd	Hamzah et al., 2016
Festuca arundinacea	Cu, Zn, Ni and Pb	Soleimani et al., 2009; Kitczak et al., 2016
Festuca rubra	Cd, Cu, Ni, Pb and Zn	Golda and Korzeniowska, 2016; Kitczak et al., 2016
Halimione portulacoides	Zn	Cambolle et al., 2016
Juncus acutus	Zn	Mateos-Naranjo et al., 2014
Lantana camara L.	Pb	Alaribe & Agamuthu, 2015
Limoniastrum monopetalum	Zn	Crambolle et al., 2013
Lolium perenne	Cd, Cu, Ni, Pb and Zn	Arienzo et al., 2004; Bidar et al., 2007; Lopareva-Pohu et al., 2011; Kitczak et al., 2016;
Medicago lupulina	Ni, Pb and Zn	Amer et al., 2013
Medicago sativa L.	Cd	Ghnaya et al., 2015
Panicum maximum	Pb, Cr and Cd	Olatunji et al., 2014
Pennisetum purpureum	Cd, Cr, Zn, Cu and Pb	Juel at al., 2018; Shehnaz et al., 2019
Perotis indica	Ni, Cd and Cr	Subhashini et al., 2018
Poa pratensis	Cd, Cu, Ni, Pb and Zn	Golda & Korzeniowska, 2016; Kitczak et al., 2016
Portulaca olerace	Ni, Pb and Zn	Amer et al., 2013
Puccinellia frigida	Bo	Ramila et al., 2015
Silene vulgaris (Moench.) L.	Zn and Cd	Brown et al., 1994
Thlaspi caerulescens J. & C.	Zn and Cd	Brown et al., 1994; Robinson et al., 1998
Trifolium repens	Pb, Cd and Zn	Bidar et al., 2007; Lopareva-Pohu et al., 2011
Typha angustifolia L.	Cd and Zn	Chayapan et al., 2015
Vetiveria zizanoides	Pb, Zn, Cu and Cd	Hamzah et al., 2016; Shehnaz et al., 2019

CONCLUSION

Heavy metals are one of the serious pollutants in the environment and become a major environmental and human health problems. Phytoremediation can be an alternative solution as a green technology to treat heavy metal contaminated areas. Phytoremediation of heavy metals is a cost-effective, efficient, environment-

and eco-friendly 'green' technology based on the use of metal-accumulating plants to remove toxic metals, including radionuclides as well as organic pollutants from contaminated soils and water. With their characteristics, the use of cover crops as phytoremediation plants was thought to be more efficient and effective to reduce heavy metals content in the soil as well as can improve soil fertility and productivity simultaneously. According to the previous studies, several non-edible plants that can be used as cover crops are potential for phytoremediation process of heavy metals contaminated soils.

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HEAT SHOCK PROTEIN EXPRESSION IN DAIRY GOATS UNDER HOT ENVIRONMENTAL CONDITIONS

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ABSTRACT

This study aimed to investigate the relationship between the environmental data, physiological parameters and plasma concentration of heat shock proteins (HSP 60 and 70) in dairy goats. This study involved 65 Saanen and 73 Alpine crossbreds reared at the Dairy Goat Research Farm of Çukurova University, Adana (Turkey). Physiological parameters (rectal temperature, respiration and pulse rate) and climatic data (air temperature, relative humidity) were recorded. In addition, blood samples were collected from jugular vein to get the plasma samples which were used to assay the concentration of HSP 60 and 70. The environmental conditions reflected through a high THI (THI= 82.6) showed that the goats were subjected to thermal stress. On the other hand, the average HSP 60 significantly lower in winter (4.4 ± 0.5 ng/ml) followed by spring (7.6 ± 0.6 ng/ml) and summer (9.05±0.82 ng/ml). Whilst, the HSP 70 was 22.6 ± 0.6, 14.4 ± 0.5 and 13.3 ± 0.4 ng/ml in summer, spring and winter respectively. We can concluded that under harsh conditions the dairy goats synthesised more heat shock protein which can be used as thermoregulatory indicator.

Keywords: *Dairy goat, heat shock protein, Goats*

INTRODUCTION

Environmental change is associated with thermal stress resulting into various physiological and biochemical reactions which are inter-correlated. The physiological adaptation to external environment has highly effect on productivity of dairy goat. Dairy goats have optimal temperature zones or thermo-neutral zones within which their body temperature remains relatively constant and favourable for optimal production. However, when exposed to the ambient temperature below or above the thermo-neutral zone, goats alter their rectal temperature, respiration and heart rate to cope whether cold or heat stress. Further, thermal stress is genetically governed, and heat shock protein play key role influencing heat stress in animal (Sailo et al. 2015). Indeed, when exposed to harsh stimuli, genes activate and form heat shock proteıns (HSPs) to protect cells against stressors. HSPs are molecular chaperons that maintain native conformation of proteins and cell viability during stress period (Kishore et al., 2016). HSP70 is an essential molecular chaperone of primary importance to all mammalian cells. They protect cells, tissues, and organs from stress by helping protein folding (assembly and refolding) in endoplasmic reticulum (Gade et al., 2010; Jee, 2016). As for the HSP60, it gathers protein by forming hetero-oligomeric protein complex (Jee, 2016). This paper reports the findings related to the investigation the relationship between physiological and serum concentration of heat shock proteins in Alpine and Saanen goats in three seasons i.e winter, spring and summer under subtropical Mediterranean conditions.

MATERIALS AND METHODS

Animal materials

The study was carried out on 65 Saanen and 73 Alpine crossbreds kept at the Dairy Goat Research Farm of Çukurova University, Adana (Turkey). The study area is characterized by subtropical climate conditions with cold dry winter (December to March) and hot humid summer (May to August). The lowest and highest ambient temperature which can reach -8.1°C and 45.6°C are recorded in January and August respectively. The average annual precipitation and relative humidity are 450 mm and 66% respectively. The trials was conducted during three seasons (winter, spring and summer).

Climatic parameters

The daily environmental data including air temperature and relative humidity (RH) on the research site were recorded using a thermometer and a barometer were used for climatic data collection. Then, temperature humidity index (THI) according to the formula developed by (Abdel-Samee, 1996): THI = db - (0.55 - 0.55 RH) (db - 58); where db: the dry bulb temperature.

Physiological data

Rectal temperature (RT), respiration rate (RR) and pulse rate (PR) were recorded from experimental animals in the morning at (07:00-08:00) and afternoon (13:00-14:00). RR and PR were recorded by using a

stethoscope. The RT was recorded using digital thermometer which inserted into the rectum: The stabilized rectal temperature was recorded after the two minutes. These parameters were recorded during every season over the experimentation period.

Heat shock proteins assay

To determine the serum concentration of HSP, serum samples were isolated from 5-8 ml of blood collected from jugular vein of each goats using heparinized vacutainers tubes. Blood samples transferred to the laboratory of the department of animal science, Çukurova University in cool box (approximately 4ºC). Then, blood samples were processed through centrifugation for 15 minutes at 1500 rpm. Using clean pipette, 210ul of serum were taken into labelled microtubes. These later were used to measure the HSP70 and 60 levels using the enzyme-linked immunosorbent assay (ELISA) test. The HSP assay procedure was described by the ELİSA kits supplier (SunRed Biotechnology Co., Catalogue No. 201-07-0733, Shanghai, China).

Statistical analysis

HSPs concentrations and physiological data were statistically analysed separately following the General Linear Model procedures in SPSS 20. Differences were tested with Duncan's Multiple Range Test at a level of 5% or 1%. Pearson's correlations among HSP and climate data were determined.

RESULTS AND DISCUSSION

Climatic and physiological parameters

The variation of environmental (AT, THI and RH) and physiological (RT, RR and PR) parameters are given in the table 1. The average THI were 54.5, 70.1 and 82.6 in winter, spring and summer respectively. Given that the THI during summer was higher than the optimal THI for thermal comfort of goat (THI< 70) (Silanikove, 2000), therefore the experimental goats were subjected to heat stress. The physiological parameters are great heat induced stress indicators in goats. In the current study, the highest records of RR, RT and PR were observed in summer, while the lowest in winter. In summer, the overall means of RT (39.8 ± 0.4ºC) were significantly (P<0.05) higher than spring (37.6 ± 0.2ºC) and winter (36.0 ± 0.08ºC). Regarding the RR, it was significantly lower in winter (55.6 ± 1.4 breaths/min) than spring (62.1±1.9 breaths/min) and summer (97.7 ± 3.0 breaths/min). The PR was significantly higher in summer (108.8 ± 1.5 bpm) followed by spring 96.8 ± 3.1 and winter 94.3 ± 3.0 bpm. However, a significant difference was not observed between winter and spring for the PR.

Several evidences demonstrated the harmful effects of environmental change such high ambient temperature and solar radiation associated with heat stress become a major factor negatively affecting domestic animals productivity. To cope this thermal uncomforting period animals develop some physiological responses which are exhibited through an increase of RR, RT and PR. The findings in the present study are consistence with previous study in the same area ((Darcan et al., 2007; Darcan and Güney, 2008; Darcan et al., 2009, Kaliber et al., 2016; Agossou et al., 2019)

HSP 60 and 70 concentration in serum

The values of HSP 60 and HSP 70 were significantly (P< 0.05) higher in summer than spring and winter (Table 2). The average HSP 60 significantly lower in winter (4.4 ± 0.5 ng/ml) followed by spring (7.6 ± 0.6 ng/ml) and summer (9.05±0.82 ng/ml). Whilst, the HSP 70 was 22.6 ± 0.6, 14.4 ± 0.5 and 13.3 ± 0.4 ng/ml in summer, spring and winter respectively.

Table 1. Environmental and physiological parameters

Seasons	Hours	AT (°C)	RH (%)	Average THI
Winter	07:00-8:00	9.4 ± 0.2	64.3 ± 1.6	54.5
	13:00-14:00	16.2 ± 0.3	52.6 ± 0.5	
Spring	07:00-8:00	20.7 ± 0.2	73.1 ± 1.3	70.1
	13:00-14:00	26.8 ± 0.3	46.3 ± 1.4	
Summer	07:00-8:00	28.7 ± 0.1	73.4 ± 0.6	82.6
	13:00-14:00	34.9 ± 0.1	46.3 ± 0.6	

Seasons	Breeds	Hours	RT (ºC)	PR (bpm)	RR (breaths/min)
Winter	Alpine	07:00-8:00	35.7 ± 0.05^{b}	89.3 ± 2.7^{a}	55.82 ± 2.2^{a}
		13:00-14:00	36.3 ± 0.06^{b}	93.5 ± 2.9^{b}	56.3 ± 1.1^{b}
	Saanen	07:00-8:00	35.9 ± 0.1^{a}	95.9 ± 3.5^{a}	51.9 ± 1.1^{a}
		13:00-14:00	36.1 ± 0.1^{b}	98.6 ± 3.0^{b}	58.2 ± 1.1^{b}

Spring	Alpine	07:00-8:00	37.3 ±0.1[b]	91.3 ± 2.7[a]	56.6 ± 1.9[a]
		13:00-14:00	38.4 ± 0.3[a]	97.6 ± 3.2[b]	67.2 ± 2.4[b]
	Saanen	07:00-8:00	36.5 ± 0.1[a]	98.4 ± 2.5[a]	58.7 ± 1.6[a]
		13:00-14:00	38.1 ± 0.3[b]	99.9 ± 3.9[b]	65.9 ± 1.8[b]
Summer	Alpine	07:00-8:00	39.0 ± 0.1[a]	105.7 ± 1.6[a]	89.3 ± 2.7[a]
		13:00-14:00	40.6 ± 0.8[b]	113.8 ± 2.3[b]	106.9 ± 2.9[b]
	Saanen	07:00-8:00	38.6 ± 0.4[a]	103.9 ± 0.9[a]	80.7 ± 2.9[a]
		13:00-14:00	40.9± 0.1[b]	108.5 ± 1.04[b]	113.8 ± 3.4[b]
Sig.	Seasons	-	*	*	*
	Breeds	-	NS	NS	NS

*AT: Ambient Temperature, RH: Relative Humidity, THI: Thermal Index Humidity; RT: Rectal Temperature, PR: Pulse Rate, RR: Respiration Rate; *,a,b significant at P<0.05, NS: Non-Significant at P<0.05*

As seen in the table 2, a positive and significant correlation was observed between HSP concentration, seasons, THI and physiological parameters. Since elevated levels of HSP was reported during exposure to different environmental stresses and water deprivation, the high HSP concentration observed in this study during summer was in accordance with previous studies carried out in cattle (Kishore et al., 2016; Archana et al., 2017). The HSP70 has been suggested to function as an indicator of thermo-tolerance in cells (Archana et al., 2017).

Table 2. Levels of HSP 60 and 70 in experimental goats

HSP	HSP60 (ng/ml			HSP 70 (ng/ml)		
Seasons	Winter	Spring	Summer	Winter	Spring	Summer
Saanen	4.3±0.65[b]	8.7±0.72[a]	9.4±1.12[a]	13.9±0.36[b]	14.7±0.61[a]	26.9±0.66[a]
Alpine	4.4±0.42[a]	6.5±0.43[b]	8.7±0.52[b]	12.7±0.5[a]	14.1±0.41[b]	18.34±0.47[b]

	Seasons	THI	RT (ºC)	PR (bpm)	RR (breaths/min)
HSP 60	0.982**	0.886**	0.996*	0.514*	0.540*
HSP 70	0.991**	0.880**	0.985*	0.538*	0.539*

CONCLUSION

Standing on the findings of the current study we can conclude that, in Saanen and Alpine goats exposed to heat stress, the thermoregulatory adaption is exhibited through an increase rectal temperature, respiration and pulse rate. Further the higher levels of HSP 60 and 70 recorded can be used as thermoregulation indicators.

ACKNOWLEDGEMENTS.

Authors are grateful to the Research Fund Unit of Çukurova University for providing financial support to this research through the project FDK-2017-7992.

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EFFECT OF HIGH POTASH FERTILIZER IN GROWTH AND PRODUCTIVITY OF THREE TABLE BEET (*BETA VULGARIS)* CULTIVARS

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ABSTRACT

The experiment was carried out in the vegetable field of Horticulture department / Faculty of Agriculture and Forestry / University of Mosul during 2017-2018 season, to investigate the effect of high-potash fertilizer with three concentrates (0, 2.5 , and 5 g. L-1) on three table beet cultivars (Netherland, American, and Iraqi).

The experiment was carried out according to Randomized Complete Blocks design with three replicates. The results showed that Iraqi cultivar gives the highest values of plant length, leaves number, leaf area , chlorophyll content , root length , root weight , total yield , TSS , and root content of N , P ,K, protien . Spraying high-potash fertilizer increased significantly leaves number, root length, average root weight, total yield, and root content of N, P, K and protein.

Keywords: *Beet, Root, Cultivars, Yield, Potassium.*

INTRODUCTION

Garden beet or Tabel beet (*Beta vulgaris* L.) are one of the winter vegetable crops in Iraq belong to Chnopodiaceae family and its conceder as a root vegetable crops although the portion eaten from this crop is an inflated lower embryonic pedicle plus the upper part of the root contains important nutrients such as carbohydrates, minerals and vitamins (Matlob et al.,1989) .The beet is a stressful soil crop so many studies have focused on fertilizing this crop on the use of chemical fertilizers. Potassium have an important effect in photosynthesis, enzyme activity improving synthesis of carbohydrates, protein, translocation of photosynthetic, which increase their ability to pests and diseases resistance. Also, potassium is considered as osmotic active cation of plant cell (Mehdi et al., 2007) where it increase water uptake and root permeability, beside its role in water use efficiency increasing (Zekri and Obreza, 2009).

Plants that accumulate large amount of carbohydrate, protein and sugar in their storage tissues have high K requirements. Potassium and others accompanying anions make a major contribution to the osmotic potential. In sugar beet, K plays a significant role in biosynthesis and transfer of sucrose to storage roots (Winzer et al., 1996).

Li Yu-ying and Liang Hong, 1997 used K by two source KCl and K_2SO_4 with five concentration (50,100,150,200,500 mg.K_2O.Kg.$^{-1}$ soil), they found that 150mg. of KCl and 100 mg. of K_2SO_4 increased significantly number of leaves and chlorophyll content, sugar content %, sugar yield.

The availability of plant nutrients are strongly related to the properties of soils. Calcium carbonate is one of the important factors that limit the nutrient availability in soils. Calcareous soils which contain significant quantities of free lime (CaCO3) are common in arid and semi-arid climate affecting over 600 million hectares of world soils (Leytem and Mikkelsen, 2005).

Sugar beet is classified as a high potassium requiring crop therefore potassium fertilization became an important factor for increasing sugar beet production under arid and semi-arid soils. Potassium (K) is an important element in the plant tissues. It has a role in physiological rocesses in the plant such as transpiration, respiration, translocation of carbohydrates and sugars, energy transformation and enzyme actions (Nafei et, al. 2010).

Amer et al. (2004) found that adding potassium up to 90 kg K_2O/fed resulted a significant increase in root and sugar yield/fed as wll as N %, P % and K %, TSS, sucrose and purity in beet root% . Nafei et. al.

2010 reported that adding potassium at 36 Kg K_2O/fed gave significant increase root length, diameter, fresh weight/plant, total soluble solids% and root yield.

Jasim, et, al. 2013 found that spraying high potash fertilizer (36% K_2O) increased significantly plant length, tuber average weight, and total yield of potato.

The aim of this study is to evaluate the effects of fertilizer application of high potash on yield, quality, and root chemicals composition of table beet.

MATERIAL AND METHODS

The experiment was carried out in Horticulture and landscape department / Faculty of Agriculture and Forestry / University of Mosul during 2017-2018 season, to study the effect of high-potash fertilizer on three table beet cultivars. The seeds planted on 10 Aug. 2018 on both sides of a beads 75 cm width and the distance between the plants 15 cm in sandy soil, some of the physical and chemical characteristics is illustrated in table 1.

Table 1: Some physical and chemical characteristics of field soil

pH	EC	N	P	K	Soil texture %		
----	Ds.m	mg/K			Clay	Silt	Sand
7.55	0.55	37.8	9	117	2	43	55

The experiment consisted of two factors: three cultivars (Netherland, American, and Iraqi) and spraying with high potash fertilizer (peter professional fertilizer 12-0-43 + TE) with three concentrates (zero, 2.5 g.L^{-1}, and 5 g. L^{-1}). The high-potash fertilizer was sprayed three times the first one after 40 days of planting on 20/9/2018 and the second one after 15 days from the first and third one after 15 day of the second. The experiment was carried out according to Randomized Complete Blocks design with three replicates The following measurements were recorded: plant length (cm.) - Number of leaves / plant - Leaf area / plant (cm^2)- Dry matter percentage of leaves - Chlorophyll content (SPAD) - Root length (mm) - Root diameter (mm) -Tap root length (mm) - total yield of roots – percentage of nitrogen, phosphorus, potassium, protein and TSS in root.

Determination of minerals content was determined in dry matter of beet root at harvest time and calculated as (mg /g dry matter weight), nitrogen determined according to Page et al, 1982 using microkeldahl method, Phosphorus was determined by the Vanadium – molybdate method according to Tandon HLS, 1999 using Spectrophotometer, potassium was determined by using the flame photometer according to Tandon, 1995.

The results were statistically analysis according to the statistical analysis system (SAS) (SAS 1998) and compared with the means by Duncan multiple rang test at 0.05 level (Al-Rawy and Kalaf, 2000)

RESULTS

Table 2: shows the effect of high-potash fertilizer on the vegetative growth parameters of three table beet cultivars. We found the superiority of the Iraqi cultivar on the Netherland and American cultivars in plant length, number of leaves and leaf area of the plant. There was also no significant effect of the levels of potash fertilizer in the traits of plant height, leaf area and dry matter, while spraying of 5 g. L^{-1} high potash fertilizer increased leaves number of plant.

Table 2: Effect of high potash fertilizer in vegetative growth parameters of three table beet cultivars

Treatment	Plant length (cm)	Number of leaves/plant	Leaf area (cm^2)	Dry matter in leaves %
Cultivars mean effect				
Netherland	41.75 b	16.71 b	2243 b	9.40 a
American	44.63 b	16.87 b	2651 b	8.99 a
Iraqi	59.81 a	25.20 a	3644 a	8.60 a
K mean effect				
0 g. L^{-1}	47.75 a	18.41 b	2526 a	8.95 a
2.5 g.L^{-1}	49.38 a	18.92 ab	2928 a	8.86 a
5 g. L^{-1}	49.08 a	21.45 a	3084 a	9.18 a

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table 3 illustrate the effect of the interaction between cultivars and high potash fertilizer in the vegetative growth properties of table beet. The highest plant length (61.58 cm) was from the treatment of the interaction between the Iraqi cultivar and 2.5 g. L^{-1} potassium which is significantly different from all Netherland and American treatments.

The highest number of leaves per plant (30.03) and the largest leaf area (3919 cm2) was obtained from the interaction treatment between the Iraqi cultivar and 5 g. L^{-1} potassium, which is superior to all other treatments While the lowest values of the three parameters (39.22 cm, 15.36, 1804 cm), respectively was from the interaction treatment between the Netherland cultivar and 0 potassium. Regardless to the percentage of dry matter in the leaves, there are no significant differences between all treatments.

Table 3: Effect of combination treatments between cultivars and high potash fertilizer in vegetative growth parameters of table beet plant

Treatment		Plant length (cm)	Number of leaves/plant	Leaf area (cm^2)	Dry matter in leaves%
Netherland	0 g. L^{-1}	39.22 b	15.36 d	1804 c	9.70 a
	2.5 g.L^{-1}	42.47 b	17.90 cd	2715 a bc	9.40 a
	5 g. L^{-1}	43.57 b	16.86 d	2211 bc	9.10 a
American	0 g. L^{-1}	45.32 b	16.63 d	2345 abc	8.60 a
	2.5 g.L^{-1}	44.08 b	16.53 d	2484 abc	8.69 a
	5 g. L^{-1}	44.51 b	17.46 d	3123 abc	8.69 a
Iraqi	0 g. L^{-1}	58.72 a	23.23 b	3428 ab	8.55 a
	2.5 g.L^{-1}	61.58 a	22.35 bc	3583 ab	8.51 a
	5 g. L^{-1}	59.14 a	30.03 a	3919 a	8.76 a

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table 4 shows the effect of high-potash fertilizer in the chlorophyll content, root length, root diameter and tap root length of the three cultivars of table beet. We observed a superiority of the Iraqi cultivar on the American and Nederland in terms of the four traits. While the addition of high potash fertilizer did not have significant effect on the properties of chlorophyll content , length and diameter of the root while the highest length of the tap root (13.88 cm) was from the fertilizer treatment with 5 g. $L.^{-1}$.

Table 4: Effect of high potash fertilizer in Chlorophyll content, root length, root diameter, tap root length of three table beet cultivars

Treatment	Chlorophyll content (SPAD)	Root length (mm)	Root diameter (mm)	Tap root length (mm)
Cultivars mean effect				
Netherland	31.05 b	74.37 ab	83.67 a	11.14 b
American	31.04 b	65.11 b	73.13 b	12.22 b
Iraqi	35.51 a	81.37 a	90.70 a	15.47 a
K mean effect				
0 g. L^{-1}	32.08 a	70.63 a	80.88 a	12.31 b
2.5 g.L^{-1}	34.45 a	73.58 a	82.38 a	12.64 ab
5 g. L^{-1}	31.06 a	76.64 a	84.25 a	13.88 a

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels. Data presented in table 5 indicated that combination treatments between cultivars and high potash fertilizer had significant effect in chlorophyll content, root length, root diameter, and tap root length of table beet, the highest chlorophyll content in leaves (37.30) obtained from interaction treatment between Iragi cultivar and 2.5 g.L-1 potassium ,while the highest values of root length (85.59 mm), root diameter (93.54 mm), and tap root length (16.30 cm) obtained from interaction treatment between Iraqi cultivars and 5 g. L-1 potassium.

Table 5: Effect of combination treatments between cultivars and high potash in Chlorophyll content, root length, root diameter, tap root length of table beet

Treatment		Chlorophyll content (SPAD)	Root length (mm)	Root diameter (mm)	Tap root length (cm)
Netherland	0 g. L^{-1}	30.06 bc	65.30 b	80.89 ab	10.33 d
	2.5 g.L^{-1}	35.20 ab	62.57 b	85.55 ab	11.48 cd
	5 g. L^{-1}	27.90 c	67.46 ab	84.58 ab	11.60 cd
American	0 g. L^{-1}	32.03 abc	76.87 ab	72.01 b	11.49 cd
	2.5 g.L^{-1}	30.86 abc	78.26 ab	72.76 b	11.43 cd
	5 g. L^{-1}	30.23 bc	67.99 ab	74.64 b	13.76 bc
Iraqi	0 g. L^{-1}	34.16 abc	78.61 ab	89.75 ab	15.10 ab
	2.5 g.L^{-1}	37.30 a	79.91 ab	88.82 ab	15.00 ab
	5 g. L^{-1}	35.06 ab	85.59 a	93.54 a	16.30 a

Table 6: revealed that there was a significant effect of cultivars and high potash fertilizer ton root weight, total root yield, dry matter in root, and TSS% in root. Iraqi cultivar gave the highest values of root weight (381.43 g.) and total root yield (54.925 ton. H.-1), while the highest values of dry matter (13.41 %) and the TSS (10.22%) was from Netherland cultivar. Regardless the effect of high potash it was found that spraying the plants with 2.5 g.L^{-1} increased significantly the root weight, total root yield, and TSS%.

Table 6: Effect of high potash fertilizer in root weight, total root yield, dry matter, and TSS% in root of three table beet cultivars

Treatment	Root weight (gr.)	Total Roots Yield (ton. Ha^{-1})	Dry matter in roots (%)	TSS in Roots (%)
Cultivars mean effect				
Netherland	213.92 b	30.804 b	13.41 a	10.22 a
American	194.92 b	28.068 b	11.10 c	8.02 b
Iraqi	381.43 a	54.925 a	12.51 b	10.18 a
K mean effect				
0 g. L^{-1}	225.97 b	32.539 b	12.13 ab	9.16 a
2.5 g.L^{-1}	305.25 a	43.956 a	12.00 b	9.68 a
5 g. L^{-1}	259.05 b	37.303 b	12.89 a	9.58 a

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table 7 illustrate the effect of combination treatments between cultivars and high potash fertilizer in root weight, total root yield, dry matter, and TSS% in root. The interaction treatment between Iraqi cultivar and 2.5 g.L-1 potassium gave the highest values of root weight (455.35 g) and total roots yield (65.570 ton. $H.^{-1}$). While the highest value of dry matter (13.94 %) obtained from the interaction treatment between Netherland cultivar and 5 g L^{-1} potassium , and the highest value of TSS (10.50%) was from the interaction treatment between Netherland cultivar and 2.5 g.L-1 potassium.

Table 7: Effect of combination treatments between cultivars and high potash in root weight, total root yield, dry matter, and TSS% in root

Treatment		Root weight (g)	Total Roots Yield (ton. H^{-1})	Dry matter in roots (%)	TSS in Roots
Netherland	0 g. L^{-1}	174.89 d	25.184 d	13.50 ab	10.00 abc
	2.5 g.L^{-1}	258.18 cd	37.177 cd	12.79 a-d	10.50 a
	5 g. L^{-1}	208.70 d	30.052 d	13.94 a	10.16 ab
American	0 g. L^{-1}	185.59 d	26.725 d	10.67 f	7.50 d
	2.5 g.L^{-1}	202.22 d	29.119 d	11.22 ef	8.16 cd
	5 g. L^{-1}	196.95 d	28.360 d	11.42 def	8.41 bcd
Iraqi	0 g. L^{-1}	317.42 bc	45.700 bc	12.23 b-e	10.00 abc
	2.5 g.L^{-1}	455.35 a	65.570 a	12.01 c-f	10.37 a
	5 g. L^{-1}	371.51 ab	53.497 ab	13.30 abc	10.16 ab

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table 8: Effect of high potash fertilizer in N, P, and K content, protein % and protein content of three table beet cultivars

Treatment	N content (mg/plant)	P content (mg/plant)	K content (mg/plant)	Protein %	Protein content (mg/plant)
Cultivars mean effect					
Netherland	927.9 b	45.471 b	642.52 a	20.029 b	5.799 b
American	606.4 c	21.566 c	433.95 b	16.381 c	3.790 c
Iraqi	2523.3 a	55.381 a	678.22 a	36.242 a	15.77 a
K mean effect					
0 g. L^{-1}	813.8 b	24.55 b	480.58 b	16.32 c	5.08 b
2.5 g.L^{-1}	1588.1 a	46.78 a	624.32 a	25.03 b	9.92 a
5 g. L^{-1}	1655.7 a	51.08 a	649.80 a	31.29 a	10.34 a

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table 8 revealed the effect of high potash fertilizer in N, P, and K content, protein % and protein content of the three table beet cultivars. The highest values of the five properties (2523.3 mg N, 55.381 mg.P, 678.22 mg K, 36.242% protein , and 15.77 mg. protein) obtained from the Iraqi cultivar with significantly superior of the Netherland and American cultivars , and the lowest values obtained from the American cultivar.

Spraying high potash fertilizer with (2.5 g.L-1 and 5 g. L-1) on the table beet plants increased significantly N ,P, K, protein content and protein % compared with control treatment.

Table 9 illustrated the effect of combination treatments between cultivars and high potash fertilizer in N, P, K content, protein % and protein content in root of table beet.

The highest content of N (3036.9 mg.) and protein (18.98 mg) was obtained from interaction treatment between Iraqi cultivar and 2.5 g.L-1 potassium. While the highest content of P (74.81 mg) and K (730.75 mg) and protein % (40.79 %) was obtained from interaction treatment between Iraqi cultivar and 5 g. L-1 potassium.

Table 9: Effect of combination treatments between cultivars and high potash fertilizer in N, P, K content, protein % and protein content in root of table beet

Treatment		N content (mg/plant)	P content (mg/plant)	K content (mg/plant)	Protein %	Protein content (mg/plant)
Netherland	0 g. L^{-1}	249.3 d	33.15 c	495.46 bc	6.62 h	1.55 d
	2.5 g.L^{-1}	1012.8 c	51.47 b	700.94 ab	20.75 e	6.33 c
	5 g. L^{-1}	1521.5 b	51.78 b	731.16 a	32.71 c	9.50 b
American	0 g. L^{-1}	372.3 d	13.25 d	307.87 c	10.87 g	2.32 d
	2.5 g.L^{-1}	714.5 cd	24.80 cd	506.50b c	17.89 f	4.46 cd
	5 g. L^{-1}	732.4 cd	26.63 cd	487.48 bc	20.37 e	4.57 cd
Iraqi	0 g. L^{-1}	1819.7 b	27.26 cd	638.40 ab	31.46 d	11.37 b
	2.5 g.L^{-1}	3036.9 a	64.06 ab	665.52 ab	36.45 b	18.98 a
	5 g. L^{-1}	2713.2 a	74.81 a	730.75 a	40.79 a	16.95 a

Means followed with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

DISCUSSION

Sugar beet is a crop with high demand for potassium, more potassium is taken up by the sugar beet crop than any other nutrient. Sugar beet responded positively to potassium application both quantity and quality.

Potassium positively effects sugar content and yield because of its specific physiological effects on synthesis, transport and storage of sugars.

Another very important Potassium function is the maintenance of plant osmotic potential, cell turgor and increases the crops' resistance to pests thereby allowing healthy crop development to proceed (Oosterhuis al 2013). It is necessary to giving recommendation that there is great potential of potassium use in produce Sugar beet for economical industrial sugar production.

The increase in vegetative parameters of plant may be due to the crucial role of potassium in controlling the ionic balance, which facilitates the readiness of the elements of the plant, photosynthesis, protein synthesis, translocation of assimilates. In addition to the role of potassium in increasing the efficiency of water consumption of plants, which reflected positively in the improvement of plant growth, and yield. These results are consistent with what Kandil (2016) noticed that that potassium fertilization induced increases the sugar beet parameters, where the three sugar beet varieties under study showed significant differences in several characters.

The increase in yield and chemical constituents due to increases potassium fertilizer levels may be due to the role crucial of potassium in water relation, stomata faction, photosynthesis, enzyme activation, oxidative metabolism, phloem transport and charge balance in plant (Marschner 1995; Cakmak, 2005). These results are consistent with what Cao and Tibbittis (1991) found that increase potassium concentration gave significant dry weight, leaf area and dry matter accumulation in plants and significant increase in chlorophyll in plant leaves compared to the control, and also in harmony with that found by Jasim et.al., 2013 that spraying high potassium fertilizer increased tuber weight and total yield in potato.

The addition of Potassium fertilizer has increasing in nutrients concentration through improving root growth, photosynthesis, translocation to different plant parts , would have enhanced nutrients content in plant Yadav et al , 2012.

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PRIMING EFFECT ON CHICKPEA *CICER ARIETINUM* SEEDS GERMINATION PERFORMANCE UNDER DROUGHT STRESS

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ABSTRACT

Cicerarietinum chickpea cultivation is practiced around the world for its agronomic economic ecological and food importance. Nevertheless, it is influenced by biotic and a biotic constraints of which the drought represents 30%. Germination is the first stage of the plant life cycle and establishment of seedlings are the crucial phases for plant development and species expansion. Multiple research efforts aimed on crop growth improving and development in agricultural field by priming or seed pre-treatment is more and more frequently applied for culture increase.

Priming with chemical or vitamin solutions can improve the germination and seed growth parameters for possible stress tolerance water.

Three chickpea genotypes are tested Flip 84 92 C, Flip 93 93 and Ghab-4. The parameters of seed germination and growth are studied after pre-treatment with ascorbic acid and zinc sulphate at different concentrations. Their germination is conducted under different levels of simulated water stress with polyethylene glycol.

The percentage of germination, the length of the seedlings their fresh and dry weight as well as vigour index are enhanced by priming including ascorbic acid for Flip 84 92 C and Flip 93 93 under water stress. For seeds of the third genotype, zinc sulphate seems more favourable.

Keywords: *Priming, Chickpea, Water stress, Zinc sulphate, Ascorbic acid.*

BACKGROUND

Cicer arietinum chickpea cultivation is practiced worldwide for its agronomic economical, ecological and food importance. Nevertheless, it is constantly influenced by abiotic and biotic constraints including drought, a natural risk affecting a significant proportion of the world's population, particularly people living in semi-arid and arid regions. Its consequences for farming communities can be considerable, directly hampering efforts to reduce poverty and hunger. In terms of drought, FAO's work is helping to build technical and institutional capacity to better manage land and water in extreme weather conditions and the development of practical options, innovative, policy-effective and to facilitate water management. Germination is the first stage of the plant life cycle and establishment of seedlings are the crucial phases for plant development and species expansion.

Priming with chemical or vitamin solutions can improve the germination and seed growth parameters for possible water stress tolerance.

Chickpea seeds germination characteristics after priming are studied to analyze their behaviour under drought stress.

METHODOLOGY

Three chickpea genotypes attested, Flip 84 92C, Flip 93 93 and Ghap-4. seed germination parameters are stated after pre-treatment with ascorbic acid and zinc sulphate under different levels of simulated water stress with PEG6000 at 0,-0.3,-0.6 and -0,8 bar.

Different PEG6000 concentrations are prepared according to Michel and Kofmann (1973) formula.

$$\Psi H=-(1{,}18\times10^{-2})C-(1{,}18\times 10^{-4})C^2+(2{,}67\times 10^{-4})CT+(8{,}39\times 10^{-7})\ C^2T$$

T: incubation temperature

C: PEG6000 concentration (g/l H_2O)

Germination rate

$$GR\%=(Gn/Tn)\times100$$

Gr: germination rate at 8th day

Tn: total seeds number

Seedling vigour index

The seedling vigour index is determined after 8 days of growth according to the formula suggested by Abdul-Baki and Anderson (1973). It is and indicator that assesses seed behaviour under poor environmental conditions.

VI=(RL+SL)xGR

RL: root length in cm

SL: aerial part length in cm

GR: germination rate

Results and discussion

The percentage of germination(Fig.1, 2), the length of the seedlings their fresh and dry weight as well as vigour index (Fig.3)are enhanced by priming including ascorbic acid for Flip 84 92 C and Flip 93 93 under water stress. For seeds of the third genotype Ghab-4, zinc sulphate seems more favourable.

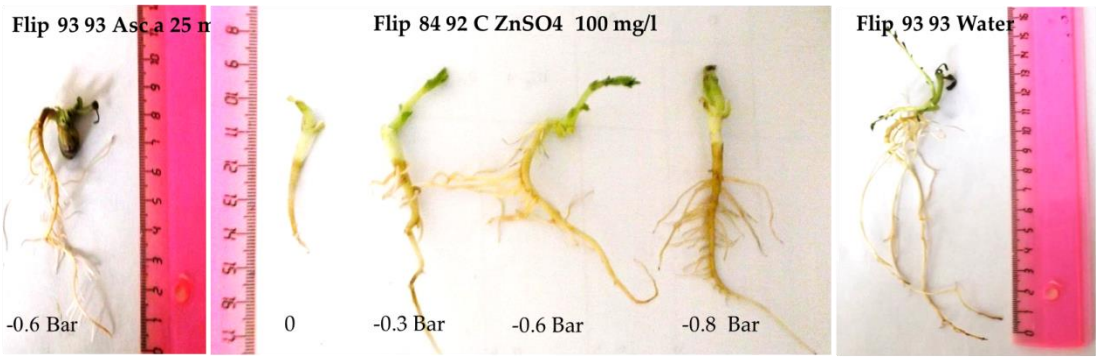

Figure 1: Seedling obtained from primed seeds under different drought levels

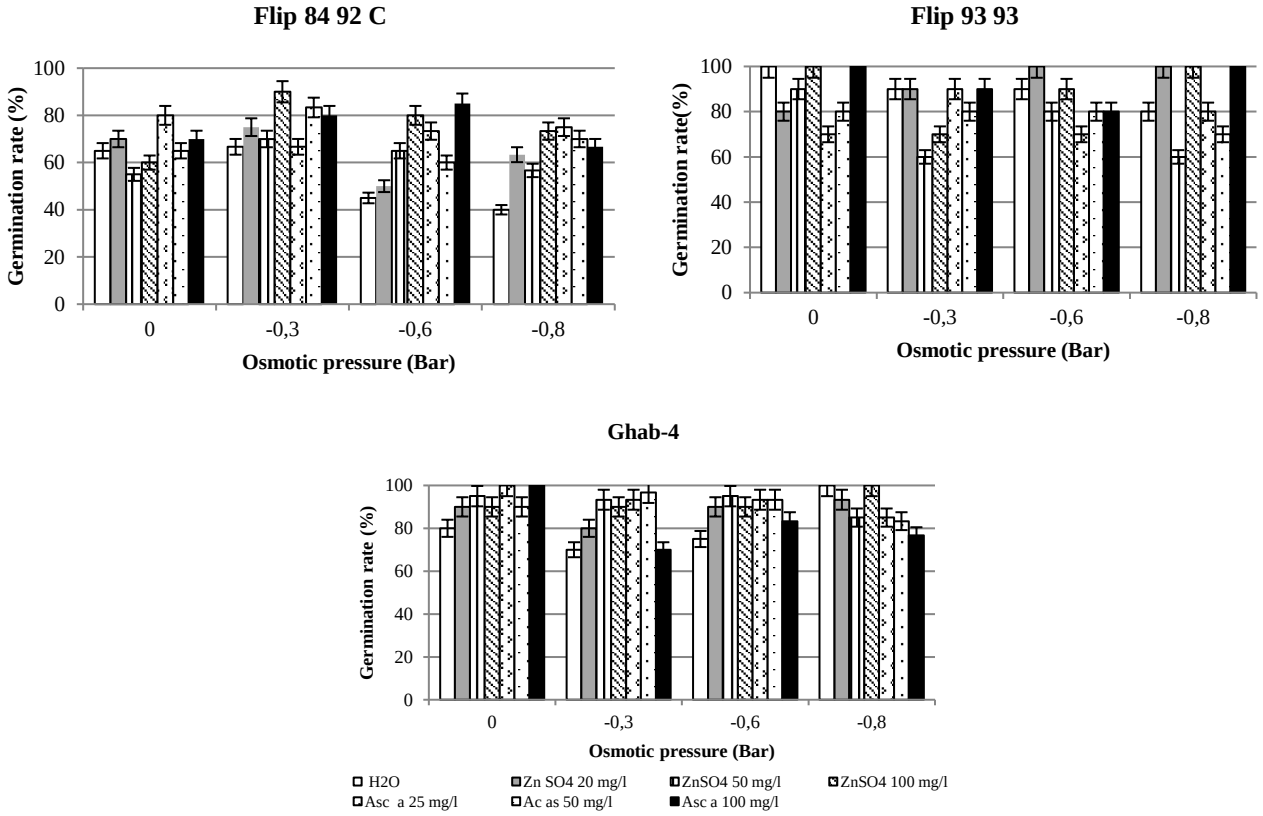

Figure 2: Germination rate of three chickpea genotypes primed seeds under drought stress

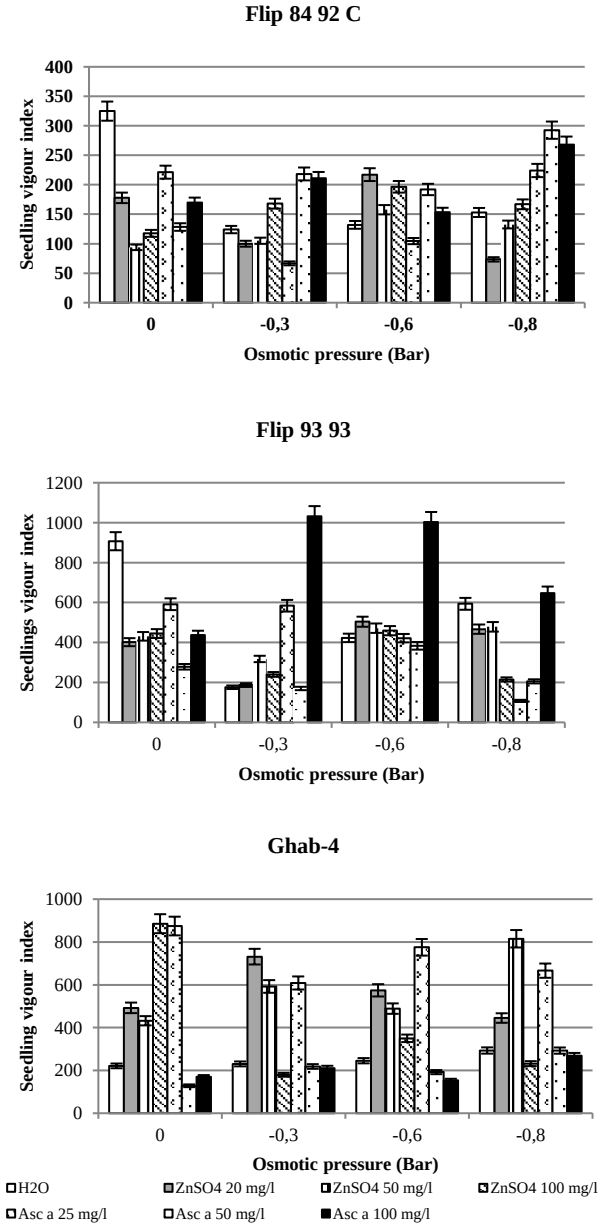

Figure 3: Vigour index of three chickpea genotypes primed seeds under drought stress

Similar results are reported by Yunial and Nautial (1998). Overall priming improves the germination of seeds under stress or not (Murungu *et al*., 2003). The results show that ascorbic acid significantly improves the growth parameters studied. Under stress, ascorbic acid can suppress free radicals. Moreover for the Ghab-4 genotype, zinc sulphate priming promoted the germination of seeds under water stress. Indeed it is reported that seed priming with zinc sulphate on the characteristics of germination and growth of chickpea plants (*Cicer arietinum* L) (Khan *et al*, 2011).

CONCLUSION

For the Flip 84 92 C genotype, seeds soaked in distilled water and not subject to water stress have a higher vigor index than the seeds of other pre-treatments and the use of ascorbic acid at 50 to 100 and 25 mg/l allows for high index under stress at -0.8 Bar. For Flip 93 93 C, it is also observed that pre-treatment with ascorbic acid at different concentrations tested resulted in the optimization of seedling vigor especially in stressed seeds) when used at 100 mg/l. For the Ghab-4 genotype, zinc sulphate pre-treatment appears to be more conducive to improving seedling vigor in stressed seeds.

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EFFECTS OF SALT STRESS ON GERMINATION AND SEEDLING GROWTH IN BARLEY (*HORDEUM VULGARE*)

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ABSTRACT

Salinity is one of the major abiotic stress limiting the growth and productivity of plants. This work presents a study of germination and early seedling growth of two varieties of Algerian barley (Hordeum vulgare) under salt stress conditions. The varieties are Saida 183 and Rihane. This study is to determine the physiological characteristics of these two varieties facing salt stress at the seed germination and post-germinative growth. Successful germination and seedling development are crucial steps in the growth of new plants. The seeds are germinated in Petri dishes containing increasing concentrations of NaCl (0, 50, 100, 150, 200 mM) at 25°C.The measurements are focused on different germination tests. Fresh weight, dry weight and length of emerging seedlings were determined, as well as the seedling height stress tolerance index calculation. Sodium chloride content had a negative effect on the germination and growth of emerging seedlings of two barley varieties. However, at evolved NaCl concentrations, Rihane variety is much more tolerant of development in saline environment than variety Saida183.

Keywords: *Barley, Saida 183, Rihane, Germination, Seedling, Salinity Stress, NaCl.*

INTRODUCTION

Soil salinization in its early stages of development reduces soil productivity, but in advanced stage it kills all vegetation and consequently transforms fertile and productive land to barren land [1]. Salinity is one of the major abiotic stress limiting the growth and productivity of plants [2]. One priority strategy that could be implemented to develop these areas is to plant species able to tolerate drought and saline soils [3]. In order to increase crop yields, more attention to the production of salt-tolerant varieties is needed to accept the challenges of the 21st century.

MATERIALS AND METHODS

Application of salt treatment

The seeds of two varieties of Algerian barley (*Hordeum vulgare*) were used, these varieties are Saida 183 and Rihane. Seeds were sterilized with 5% sodium hypochlorite for 03 min and washed thoroughly with distilled water. Then they were placed to germinate in Petri dishes containing two sheets of filter paper, saturated with distilled water (control) or NaCl solutions (50,100,150 and 200 mM) at 25°C.

1- Precocity of germination

The precocity of seeding which corresponds to the rate of seeds germinated from first day.

$$PG\ (\%) = \frac{n}{N_t} \times 100$$

n: number of germinated seeds on first day.

N_t: total number of seeds sown for germination.

2- Final germination rate

Final germination rate (FGR) means total number of seeds germinated on the fifth day, calculate in form of percentage [4].

$$FGR(\%) = \frac{N_i}{N_t} \times 100$$

N_i: number of total seeds germinated at end of trial.

N_t: total number of seeds sown for germination.

3- Length of germs

After five days of growth seedling length were measured.

4-Fresh and dry weight germs

Fresh weight of seedling was measured at once after harvest. These latter were dried in an oven under 70°C for 48h and weighed again to get dry weight.

5- Germination vigor index

Germination vigor index (GVI) is calculated according to the following formula [5]:

$$GVI(\%)=\frac{GP\times MSL}{100}$$

GP: germination percentage (%).

MSL: mean of seedling length (cm).

6-Seedling height stress tolerance index (SHSI)

Seedling height stress tolerance index (SHSI) was evaluated using the formula:

$$SHSI(\%)=\frac{SHS}{SHC}\times 100$$

SHS: seedling height of stressed plant (cm).

SHC: seedling height of control plant (cm).

RESULTS

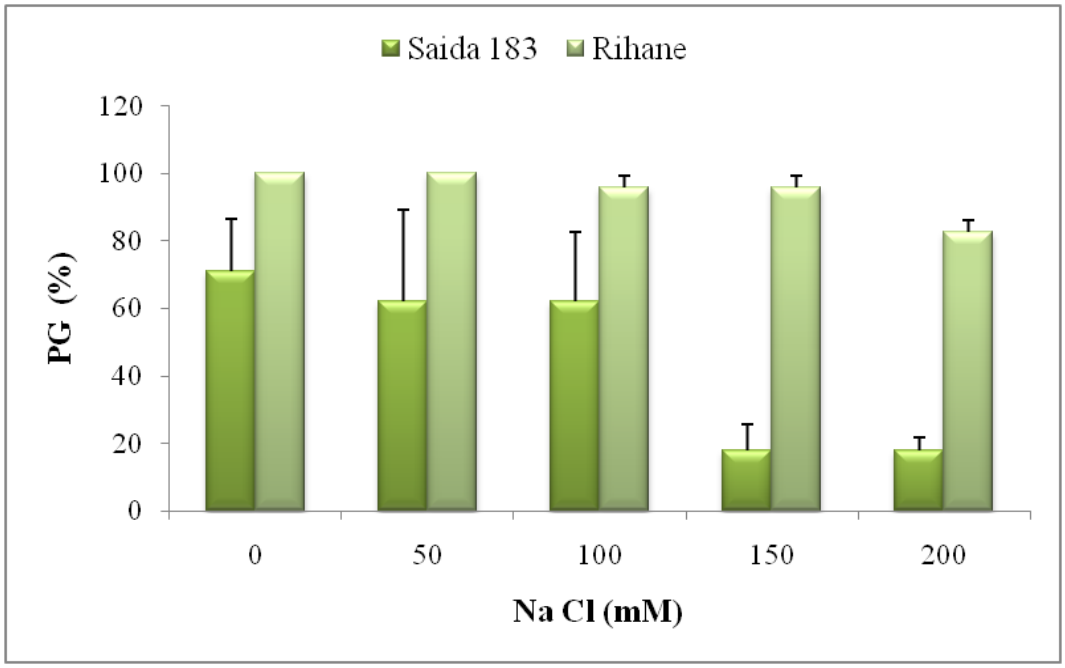

Fig. 1- Effect of NaCl on precocity of germination (PG) of two varieties of Algerian barley.

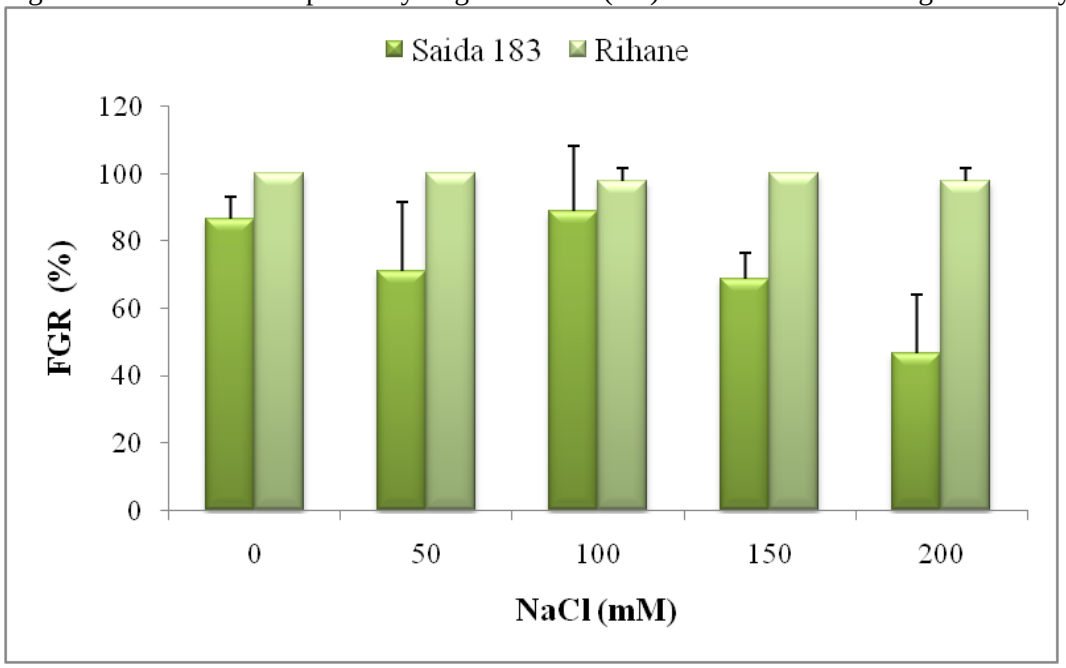

Fig. 2- Effect of NaCl on final germination rate (FGR) of two varieties of Algerian barley.

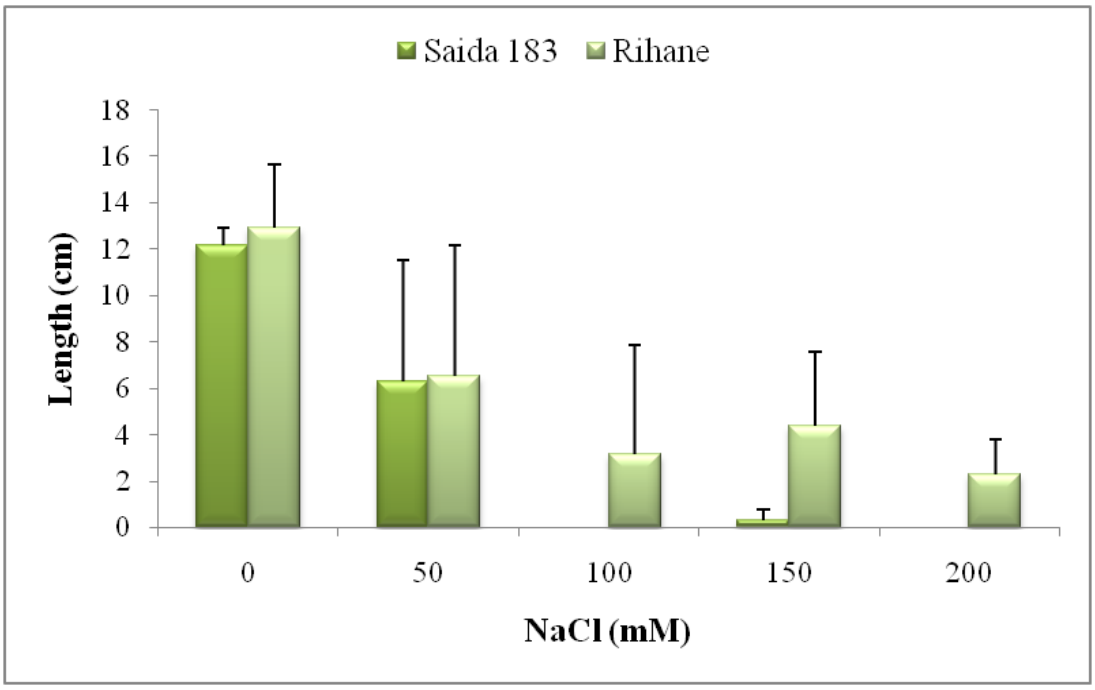

Fig. 3- Effect of NaCl on length of two varieties of Algerian barley germs.

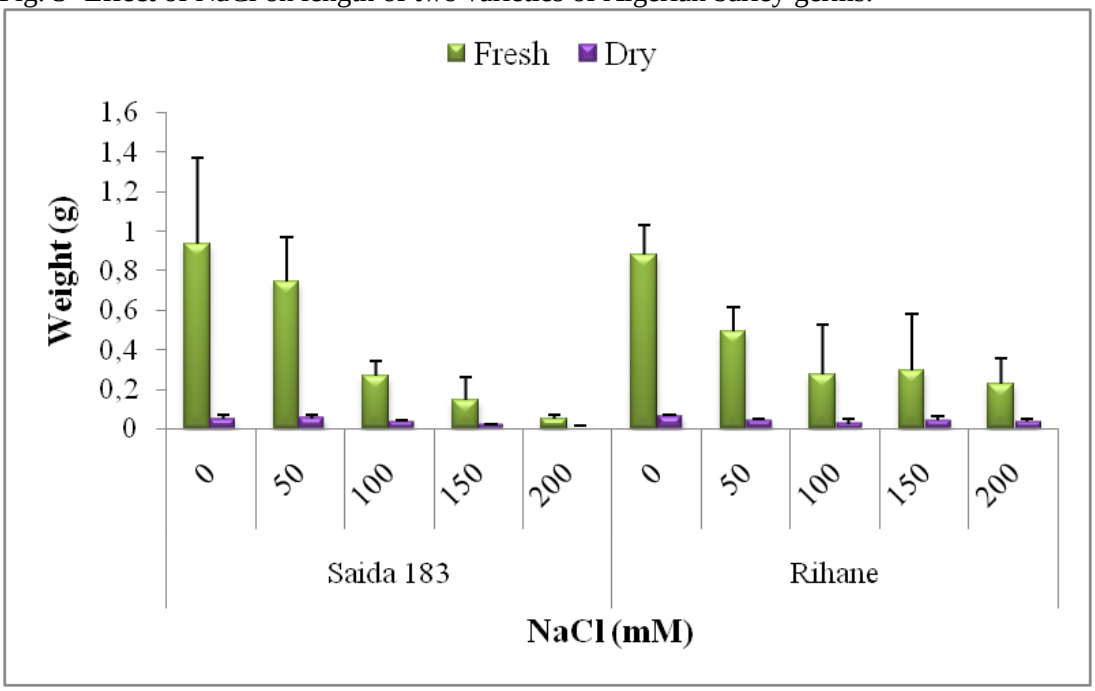

Fig. 4- Effect of NaCl on fresh and dry weight of two varieties of Algerian barley germs.

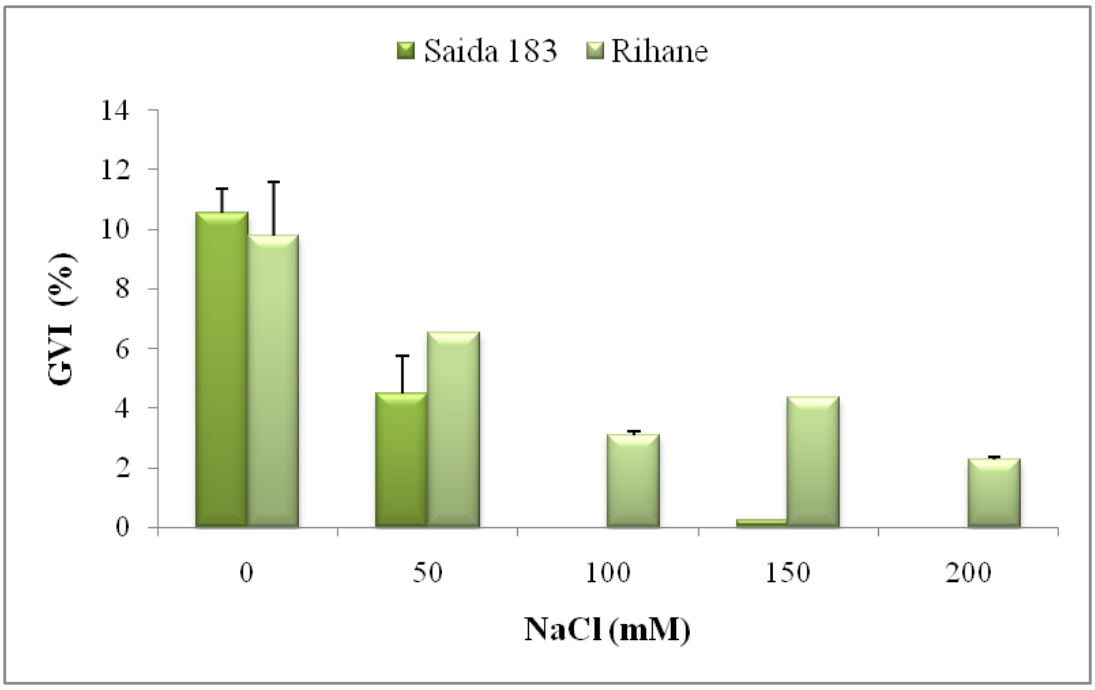

Fig. 5- Effect of NaCl on germination vigor index (GVI) of two varieties of Algerian barley.

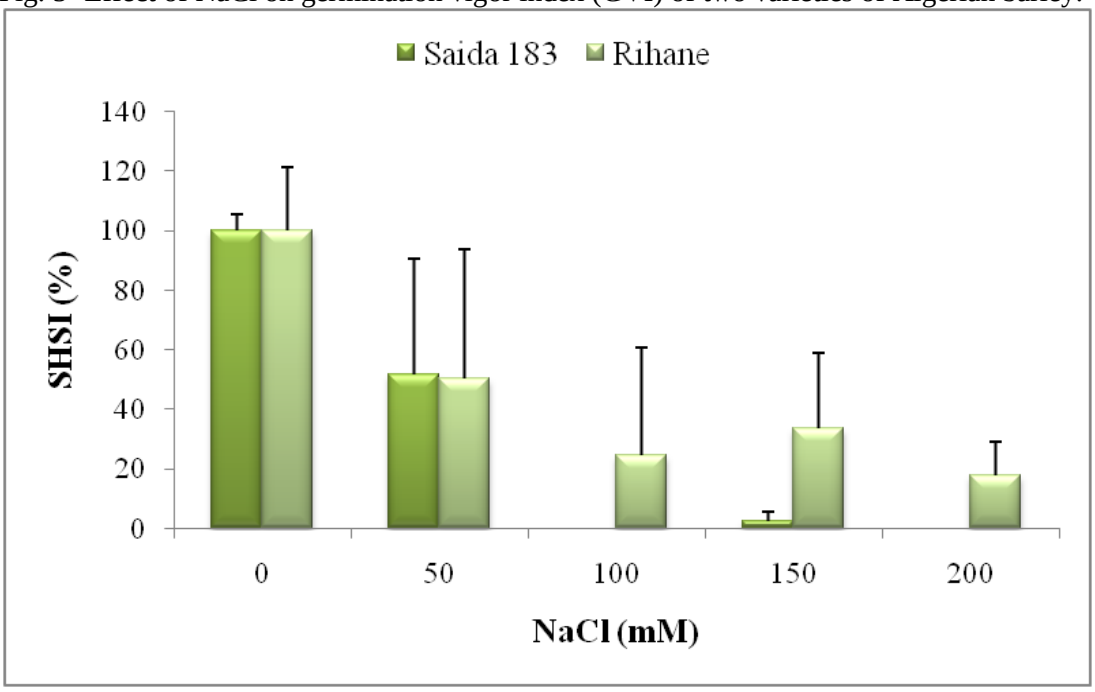

Fig. 6- Effect of NaCl on seedling height stress tolerance index (SHSI) of two varieties of Algerian barley.

DISCUSSION AND CONCLUSION

Sodium chloride content has a negative effect on the germination and growth of emerging seedlings of two barley varieties. However, at high concentrations of NaCl, Rihane variety is much more tolerant of development in saline environment than variety Saida 183. Salinity can affect germination of seeds either by creating osmotic potential that prevent water uptake, or by toxic effects of ions on embryo viability [6, 7] which may cause change of certain enzymatic or hormonal activities inside the seed [8]. High salinity may inhibit root and shoot elongation due to slowing down the water uptake by the plant [9].

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THE EFFECT OF FE APPLICATIONS IN DIFFERENT FORMS AND TIMES ON THE YIELD OF ROUND SEEDLESS GRAPES (VITIS VINIFERA L.)

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ABSTRACT

Fe is an important element for plant growth; it helps chlorophyll formation in plants. Although it is not present in chlorophyll molecule like magnesium, it has catalytic effect on chlorophyll formation. Yellowing (chlorosis) caused by iron deficiency is mostly originated by the amount of chlorophyll in young leaves. In addition, iron uptake of the plant is related to the reduction of Fe^{+3} to Fe^{+2}. The most important factor that causes Fe chlorosis in Turkey is that the soils are rich in calcium carbonate and has a high pH. The reasons such as unconscious fertilization, spraying, excessive irrigation and tight planting are also effective on this situation.

A large part of the production of seedless raisins is met from the Aegean Region in Turkey, with the production of 250 thousand tons annually, which constitutes a big part of the exports (80%). Alaşehir district of Manisa province in Aegean Region meets twenty-five percent of seedless raisins (Vitis vinifera L.). As a result of interviews with the producers and the field analyzes, there were intense iron chlorosis symptoms in Manisa, Alaşehir and Kemaliye region. In this study, 2 different experiments were carried out in round seedless grape cultivar (Vitis vinifera L.) in the Kemaliye region of Alaşehir in a producer's vineyard. Fe-EDDHA fertilizer was applied in chelate form with 4 replicates at 4 different levels (10-20-40-60 vine^{-1}) in February and April as a different experiments.

For the second trial, one of them was a control group, three different forms of iron fertilizer (Fe EDTA=25 g vine^{-1}; Fe EDDHA=50 g vine^{-1}; $FeSO_4 7H_2O$= 50 g vine^{-1}) were applied into the soil of the same producer vineyard with four replications.

During the harvest, the amount of grapes taken from each vine was weighed and the yield of fresh grapes per vine (kg) was recorded. As a result of the statistical analysis, organic and inorganic iron fertilizers applied in different forms and times were found to significantly affect the yield of round seedless grape cultivar (Vitis vinifera L.).

Keywords: *grape, Vitis vinifera L., FeEDDHA, FeEDTA, $FeSO_4 7H_2O$, yield*

INTRODUCTION

Fe deficiency in our soil as well as our agricultural products in Turkey (Fe chlorosis) is in first place. Fe content of 26.87% of our soils is less than 4.5 mgkg^{-1} which is known as critical value (Güneş et al., 2000).

Fe in plants are Fe^{+2}, Fe^{+3} and Fe-chelate forms. Fe^{+2} (active, free, soluble and available iron) is used in plant metabolism (Mehratra and Gupta, 1990). In Turkey and Manisa-Kemaliye where we conducted our research, the most important factor causing the Fe deficiency is in the soil that is rich in $CaCO_3$. When the lime content in soil is more than 20%, Fe deficiency (chlorosis) is seen due to lime (Schinas and Rowell, 1977; Saatçı and Yağmur, 2000, Talas et al., 2016). Iron, which has an importance in the quality of agricultural production, it provides chlorophyll synthesis although it is not in the structure of chlorophyll. Therefore, it plays a role in the formation of photosynthesis and photosynthesis products (Bergmann, 1992). In plants, Fe is known as a moderately mobile micro element. Therefore, chlorosis caused by Fe deficiency occurs in young leaves (Güneş et al., 2000; Talas et al., 2016).

Iron chlorosis occurs due to many factors (environmental conditions, water-related factors, plants, soil, wrong agricultural production techniques (Talas et al., 2016)

Iron (Fe) is involved in the enzyme systems in the plant where it acts as a prosthetic group. It plays an important role in biochemical, metabolic, enzymatic events, protein synthesis and nodule formation in plants (Aktaş, 1995; Kacar and Katkat, 2010).

To prevent iron chlorosis; genetic control should be made, environmental conditions that cause chlorosis should be corrected and Fe fertilizers (preparations) should be applied into the soil, onto the leaves or into the irrigation water (Güneş et al., 2000). Applications are generally made with inorganic Fe salts ($FeSO_4.7H_2O$, ferric sulfate, ferrous ammonium sulfate) and organic chelates with Fe (EDTA, EDDHA, DTPA, HEDTA). Commercially produced chelates are artificial organic compounds. By forming a complex structure with iron,

it prevents iron from turning into insoluble compounds in soil. Although Fe-chelate is very expensive, it is preferred today; it is less toxic than inorganic iron salts and is more effective (Merge and Kirkby, 1987; Davarpanah et al., 2013).

The activity of iron (Fe) chelates depends on the degree of stability at different soil pH reactions. Fe-EDDHA was found to be more effective to calcareous soils than others (Davarpanah et al., 2013). Vineyard, fruits, tomatoes, strawberries and cotton are sensitive plants to iron deficiency (Chaney, 1984).

An important part of the seedless raisin production is provided by Aegean region from Manisa, İzmir and Denizli provinces and constitutes the majority of the export (80%) with an annual production of 250 thousand tons. Manisa-Alaşehir is a viticulture area and 90% of the vineyards are composed of round seedless grape variety (*Vitis vinifera* L.) (Anonymous, 2019). Although viticulture is carried out in 7.096.741 ha area in the world, Turkey is at the 5th rank with 435 227 ha of vineyard area and ranks first in terms of exports (FAO, 2017).

As a result of the researches carried out in the vineyards of Manisa Alaşehir, Kavaklıdere and Kemaliye regions, Fe and Zn deficiencies were determined especially as micro elements (Yener et al., 2002; Olcay and Aydın, 2019).

In this study, it was aimed to investigate that the effect of inorganic and organic iron (Fe) applications into soil at different doses and times as 2 different experiments on yield of round seedless grape variety (*Vitis vinifera* L.) in the same producer vineyard in Kemaliye region of Alaşehir district in Manisa where Fe deficiency is shown widespreadly in the region.

MATERIALS AND METHODS

The experiments were carried out in the producer vineyard in the Kemaliye region where the Fe deficiency symptoms were more common in Manisa-Alaşehir district in the Aegean region. Material is the 18 year old vineyard where round seedless grape (*Vitis vinifera* L.) is produced. The experimental vineyard was established with a large rooted T- system with a length of 1.80 m and 3.0 m between rows. Some soil characteristics of the experimental area are given in Table 1.

Table 1. Some physico-chemical properties of research vineyard soil

Depth (cm)	pH	$CaCO_3$	Water soluble total salt	Organic Matter (%)	Structure
0-30	7.76	24.58	0.032	1.85	Sandy-loam
30-60	7.79	24.60	0.030	1.22	Sandy-loam
	Light alkaline	Lime rich	Salt free	Poor	

Depth (cm)	Total (%)	Available (ppm)								
	N	P	K	Ca	Mg	Na	Fe	Zn	Mn	Cu
0-30	0.084	3.68	190	5850	180	50	4.0*	0.67	16.50	5.12
	0.058	2.31	175	6200	192	55	3.72*	0.52	15.58	4.96
	Sufficient	**Poor**	**Poor**	**High**	**Sufficient**	**Not problematic**	**Insufficient**	**Poor**	**Sufficient**	**Sufficient**

The first experiment was conducted at two different times on 15 February 2014 and 10 April 2014 as 4 replicates by applying Fe-EDDHA fertilizer in organic chelate form into soil at 4 different levels (0-20-40-60 g vinestock^{-1}) according to randomized blocks trial design.

Fe-EDDHA is especially effective in calcareous, and alkaline soils at high pH. EDDHA has 3 different isomers: ortho-ortho, ortho-para and para-para. -O isomers form stable chelates at high pH and lime conditions while others have lower stability. Fe-EDDHA organic chelate used in the research can be dissolved 6% in water. Fe-containing (ortho-ortho isomer iron 4.8%) and chelated fraction can be available in the range of 3-9 pH (Anonymous, 2008). Fe-EDDHA product was supplied from Dr. TARSA company (Antalya, Turkey) that is the distributor of JAER company (Spain-Barcelona).

The second experiment was conducted in the same producer vineyard with one control dose by using 3 different organic and inorganic Fe forms from soil (Fe_1= Fe-EDTA=25 g vinestock^{-1}; Fe_2=Fe-EDDHA= 50 g vinestock^{-1}; Fe_3=$FeSO_47H_20$=50 g vinestock^{-1}) according to randomized blocks trial design. $FeSO_47H_20$ was applied on 3 March 2014 and other Fe chelated fertilizers (Fe-EDTA; Fe-EDDHA) were applied on 10 April 2014. FE-EDTA (ethylene diamine tetra acetic acid) is an organic chelate containing 13% Fe. Fe-EDDHA

(ethylene diamine di-o-hydroxyl ferylacetic acid) is also an organic chelate containing orto-orto isomer Fe 4.8%. In all experiments each three vines are used as one replication.

As basal fertilizer; on 18 February 2014, nitrogen (ammonium sulfate), phosphorus (triple super phosphate) and potassium (potassium sulfate) fertilizers were applied to all vinestock before iron (Fe) fertilization as 12 kg N da^{-1}, 4.5 kg P_2O_5 da^{-1} and 20.8 K_2O da^{-1} at fixed doses by the producer. Physical and chemical analyzes of soil samples used in the experiment were performed according to international methods (Jackson, 1962; Çağlar, 1949; Bouyocous, 1955; Bremner, 1965; Lindsay and Norvell, 1978). The results obtained are given in Table 2.

Fresh grape yield (kg) was obtained from each three vines during the harverst period 25 August, 2014. The amount of grapes taken from each vinestock was weighed to determine the fresh grape yield per vinestock (kg). JMP 7.0 statistical software was used to evaluate the data obtained from the research (SAS Guide, 2007) and Tukey HSD test was used.

RESULTS and DISCUSSION

As a result of the experiment performed with different iron forms (Fe-EDTA, Fe-EDDHA, Fe Sulphate), the difference among the iron forms in terms of grape yield was found to be statistically significant (Table 2). The lowest yield was obtained from the control group (27.1875 kg) and the highest yield was found in FE-EDDHA group (45.3125 kg). When compared with the control, the lowest yield value was found in Fe Sulfate group (32.0550 kg).

Table 2. The results of the different iron appliciations into soil

Iron Forms	**Yield (kg)**
Control	27.1875 [d]
Fe-EDTA (25 g $vinestock^{-1}$)	43.1800 [b]
Fe-EDDHA (50 g $vinestock^{-1}$)	45.3125 [a]
Iron Sulphate (50 g $vinestock^{-1}$)	32.0550 [c]

When Fe-EDDHA applications from February to April compared with together they were also found to be statistically significant different among the doses and times. The lowest yield was obtained in the control group (25.9875 kg) and the highest yield was obtained at the 3rd dose (40 g vinestock-1; 35.675 kg) according to the averages of two different periods. In February and April applications, the effect of both applications time and Fe-EDDHA dose on yield were statistically significant.

When Fe-EDDHA application from soil was determined, the difference among Fe-EDDHA doses was found to be statistically significant in February iron chelate applications into the soil (Table 3). The lowest yield value was observed in the control group (15.9250 kg) and the highest yield was determined at the third dose of 40 g vinestock-1 (25.100 kg). In the April application of Fe-EDDHA doses, the highest yield was obtained in the 3rd dose (40 g vinestock-1) (46.2500 kg) and the lowest yield was found in the control group (36.0500 kg). For both February and April iron chelate applications into the soil, the lowest yield was observed in the control group and the highest yield was the 3rd dose (40 g vinestock-1).

Table 3. The results of Fe-EDDHA applications into the soil in February and April

Fe-EDDHA February		Fe-EDDHA April		Fe-EDDHA February and April	
Dose	Mean yield(kg)	Dose	Mean yield (kg)	Dose	Mean yield (kg)
Control	15.9250 [d]	Control	36.0500 [d]	Control	25.9875 [d]
20 g $vinestock^{-1}$	20.3000 [c]	20 g $vinestock^{-1}$	41.1500 [c]	20 g $vinestock^{-1}$	30.7250 [c]
40 g $vinestock^{-1}$	25.1000 [a]	40 g $vinestock^{-1}$	46.2500 [a]	40 g $vinestock^{-1}$	35.6750 [a]
60 g $vinestock^{-1}$	23.4000 [b]	60 g $vinestock^{-1}$	44.0250 [b]	60 g $vinestock^{-1}$	33.7125 [b]

The effect of inorganic salts and organic Fe-chelates in plant production were investigated by different researchers. Smith and Cheng (2006) reported that there was a correlation between active Iron (Fe) content

and Fe-EDDHA levels in plant leaves. Fe-EDDHA was also prevented the chlorosis in Concorde vines in high pH soils. It was found that Fe-EDDHA and FeSO4 with citric acid applications given better results than the farmyard manure and FeSO4 in grapevine genotypes growing in calcerous soils by Ozdemir and Tangolar (2007). It was investigated the effect of Fe concentrations from Fe-EDDHA on anthocyanin content and the expression of related genes in Cabarnet Sauvignon grape vines by Shi et al. (2017). Since the anthocyanin content is important for the quality of red grapes and red wines, they found 46 μM Fe concentration was given better results than the other concentrations. They suggested that sugar content, anthocyanins content, and genes transcriptions of anthocyanin biosynthesis were related with Fe concentrations.

Iron has an effect on photosynthesis even tough it has not a direct role in the process. It plays an important role regarding the yield. Because of the positive relationship between chlorophyll formation and iron. The chlorosis is seen in young leaves related with the low chlorophyll concentration in the leaf. In order to prevent Fe deficiency in plants, organic Fe-chelates and inorganic Fe fertilizers should be applied from the soil or foliar. Inorganic fertilizers such as Fe sulphate ($FeSO_4 \cdot 7H_2O$) are cheap in the cost, however, these compounds are not usually adequate for rectifying chlorosis in plants. Organic chelates are more expensive fertilizers, but they are mostly preffered today since they are more efficient regarding the rectification of chlorosis and the burning effect of these compounds are less than inorganic Fe salts (Talas et al., 2016; Davarpanah et al., 2013; Mengel and Kirkby, 1987).

The stability of organic Fe chelates are dependent on their acts in different pH levels of soil. This stability is also caused the effectiveness of the fertilizers. Fe-EDDHA is to be found relatively more effective than the other Fe-chelates in calcerous soils (Fernandes et al., 2005; Davarpanah et al., 2013, Talas et al., 2016).

CONCLUSION

Vineyards are one of susceptible plants for Fe chlorosis, especially for vines growing in soils which are calcerous and high pH of soil. Iron deficiency is the most widespread micronutrient deficiency in Turkey's soils. Iron chelates such as Fe-EDTA and Fe-EDDHA and inorganic Fe salts are used for prevention of Fe chlorosis. As a result of this study, Fe-EDDHA was increase the fresh fruit yield compared to the other Fe forms and increased the fresh grape yield (kg) for both February and April applications at 40 g vinestock-1 dose.

As a result, we could be suggested that Fe-EDDHA should be used for preventing the Fe chlorosis in grape production. At the amount of 40 g vinestock^{-1} can be suggested to incease yield when it applicates in April in Kemaliye region of Alaşehir District in Manisa.

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CONTROL OF *Pseudomonas syringae* pv. *syringae* BY ECO-FRIENDLY CHEMICALS ON ROSA CULTIVARS IN LANDSCAPE AREAS

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ABSTRACT

Rose, a plant of the genus Rosa in the family Rosaceae, is one of the most popular and versatile flowering shrubs in urban landscape areas. In recent years, rose bacterial diseases are increased and they are caused significant economic losses. In this study, 58 rose cultivars located in landscape areas of Konya province were determined different diseases symptoms at various levels by carried out survey studies. Identification of 138 isolates obtained from isolations was made by biochemical, morphological, physiological and molecular tests, and the most common bacterial agent was determined as Pseudomonas syringae pv. syringae. In pathogenicity tests, 4-year-old and 3 healthy rose seedlings were used. Disease severities of P. s. pv. syringae were determined by shoot, root and leaf inoculations in land conditions and the bacteria showed important differences on their pathogenicities at different levels. Efficacy of different chemicals, phosphoric acid, copper oxychloride, hydrogen peroxide and sodium hypochlorite, were tested against P. s. pv. syringae and evaluated according to 0-4 disease scale. According to the findings, phosphoric acid (53.33-100%) had the highest effect while sodium hypochlorite (0.08-100%) had the lowest identified. Many of pesticides are highly toxic and have immediate adverse effects on human health and wildlife or contaminate local food, water, soil and air. Obtaining to data, plant defense activators as like phosphoric acid and sodium hypochlorite may be used for bacterial disease management in rose production and breeding programs within organic and sustainable agricultural approaches.

Keywords*: rose, bacterial blight, eco-friendly chemicals, landscape, organic agriculture*

INTRODUCTION

Rose, which is included in the *Rosaceae* family (*Rosa* spp.), originates actually from West Asia, and is partly based on Europe. It is a perennial woody plant in the form of shrub, and is usually 50-300 cm long (Özçelik et al., 2009). Its varieties range from small miniature roses to climber ivies with a height of up to seven meters. Depending on the features of its variety, the fact that it can be easily hybridized allows the development of different garden roses in landscape designs (Christopher, 2002).

The shoot and blossom blight disease, which is caused by *Pseudomonas syringae*, is common in the world, especially in areas where fruit cultivation is common. It causes significant losses every year because of the difficulty in fighting against the disease. As a result of systemic infections that occur in seedling production areas, seedlings die, and significant economic losses are faced. A total of 30% of trees die in Germany every year because of this illness, and similar losses are also seen in Italy and in other European countries (Kennelly et al., 2007). In our country, it was reported that *P. s.* pv. *syringae* was seen in citrus trees in Antalya, Mersin and Adana (Mirik and Aysan, 2004), in apricot trees in Erzurum and its counties (Görmez, 2011). Kavak and Çıtır (1995) conducted a study and reported that the 20% of the production areas in Malatya region were infected with *P. s.* pv. *syringae*, which causes bacterial cancer. Kotan and Sahin (2002) conducted surveys in Erzurum, Erzincan and Artvin provinces in commercial and home gardens, and reported that 80% of the production areas were infected with *P. s.* pv. *syringae*, which is a polyfag and pathogenic bacterium that causes disease in annual and perennial 180 plant species (Agrios, 2005).

Active oxygen compounds that are produced in plant cells as a result of the infection of the disease agent stimulate endurance system of the plant. Reactive oxygen species not only stimulates the genes in the infected area, but it also causes that the genes become active in areas which are known as systemic tissue where the plant is not yet affected by the disease. This phenomenon, which is known as Systemic Acquired Resistance (SAR), is a feature that strengthens the plant defense system by stimulating the damaged tissue in the area where the infection occurs in the first infection (Kunkel and Brooks, 2002). In a plant with stimulated SAR system, the resistance to infections is increasing (Chen et al., 1994; Bolwell, 1999).

This research was abstracted from phD thesis by made Aysun OZTURK

In this study, some SAR activators and conventional chemicals were tested against *P. s.* pv. *syringae* on 58 different Rosa cultivars with the aim of examination of environmentally friend and organic agriculture applications.

MATERIAL AND METHOD

The chemicals and doses used in the trials are given in Table 1, and the rose varieties are given in Table 2.

Table 1. Detected chemicals and their dosages to against *P. s.* pv. *syringae*

Chemical	**Active Ingradient and Ratio**	**Commercial Name**	**Dose/100 L water**
Hydrogen peroxide	Hydrojen peroxide % 50 (C pure)	TEKKİM Hydrogen peroxide	3 mlt
Phosphoric acid	Ortho-Phoshoric Acid % 85 (C pure)	TEKKİM O-Fosforic Asid	800gr
Sodium hypochlorite	Sodium hypocloride % 6 - 14 (C pure)	TEKKİM Sodium hypochlorite	3 mlt
Copper oxychloride	% 50 metallic copper (% 50 copper oxychloride)	HEKTAŞ Copper	300gr

Table 2. Rose varieties used in the experiments

1	Abracadabra	21	Flaming F.c	41	Petticoat
2	Afrodit	22	Foxy F.c	42	Planten Un Blomen
3	Alexandra	23	Garten Spass	43	Pompenella
4	Amore F.c	24	Gebrüder Grimm	44	Queen Of Hearts
5	Andolusian	25	Gerber Engel	45	Romantic Antike
6	Angel F.c	26	Harlequin	46	Rosenstadt Freising
7	Angela	27	Harmonie	47	Rugelda
8	Apricot F.c	28	Jugendliebe	48	Salita F.c
9	Bad Birnbach	29	Königin Der Rosen	49	Sangerhauser
10	Bad Wörishofen	30	Laperla	50	Solero
11	Blush F.c	31	Larissa	51	Sunbeam F.c
12	Brillant	32	Lavender F.c	52	Sunny
13	Cheryy Girl	33	Lemon F.c	53	Tatiana
14	Chica F.c	34	Lions Rose	54	Valencia
15	Cinderella	35	Marango	55	Vulcano F.c
16	Crimson F.c	36	Mariandel	56	Zwergenfee
17	Cubana	37	Memoire	57	Sevillana (Meillant)
18	Diamant	38	Nicole	58	Garden Rose
19	Dornröscheschlos Sababurg	39	Patricia		
20	Escimo F.c	40	Pepita		

P. s. pv. *syringae* (PssK26) isolate which have 83% virulence in the preliminary, was used in the the experiments. Bacterial inoculation was performed by spraying of PssK26 suspension at 10^8 CFU ml^{-1} density to the leaves of 58 different rose varieties. The disease was evaluated by counting the lesions on the leaves by using a 0-4 scale (0: no symptom; 1: 1 lesion; 2: 2 lesion; 3: 3 - 6 lesion; 4: 6-10 < lesion). The Abbott (1925) formula was used to determine the effectiveness of the chemicals against *P. s.* pv *syringae*. The data obtained were analyzed by using the MINITAB version 14 program and Duncan Multiple Comparison Test.

RESULTS AND DISCUSSION

In the present study, the efficacy of some eco-friendly chemicals, which could activate plant defense mechanisms against *P. s.* pv. *syringae* were researched on 58 different rose varieties. Obtaining to data, the most succesful chemical phosphoric acid had an effect between 53.33-100% and, it showed the highest effectiveness on Escimo F.C., Tatiana and Gerber Engel varieties. It was followed by Copper oxychloride, Hydrogen Peroxide and Sodium Hypochloride with ratios 52.55-100%, 35.29-100% and 100, respectively (Table 3). While phosphoric acid was a succesful in 57 varieties at the ratio of 98.27%, copper oxychloride in 27 varieties (46.55%), hydrogen peroxide in 11 varieties (18.96%), and sodium hypochlorite in 7 varieties (12.06%) had efficiency against *P. s.* pv. *syringae.* Zwergenfee variety, which is prominent in the sensitivity tests, is the most defined highly variety with 44.93% which is also revealed by the statistical results in the controls.

Table 3. Percent effectiveness of some chemicals used against *P. s.* pv. *syringae* in some rose varieties

No	Rose varieties	Hydrogen peroxide	Phosphoric acid	Sodium hypochlorite	Copper oxychloride
1	Abracadabra	62,5	83,75	51,25	73,75
2	Afrodit	67,64	94,11	47,05	79,41
3	Alexandra	66,66	86,36	51,51	77,27
4	Amore F.c	57,03	77,34	23,43	72,65
5	Andolusian	52,17	89,13	34,78	76,86
6	Angel F.c	41,86	81,39	32,55	67,44
7	Angela	54,92	76,05	40,84	78,87
8	Apricot F.c	41,66	76,66	16,66	65
9	Bad Birnbach	79,31	94,82	50	82,75
10	Bad Wörishofen	-	-	-	-
11	Blush F.c	57,4	81,48	27,77	70,37
12	Brillant	79,83	92,43	73,1	88,23
13	Cheryy Girl	-	-	-	-
14	Chica F.c	56,89	77,58	44,82	62,06
15	Cinderella	52,3	83,07	52,3	69,23
16	Crimson F.c	53,19	53,33	0,08	68,08
17	Cubana	58,82	76,47	45,88	63,52
18	Diamant	70	87,5	40	66,25
19	Dornrös. Sababurg	65,3	-	42,85	77,55
20	Escimo F.c	75,67	100	58,1	89,18
21	Flaming F.c	55,55	84,44	75,6	66,66
22	Foxy F.c	65,45	85,45	45,45	75,54
23	Garten Spass	72,58	91,93	56,45	80,64
24	Gebrüder Grimm	57,4	79,62	77,77	85,18
25	Gerber Engel	100	100	100	100
26	Harlequin	75,92	100	64,81	87,03
27	Harmonie	48,14	74,53	40,27	69,44
28	Jugendliebe	68,08	85,1	55,31	77,65
29	Königin Der Rosen	52,94	65,68	42,64	68,13
30	Laperla	35,29	69,74	26,05	63,86
31	Larissa	74	91	68	82
32	Lavender F.c	92,95	87,5	62,5	85,22
33	Lemon F.c	73,45	82,09	58,02	79,62
34	Lions Rose	65,43	83,95	50,61	82,71
35	Marango	65,33	82,66	46,66	73,33

36	Mariandel	65,9	85,22	43,18	79,54
37	Memoire	50	75	30	62,5
38	Nicole	-	-	-	-
39	Patricia	77,34	85,15	63,28	80,46
40	Pepita	74,25	89,1	64,35	84,15
41	Petticoat	67,34	89,11	52,34	82,99
42	Planten Un Blomen	35,76	62,77	3,64	52,55
43	Pompenella	71,64	84,32	56,71	79,1
44	Queen Of Hearts	51,36	73,28	30,13	65,06
45	Romantic Antike	73,1	89,07	52,94	82,35
46	Rosenstadt Freising	57,02	69,18	37,73	63,94
47	Rugelda	70,76	92,3	58,46	80
48	Salita F.c	66,12	79,03	53,22	70,96
49	Sangerhauser	81,44	89,69	71,13	84,53
50	Solero	83,33	96,42	76,19	89,28
51	Sunbeam F.c	74,07	90,74	62,96	85,18
52	Sunny	72,97	85,13	52,7	79,72
53	Tatiana	78,94	100	63,15	89,47
54	Valencia	65,38	84,61	50	78,84
55	Vulcano F.c	76,81	95,08	95,08	83,6
56	Zwergenfee	92,28	96,88	89,02	94,36
57	Sevillana	71,05	79,75	59,71	75,1
58	Garden Rose	84,13	89,65	73,79	88,27

(-) Disease symptoms were not observed in plants.

The chemicals, which effectiness researched in this study, obtained a successful results by plant defence activation patway against *P. s.* pv. *syringae* on 58 rose variety. Reactive oxygen species and plant activators play roles in defence reactions of plants and lignification which strengthening cell wall following by infection in plants (Özcan et al., 2001; Kunkel and Brooks, 2002). In the present study, efficiency of hydrogen peroxide, sodium hypochlorite and phosphoric acid which were previously known to be use with various aims, was examined on Cordes roses in landscape areas of Konya province against *Pseudomonas syringae* pv. *syringae*, and successful and hopeful results were obtained for human and environment health. In addition, we discuss that phosphoric acid will supply ensure durability for the plant body, and prevent pathogens from entering to the plant body using in early spring. Further studies should be performed on different rose cultivars, climate conditions and rose bacterial pathogens.

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A RESEARCH ON THE USE OF RAINWATER IN THE FACULTY OF AGRICULTURE OF ULUDAG UNIVERSITY IN BURSA: RAINWATER HARVESTING

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ABSTRACT

Water undoubtedly has a critical important in the life of living things. The use of water has a wide area such as agricultural production, industry and energy production. Depend on the increase in water demand, negative effects of the global warming on the already limited water resources reach alarming dimensions for the next generation. Therefore, reuse of wastewater and collection of rainwater are considered as an alternative to water resources. In this study, the usage potential of rain water falling on the roof of buildings of Bursa Uludag University Faculty of Agriculture is evaluated for different usage areas. In this study, collectible rainwater amount were determined from 7 building roofs of Faculty Administration Office building, canteen, lecture hall buildings (D and E halls) and Faculty Member Office buildings (A, B and C halls). At the end of the study, it found that rainwater collection capacity of Hall A, B, C, D, E, Faculty Administration Office building and, canteen are 574 mm^3, 536 mm^3, 572 mm^3, 539 mm^3, 263 mm^3, 455 mm^3 and 172 mm^3 respectively. It was determined that total rain water collection capacity of agriculture faculty can compensate 60 % of daily domestic water.

Keywords; *rainwater harvesting, reuse, Bursa Uludag University, Bursa*

INTRODUCTION

Water undoubtedly has a critical important in the life of living things. 97.5% of the world's water resources are found as salt water in oceans and seas, and 2.5% as fresh water in rivers and lakes. Existing water potential in Turkey is 112 m^3 and 44 m^3 used only part of it. Turkey is not a country rich in water. According to the annual amount of water per capita, our country is a country experiencing water scarcity. The annual amount of usable water per capita is around 1,519 m^3 (DSİ 2014).

The use of water has a wide area such as agricultural production, industry and energy production. As the population increases, water demand increase. In addition, the negative effects of global warming on limited water resources have increased in recent years. These factors lead to a significant reduction in useable water resources and reaches alarming levels for the next generation. Therefore, reuse of wastewater and collection of rainwater are considered as an alternative to water resources. Rainwater harvesting is the collection and storage of rainwater and surface runoff and provision of water for the plant, animal production or domestic consumption (Oweis et al. 2001, Kantaroğlu 2009, Kılıç ve Abuş 2018).

In this study, the usage potential of rainwater falling on the roof of buildings of Bursa Uludag University Faculty of Agriculture is evaluated for different usage areas.

MATERIAL AND METHOD

In this study, the theoretical calculation of the amount of rain falling on the lofts of the buildings belonging to the Faculty of Agriculture of Uludag University in Bursa and the evaluation of the compensability for usage water were aimed. The material of the study, consists of buildings belonging to the Faculty of Agriculture. Data on the amount of rainfall falling to Bursa on a monthly basis was obtained from the General Directorate of Meteorology (Table 1).

Table 1: Average precipitation amount of Bursa between 1928-2018 (MGM 2019)

Month	**Rainfall**	**Month**	**Rainfall**
January	89,1	July	21,40
February	76	August	16,3
March	70,3	September	41,7
April	62,4	October	67,0
May	50,1	November	77,8
June	34,1	December	101,4
Total (mm)		**707,6**	

In the study, the roof areas of the buildings of Bursa Uludag University Faculty of Agriculture were calculated from via the building design projects (Table 2). In this study, annual rainwater collection capacity of 7 buildings belonging to Bursa Uludag University Faculty of Agriculture was calculated. These buildings are Administration Office, canteen, lecture halls (D and E halls) and Faculty Member Office (A, B and C halls).

Table 2: Areas of the roofs of the buildings examined (m^2)

Faculty Member Office Buildings			**Lecture Hall Buildings**		**Faculty Administration Office building**	**Canteen**
A Hall	**B Hall**	**C Hall**	**D Hall**	**E Hall**		
1126	1053	1122	1058	517	894	338

FINDINGS

In this study, it was aimed to calculate the rainwater harvest of the roofs of Bursa Uludag University Faculty of Agriculture. Rainwater yield was calculated with (Equation 1) (Anonymous 2016):

Rainwater capacity = Rain collection area * rainfall quantity * roof coefficient * filter efficiency coefficient..……..……..(Equation 1)

Rain collecting area: Roof area of buildings

Rainfall quantity: Total annual rainfall determined by the Turkish State Meteorological Service

Roof coefficient: This is the coefficient specified by German standards as 0.8 in DIN 1989. It means that all rain falling on the roof cannot be recycled.

Filter efficiency coefficient: The coefficient specified by German standards in DIN 1989 (0,9) (DIN 1989). It is the efficiency coefficient of the first filter passed to separate the rainwater from the visible solids obtained from the roof. It is a coefficient given by calculating that an amount of water cannot pass through it.

As a result of the calculations, the rain water retention capacities of the building roofs are given in Table 3.

Table 3: Annual rain water harvesting potential of the investigated building roofs (m^3)

Faculty Member Office Buildings			**Faculty Administration Office Building**	**Canteen**	**Lecture Hall Buildings**	
A Hall	**B Hall**	**C Hall**			**D Hall**	**E Hall**
574	536	572	455	172	539	263

When the rain water retention potential is examined in all the roofs examined, the roofs of the buildings belonging to the Faculty of Agriculture have a total rain water harvest of 3111 m^3. When the total rain water usage is evaluated, the faculty can meet approximately 60% of the domestic domestic water in the year. Storage volumes to be constructed on the roofs were calculated with Equation 2 (Kılıç ve Abuş, 2018):

Storage volume = Amount of rain * Roof area * 0,8 * 0,9……. (Equation 2)

Table 4: Storage capacity (m^3)

Faculty Member Office Buildings			**Lecture Hall Buildings**		**Faculty Administration Office building**	**Canteen**
A Hall	**B Hall**	**C Hall**	**D Hall**	**E Hall**		
82	77	82	77	38	65	25

The storage volume of the system for storing the amount of precipitation was calculated by considering the month in which the precipitation amount is the highest (Table 4).

CONCLUSION AND DISCUSSION

In this study, the rainwater retention potentials of the roofs of the buildings of Bursa Uludag University Faculty of Agriculture have been put forward theoretically. Storage capacity were calculated according to determined rainwater potentials. The total storage capacity of the warehouse systems foreseen in all buildings is 450 m^3. When the total cost of the rainwater collection system of calculated, approximately 90 000 TL is

obtained. When the cost of the rainwater collection system and the annual cost of the tap water were compared, the depreciation period of the system was found to be 8.5 years.

This value shows that it meets more than half of the Faculty of Agriculture's need for usage water. When evaluated in general; rainwater harvesting is seen as an important alternative to usable water resources for the future. And studies on this subject should be done.

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EVALUATION OF ENVIRONMENTAL SUSTAINABILITY OF AN EGG PRODUCTION SYSTEM: THE CASE OF BURSA

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ABSTRACT

Egg; consumption is widespread in the world, high protein content and comes to the fore as an economic animal food product. With the increase of world population, egg consumption increases. With the increase in the production in laying hens operations, the use of natural resources, resulting in negative effects to the atmosphere, soil and water resources, while also it is accelerating the consumption of natural resources. In order to ensure enough food production for the growing human population, natural resources should be sustainable and emissions to the environment should be minimized. This can be achieved through an assessment of environmental sustainability. In this study, the environmental sustainability of a laying hens house in the Karacabey district where the livestock activities are carried out extensively in the Bursa region was evaluated as a material. In the monitored laying hen house while the global warming potential, ammonia emission, land use and energy use are determined as environmental sustainability indicators. The environmental sustainability of the laying hen farm has been evaluated as over the sustainable, semi-sustainable and unsustainable according to limits of the identified indicators. As a result of this study, scores of environmental factors for 1 kg egg production were; global warming potential 2,8 kg CO_2 / kg egg, land use 1,56 m^2 / kg eggs, energy use 2,95 MJ / kg eggs and NH_3 emission 0,065 kg / hen placed / year was obtained.

Keywords: *sustainability, egg, Bursa, environmental impact*

INTRODUCTION

The world population is approaching eight billion people. This situation leads to an increase in people's food demands. An important part of the daily nutrient requirement for balanced and healthy nutrition consists of proteins of animal origin. Egg is a food product that is widely consumed due to its high protein content and economic source of animal protein. Egg production has continuously increased in the last decade in the world. According to FAO, egg production in the world reached 80 million tons in 2017 (FAO 2019). Turkey among the first 20 countries in the world egg production ranks 8th with 1 250 075 tons of eggs (YUM-BİR 2018). Ensuring optimum conditions for the vital activities of chickens is one of the most important factors in achieving productivity in egg production. Chickens are sensitive animals. It is important to analyze the environmental effects of harmful gases that produced disintegration of wastes and respiration in the hen house, for the continuity of production (Kılıç ve Karaman 2014).

In order to meet the increasing consumption, intensive enterprises where production was made more intensive became widespread in time. The increase in production has led to an increase in the use of natural resources (such as land use, water use, energy use etc.) and decreases in the resources. In addition, emissions and pollution to the atmosphere, soil and water resources that emerge during the production process put pressure on the environment. This is expected to reach alarming dimensions for the future.

Sustainability; it is becoming the most important supporting force behind human activities. A holistic sustainable development will be realized when social, economic and environmental aspects are examined through the assessment of sustainability. It is a well-known fact that environmental impacts from intensive livestock enterprises pose an obstacle to environmental sustainable development. Therefore, sustainability assessment has become increasingly important (Boggia et al. 2010). Environmental sustainability is an important issue that needs to be emphasized in order to prevent the irreversible damages caused by the developments in egg production and the effects on the environment over time, to prevent the destruction and protection of resources for the next generation (Hellstrand 2013, Yaylı 2019).

In this study, in the framework of the system boundaries of a laying hen enterprises monitored in Bursa in Turkey was aimed to evaluate the environmental sustainability.

MATERIAL AND METHOD

The egg farms studied in the study operate in Karacabey district of Bursa. The assessment of environmental sustainability has been tried to be put forward within the defined system limits and per functional unit. In this study, system boundaries were determined as hen house boundaries. Sustainability assessment was examined per the determined functional unit. When similar studies were examined in laying hens, it was seen that 1 kg egg was taken as the functional unit (Leinonen et al. 2013, de Vries and de Boer 2009, Dekker et al. 2011). Therefore, the functional unit (f.u.) was determined as 1 kg egg.

Since sustainability is a very broad topic, in this study, environmental sustainability assessment has been tried to be determined by taking into account the sustainability indicators identified. Van Asselt et al. (2015) defined environmental sustainability indicators for evaluation of sustainability in a study based on consultation with 6 scientific experts and literature review. These indicators are global warming potential, ammonia (NH_3) emission, land and energy use. Energy and land use are included in the subtheme of natural resource use. In this study, the indicators specified per functional unit were taken into consideration (Table 1).

Table 1: Indicators for assessing the sustainability in egg production

Sustainability indicators	**Unit**
Global warming potential	kg CO_2 equivalent / kg egg
Emission of NH_3	kg / hen placed / year
Land use	m^2 / kg egg
Energy use	MJ / kg egg

Van Asselt et al. (2015) presented the environmental sustainability assessment by taking into account the sustainability limits (sustainable, semi-sustainable and unsustainable limits) that they set. Sustainability limits for the determined environmental indicators are given in Table 2 and these limit values are used for this study. The values obtained in the study were evaluated according to these limits.

Table 2: Sustainability limits for the core indicators

Indicators	**SL**	**MSL**	**USL**
Global Warming	2,235	2,629	3,193
Emission of NH_3	0,028	0,04	0,125
Land use	3,21	3,78	4,59
Energy use	20,3	23,9	29,0
SL: Sustainability limit, **MSL:** Mid-sustainability limit, **USL:** Unsustainability limit			

FINDINGS

Evaluations were made on the environmental sustainability indicators mentioned in the study. In order to determine the global warming potential, CO_2 emission per functional unit was calculated with the help of Tier-1 (IPCC 2006). It was calculated that 2,8 kg CO_2 emission was produced for 1 kg egg production. The source of NH_3 emission in this study is the manure of chickens. As a result of the measurements made within the enterprise, it was calculated that 0,065 kg of NH_3 emission per animal was released. The area usage was calculated as 1,56 m^2 per 1 kg egg by taking into consideration the dimensions of the hen house. There is no heating in the hen house and no mechanization is used. Belt system is used as fertilizer operating system. In addition, lighting and ventilation is done in the hen house. The electricity consumption used for these activities has been examined within the scope of energy use and as a result it has been shown that 2.95 MJ of energy is used per functional unit (Table 3).

Table 3: The values of environmental indicators of the monitored laying hen house

Indicators	**Values**
Global warming potential (kg CO_2-equivalents/f.u.)	2,8
Emission of NH_3 (kg/hen placed/year)	0,065
Land use (m^2/f.u.)	1,56
Energy use (MJ/f.u.)	2,95

In this study, environmental sustainability values of the laying hen house were evaluated according to the sustainability limits. According to the results of the evaluation; when the global warming potential and ammonia (NH_3) emissions are evaluated, the enterprise under investigation is at an environmentally semi-sustainable boundary. When evaluated in terms of land use and energy use, the enterprise was observed within the environmentally sustainable limits.

CONCLUSION AND DISCUSSION

As a result of the study, when the global warming potential and ammonia (NH_3) emission effects of the egg laying enterprise were evaluated, an environmentally semi-sustainable value was obtained. When the area and energy use is evaluated, environmentally sustainable value was obtained.

In terms of natural resource use, land use and energy use was considered environmentally sustainable. The fact that intensive production is carried out in a narrow area provides efficiency in the use of the area while the lack of heating and mechanization in the enterprise provides an advantage in energy use.

Since global warming and ammonia emissions are at the mid-sustainable limit, it is foreseen that there may be issues in the future. In order to reduce the potential for global warming, first production at the source, i.e. in the hen house, should be reduce. The most effective way to reduce CO_2 is to reduce emissions by offering lower protein diets. If problems cannot be prevented at the source, they should be prevented in the environment.

Chicken manure is an important source of formation, especially in terms of NH_3 emissions. Since it is a bad smelling gas, it also causes odor problems. Therefore, studies should be made to reduce NH_3 emissions.

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ENVIRONMENTAL IMPACT OF BIOGAS SYSTEMS

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ABSTRACT

In today's world, when the population is increasing, the needs of growing populations appear to increase. One of the vital needs is energy that is frequently used in developing industries, residences, and transport. The several negative effects related to the utilization of energy-based from fossil fuels have appeared on environmental and people health issues over the years. This situation has led to a tendency to biomass which is an alternative energy source. Organic wastes are used to the production of biogas which is one of the biomass energy sources. As a result of the biogas production electricity, heat and fermented fertilizer are obtained. However, biogas production has some disadvantages. It causes various environmental problems because biogas systems have technical problems such as a gas leak, lack of qualified personnel and lack of legal legislation. The aim of this study is that it is aimed to investigate the solutions developed for the environmental problems encountered during the production of biogas obtained from organic wastes which are an important biomass source.

Keywords: *Environmental impact, Biomass Energy, Biogas.*

INTRODUCTION

With the world's population increasing to supply the needs of people have been developed technologies and industries, and energy demand has increased after these developing. After the energy that is produced fossil sources had seriously occurred some problems, alternative energy sources which had beginning to researched were got results within 21 centuries, so renewable energy is begun to prefer [1].

Renewable energy that is sustainable and environment-friendly is continuously improving with researching on the around the world. Moreover, Turkey has suitable as a location for using renewable energy sources. There are various renewable energy sources as solar energy, wind energy, geothermal energy, oceans energy, hydroelectrical energy, and bioenergy.

Bioenergy is, in other words, biomass energy. Biomass includes organic matters that are on the world, and the matters' wastes and residues. If an example should be given, these raw materials are a variety of plants, municipal wastes, some industrial wastes, and manure [2]. These raw materials have been used to occur bioenergy. Bioenergy is less harmful to the environment and people in comparison with fossil energy. Also, bioenergy has a similar characteristic as fossil energy, so this energy could be used to alternatively energy. Figure 1 displays this situation [2]. Biomass energy is obtaining with three methods of energy conversion, such as thermochemical, physicochemical and biochemical. The products that are as a result of these conversions are used to be heat, power, and fuel [3].

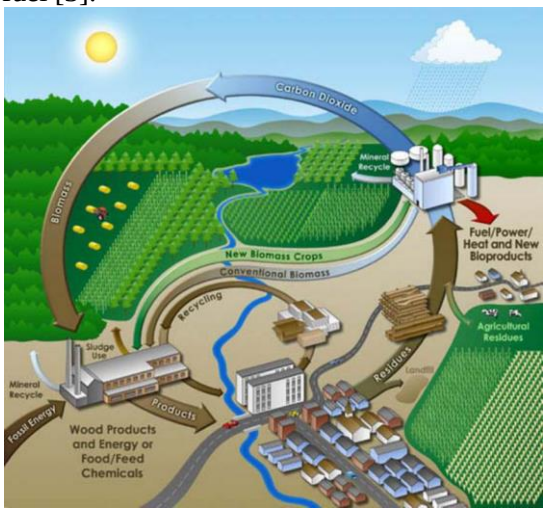

Figure 1: Biomass energy cycle

Organic wastes and residuals have been used to anaerobic digestion which is the biochemical method, at the end of the digestion as an occurring product is a biogas and also the fertilizer that has organic and high quality is the by-product.

This paper includes the environmental impact of biogas systems so, biogas should firstly be explained. Biogas includes 40-70% Methane (CH_4), 60-30% Carbon dioxide (CO_2), <4% Nitrogen (N_2), <1% Carbon monoxide (CO) and 100-5000 ppm Hydrogen sulfur (H_2S). Besides, biogas could be used to be power, heat, and fuel [4].

ENVIRONMENTAL IMPACT

Even though the searches were generally conducted about that biogas has positive effects on the environment, biogas and biogas systems have various negative environmental impacts. The environmental impacts were researched to be two subtitles as advantages and disadvantages, and these impacts were detailly explained.

Advantages of Biogas Systems

While biogas is production and utilization, it has various environmental advantages. If an explained should be given, the primary advantage is that it is an alternative instead of fossil fuel because it is one of the renewable energy sources. Other advantages are that providing reduce to the release of greenhouse gas in the atmosphere compare to traditional waste management like CH_4, CO_2. Also, producing high yield, and quality digestate which can be used as a fertilizer, thus in the soil chemical pollution will be supplied to reduce. When organic waste matters which are used as feedstocks are stocked it could be creating environmental pollution, during biogas production that is periodical will reduce these effects [5] [6] [7].

Disadvantages of Biogas Systems

In spite of the environmental advantages of biogas that were above-mentioned, several environmental disadvantages are had in the life cycle of biogas. In this paper, the subject that is wished to emphasize is these disadvantages, so it detailly explained below.

- When crop waste and residues are prepared as feedstock such silage, for example during to manufacture of it will occur particle matters and cause air pollution and also visible respiratory problems on the people [8].
- Contents of waste which is used as feedstock could have various pathogenic bacterium and this situation is threat health-wise [7].
- In the process of biogas production, one of the crucial disadvantages is that it has toxication, burning, and explosive effects [9] [10].
- The content of anaerobic digestate that is used as fertilizer which is produced has high-level N_2, the fertilizer would be in the stocked process under the soil, thus this N_2 is got mixed the soil and underground water and would be caused to be ecosystem degradation [10] [11].
- In the biogas systems could be leakages, hereat increasing emissions of greenhouse gas that is as methane and carbon dioxide would occur in the atmosphere [12].
- Biogas systems could cause a traffic jam if the area of raw material procurement far away to it. As a consequence of this, noise pollution would be taken place. Furthermore, biogas plants that are used the generator, pump, and compressor could cause noise pollution [10].

Besides, in the life cycle of biogas, according to each phase could occur direct or indirect pollutants. Wang et al. (2018) prepared two different scenarios that are direct and indirect pollutants to could be examined for two different biogas systems that are large and household biogas production. In the first instance, the direct emissions were approached as the scenario. These emissions happen that during the process of biogas production, manure pollutants include in the storage phase and consisting of the gas leakage accidentally in the biogas reactor. In these situations, occurring rates of emissions assessment are shown in Table 1.

Table 1: Summarizing assessment of direct emissions rate

Emissions	LBP	HBP
Manure emissions		
CO_2-C from initial total carbon [1,2]	4.71%	5.89%
CH_4-C from initial total carbon [1,2]	0.78%	0.98%
NO_X-N from initial total nitrogen [2]	0.05%	0.06%
NH_3-N from initial total nitrogen [2]	5.95%	7.86%
Biogas leakage [3,4]		
CO_2 from total biogas	0.22%	3.18%
CH_4 from total biogas	0.37%	5.27%
Digestate emissions during management		
CO_2-C from digestate total carbon [5,6]	0.23%	0.13%
CH_4-C from digestate total carbon [5,6]	0.38%	0.21%
NO_X-N from digestate total nitrogen [2]	0.05%	0.05%
NH_3-N from digestate total nitrogen [2]	6.40%	6.33%
Digestate emissions during fertilization [7]		
CO-C from digestate total carbon	0.01%	0.01%
NO_X-N from digestate total nitrogen	0.25%	0.25%
CH_4-C from digestate total carbon	0.02%	0.02%
CO_2-C from digestate total carbon	3.49%	3.49%
NH_3-N from digestate total nitrogen	0.07%	0.07%
NO_3–N from digestate total nitrogen	2.09%	2.09%
PO_4-P from digestate total phosphor	0.12%	0.12%
SO_2 from digestate (kg/tonne)	0.018	0.018

LBP, Large biogas production; HBP, Household biogas production.

In the other scenario, the indirect emissions are indicated to occur throughout energy consumption such as due to biogas burn form emission. values of the emissions that are resulting from the cases are illustrated in Table 2 [6].

Table 2: List of indirect emissions (kg/functional unit)

	Phase	Process	Pollutant emission									
			CH_4	CO_2	CO	NH_3	NO_X	NO_2	SO_2	VOC	PM_{10}	NO_3	PO_4
LBP	Gathering		2678.40	44,193.57		638.00	8.66						
	Processing	CSTR	659.10	1082.87									
		CHP		287,112.15	439.55		60.21	46.04		339.70			
		Biogas fueled boiler		33,091.51	50.66		6.94	5.31		39.15			
	Use	Storage	6712.37	10,998.30		8414.34	114.22						
		Fertilization	36.21	14,035.65	20.17	7.01	40.67		142.01			716.31	264.01
		Transport			66.72		270.00		1.82	0.08	15.59		
		Use of biogas		158,316.59	242.37		33.20	25.39		187.31			
HBP	Gathering		2757.39	45,497.00		984.32	13.36						
	Processing		5501.99	9145.28									
	Use	Storage	3948.53	6545.39		9515.25	129.17						
		Fertilization	38.18	14,799.58	21.27	8.02	46.51		145.55			819.01	286.74
		Transport			25.88		104.72		0.71	0.03	6.05		
		Use of biogas		239,018.60	364.33		101.77	77.82	559.19	281.56			

LBP, Large biogas production; HBP, Household biogas production; CSTR, Continuous stirred tank reactor; CHP, Combined heat and power system.

As a consequence of this research, compared to the environmental effect of two different systems of biogas was concluded the index of the total effect of the environment is that household biogas production was 13% higher than that of large biogas production. The effects were detailly given in Table 3 [6].

Table 3: Environmental impact indexes of the life cycle for two different biogas systems

	EC	GWP	AP	EP	POP	HTP	Total
LBP	0.13	13.69	47.71	227.47	1.73	0.10	290.83
HBP	0.00	10.29	56.32	261.25	1.16	0.22	329.24
LBP - mitigation	−0.56	−16.36	−68.54	−290.00	−0.87	−0.26	−376.60
HBP - mitigation	−0.28	−11.84	−74.11	−320.90	−0.73	−0.15	−408.01
LBP - net	−0.43	−2.67	−20.83	−62.53	0.86	−0.17	−85.77
HBP - net	−0.28	−1.55	−17.79	−59.65	0.43	0.08	−78.77

LBP, Large biogas production; HBP, Household biogas production; EC, Energy consumption; GWP, Global warming potential; AP, Acidification; EP, Eutrophication; POP, Photochemical oxidation; HTP, Human toxicity potential.

CONCLUSION AND RECOMMENDATIONS

Bioenergy is a significant source of renewable energy, because of being both environment-friendly, and alternative energy to fossil fuels in terms of economy. One of the sources of bioenergy is biogas, and biogas production uses organic materials as feedstock for occurring, so establishing biogas plants is preferred to

regions that have sectors of agriculture and livestock breeding. Also, research shows that the production of biogas is rapidly developing in the world.

While Biogas that uses as power, heat, and fuels compare are said environment-friendly, biogas systems could possibly cause some environmental problems. In the paper, in biogas production life cycle phases could be various environmental problems are explained, and from research that was done are given some examples.

Making some provisions for the negative environmental impacts that would be minimized should be. If an explained should be given for the provisions;

- The study of the geographical information system should be done and biogas plants should be nearby areas of feedstock for minimizing noise pollution.
- The wastes process' logistics and stocks should be paid attention to hygiene rules.
- The system process' rules should be carefully decided and periodically controlled.
- Employees who work in the plant should be given educations about the system.
- Energy crops or crop waste and residues which are used as feedstock should be under controlled before the process of plant for keeping out a fertilizer that includes chemicals, and pesticides.
- Animals should be raised in a controlled manner for the animal wastes that are used as raw material because manure mustn't include chemicals like antibiotics.
- Biogas should be purified and as a result, values of emissions would decrease. Further, the process of purification is used to increase the quality and yield of biogas.

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ETUDE DES FACTEURS NATURELS DE RÉGULATION DES POPULATIONS DE BEMISIA TABACI ASSOCIÉ AUX CULTURES SOUS SERRE CHAUFFÉE DANS LE SUD TUNISIEN

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RESUMÉ

Un complexe très important de parasitoïdes de la famille des Aphelinidae (Hymenoptera) appartenant aux genres Encarsia et Eretmocerus s'attaque à Bemisia tabaci associé aux cultures sous serres chauffées par les eaux géothermiques dans le sud tunisien

L'étude de l'influence des facteurs naturels de régulation sur les populations de Bemisia tabaci a eu lieu dans deux serres de tomate. Une serre conduite en production biologique installée dans un site de géothermie dans la région de Gabès. La serre conduite selon les techniques conventionnelles est installée dans un site de géothermie à Limaguès dans la région de de Kébili.

En se basant sur les caractéristiques phrénologiques, sur la modalité du parasitisme et sur la forme des larves du parasitoïde à l'intérieur de la larve hôte, on a pu déterminer le taux d'abondance des deux principaux genres de parasitoïdes en présence. En effet, Eretmocerus mundus constitue 76,4% et Encarsia sophia 23,6 % uniquement de la population parasitaire. Les stades parasités et prédatés sont constitués par des larves de deuxième, troisième, quatrième stade et des pupes.

L'analyse statistique au seuil 5%, et la comparaison des moyennes montrent que les taux de parasitisme et de régulation par les parasitoïdes naturels indigènes (Eretmocerus et Encarsia) des larves de Bemisia tabaci situées sur les feuilles de la partie inférieure des plantes de tomate dans la serre conduite selon les techniques de production biologique, varient d'une façon hautement significative en fonction du temps. Par contre, au niveau des feuilles de la partie moyenne et de la partie supérieure des plantes les taux de parasitisme et de régulation naturelle ne varient ni en fonction du temps ni en fonction des lignes de culture.

Les taux de parasitisme et les taux de régulation des populations de Bemisia tabaci rencontrées au niveau des feuilles des différents niveaux des plantes dans la serre conduite selon les techniques conventionnelles, ne sont pas différents ni en fonction du temps ni fonction des lignes de cultures.

Mots clés : Bemisia tabaci, Eretmocerus mundus, Encarsia sophia, serre géothermique, régulation naturelle, parasitoides indigènes, sud tunisien

INTRODUCTION

Le suivi de l'état phytosanitaire des serres géothermiques dans le sud tunisien a débuté depuis le démarrage de la géothermie en 1986 dans la région de Kébili. Dans le cas particulier des aleurodes, leur présence a été signalée en abondance dés le départ, mais l'attaque du virus Tomato Yallow Leaf Curl (TYLC) qui l'accompagnait, insignifiante, est passée inaperçue. Très rapidement, et plus précisément après trois compagnes de production, le problème de l'attaque par le virus TYLC s'est accentué, notamment sur les cultures d'arrière saison. C'est ainsi qu'un programme de lutte chimique basé sur l'utilisation d'une multitude de produits chimiques a été la règle pour limiter les dégâts des aleurodes.

Conscients du danger des effets secondaires qui peuvent survenir par l'utilisation abusive et anarchique des produits chimiques, nous avons commencé l'évaluation de l'importance des facteurs naturels de régulation. En effet, un complexe très important de parasitoïdes de la famille des *Aphelinidae* (*Hymenoptera*) s'attaque à *Bemisia tabaci* appartenant aux genres *Encarsia* et *Eretmocerus* qui sont les plus importants ennemis naturels de *Bemisia spp* (Lopez-Avila, A.1987, Jones et al. 1995).

Les populations d'*Eretmocerus mundus* se sont montrées les plus efficaces aussi bien au laboratoire qu'en plein champ contre *Bemisia tabaci* (J.A. Goolsby et al., 1998). Les travaux en laboratoire de J.A. Goolsby et al. (1998), ont montré qu' *Eretmocerus mundus* attaque significativement un nombre plus important d'hôtes qu'*Encarsia pergandiella*. Ces résultats pourraient être confirmés par le résultat des travaux de Walker et al. (1997) qui a montré qu'*Eretmocerus mundus* Mercet acquiert une tolérance intéressante vis-à-vis de plusieurs insecticides comparativement à d'autres espèces de parasitoïdes.

Eretmocerus mundus est originaire de la région méditerranéenne où il parasite spontanément *Bemisia tabaci* sur les cultures maraîchères sous serre (Alberto et al., 2002). Son utilisation en tant qu'agent biologique pour le contrôle des mouches blanches a été considérée comme prometteuse (Simmons and Minkenberg 1994).

Les espèces *d'Eretmocerus* sont toutes des ecto-endoparasites des larves de la mouche blanche (Rose et al., 1995). La plupart sont arrhénotoques, mais certaines espèces sont connues comme étant thélytoques (Gerling 1966 ; McAuslane et Nguyen, 1996). Les œufs sont déposés sous les larves de la mouche blanche qui sont fixées sur la face inférieure de la feuille. Après éclosion, la larve du premier stade du parasitoïde pénètre dans la larve hôte (Clausen et Berry, 1932 ; Foltyn et Gerling, 1985). En se développant, la larve du parasitoïde consomme totalement le contenu de la larve hôte avant de se transformer en nymphe (Walker et Greenberg, 1998).

Le parasitoide *Eretmocerus mundus* parasite tous les stades larvaires de *Bemisia tabaci*. Mais son développement et son efficacité diffèrent selon le stade parasité. En effet, les larves de 2ème et 3ème stade de *Bemisia tabaci* sont les plus favorables pour le développement d'*Eretmocerus mundus* (Foltyn et Gerling, .1985). D'après les résultats de Walker et Greenberg (1998), son taux de parasitisme le plus élevé est enregistré sur les larves de 2ème stade soit 66,4%, et le taux le plus faible sur les larves du 4ème stade soit 8,6%. *Eretmocerus mundus* est qualifié de koïnobionte lorsqu'il parasite les jeunes stades larvaires de *B. tabaci* , puisque ces derniers continuent à se nourrir et à se développer. Il est qualifié d'idiobionte lorsqu'il parasite les 3ème et 4ème stades qui arrêtent évidemment leur développement (Walker et Greenberg. 1998). Le pourcentage d'émergence dépend aussi du stade larvaire hôte. Il est de 93,8% s'il s'agit de jeunes larves et de 65,9% sur les larves âgées.

Si l'efficacité d'*Eretmocerus eremicus* est douteuse contre *B. tabaci* (Heinz et Parella, 1994), *Eretmocerus mundus* donne des résultats supérieurs sur *B. tabaci* (Goolsby et al., 1996), mais ne parasite pas *T. vaporariorum* et ne peut être produit en masse que sur *B. tabaci*.

Le genre *Encarsia* englobe, plus de 200 espèces décrites (Woolley et Heraty, 1998), dont 25 sont connues comme parasitoïdes de *B. tabaci* (Loomans & van Lenteren, 1999).

Au sein d'un complexe parasitaire, les *Encarsia* peuvent avoir une interaction avec d'autres parasitoïdes, tels que l'endoparasite *Amitus* ou l'ecto-endoparasitoïde *Eretmocerus* (Viggiani, 1994). Toutes les espèces d'*Encarsia* sont endoparasites sur les différents stades de *T. vaporariorum* (Fransen et Montfort, 1987). Toutefois *Encarsia* pond ses oeufs de préférence dans le 3ème ou le 4ème stade larvaire de l'aleurode. Dix jours après le parasitisme, la larve se transforme en pupe. Environ dix jours plus tard un nouvel *Encarsia* adulte émerge de la pupe par un trou rond spécifique.

MÉTHODOLOGIE UTILISÉE.

L'étude de l'influence des facteurs naturels de régulation sur les populations de *Bemisia tabaci* a eu lieu dans les deux serres de tomate qui ont été choisies pour l'étude de la distribution spatio-temporelle des différents stades pré-imaginaux de *B. tabaci*.

Le taux de parasitisme est déterminé selon la formule suivante :

$$TP = \text{pourcentage de parasitisme} = \frac{A + T}{A + B + T + P + L}$$

Pour le pourcentage du taux de régulation, il faut ajouter les larves prédatées au numérateur soit:

$$TR = \text{taux de régulation} = \frac{A + T + L}{A + B + T + P + L}$$

A : L2 +L3 +L4 parasitées
B : L2 +L3 +L4 non parasitées
T : Trou de sortie (parasite)
P : Puparia éclos de *Bemisia tabaci*
L : Larves prédatées

Sur les tableaux de comparaison des moyennes en fonction du temps et sur les graphiques de variation des taux de parasitisme et de régulation en fonction du temps, les données représentent le pourcentage moyen des pourcentages (calculés sur la base des formules de TP et TR) de tous les niveaux de toutes les lignes à une date d'échantillonnage bien déterminée.

Concernant les populations représentées sur les graphiques relatifs à l'évolution des populations sur les niveaux des feuilles en fonction des lignes, chaque donnée correspond à la population rencontrée sur un échantillon global constitué de 120 feuilles (4 parties sur la ligne x 3 plantes sur chaque partie de la ligne x 2 feuilles par niveau de chaque plante x 5 dates)

L'effeuillage (l'enlèvement de quelques feuilles les plus vieilles sur la partie inférieure de la plante) de la tomate est pratiqué de telle sorte que, le nombre de feuilles enlevées à la base soit proportionnel à la vitesse de croissance du végétal. Ainsi, le nombre de feuilles enlevées est généralement équivalent au nombre des nouvelles feuilles apparues. Cette opération commence une fois que la hauteur des plantes atteint le niveau des supports de culture qui sont situés à environ deux mètres du niveau du sol.

La serre biologique est installée dans un site de géothermie plus au moins isolé à Ben Ghilouf du coté sud ouest d'Elhamma de Gabès. La serre est installée dans une position ouest par rapport à une série de serres cultivées dans le même site, et par rapport à un site de géothermie de production normale et une oasis qui se trouvent à une distance d'environ 1000 mètres.

La serre conduite selon les techniques normales habituelles est installée dans un site de géothermie à Limaguès situé du coté nord est de la ville de Kébili sur la route de Gabès. Elle est localisée au milieu du site entourée par des serres de production normale de tous les cotés. En plus des espaces créés sous forme de petites oasis à l'intérieure du site, ce dernier se trouve à l'ouest d'une oasis traditionnelle à 300 mètres de distance. Dans les deux cas, la serre est orientée dans une position nord sud. Nous avons choisis la porte principale celle du coté nord, et la numérotation des lignes de culture de droite à gauche de telle sorte que la ligne L1 soit du coté ouest et la ligne L8 du coté est.

RÉSULTATS

Taux de parasitisme et de régulation dans la serre biologique

En se basant sur les caractéristiques phrénologiques, notamment la couleur et la présence ou l'absence du méconium sur les pupes, et sur la modalité du parasitisme (ectoparasite ou endoparasite) et la forme des larves du parasitoïde à l'intérieur de la larve hôte, on a pu déterminer le taux d'abondance des deux principaux genres de parasitoïdes en présence. En effet, *Eretmocerus mundus* constitue 76,4% et *Encarsia sophia* 23,6 % uniquement de la population parasitaire. Au cours de l'échantillonnage dans la serre on a remarqué la présence du prédateur du genre *Macrolophus caliginosus* mais en nombre très réduit. Les stades parasités et prédatés sont constitués par des larves de deuxième, troisième, quatrième stade et des pupes.

Au niveau des feuilles de la partie inférieure

La population des stades parasités et prédatés rencontrés sur les feuilles inférieures est constituée essentiellement par des pupes parasitées, et quelques individus de larves parasitées des $2^{ème}$, $3^{ème}$ et $4^{ème}$ stade.

L'analyse statistique au seuil 5% (Tableau VBp1, Tableau VBr1).et la comparaison des moyennes (tableau VBp2, Tableau VBr2) montrent que les taux de parasitisme et de régulation par les parasitoïdes naturels indigènes (*Eretmocerus* et *Encarsia*) des larves de *Bemisia tabaci* situées sur les feuilles de la partie inférieure des plantes de tomate dans la serre conduite selon les techniques de production biologique, varient d'une façon hautement significative en fonction du temps. Par contre sur les huit lignes de culture dans la serre ces taux sont parfaitement comparables.

Source	Degrés de liberté	Type III SS	Carré moyen	Valeur de F	Pr > F
Dates	4	0,00998037	0,00249509	4,12	0,0095
Lignes	7	0,00365112	0,00052159	0,86	0,5482

Tableau VBp1 : Analyse de variance des moyennes du taux de parasitisme au niveau des feuilles inférieures dans la serre biologique

Source	Degrés de liberté	Type III SS	Carré moyen	Valeur de F	Pr > F
Date	4	0,00691820	0,00172955	4,48	0,0064
Ligne	7	0,00241729	0,00034533	0,89	0,5243

Tableau VBr1 : Analyse de variance des moyennes du taux de régulation au niveau des feuilles inférieures dans la serre biologique.

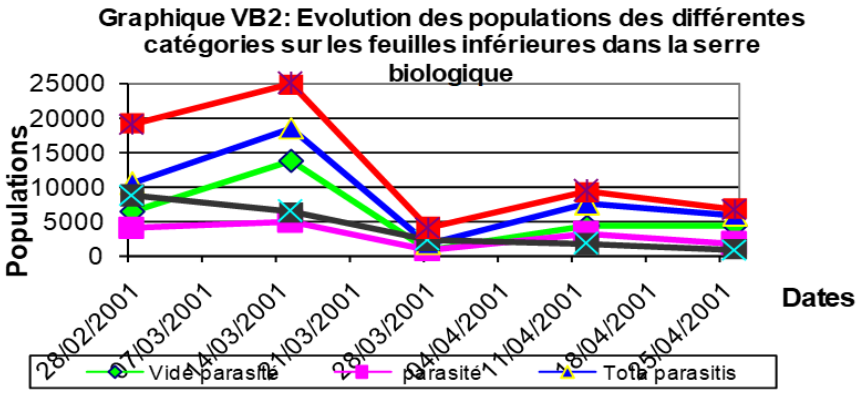
Dates	Nombre	Moyennes
12/04/2001	8	0,95160 *a*
26/04/2001	8	0,94751 *ab*
15/03/2001	8	0,93848 a*bc*
28/02/2001	8	0,91730 b*c*
28/03/2001	8	0,91261 *c*

Tableau VBp2 : Comparaison des moyennes du taux de parasitisme au niveau des feuilles inférieures dans la serre biologique, en fonction du temps

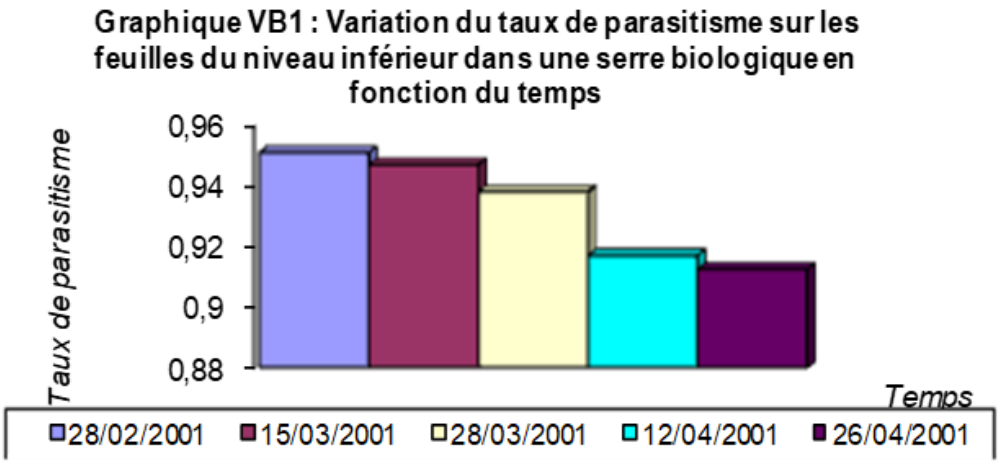
Dates	Nombre	Moyennes
12/04/2001	8	0,962646 *a*
26/04/2001	8	0,953887 *ab*
15/03/2001	8	0,950101 *bc*
28/02/2001	8	0,938951 *cd*
28/03/2001	8	0,924576 *d*

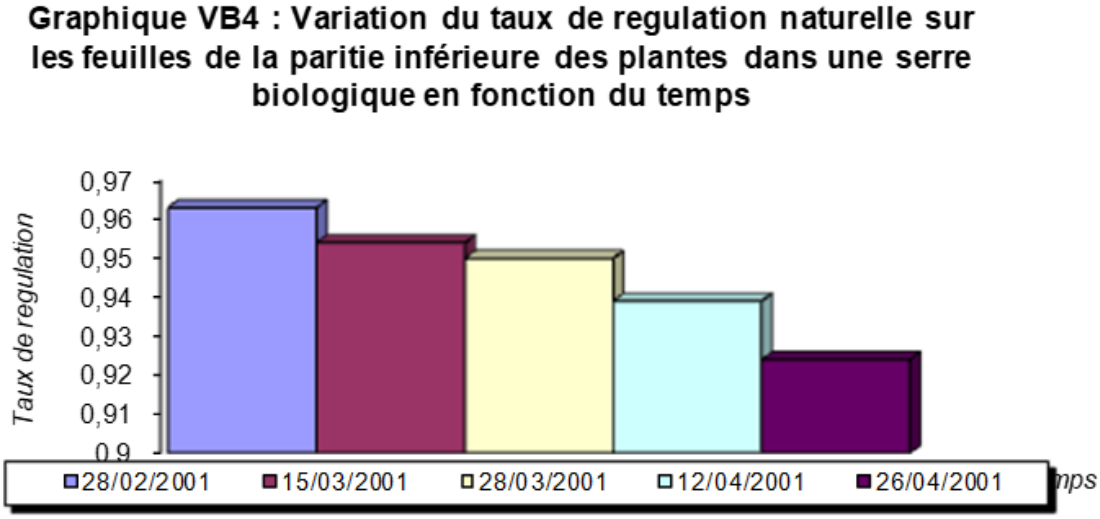
Tableau VBr2 : Comparaison des moyennes du taux de régulation au niveau des feuilles inférieures dans la serre biologique, en fonction du temps

A la fin du mois de février les pieds de tomate plantés au début du mois de janvier ont atteint la hauteur d'environ deux mètres arrivant ainsi au niveau des supports de culture,sans que les opérations d'éffeuillage et de couchage soient encore pratiquées. Le niveau des populations de *Bemisia* augmente alors, présentant des niveaux assez élevés, surtout que l'on est en présence d'une serre biologique qui n'a subit aucun traitement chimique. Cette absence est aussi en faveur des parasitoïdes qui ont pu s'installer sur *Bemisia* **(**Graphique VB2**)**. En effet, la plupart des insecticides communs peuvent être au moins 100 fois plus toxiques aux parasitoïdes qu'à leurs insectes hôtes (Plapp et Winson, 1997).



Au cours de la première quinzaine de mars, le nombre de trous de sortie connaît une importante augmentation, ce qui suppose l'émergence d'un grand nombre d'adultes de parasitoïdes, qui ont réussi à augmenter le nombre de larves parasitées et diminuer le nombre de larves saines (ni parasitées,ni prédatées) **(**Graphique VB2**),** et ainsi le taux de parasitisme et de prédatisme sont devenus plus importants **(**Graphique VB1, Graphique VB4 **)**. Suite à une opération d'éffeuillage, cette situation s'est détériorée, caractérisée par une diminution spectaculaire des différentes catégories au cours de la deuxième quinzaine du mois de mars, enregistrant un équilibre entre le nombre de trous de sortie et le nombre des larves parasitées. La faiblesse des populations des parasitoïdes et de leurs hotes s'est traduit par des taux de parasitisme et de régulation les plus faibles **(**Graphique VB1, Graphique VB4**)**.





Au cours de la première quinzaine d'avril, la population de *Bemisia* est restée faible connaissant une légère diminution, suite à une légère augmentation des larves parasitées et prédatées. Le nombre de trous de sortie augmente se traduisant par l'augmentation de la population d'adultes de parasitoïdes **(**Graphique VB2**)**. Au cours de cette période on enregistre les taux de parasitisme et de régulation les plus élevés **(**Graphique VB1, Graphique VB4**)**. Suite à une opération d'éffeuillage à la fin du mois d'avril, on enregistre une légère diminution des stades parasités et prédatés se traduisant par une légère diminution des taux de parasitisme et de régulation.

Au niveau des feuilles de la partie moyenne et de la partie supérieure

La population parasitée et prédatée rencontrée sur les feuilles de la partie moyenne des plantes dans la serre biologique est constituée essentiellement par des larves parasitées et prédatées de deuxième (L2) et troisième stade (L3), des larves parasitées de quatrième stade (L4), et des pupes parasitées. Celle sur les feuilles de la partie supérieure, constituée essentiellement par des larves parasitées de deuxième stade (L2), avec très peu de larves du troisième stade (L3).

Dans la serre biologique, au niveau des feuilles de la partie moyenne et de la partie supérieure des plantes, l'analyse de variance et la comparaison des moyennes des taux de parasitisme par les parasitoïdes naturels indigènes à savoir : *Eretmocerus* et *Encarsia,* des larves (L2, L3, L4) de *Bemisia tabaci*, nous permettent de constater que statistiquement les taux de parasitisme et de régulation naturelle ne varient ni en fonction du temps ni en fonction des lignes de culture.

En comparaison avec la répartition du biotype « B » de *Bemisia tabaci* qui varie très significativement avec le temps, la position des feuilles sur les plantes, et les lignes de culture dans la serre sous l'influence des facteurs climatiques, on peut déduire, que les adultes de parasitoïdes sont moins influencés par les facteurs climatiques dans la serre, et leurs répartitions se trouvent très homogènes.

Taux de parasitisme et de régulation dans la serre normale

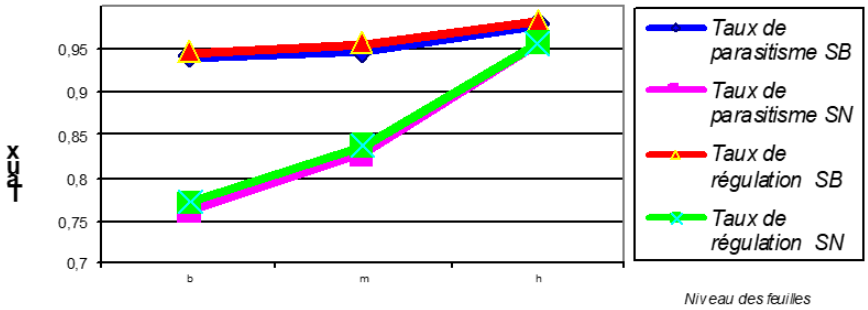
L'analyse statistique au seuil 5% et la comparaison des moyennes du taux de parasitisme et des taux de régulation des populations de *Bemisia tabaci* rencontrées au niveau des feuilles des différents niveaux des plantes dans la serre conduite selon les techniques de production normale, révèlent que les différences entre les taux de parasitisme et les différences entre les taux de régulation ne sont pas différents aussi bien en fonction du temps qu'en fonction des lignes de cultures.

La faiblesse des populations aussi bien des parasitoïdes que de leur hôte serait la cause principale de cette distribution homogène en fonction du temps, de la position des feuilles sur les plantes, et des lignes de cultures.

DISCUSSION

D'une façon générale, les taux de parasitisme des larves par les parasitoïdes naturels indigènes et les taux de régulation des populations de *Bemisia tabaci* dans les serres géothermiques du sud tunisien, sont plus élevés dans la serre de production biologique que dans la serre conduite selon les techniques de production normale, notamment sur les feuilles de la partie inférieure de la plante. Cette différence diminue en allant de bas vers le haut au niveau de la plante (Graphique V.B.N).

Graphique V.B.N : Evolution des taux de parasitisme et de régulation en fonction des niveaux des feuilles sur les plantes



La production en conditions normales dans les serres est basée sur l'intensification par l'utilisation des fertilisants chimiques industrialisés, qui fragilise les plantes vis-à-vis des agents phytopathogènes. Cette situation est de nature à forcer l'agriculteur à une utilisation abusive des pesticides. *Bemisia tabaci* est en effet, l'un des principaux problèmes associés aux cultures sous serre chauffée dans le sud tunisien, qui nécessitent une énorme quantité de produits chimiques les plus variés. Les contrôles chimiques contre ce ravageur sont de plus en plus inefficaces provoquant des problèmes de résistance (Perring et al., 1993), notamment sur le biotype B qui connaît une grande résistance aux pesticides (Cahill et al. 1996). C'est ainsi que les concentrations qui provoquent 95% de mortalité n'arrivent qu'à 10% de mortalité des phénotypes résistants de la mouche blanche (Omer et al., 1992). Au Soudan dans la région de Gezira,, ont constaté que l'utilisation des pesticides peut provoquer une diminution du taux de parasitisme de *Bemisia tabaci* par des parasitoïdes des genres *Encarsia* et *Eretmocerus* (36,7% dans un champ du coton traité par les pesticides et 76,8% dans un champ non traité). Ils ont remarqué que l'utilisation de 19 types de pesticides (Confidor 20LS, Rufast, Mesurol 50PM,…) attaquant les Aleurodes et les Thrips a un effet nuisible surtout sur le stade pupe d'*Eretmocerus mundus*.

Ces résultats expliquent la différence des taux de parasitisme et de régulation que nous avons trouvés entre la serre conduite en conditions de production biologique en l'absence de toute intervention de produits chimiques, et la serre de production dans les conditions normales au niveau de laquelle l'utilisation des produits chimique est une règle qu'on ne peut transgresser. En effet, ces produits chimiques qui agissent d'une façon agressive sur les ennemis naturels diminuent très remarquablement le taux de parasitisme et de régulation. La mortalité naturelle de *B. tabaci* en absence de parasitoïdes est de 2% (Michael de Courcy, et Wright, 1999). De plus, le parasitoïde *Eretmocerus mundus Mercet,* connu pour être le plus efficace et le plus fréquemment rencontré dans les serres géothermiques du sud tunisien. Il a montré une tolérance significative vis-à-vis de plusieurs insecticides comparativement à d'autres espèces de parasitoïdes (Walker et al.1997). Traité avec la bifenthrine, il perd 63% de sa population durant le processus d'émergence (Walker et al.1997).

La distribution des taux de parasitisme des larves de *Bemisia tabaci* et des taux de régulation de sa population dans les serres est étroitement liée à la distribution des adultes des parasitoïdes et des stades susceptibles d'être parasitées ou prédatées. Les stades larvaires susceptibles d'être parasitées et prédatés sont principalement constitués par des larves de 2ème et 3ème stade, et en second lieu par des larves de 4ème stade.

La réussite d'un agent biologique est régie par plusieurs facteurs. En effet, l'introduction d'*Eretmocerus eremicus* au cours de l'année 2000, dans une exploitation géothermique au sud tunisien a été un échec (Kamel, 2000, com. pers.). Les conditions climatiques en particulier la température élevée avec une humidité relative généralement élevée dans les serres, et la mauvaise synchronisation spatio temporelle entre l'agent biologique et le stade larvaire sensible de l'hôte pourraient être les causes principales, si l'on sait que l'introduction d'*Eretmocerus serius Silvestri* au Mexique a échoué à cause de la baisse de l'humidité relative Russel (1962) , et la réduction des températures dans les serres a provoqué des problèmes pour l'utilisation de *l'Encarsia formosa* (Hulpas-Jordaan et al. ,1987), et que l'augmentation du nombre *d'Encarsia formosa* a amélioré ses résultats (Onillon et al. 1988).

L'influence conjuguée de ces facteurs sur la variation des taux de parasitisme dans les serres a montré une différence entre ces taux en fonction de la position des feuilles sur les plantes. Les taux enregistrés au niveau des feuilles inférieures dans la serre biologique sont plus élevés par rapport à ceux enregistrés sur les feuilles moyennes et les feuilles supérieures qui sont caractérisées par une forte population des œufs et des larves du 1er stade qui sont généralement peu sensibles au phénomène de parasitisme.

Aussi bien dans le cas de la serre biologique, que dans le cas de la serre normale, les taux de parasitisme et de régulation sont comparables sur les lignes.

Il semble que l'importance des populations des parasitoïdes dans la serre biologique ait pu maintenir des taux comparables sur les lignes, alors que l'action de l'opération d'effeuillage qui était conduite à plusieurs reprises, et à chaque fois étalée sur deux ou trois jours serait la cause principale de variation des taux en fonction du temps, notamment au niveau des feuilles de la partie inférieure de la plante.

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EFFECTS OF DIFFERENT BIOGAS RESIDUE CONCENTRATIONS ON SEED GERMINATION PRE-TREATMENT OF LACTUCA SATIVA L.

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ABSTRACT

Biogas plants as a renewable energy technology for generating energy also produce biogas residue. The biogas residue, which is a sustainable source, has a rich mineral content and a wide application range in agricultural production. We hypothesized that the mineral substances in the biogas residue will have a positive effect on germination by promoting enzyme activity in seed pre-treatment. The aim of this study is to investigate the usability of biogas residue in seed germination applications. In this context, biogas residue and seed pre-soaking treatment were applied to lettuce (Lactuca sativa L.) seeds. A laboratory experiment was conducted to study the effects of different biogas residue concentrations (0%, 1%, 5%, 10%, 15%) and time (1h, 2h, 3h). The study was conducted with 4 repetitions and 16 applications. In this experiment, T50, peak value and germination percentage were examined. As a result of the experiment, T50 value decreased, peak value increased with increasing biogas residue concentration and application time. Although there was no significant change in the percentage of germination due to changes in application time, there was an increase compared to control group. The study showed that the concentration and application time of the biogas residue in seed pre-treatment were important parameters in terms of positive or negative effect.

Keywords: *Biogas residue, Anaerobic Fermentation, Seed Pre-treatment, Lactuca sativa, Sustainable Agriculture.*

Highlights

- Impacts of different biogas residue concentrations as priming agent were tested.
- Increased concentration of solution had a negative effect on the seed germination of *Lactuca sativa* L. seeds.
- It was found to have a positive effect at low biogas residue concentrations.

INTRODUCTION

Rapid population growth, decrement of arable land and climate change poses are risks for food security. In this context different techniques are being developed to produce higher quality and larger quantities of food. One of these techniques in agricultural produce is priming (pre-treatment). Seed priming is an easy and low-cost technique that speeds up germination and seedling emergence, and promotes vigorous early growth (Jalali and Salehi, 2013; Kenanoğlu, 2016) Priming can be done with distinct methods. Important priming methods include hydropriming, osmopriming, matrices priming, thermopriming, hormonal priming, halopriming, chemical priming, physical priming, biopriming and nano priming (Nawaz et al., 2013; Rakshit and Bahadur, 2018). The point that the separates the applications is the mediums used in the application (Nawaz et al., 2013; Paul and Dutta, 2018).

Some enzymes such as amylase, protease and lipase play a role in embryo development and growth in seed. The increase in the activity of these enzymes can provide an increase in germination. Seed priming (soaking) is defined is as holding the seed in the liquid for a period without allowing the emergence of root to promote seed metabolic activity (Heydecker and Gibbins 1978). With this treatment, germination-enhancing metabolites are formed by activating the enzymes in the seed and the stored nutrients for germination are made ready for use (Basra et al. 2005; Demir et al. 1994). Seed priming is the most important physiological methods. With this process germination, faster, quality and a same amount of germination (Bradford, 1986). Seed priming treatment can be used as a treatment against drought stress by shortening germination time (Nawaz et al., 2013). Seed priming (soaking) is widely used to reduce the time between seed sowing and seedling emergence and to provide a sample output of seedlings (Parera and Cantliffe, 1994).

Generally, about 6% solids are recovered from the biogas reactor. Separating the solid and liquid phase can be use (Bauer et al., 2009; Kaparaju and Rintala, 2008; Kocar, 2008). After the separation of the phases, most of the N and K remain liquid phase (Bauer et al., 2009). Biogas residue is also rich in micro elements.

The nutrients in the form of biogas residue can be taken into the seed pre-treatment applications, absorbing and osmosis is taken into the seed together with the activation of the enzymes in the embryo and endosperm to promote germination and stimulate the growth process (Feng et al., 2011). For example, Zhao et al., 2014 used biogas residue in *Vicia faba* seed pre-treatment. At the end of the study, the mineral content of biogas residue was high and had a positive effect on germination and seedling growth. However, the use and application rate in seed pre-treatment varies according to the content of plant species fermented fertilizer (Ramana et al., 2002).

The factors affecting germination of lettuce (*Lactuca sativa* L.) seeds; plant growth regulators are many internal and external factors, including light, temperature and water (Dutta and Bradford, 1994; Weges, 1987). Internal and external factors can have negative effects on germination. Germination activity could be increased by minimizing these negative effects with different methods. In this context, lettuce (*Lactuca sativa* L.) seed priming with liquid part of biogas residue was investigated.

MATERIAL AND METHODS

The study was conducted in 2018-2019 at Ege University, Institute of Solar Energy, Biomass Energy Systems and Technologies Centre at Energy Plants Laboratory. Seed germination was performed in SI-BSD-100 incubator.

SEED AND BIOGAS RESIDUE

The seeds of lettuce (*Lactuca sativa* L.) variety 'Yedikule-5719' were obtained from Bursa Tohumculuk. The seeds are standard vegetable seeds and are specified by the company to comply with the least seed requirements. However, biogas residue was obtained from Altaca Biogas Plant, Balıkesir, Turkey (40°09'08.9"N 27°38'36.1"E). The materials used in biogas production in the plant are; chicken farm wastes, cattle wastes, rice husks and stems, dairy factory wastes, slaughterhouse wastes, yeast factory wastes. After the hydraulic retention time in the biogas reactor, the solid and liquid parts of the fermented manure removed from the system were separated with the aid of a separator. While the solid portion was evaluated in a separate process, the liquid portion was made sanitation from the cogeneration system, making the liquid fermented product usable.

Nitrogen analyses of biogas residue were carried out according to ASTM D-5373 and D-4236 using Leco Truspec, CHN-S, USA elemental analyser. Total solids and volatile solids analyses were performed according to DIN 12880- DIN 12879 German Standards, with 3 replications for each sample. pH and EC analysis were performed with WTW pH/Cond 3320 measuring device.

EXPERIMENTAL SETUP

The germination test of the control group seeds, and experimental group seeds was performed according to ISTA and Canadian Methods and Procedures for Seed Testing. Macherey-Nagel 751/61 type filter papers were cut according to petri dishes and the 0.25 g of fungicide (Bayer, Pomarsol Forte, thiram active substance; 80 WP) was added to 1 liter of pure water and mixed thoroughly after a half hour in the prepared solution. The seeds were placed on filter paper in petri dishes with 4 replications and 50 replicates. The germination test took 7 days in the incubator. Seeds with 2 mm root emergence were considered germinated and counted. After the last day count germination percentage was calculated.

In order to study with biogas residue (liquid part) on lettuce seeds, a factorial experiment was conducted based on randomized block design with four replications, three priming times and five concentrations. Seeds were treated at 1,2, 3 hours with 0% (distilled water), 1%, 5%, 10% and %15 biogas residue (liquid part was prepared with distilled water) and nonprime (control) (Table 1). After priming, seeds were washed with distilled water and dried to original weight. The seeds were then sown on two sheets of filter paper placed in glass petries. The experiment was conducted in a growth chamber (20±2°C). During the experiment, distilled water was applied if necessary.

Table 1: Treatments

Concentrations	Content	N (%)
-	DW	-
%1	DW+ BR	0,02
%5	DW+ BR	0,05
%10	DW+ BR	0,1
%15	DW+ BR	0,15

Note: DW: Distilled water, BR: Biogas residue

Germination parameters were calculated according to the following formulas. Time taken to 50% germination was calculated by Coolbear et al. (1984):

$$T50 = t_i + \frac{\left(\frac{N}{2} - n_i\right)(t_j - t_i)}{(n_j - n_i)}$$

Germination percent (%):

$$Germination\ percent\ (\%): \frac{100 * total\ germinated\ seeds}{Total\ seeds}$$

STATISTICAL ANALYSIS

In order to understand the statistical difference between the results, the analysis results were subjected to Duncan Multiple Range Post-hoc test. IBM SPSS (Version 25.0) statistical package program and Microsoft Excel were used for the calculations.

RESULTS AND DISCUSSION

The T50 value is the day when half of the seeds germinate. This value is lower than the control means that the application is successful in terms of early germination. In this context, it is seen that germination time of T50 value increases in direct proportion with increasing seed pre-treatment application time and concentration. When the T50 value was examined, 1% (2h) biogas residue concentration there is a difference, 4.8% compared to control and %7.1 compared to distilled water (0%) (Table 2).

Peak value indicates the maximum number of germinations per day during the entire germination period. When the peak value is examined; the highest value (42.5) 1% (2h) is seen in the experiment. This value is also the only application that is higher than the control experiment and the difference is about 14.12%. In terms of germination rate; it was determined that 1% (2h) experiment increased germination rate by 20.3% compared to control. Another application that is higher than the control is 5% (1h) experiment. Other experiments are lower than the control (Table 2).

Germination percentage (%) means how much of the total number of seeds germinate. When germination percentage is evaluated; The highest germination percentage appears to be 5% (2h). This in order; 1% (2h), 15% (1h), 10% (1h) and DW (0%) (2h) follow the experiment. It was observed that germination percentage decreased with increasing experiment time and concentration. Lower concentrations of biogas residue experiment showed a higher germination percentage compared to DW (0%). High concentrations of biogas residue have a positive effect on the percentage of germination compared to the control if the experiment time is short (Table 2).

Table 2: Results of treatments

Priming Treatments		**Priming time (hour)**	**T50 (day)**	**Peak Value**	**Germination Percentage (%)**
Control	T1	0	**1.65ab**	**36.5c**	93.5abc
	T2	1	**1.69ab**	35bc	94.5bcd
%0	T3	2	1.76b	31.25b	**95cd**
	T4	3	1.95c	26.08a	82.5a
	T5	1	1.68ab	34.5bc	93abc
1%	T6	2	**1.57a**	**42.5d**	**96.5cd**
	T7	3	2.41d	23.3a	93.5bcd
	T8	1	1.7ab	35.25bc	**98d**
5%	T9	2	1.73b	32.25bc	93.5bcd
	T10	3	2.35d	24.5a	90bc
	T11	1	1.68ab	35bc	**95cd**
10%	T12	2	1.67ab	32.7bc	87.3ab
	T13	3	2.34d	24.8a	92abc
	T14	1	1.73b	33.25bc	**96cd**
15%	T15	2	1.66ab	34.7bc	92abc
	T16	3	2.4d	24.3a	91.5abc
Mean	-	-	*1.80**	*31.60**	*92.80**

Note: Means in each column followed by similar letters are not significantly different at the 5% level (Duncan's test)

When the examined in pH and EC changes in concentrations of biogas residue, it is noteworthy that there is no significant difference in pH as concentration increases, but it is remarkable that there is a significant increase in EC value (Table 3). In this case, EC value is known to have a significant effect on seed germination and germination parameters; negative correlation between germination percentage, germination rate, peak value, T50 value. Alburquerque et al. (2012a), similar results were reached.

Table 3: pH and EC changes in concentrations

Treatment	pH	EC
DW (0%)	8.32	1.81
1%	8.68	1.68
5%	8.74	7.18
10%	8.77	13.3
15%	8.77	19.3

In the study carried out in order to reveal the effects of the applications on germination of lettuce seeds, it was determined that the germination values of the seeds exposed in short periods of time, especially at low concentrations, had a positive effect on the germination values. Alburquerque et al. (2012) also emphasized that low concentration (1%) applications can be applied successfully in germination parameters, whereas high concentrations decrease germination values. Pivato et al., (2016) emphasized that ecotoxic effect will increase with increasing fertilizer concentration.

CONCLUSIONS

Cellular metabolism is affected by seed pre-treatment techniques and seedling development is encouraged in seed (Kenanoğlu, 2016). Biogas residue is thought to have a stimulating effect for seed germination at low concentrations (Alburquerque et al., 2012; Emino and Warman, 2004). In this context, the effects of biogas residue on germination of lettuce seeds at different concentrations and periods were investigated. At the end of the study, it was decided that the most suitable pre-treatment was 2 hours at 1% and 1 hour at 5%. The results of the seed germination study Show that the effect of biogas residue on seed germination can be positive of negative. This effect may vary depending on the concentration of fertilizer. Therefore, caution should be exercised when using biogas residue for irrigation purposes before planting (Ramana et al., 2002). If biogas residue is used, especially EC analyses should be carried out and then the concentration should be determined accordingly. Otherwise, it is thought that germination activities of the seeds may be adversely affected.

ACKNOWLEDGEMENT

This study is included in the master thesis (2019) of Benginur Baştabak.

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AN ECO-FRIENDLY APPROACH TO CLIMATE CHANGE: ENERGY PRODUCTION FROM BIOMASS SOURCES

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ABSTRACT

Today, a large part of energy needs are met from fossil sources. Emissions from utilization of the fossil sources cause greenhouse gas concentrations in the atmosphere. Climate change caused by greenhouse gas emissions has become the most important environmental problem. Climate change threatens all ecosystems on earth, from micro-organisms to macro-organisms. The use of fossil sources is known to have negative effects on human health. Apart from these effects, it is also known that soil and water pollution, acid rain and desertification are other consequences. Due to the depletion of fossil fuels and such environmental consequences, scientists focused their research on renewable and sustainable energy resources. In this manner, biomass energy and biogas production technologies are the forefront issues. Biomass resources include animal and agricultural wastes as well as industrial and municipal wastes. Biogas from anaerobic fermentation process can be used for heating and generating electricity. Anaerobic fermentation is an efficient alternative technology with sustainable waste management in biogas production. In addition to this, biomass energy and biogas production process are known to have the potential to reduce climate change and air pollution resulting from greenhouse gases. In this study, it is aimed to investigate the effects of using renewable and sustainable biomass resources for energy production on climate change.

Keywords: *Biomass, Bioenergy, Biogas, Climate Change.*

INTRODUCTION

In recent years, energy demand has rapidly increased in parallel with population, industrialization and technological developments. Intensive consumption of fossil fuels to meet increasing energy demand is a source of greenhouse gas emissions causing global climate change and environmental pollution. It has been known that fossil source consumption causes global climate change along with the negative impact on the environment, human health and all ecosystems on Earth [1].

There is a connection between climate, social and environmental conditions and human health, consequently climate change affects the quantity and quality of food and water, increases air pollution, and changes the disease transition dynamics [2]. Climate change is seen as one of the biggest environmental threat for human beings and especially carbon dioxide, emissions from fossil fuel use are considered to be the dominant cause of climate change [3]. By the use of fossil fuels, gases such as carbon dioxide, methane, nitrogen oxides, sulfur oxides, chlorofluorocarbons are emitted. Among these gases, carbon dioxide is the gas that contributes the most to greenhouse gas emissions and it stays in the atmosphere for the longest time. Worldwide, carbon dioxide is responsible for around 65% of greenhouse gas emissions [4]. In 2018, the global atmospheric carbon dioxide level reached approximately 408 ppm and it is a new record [5].

Today, more than 80% of global energy demands are met from fossil sources [6]. Until 2050, it is estimated that it will remain approximately 14% of oil reserves, 72% of coal reserves and 18% of gas reserves [7]. Rapid consumption of fossil fuels in order to meet rising energy demand caused the acceleration of the using alternative energy sources. At the same time, significant transformations are needed in global energy systems to mitigate climate change impacts [8]. In recent years, the studies on renewable energy resources have gained a place in order to prevent damage to environment and sustainability caused by the use of fossil fuels. It was reported that legislation and policy encouragement in many developed countries provided using renewable energy and reduce greenhouse [9]. Renewable energy sources play an important role in reducing greenhouse gas emissions and carbon footprint. Around the world, 13.4% of the total energy is supplied from renewable energy sources and the rest is from oil, natural gas and coal [10]. It is foreseen that energy demand will increase by 40% by 2040 and renewable energy sources are expected to continue to gain importance in the global energy platform [11].

Among renewable energy sources, biomass energy and biogas production technologies are forefront issues. Anaerobic fermentation is known to be an efficient alternative technology with sustainable waste management in biogas production. Biogas is a clean energy source that is used in areas such as cooking, heat

and electricity generation by direct and indirect usage methods. It is known that biogas has good potential to reduce climate change and also has environmental benefits such as reducing air pollution from greenhouse gases [12]. Because of these features, biogas has become one of the most important renewable sources of energy in different parts of the world that draws more and more attention in both developed and developing countries.

In this study, it is aimed to investigate using of biomass resources as renewable and sustainable energy sources and the effects of biogas production on climate change.

BIOMASS ENERGY AND BIOGAS PRODUCTION TECHNOLOGIES

Biomass is defined as all non-fossil organic matter of biological origin. Biomass resources include animal and agricultural wastes as well as industrial and municipal wastes. Biomass also includes agricultural plants, plant residues and energy plants that are widely available all over the world [13]. According to literature research, biomass will provide more than 11,5% of the world's major energy requirement and it is expected that biomass will account 55% of renewable energy at the end of 2020 [14]. In addition to these, biomass is an energy source with the potential substitute of fossil fuels due to its renewable and eco-friendly properties. It is predicted that the development and use of biomass energy can help change the energy production and consumption policies, improve the economies of the communities and establish a sustainable energy system that supports environmental protection [15].

Anaerobic fermentation is a complex biological process that converts biomass into biogas through different microbial pathways and biochemical reactions. In this process, biogas production occurs as a result of decomposition of organic substances and this fermentation is widely used in the treatment of different organic wastes. Biogas production by anaerobic fermentation takes place in natural environments as well as small- or large-scale controlled production. Biogas is a clean energy source that is used in areas such as cooking, heat and electricity generation by direct and indirect usage methods. At the same time, fermented fertilizer with high nitrogen content is formed in a form suitable for the agricultural activities after anaerobic fermentation. Because of these features, biogas has become one of the most important renewable sources of energy in different parts of the world that draws more and more attention in both developed and developing countries.

THE EFFECT OF BIOMASS ENERGY AND BIOGAS PRODUCTION ON CLIMATE CHANGE

Climate change is a global problem and threatens all ecosystems. This is mainly due to the increase in greenhouse gas emissions and the initiatives to reduce these emissions are accepted as one of the best approaches in order to prevent climate change in the world. Temperature changes since the industrial revolution have been associated with the use of fossil fuels [16]. Recent analyzes have shown that the rise in global temperatures is due to greenhouse gas emissions and there will be major changes in climate in the coming years [17]. As a result of the studies, it has been reported that increasing temperatures due to emissions will be permanent [18].

Today, the rapid increase in energy consumption is becoming an important problem for humanity and ecological balance. Fossil fuels are used to meet energy demands and this contributes to greenhouse gas emissions especially carbondioxide. Using clean and sustainable energy sources instead of fossil fuel can be an effective strategy to reduce carbon dioxide emissions [19]. Growing international cooperation on climate change and rapid advancements on clean and sustainable energy indicated the end of the fossil fuel era [20].

Fossil reserves emits carbon to atmosphere during the formation process for millions of years while biomass capture carbon rather than releasing to the atmosphere because of the photosynthesis of biomass [21]. Therefore, biomass energy and biogas production technologies provide important advantages to minimize future environmental impacts such as greenhouse gas emissions from fossil fuel use and for future energy demands. How does biogas provide these advantages? There are many suitable raw materials in the biogas production process and has a closed nutrient cycle potential. In biogas production, the carbon released to the atmosphere is reused by plants and other biomass sources, and thus a cycle takes place. Therefore, unlike fossil sources, biogas production is considered to be carbon neutral.

CONCLUSSIONS

Due to industrialization, technological developments and population growth, enery demand is increasing day by day. Since a major part of greenhouse gas emissions result from fossil fuel use, it is a hot topic for

climate change and energy consumption issues. The most important way to prevent climate change is to move away from fossil fuels. Considering greenhouse gas emissions from fossil resource use in energy production, biomass energy and biogas production technologies come to the forefront. Studies show that biogas obtained by anaerobic fermentation of different biomass sources is a clean energy source. Biomass energy and biogas are carbon-neutral compared to fossil sources and it is predicted that they play an important role in reducing climate change. With its features, biogas seems to be one of the energy sources with the lowest environmental impact. With the development of biogas production technologies in the future, major developments and impacts will be experienced in clean energy production. In addition to these, the impacts and develeopments include reduced release of greehouse gases to the environment ensures that the battle against global warming.

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CONTROL OF *ATRIPLEX HALIMUS* L. SEEDS GERMINATION BY ABSCISSIC ACID

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ABSTRACT

Abscisic acid (ABA) is considered to be a germination inhibitor and is held responsible for seed dormancy. Radicle emergence is a program that controls seeds germination. This program is influenced by ABA but how this hormone controls seed germination is still poorly known. In order to achieve our objective, two orientations are given to this approach: on the one hand, the study of the physiological behaviour of the seeds of Atriplex halimus (L.) with respect to NaCl salinity (0, 100, 300, 400 and 500 mM), and on the other hand, the involvement exogenous ABA (0, 10^{-6}, 10^{-4}, 10^{-3} M) in the inhibition of germination and the emergence of radicle. For this we evaluated the parameters for the final germination rate of the seeds as well as the root growth. The results showed that the increase in NaCl concentrations from 300 mM significantly reduced the germination rate of the seeds and slowed the growth of the radicles. Trials conducted on ABA-treated seeds indicate that germination of Atriplex seeds is inhibited only at high concentration (10^{-3} M). The mean length of the radicle was less than 1.33 mm. This expression was re-established in the ABA transitory-treatment (ABA/water) after the seeds were transferred back on water and proceeded to germination. Elongation of the radicles of germinated seeds subjected to the transitory-treatment progresses slowly to a length comparable to that of the control. Our results suggest that ABA controls germination through the control of radicle emergence,by inhibiting cell-wall loosening and and expansion.

Keywords: *ABA, germination, Atriplex halimus, NaCl, radicle, emergence.*

INTRODUCTION

Abiotic constraints (salinity, drought and cold) result in a 70% decrease in yield of field crop plants (Kosova et *al*., 2011). The search for plants more adapted to abiotic stresses is a fundamental issue for ensuring agricultural production in the coming decades (Turner et *al*., 2001). Inhibition of germination by salinity is commonly observed in halophytes, probably as a result of salt-induced hormonal imbalance. Abscisic acid (ABA) is considered to be a germination inhibitor and is responsible for seed dormancy (Gavassi et *al*., 2014). Evaluation of the role of ABA during seed germination under salt stress provides information on plant resistance and / or tolerance mechanisms to abiotic stress. Radicle emergence is a program that controls seeds germination. This program is influenced by ABA (Gimeno-Gillesa et *al*., 2009). The aim of our work is to understand the strategies involved in the germination of the seeds in the presence of salt and ABA.

MATERIAL AND METHODS

Plant material: The present study is carried out on seeds of *Atriplex halimus* L. harvested from shrubs growing in Algeria.

Experimental protocol: The germination test was conducted in a growth chamber at Oran University at Algeria. The seeds undergo three treatments:

1- Effect of sodium chloride (NaCl) at 100, 300, 400 and 500 mM.
2- Effect of ABA at 10^{-6}, 10^{-4} and 10^{-3} M.
3- Effect of constant and transitory ABA treatment versus water.

For each treatment, 30 seeds were disinfected with sodium hypochlorite for 5 min. and rinsed with distilled water. They were then germinated in darkness at 22°C in 9 cm diameter Petri dishes on filter paper soaked with 7 ml of appropriate solution. Germination rate was determined by the radicle appearance, according to the definition of Bewley (1997). Radicle length was determined by a graduated rule. Measures were repeated three times.

RESULTS AND DISCUSSION

Effect of NaCl on seeds germination and radical growth

The results shows that seeds germination rate of *Atriplex halimus* L. decreases significantly from 300 mM NaCl to reach a rate of 40%. At 500 mM, seed germination is inhibited (Fig. 1A). Radicle length decreases as the concentration of salt increases (Fig. 1B, C). This reduction could be due to the seed enzymes and hormones alteration (Benjelloun and *al*., 2013). According to Daroui et *al*., (2013), the decrease in the germination rate of seeds subjected to salt stress is due to an osmotic dormancy process developed under these stress conditions. Otherwise, Panuccio et *al*., (2014) note the decrease in growth is the result of a decrease in the number of cellular divisions during abiotic stress.

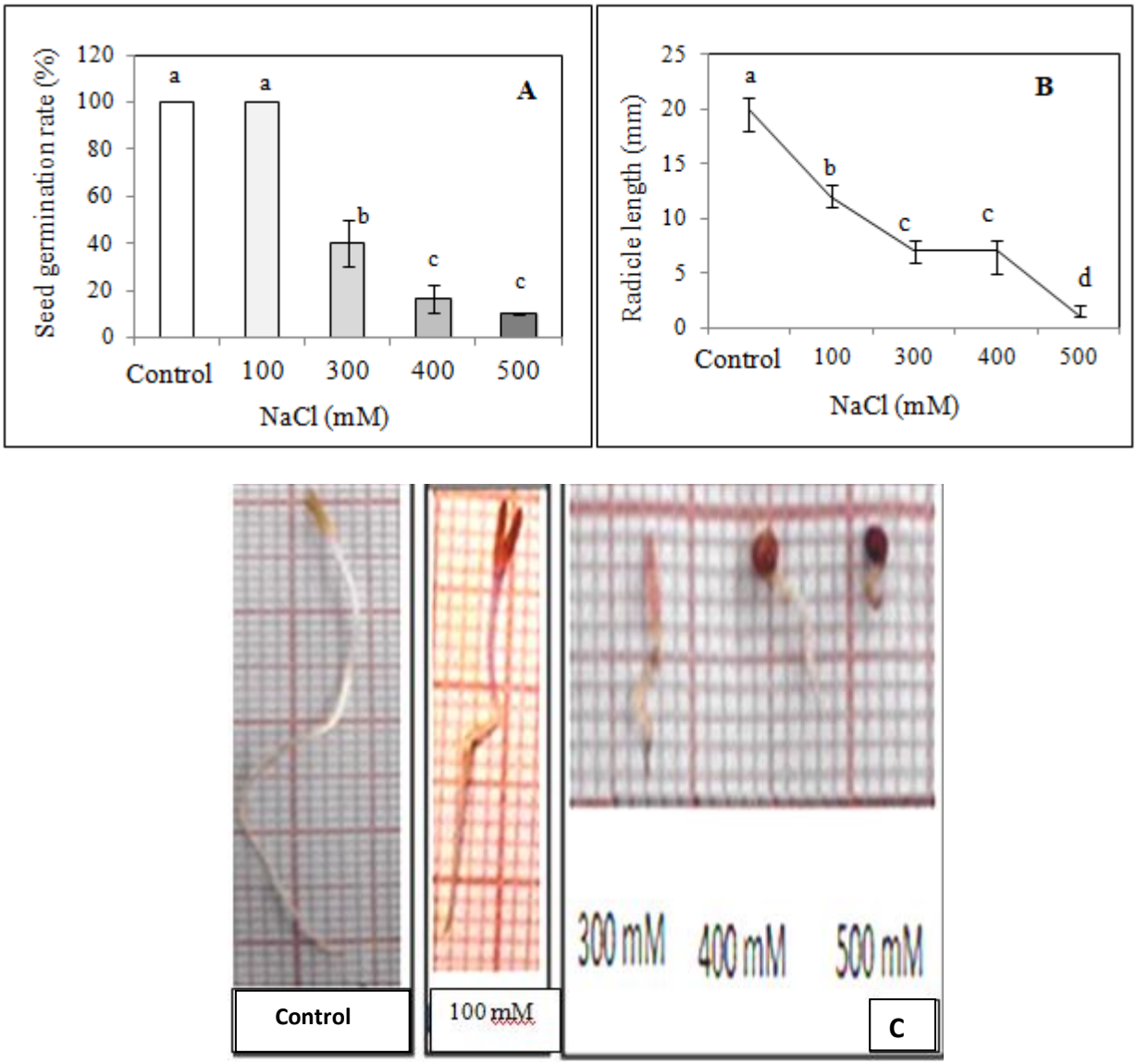

Figure1- Germination rate (A) and radicle length (B, C) of seeds A*triplex halimus* under NaCl stress

Effect of ABA on seeds germination and radical growth

The figure (2 A) shows that under ABA hormonal treatment, germination is inhibited only at high concentration (10^{-3}M).

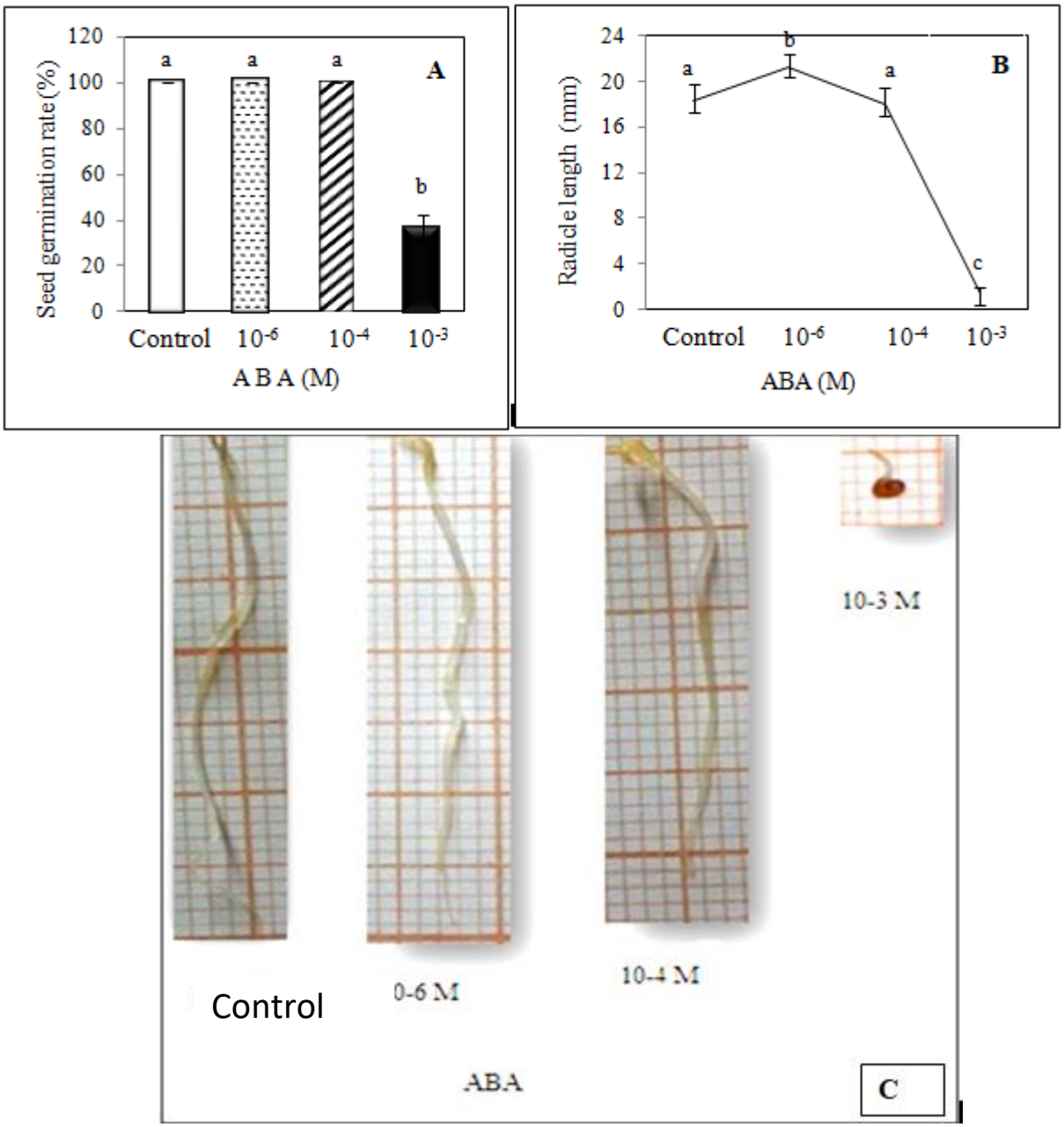

Figure 2- Germination rate (A) and radicle Length (B, C) of seeds *Atriplex halimus* under ABA treatment

Similar results were obtained for *Capsicum annuum* and *Brassica napus* (L.). In these species, the ability of embyos to absorb water is reduced as a result of osmotic stress caused by ABA at 10^{-4} M, which delays seed germination and lengthens germination time. While at 10^{-3}M ABA, germination is completely inhibited (Schopfer et Plachy, 1984; Leskovar et Cantliffe, 1992).

The results (2B, C) indicate that the low concentration of ABA (10^{-6}M) seems to stimulate root growth. This last is inhibited only from 10^{-3}M. According to Kutschera and Schopfer (1986), a high concentration of ABA, including exogenous ABA, results in a decrease in cell extensibility.

Effect of Constant and Transitory ABA treatment on seeds germination and radicle growth

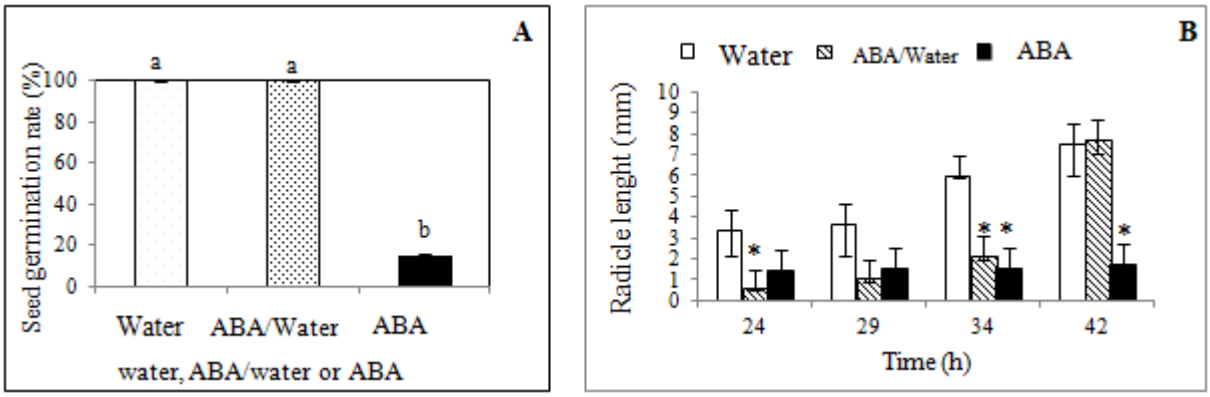

Figure 3-Effect of Constant and Transitory ABA treatment on seeds Germination (A) and radicle growth (B) of *Atriplex halimus* L.

In the transitory ABA treatment, seeds were imbibed on 10^{-3} M ABA (germination inhibitory concentration), washed after 5 h and transferred on water. Seeds germination rate and radicle length were comparable to that on water condition (Figure 3A and 3B). Analysis of the impact of ABA on *Brassica napus* seeds germination showed that neither osmotic potential of embryo axis cells nor their ability to take up water was affected by the presence of ABA, but rather cell-wall loosening was prevented, resulting in inhibition of germination (Bewley, 1997; Gimeno-Gillesa et *al*., 2009).

CONCLUSION

ABA controls germination through the control of radicle emergence, namely by inhibiting cell-wall loosening and expansion.

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RURAL LIVELIHOOD AND COMMODITY VALUE CHAINS: A CASE STUDY OF CHARCOAL VALUE CHAIN IN SOUTHWESTERN NIGERIA

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ABSTRACT

Rural areas are known as raw material bases for commodity production. The efficiency of the supply chain from these areas to its consumption sites is imperative for sustainability of such commodities. Climatic variability has instigated adoption of alternative livelihood such as charcoal production. The study evaluated the transfer of charcoal from rural producing areas in Ibarapa region of Oyo state to urban areas of Ibadan and Lagos with the aim of assessing the efficiency of the value chain. Structured questionnaires were administered to charcoal producers, and marketers. Focus group discussions were also held with charcoal dealers while structured interviews were conducted with exporters, transporters and toll-collectors. Results of the social survey indicated that scale of production increased from Ibarapa East towards Ibarapa North as a result of feedstock availability. About 34,771.2 metric tons of charcoal was estimated to be transported out of the region annually worth about ₦1.3 billion ($3.7million). Producers obtained the highest percentage of income along the chain to Ibadan (16.56%), retailers had the highest share in the chain to Lagos (20.8%). Rural residents had a lower share of income in the chain to Lagos (13.88%) than to Ibadan (17.53%). Unfortunately these are the production community residents who are faced largely with the environmental and social impacts of charcoal production. The formalization of charcoal production activities in the region is recommended as the basic step towards an efficient value chain.

Keywords: *Livelihood, Charcoal, Value chain, Sustainability, Alternative Energy*

INTRODUCTION

Rural areas are known as raw material bases for commodity production. In some cases, the raw materials are processed in areas close to their source. This expectedly provides some form of alternative livelihood for the rural dwellers. In other cases, especially in the production of agricultural goods, the rural dwellers grow the crops and sell them to manufacturers, wholesalers, or consumers directly. Climatic variability and rising cost of agricultural inputs and household consumables without corresponding rise in agricultural product prices are however driving noted rural farmers to adopt alternative livelihood strategies (Olusola & Adenegan, 2011). The value chain concept is used to describe this process of production and distribution till it gets to the final consumers. The concept has been defined in various forms but all reflect the idea of it being the full range of activities which are required to bring a product or service from conception, through the different phases of production, transformation and delivery to final consumers, and eventual disposal after use (Kaplinsky & Morris, 2002).

It is not sufficient to participate in the production and distribution of these products, but more importantly, to do so in a way that provides sustainable income growth, especially for poor people. Indeed, understanding relationships, opportunities, and bottlenecks in a commodity value chain is crucial to the determination of the contribution of the commodity to economic development (Adeoye *et al.*, 2013). A value chain is said to be efficient when all actors in the chain operate in a way that maximizes the generation of value along the chain (Oni, 2013). Value can be the amount of wealth created by a player in the chain (Adeoye *et al.*, 2013). In other words, the basic aim of improving a value chain is to ensure equitable distribution of wealth along the chain, major constraints to which include: market access restrictions, weak infrastructure, inadequate resources, and institutional voids (Trienekens, 2011).

Commodity producers like farmers in rural areas receive a relatively little percentage of total value generated from their products hence depend on increasing their scale of production to increase employment generation and income (Oni, 2013). Unfortunately, such small-scale producers are at a disadvantage because they have little capital to invest, use traditional methods, depend on family labour, and lack contact with (international) market players. The three (3) systems of value chains in developing countries were noted by Trienekens (2011) as:

(i) A-System: made up of large numbers of small producers who make their products available to only the local low-income market. Little value is added but involves a high volume of production. E.g. Cassava production in West Africa

(ii) B-System: relatively less number of producers (local middle to high-income chain). Most of the products are delivered on demand to local middle to high-income market like supermarkets. This has less volume of products but higher value added than the A-system. E.g. Vegetable production in Kenya for South African retailers operating in Kenya

(iii) C-System: completely focused on the export market while low quality products are sold in local market. There is high value added though with less volume of products and limited actors. E.g. South African table grape production.

Enhancing commodity value chain in rural areas according to Sivapalan & Rajendran (2012) is thus a development strategy that widens and sustains three major pathways out of poverty:

(i) Securing assets
(ii) Improving smallholder productivity and
(iii) Increasing market participation by the poor.

Charcoal production in developing countries is majorly fuelled by demand from households in surrounding urban areas (NTL, 2002; Palmula & Beaudin, 2007; Kituyi 2002; Tunde *et al.*, 2013). In Nigeria, the contribution of charcoal to primary energy use is just about 1.3% and 4.4% in the southwestern region yet there is a growing increase in production volume (NBS, 2011). Rural producers however care less where products end up and more about the immediate income generated from sales to meet present needs. We thus capture the flow of products from the rural producing areas to the urban centers for appropriately targeted interventions.

Rural areas especially in developing nations are known to possess low levels of technology that could facilitate efficient transformation and use of natural resources; hence they tend to consume more to meet higher demands of increased population, and prices of household consumables. Traditional kilns have an average yield rate of between 5% and 30% (FAO, 2008; Seboka, 2010; Uisso & Balama, 2011). The implication of this is that at an efficiency of 20%, about five (5) tons of wood will be required to produce one (1) ton of charcoal. This has brought about assertions that charcoal production is one of the leading causes of deforestation with implications for climate change, in the face of increasing demand especially in developing countries (Adedayo, Fasona, Olorunfemi, Elias, & Oloukoi, 2013; Palmula & Beaudin, 2007; Uisso & Balama, 2011).

The value chain concept in commodity studies has been applied more to agricultural products. However in their study of charcoal value chain in Malawi, Kambewa *et al* (2007) found that values accruing to producers ranged from 20 to 33%, transporters earned 20 to 25% and retailers obtained 25 to 33% of the retail price. This study examines the charcoal value chain in an oil producing nation and went further to consider the value that accrued to other stakeholders from feedstock sourcing to product sales.

The role of woodfuels has not been adequately captured in several national energy development strategies due to poor forest management and inadequate reliable data (FAO, 2010). Also, natural resources management has remained unsustainable in Nigeria because it is bequeathed with complex issues of policy formulation, institutional gridlocks and research gaps (Soneye, 2004). Nigeria's forest policy recognized the consumption rate of woodfuels but failed to acknowledge the growing interest in charcoal as both a locally consumed and exported commodity.

The study thus provides a holistic yet basic view of the various components of the industry for appropriate and effective policy interventions. Specifically, it identified charcoal production areas, major value chain actors, evaluated product flow and challenges for efficiency, all with the aim of ensuring sustainable natural resource exploitation and by extension climate change mitigation.

STUDY AREA

The southwest zone of Nigeria is made up of six states namely Lagos, Oyo, Ogun, Osun, Ekiti and Ondo states, located within longitude 2º to 6º East and latitude 6º to 9ºNorth and (fig. 1). It is bounded in the North by Kogi and Kwara states, in the east by Edo and Delta states in the south byAtlantic Ocean and in the west by Republic of Benin. The region lies within three ecological zones; the Derived Savannah to the north, Rain Forest in the middle, and the Mangrove Forest to the south. The study covered production activities in Ibarapa region of Oyo state, which lies within the derived savannah, and tracked its distribution to Ibadan and Lagos, which lie within the rain forest and mangrove forest respectively.

The Ibarapa region comprises Ibarapa East, Central and North local government areas, which cover about 838 km², 440 km², and 1,218 km² respectively with a population of 118,226 in Ibarapa East, 102,979 in Ibarapa Central, and 101,092 in Ibarapa North. Ibadan North east LGA was one of the urban sample areas with

a population of 330,399 which comprises a fair mix of all income classes. Somolu LGA was the other urban sample area with a population of 402,673 and is largely regarded as a low-income area. (NPC, 2006)

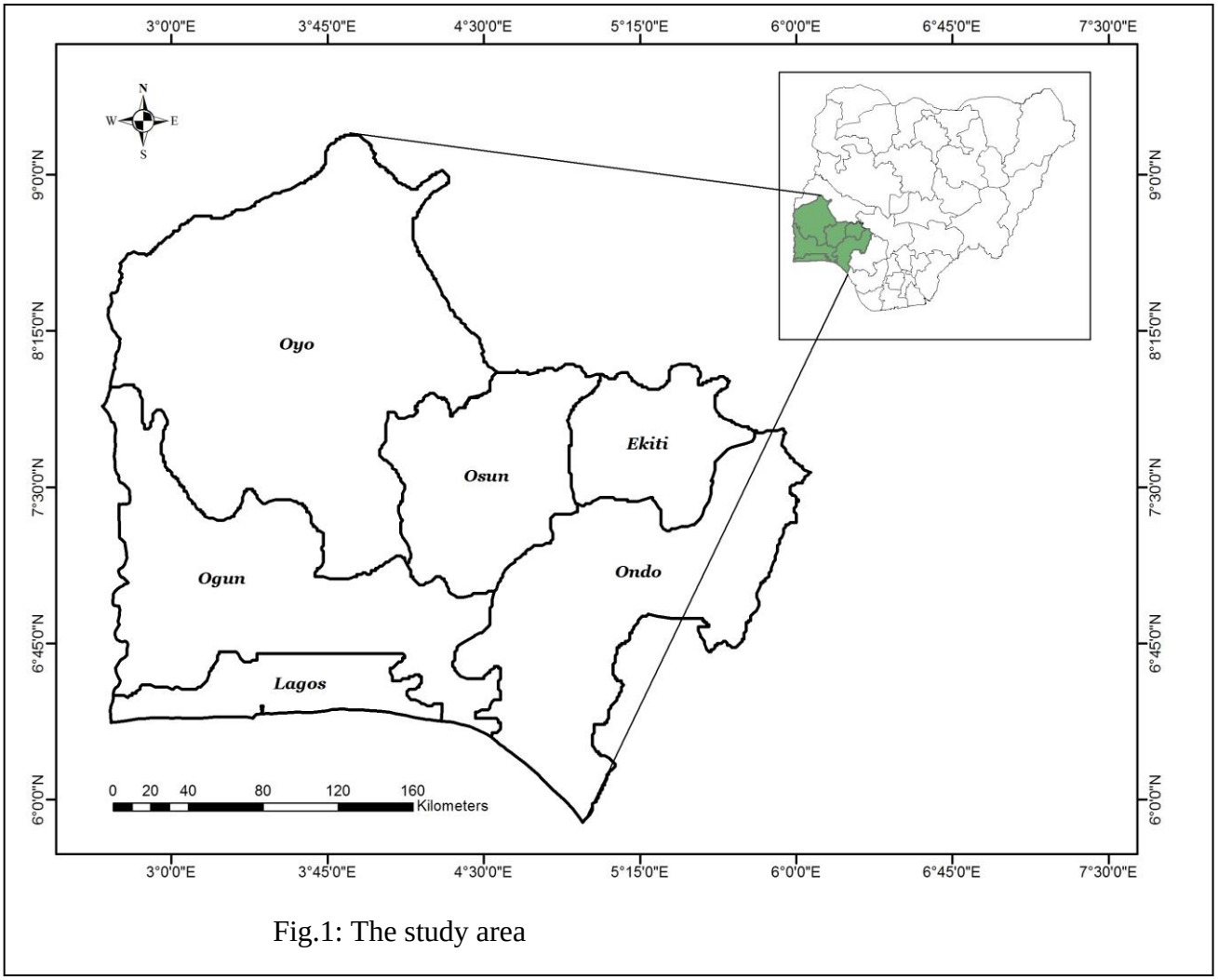

Fig.1: The study area

MATERIALS AND METHODS

Data for the study were collected through a set of multiple sources. A detailed reconnaissance of the LGAs was embarked upon in July 2012 with a view to determine the sampling protocol and procedure. This was supported by a set of topographic maps and field assessment, administrative records, interviews and social survey. Participatory rural appraisal techniques of Focus Group Discussion (FGD) and structured interview/questionnaire were also adopted. Two sets of questionnaires were used in the study including:

- Charcoal Producers Questionnaire: were used to acquire data on production dynamics, and producers' socio-economic characteristics. Thirty (30) copies of the questionnaire were administered in the production region to producers who were not part of the Focus Group Discussions (FGD) with respondents selected through the snowball sampling method wherein they were chosen by referral since charcoal production is an informal and largely secondary source of livelihood.

- Charcoal Marketers Questionnaire: administered in both the production and consumption regions. A total of thirty (40) marketers were chosen as respondents including twenty (20) in Ibarapa region, ten (10) in Ibadan North-East, and ten (10) in Somolu LGAs using the purposive sampling technique wherein they were identified on the major roads and interviewed accordingly. Data on supply and demand functions were retrieved from this set.

The study adopted the concept of value chain analysis to achieve its objectives. It involves the identification and quantification of the sequence of related business activities from production to consumption; asmuch as also the functions of operators and supporters in the chain (Sepp, 2008).Value chain analysis goes through six (6) basic steps as shown in Fig. 2

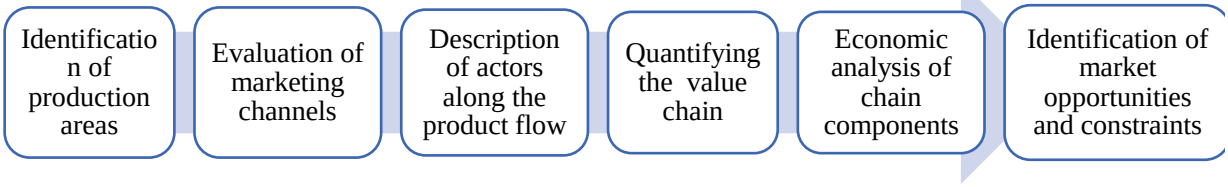

Fig 2: The Value chain framework

Source: Modified after Sepp, 2008; Kambewa et al, 2007; Kaplinsky& Morris,2001

In the process, attempts were made to identify and quantify the flow of products from one unit of operation to another till it got to the final consumers. Hence major production areas were identified from the reports of the FDGs and validated by field observation; marketing channels were identified from the results of questionnaires administered to producers in addition to the earlier methods. Functions of actors along the chain and data for economic analysis of the chain were summarized from the FDGs, producers' and marketers' questionnaires, interviews with transporters, toll collectors and exporters, field observation and inventory. The value chain was quantified using the volume of charcoal passing through the central toll gate as the dummy for volume transported out of the region.

RESULTS AND DISCUSSION

Identification of Production Areas:

Production is carried out in all areas of the region but differentiated by volume, which is a function of some factors including: (i) Feedstock availability (ii) Labour availability (iii) Security of kilns, and (iv) Land for agriculture. Outcomes of the FGD indicated that large scale production was done in areas in and around forests, which generate adequate volume of feedstock to meet production demand as its availability was most significant in determining production location. This was validated by the use of warehouse location as dummy for the scale of production, where it was found that production intensity increased from Ibarapa East to North as reflected in fig. 3. Retail points have stocks ranging from two (2) to about two hundred (200) bags while warehouses hold from five hundred (500) to more than three thousand (3,000) bags.

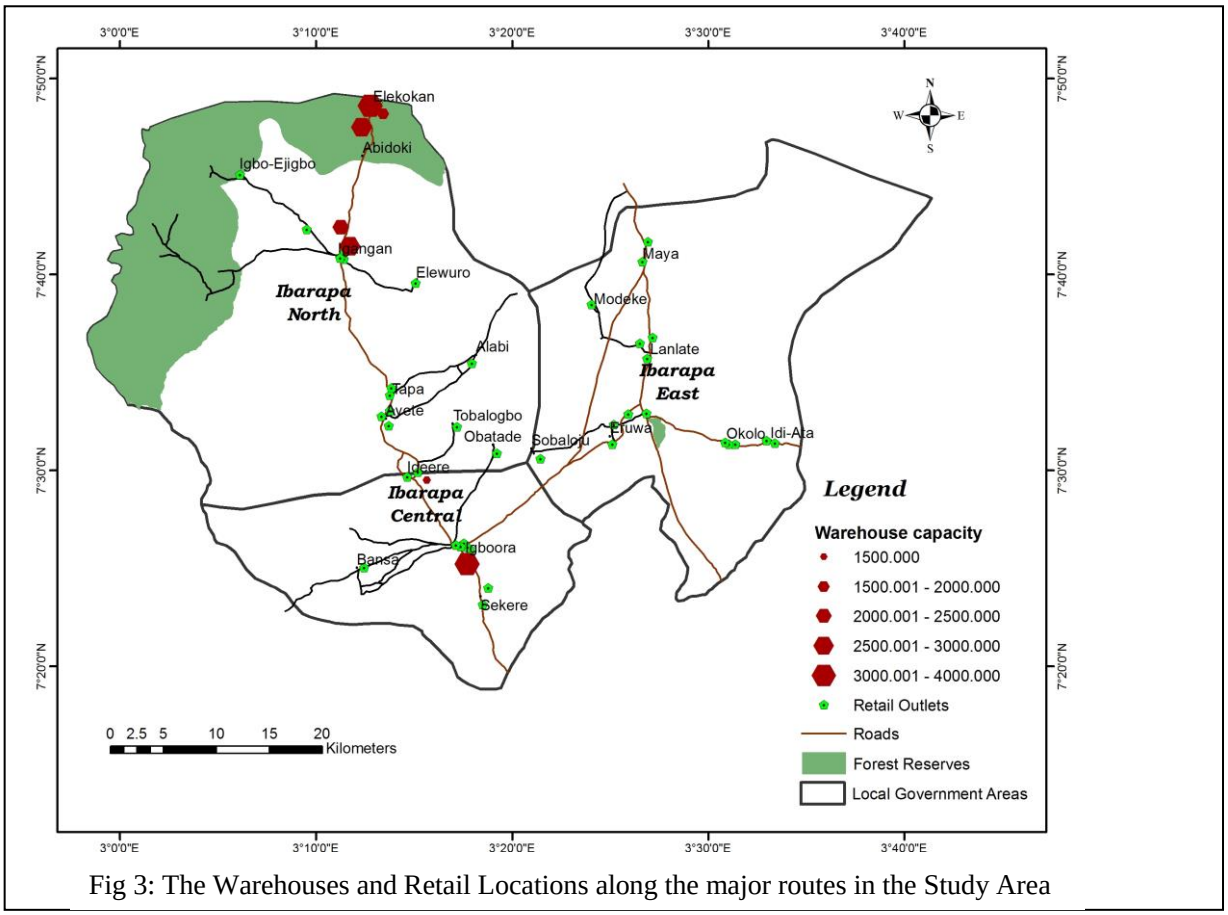

Fig 3: The Warehouses and Retail Locations along the major routes in the Study Area

Source: Computed from fieldwork (2013-2014)

Retail outlets were found everywhere yet there was no warehouse in Ibarapa East LGA; two (2) were found in Ibarapa Central LGA and five (5) in Ibarapa North LGA. The implication of this is the direct and indirect degradation of reserved forests to ensure adequate feedstock supply. Concerns are therefore rife on the need for holistic environmental protection strategy that takes into cognizance the livelihood challenges and opportunities in the region.

Evaluation of Product Flow:

The distribution of charcoal from production point to consumers follows the routes outlined in Fig 4.

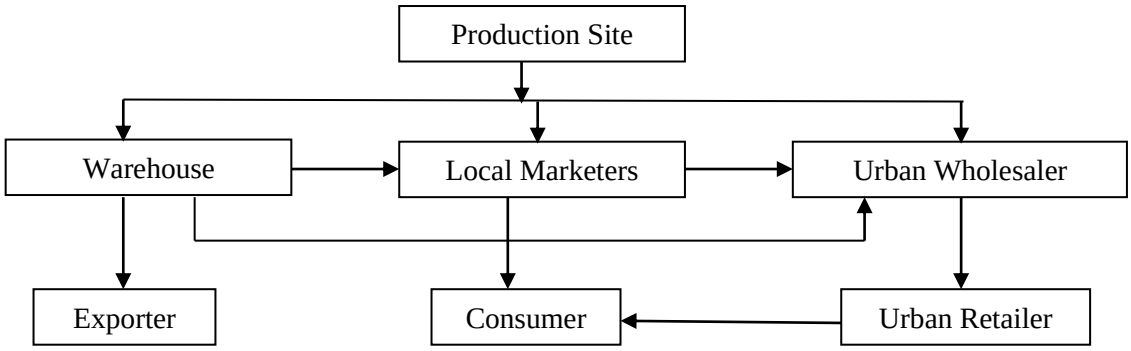

Fig 4: The Product Flow in the Study Area

Small scale village producers have an average stock of four (4) or five (5) bags, and costumers are usually those around them, or travelers along the routes. Local marketers transport products to towns using pick-ups or mini-trucks (locally called *Landstar*). Local wholesalers stock averagely about 200 bags while local retailers stock about 50 bags. Products are then either sold to consumers directly or to urban wholesalers who mop-up products to fill up their orders in an event of supply shortfalls. Large scale producers transport products to their warehouses where they are further processed to meet the requirements of consumers. In this case, the product is either processed or unprocessed charcoal. Processing involves selective packaging where

uniform briquettes are weighed to standard 32kg. This expectedly costs more than the unprocessed charcoal. Products are transported to warehouses by pick-ups and mini-trucks. In few cases, products are loaded directly from production sites into container tucks. Typically, products are transported from warehouses to either urban wholesalers by pick-ups and mini-trucks, or to exporters by container trucks. Two forms of packaging are done for export: Bagged charcoal and Pouring charcoal.

Urban wholesalers get products either directly from the production sites, or request supply from the warehouses. Urban charcoal dealers have local names for the different levels of involvement, and also formed sub-units within the dealers' association. *Oloko* refers to wholesalers who go over to villages as producers. *Ajagunta* are wholesalers who receive supply form villages. Some of them combine these two levels of involvement and it was gathered that this was a function of financing and scale of production as it requires more financial commitments to be involved in direct production, yet it offers more benefits.

Retailers, known as *Alabo* get supply directly from the wholesalers. While the wholesalers are restricted in profit margin by union directives, retailers have relative freedom to profit on bargaining power. Hence most wholesalers supply retailers and also have their own retail outlets. Products are sold in smaller packages of N20 or N50.

***The Value Chain Actors*:**

The basic actors in each section of the charcoal value chain from production to consumption are shown in Fig 5. The basic role of each actor in the chain is then summarized in Table 1.

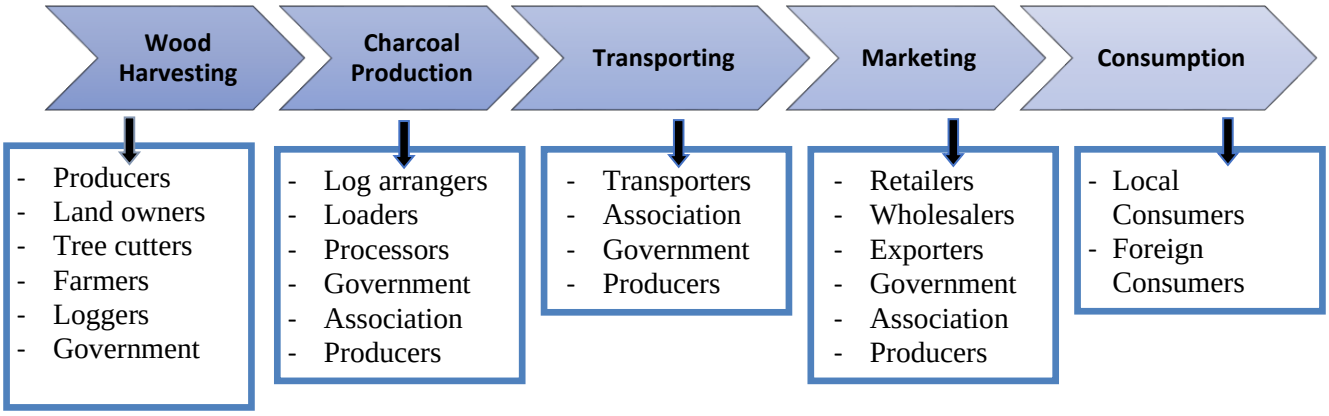

Fig 5: The charcoal value chain in the study area.

Table 1: Role of Charcoal Value Chain Actors

Sector	Actor	Role
Wood Harvesting	Producer	-Finances and monitors production and distribution process
	Land Owners	-Receive payment on land where feedstock is acquired from
	Tree cutter	-Recieves payment per half-load of trees cut down or cut into required sizes
	Farmers	-Make feedstock available by clearing land for agriculture
	Loggers	-Make feedstock available from logging wastes
	Government	-Certifies trees cut down for logging and charcoal production in line with forest laws and policies
Production	Log arrangers	-Receive payment for arrangement of logs and kiln profile
	Loaders	-Receive payments for packaging and loading products into vehicles
	Processors	-Receive payment for sorting and bagging products at warehouses
	Government	-Interacts with Charcoal Dealers Association to promote forest sustainability
	Association	-Interacts with government on production policies including regulation of tree specie used for production -Monitor activities of producers to ensure compliance with government regulations -Ensure tree re-planting to secure future feedstock

Transportation	Transporters	-Receive payment on movement of products from site to warehouse, local and urban markets, and to the ports
	Association	-Collect fees on each consignment of products that pass through toll points
	Government (Local/ State)	-Colect fees and issue tickets on every vehicle transporting charcoal from the region at Igbo-ora toll gate and other LGA toll-gates
Marketing	Retailers	-Sell products directly to consumers at local villages, towns andin urban areas
	Wholesalers	-Receive products from warehouses and production sites and sell to either retailers or consumers
	Exporters	-Finance large scale production in preparation for export -Ensure production of standard quality charcoal -Sell products to foreign consumers
	Government	-Recieves taxes on income of producers, marketers and exporters -Monitors export procedures
	Association	-Regulates wholesale price in urban markets
Consumption	Local Consumers	-Use charcoal as household cooking fuel, catering, and in other cottage industries
	Foreign Consumers	-Use charcoal as recreational fuel, house heating, co-generation of electricity, etc

Source: Computed from Field Survey (2014)

***The Value Chain Quantified*:**

Average daily volume of charcoal produced was estimated from the number of tickets issued at Igbo-ora toll gate on vehicles transporting charcoal from the region as presented in Table 2. The toll gate is central to production in the region as it is a major junction which is connected to the major roads in the three local government areas on the way to Abeokuta and Lagos. Estimations were made conservatively based on the variation in volume during the dry and wet seasons.

Table 2: Average daily volume of charcoal transprted from Ibarapa region

Vehicle	**Average number of vehicle per day**		**Average volume of charcoal (bags)**		
	Dry Season (Oct-March)	**Wet Season** (April-Sept)	**Av. Capacity**	**Dry season**	**Wet season**
Pick-Up	35	30	70	2450	2100
Mini Truck *(Landstar)*	25	20	90	2250	1800
Container Truck	0.5	0.2	650	325	130
Total	**60.5**	**50.2**		**5025**	**4030**

Source: Computed from Field Survey (2014)

Charcoal is packaged mostly in bags of 32kg; hence annual charcoal volume transported out of the region is estimated at about 34,771.2 metric tons, worth about ₦1,321,653,312 ($3.7million). These products were supplied to the active routes presented in figure 6.

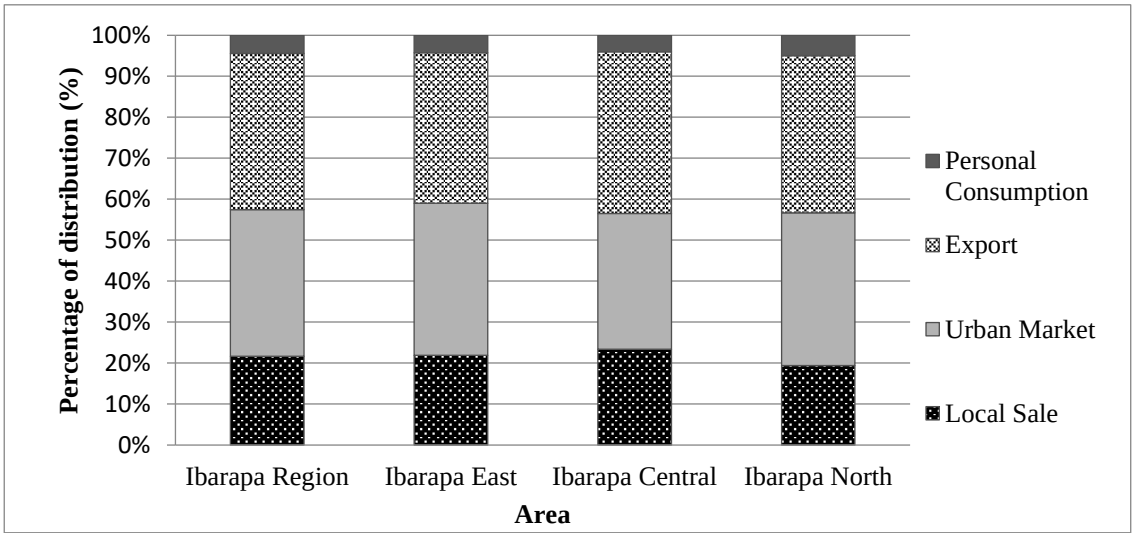

Fig 6: Proportion of products supplied to active routes from Ibarapa region**.**
Source: Computed from Field Survey (2013)

Four major supply routes were identified: (i) Local Sale (ii) Urban Market (iii) Export and (iv) Personal Consumption. Pecentage of products supplied to exporters returned the highest figure (38.17%) as exporters demand a higher volume of products at a single order than the urban merchants or local users. Furthermore, some exporters pay in advance for products hence some production sessions are solely for them.

Economic Analysis of the Value Chain:

The standard measure for production in the region is called "Half-load", which is the volume of feedstock that three (3) full tanks of chain-saw can cut into size for log arrangement, regardless of the tree species. A half-load of feedstock produces averagely about 70 to 75 bags of charcoal, which is about the number of bags transported by a pick-up. About 30 bags of 32kg make 1 tonne of charcoal hence the analysis was done on the 2.5 tons transported by pick-up to Ibadan and Lagos (Appendix 1).

Producers obtained the highest percentage of income along the chain to Ibadan (16.56%), retailers had the highest share in the chain to Lagos (20.8%). The workers in the production section (tree cutters, log arrangers) and land owners have fixed rates to a large extent hence they had a lower share of income in the chain to Lagos (13.88%) than to Ibadan (17.53%). Unfortunately these are the production community residents who are faced largely with the environmental and social impacts of charcoal production. Government and Association rates are also fixed irrespective of end point locations.

Identification of Market Opportunities and Constraints:

The basic challenges faced by the major actors in the value chain were identified and summarized in table 3.

Table 3: Constraints faced by major actors in the value chain

Actor	**Constraints**
Producers	Increasing distance to production location
	Forestry regulations
	Multiple taxation
	Inaccessible credit facilities
Transporters	Harassment by traffic officials
	Night journey risks
Exporters	Lack of quality control facilities
	Unstable government policy
	Sector is still informal
Government	Inadequate forest monitoring facilities
	Shortage of forestry officials
	Tax evasion by producers
	Inadequate data on supply and demand

Source: Computed from field survey (2014)

These constraints were evaluated and it was found that recognizing charcoal production as an industry and formalizing its operations will go a long way in addressing them. In which case, producers would be licensed bi-annually based on their report of activities including efforts at ensuring sustainability of feedstock sources.

CONCLUSION

There is an apparent growing interest in charcoal production within and outside the production areas especially for export purposes. Its nature as a low-risk income source with high returns makes this evident. Climate variability amongst other factors have instigated this hence there is need for an environmental protection strategy that takes into cognizance the livelihood challenges and opportunities in the region. Beyond formalizing charcoal operations in the region, it is imperative to ensure that levies being charged on products are channeled into environment-protection programs and for the strengthening of forest monitoring agencies which are mostly short-staffed with inadequate equipments. A more aggressive deployment of energy-efficient cookstoves both for household and large-scale charcoal use is also desirable to regulate local demand, coupled with strict monitoring of export activities to regulate foreign demand.

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Appendix 1**:** Breakdown of the Actors' Revenue on a 2.5-Tonnes size produce in Naira

	Ibadan				**Lagos**			
Actor	**Variable cost per 2.5 tons (Naira)**	**Revenue (Selling Price of 2.5 tons)**	**Gross Profit (Revenue-Cost)**	**% of Retail Price**	**Variable cost per 2.5 tons (Naira)**	**Revenue (Selling Price of 2.5 tons)**	**Gross Profit (Revenue-Cost)**	**% of Retail Price**
Producer								
Land owner	3000			4.21	3000			3.33
Tree cutters	4000			5.61	4000			4.44
Log arrangers	4000			5.61	4000			4.44
Loaders	1500			2.10	1500			1.67
Transport to Warehouse	10000			14.03	10000			11.11
Local Govt. Charge	200			0.28	200			0.22
Association/Union charge	500			0.70	500			0.56
State Charge	500			0.70	500			0.56
Sub-Total	40,700				43,700			
Sales	*₦700 per bag*	52,500	11,800	16.56	*₦800 per bag*	60,000	16,300	18.11
Transporter (Pick-up)								
Maintenance	11,500				12,500			
Amount charged per trip		17,000	5,500	7.71		20,000	7,500	8.33
Wholesaler (Urban)								
Price received	52,500				60,000			
Sales	*₦800 per bag*	60,000	7,500	10.52	*₦950 per bag*	71,250	11,250	12.50
Retailer								
Price received	60,000				71,250			
Sales	*₦950 per bag*	71,250	11,250	15.78	*₦1200 per bag*	90,000	18,750	20.80

Source: Computed from Field Survey (2014)

RECENT ADVANCES IN POLYMERIC MEMBRANE FABRICATION BASED ON LIGNOCELLULOSIC BIOMASS FOR WASTEWATER TREATMENT

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ABSTRACT

Water scarcity remains a challenge that mankind has to deal with in many regions. Water resources are insufficient to meet the water needs of the growing population due to urban development, the rapid development of industries and the use of water in agriculture. Recent advancements in membrane technology, such as the development of new membrane materials, coatings, and production methods, are of great importance in dealing with this problem. The use of biopolymers and biodegradable materials obtained from lignocellulosic biomass in membrane production stands out as a method to increase the efficiency of classical processes and to be environmentally friendly. This paper reviews recent advances in different biopolymer-based wastewater membranes in terms of materials and manufacturing methods for improving properties and performances.

Keywords: *lignocellulosic biomass, biopolymers, polymeric membrane, membrane technology.*

INTRODUCTION

The rapid development of modern industries and rapid population growth have led to major problems such as wastewater generation and water scarcity, which are a major threat to the environment and human health. Therefore, membrane technology is emerging as a cost-effective technology to cope with wastewater treatment and water pollution problems. Membrane technology plays an increasingly important role in areas such as wastewater treatment, drinking water treatment, desalination of seawater, reuse and disposal of wastewater **(Kim et al., 2019).**

In recent years, bio-based membranes have attracted interest due to the increasing environmental pollution problem resulting from the use of petroleum-based synthetic polymers. Since the degradation of traditional plastics takes place over a long period of time, sustainable membranes produced from renewable sources by environmentally friendly methods replace oil-based membranes **(Galiano et al., 2018)**. This paper reviews the studies and investigations conducted on the latest developments in membrane technologies and membrane materials obtained from biopolymers and the importance of environmentally friendly biopolymers in the membrane market.

MEMBRANE TECHNOLOGY

Water scarcity remains one of the most important problems facing humanity in many parts of the world. Wastewater recovery and reuse are of great importance in dealing with this problem **(Etemadi et al., 2017).** Compared to conventional wastewater treatment processes, membrane filtration processes have important advantages such as easy operation, low energy consumption, high separation performance and environmentally friendly technology **(Yang et al., 2019).**

Membrane technologies are considered to be a very good alternative to other separation technologies due to their low energy consumption, simple scaling, and versatility. Membrane technology is a separation technique integrated into processes to achieve higher separation selectivity and efficiency. Microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO) are the most common filtration processes used to remove contaminant from water. The feasibility of membrane systems is related to the technical properties of the membrane, which have a significant impact on the selectivity of the membrane (separation force), contamination and biofouling tendency. In terms of materials science, the most important factors in membrane production are membrane material and its configuration which provides high selectivity and high fluxes **(Kamali et al., 2019).**

Microfiltration and ultrafiltration

Microfiltration (MF) and ultrafiltration (UF) are classified as low pressure (<2 bar) processes. Microfiltration is a system with a particle size of approximately 0.1-1.0 μm, which removes suspended solids, bacteria and small amounts of organic colloids. In wastewater treatment, microfiltration membranes are

generally used as pretreatments to increase the efficiency of ultrafiltration, nanofiltration and reverse osmosis processes. Campos et al. (2002) used the microfiltration and biological treatment process for wastewater treatment. As a result of microfiltration process using 0.1 μm commercial cellulose ester microfiltration membrane, phenol, COD, TOC, oil and grease treatment were provided 35%, 25%, 92%, and 35%, respectively **(Campos et al., 2002).**

Ultrafiltration membranes can remove particles, pathogens, viruses, and colloids with a particle size of 0.01 - 0.1 μm. However, UF membranes are susceptible to contamination because of their high permeability flux. Therefore, one of the main objectives of the studies on UF membranes is to reduce the contamination on the membrane surface. Studies have reported that the most effective way to reduce contamination is to make the membrane surface more hydrophilic and to reduce roughness **(Munirasu et al., 2016).**

Nanofiltration and reverse osmosis

Both nanofiltration and reverse osmosis membranes are operated at a relatively higher pressure than microfiltration and ultrafiltration membranes. Both membranes are effective in the removal of inorganic minerals. The greatest difference between nanofiltration and reverse osmosis membranes is selectivity. The reverse osmosis membrane removes all ionic species, including monovalent ions, while nanofiltration is more selective for divalent ions as well as allowing the passage of monovalent ions such as Na^+ and Cl^- (**Munirasu et al., 2016).**

Membrane fabrication methods

Phase inversion

Phase inversion and electrospinning are the most commonly used manufacturing methods for membrane production. The choice of the production method generally depends on the membrane material more than the membrane class (UF, MF, etc.). The phase inversion method can be divided into immersion-precipitation, thermal phase separation, controlled evaporation and vapor phase conversion **(Warsinger et al., 2018).**

In the immersion-precipitation process, the membrane is formed by immersing the polymer solution containing a polymer and a solvent in a non-solvent coagulation bath and transferring the solvent surrounding the polymer to the non-solvent. During this process, the solvent evaporates and phase separation takes place. The asymmetric structure of the membranes produced by this method provides mechanical support to the membrane structure without greatly increasing the flow resistance **(Paul and Jons, 2016).**

Electrospinning

In the electrospinning process, a charged polymer solution or melt is sprayed through a needle or capillary end and pulled into a high electric field to form fibers. Compared with conventional phase conversion methods for membrane production, electrospinning allows for homogeneous pore size and a porous structure of more than 90%. However, membranes produced by electrospinning are increasingly being used in many water treatment applications, such as membrane distillation and pre-treatment of feed water to remove divalent metal ions, grease, and other contaminants before reverse osmosis or nanofiltration **(Ahmed et al., 2015).**

Membrane materials

The development of new membrane materials is an important research area for universities, industry and national laboratories. Membrane material properties and membrane production mechanisms for membranes used in wastewater treatment are guided by membrane technologies. For material selection, pore size distribution, wetting sensitivity, porosity, mechanical strength, cost, polymer flexibility, stability, durability, contamination and chemical resistance can be listed among the important factors. These membranes must be resistant to chemical cleaning processes **(Warsinger et al., 2018).**

Polymeric membranes

Polymers such as polysulfone, polyethersulfone, polyacrylonitrile, polyvinylidene fluoride, polyethylene, polypropylene, polyvinylchloride, cellulose acetate, and polyamide are used in the production of polymeric membranes **(Warsinger et al., 2018).** Polymeric membranes have been used for desalination due to their selectivity, good permeability, mechanical stability, chemical resistance as well as low-cost production. Different configurations of cellulose acetate and polyamide are used for nanofiltration (NF) and reverse osmosis (RO) processes **(Soto-Salcido et al., 2018).** However, the main application of cellulose acetate is membrane production. The properties of cellulose acetate such as high biocompatibility, high mechanical

strength, easy processing ability, and relatively low cost make it a competitor for other biodegradable polymers **(Yang et al., 2019).**

Ceramic membranes

Ceramic membranes are generally produced from metal oxides such as alumina, titanium, silicon and zirconia, and silicon carbide **(He et al., 2019).** Since Finnigan and Hanley produced the first ceramic membrane in 1966, porous ceramic membranes have attracted great attention for microfiltration (MF) and ultrafiltration (UF) applications, including membrane distillation. Ceramic membranes have hydrophilic structure, high thermal and chemical stability due to their porous structure and hydroxyl group in their structure **(Hubadillah et al., 2019).** In recent years, the combined phase inversion and sintering methods have been used as alternative methods for producing a wide range of ceramic membranes, including flat plate, hollow fiber and tubular configurations **(Li et al., 2017).**

For practical applications, membranes need to be configured in packages called membrane modules. This provides a large surface area for an efficient feed flow during the filtration process. The ceramic membranes may be manufactured in a straight geometry or cylindrical shape. For industrial wastewater filtration, single and multichannel pipes and hollow fibers are more suitable than straight geometry because of their higher mechanical stability and better ability to cope with high crossflow rates. Ceramic membranes have disadvantages such as contamination and breakage of fibers under severe operating conditions. In recent years, good results have been obtained in many studies on improving the package density of ceramic membrane modules **(Samaei et al., 2018).**

Nanocomposite membranes

Nanocomposites are composites in which at least one of the phases contains particles in the nanometer range (10-1000 nm). In the synthesis of membranes, nanoparticles, nanotubes or nanofiber polymers having particle sizes ranging from 4-100 nm are generally used. These nanomaterials have small pore sizes, large surface areas, high reactivity, and catalytic behavior. Furthermore, the performance of the nanoparticles can be improved by adding any suitable functional group **(Saleh ey al., 2019).**

Nanocomposite membranes can be classified as polymeric matrix nanocomposites, metal matrix nanocomposites, polymer/ceramic nanocomposites and polymer/layered silicate nanocomposites. The use of metal oxide nanoparticles in the production of nanocomposite membranes improves the hydrophilicity of the membrane. In a study, the addition of copper nanoparticles to the content of polymeric nanocomposites showed that the number of live bacteria in the treated wastewater decreased by 80-95% **(Bassyouni et al., 2019).**

The phase inversion method is frequently used in the production of thin and dense layer asymmetric polymeric nanocomposite membranes. The composition of polymer solutions, solvent, non-solvent, film casting conditions and the composition of the coagulation bath are important parameters affecting membrane production **(Nasir et al., 2019).**

BIOPOLYMERS IN MEMBRANE PROCESSES

Methods for obtaining polymers from natural sources have been investigated for more than twenty years. The products used as foodstuffs in the production of first-generation biobased polymers were considered as raw materials. However, to ensure sustainable food production, second-generation polymers originating from non-food consumable products have become the focus of attention. Therefore, the current approach to the production of biobased plastics involves the use of biomass as a raw material for the production of new chemicals using sustainable processes and green chemistry **(Galiano et al., 2018).**

In recent years, following environmental trends, many materials obtained from biomass wastes are considered as raw materials in membrane production. Various sources of biomass such as wheat straw, corn fiber, rice husk, sugar cane, rice husk, and pine shavings are used in the production of cellulose acetate-based on raw materials in membrane production. For the recovery of cellulose from biomass, the components contained in the biomass structure need to be broken down by an appropriate pretreatment including physical, physicochemical, chemical and biological **(Soto-Salcido et al., 2018).**

Bacterial fermentation products Polylactic acid (PLA), Polyhydroxyalkanoate (PHA) and Polybutylene succinate (PBS), vegetable biomass-derived cellulosic polymers, alginate, polyisoprene, starch, animal biomass-derived chitosan, collagen and sericin as a raw material in the production of biopolymer membranes can be used **(Galiano et al., 2018).** Chinyerenwa et al. (2018), who developed a new production method for polylactic acid (PLA) membranes, succeeded in producing porous PLA membranes. They reduced the membrane preparation time by the phase conversion process provided by hot water droplets produced by an electric heating steam generator and used as non-solvent. In addition, they found that the concentration of PLA

polymer had a direct effect on the thickness and morphology of the membrane produced **(Chinyerenwa et al., 2018).** Keawsupsak et al. prepared biodegradable membranes for wastewater treatment using NMP as solvent by phase conversion method and water as non-solvent by using PLA blended in certain proportions with polybutylene succinate (PBS) and poly 3-hydroxybutyrate-co-3-hydroxy valerate (PHBV) **(Keawsupsak et al., 2014).**

Cellulose acetate is a polymer used in various membrane applications. Cellulose acetate has been shown to be one of the most suitable polymers used in membrane production due to its high hydrophilicity and biocompatibility, non-toxic nature, high desalting performance, high potential flux, and relatively low cost. Its main disadvantages are its low pH and temperature resistance compared to other materials. However, high biodegradability and biodegradability are disadvantages of cellulose acetate membranes used in the MBR system **(Etemadi et al., 2017).** Cellulose acetate, which is used in many industrial areas, is one of the most important cellulose esters which can be obtained from a renewable source, biodegradable, non-toxic. This polymer can be produced by low-cost processes and has low flammability **(Candido et al., 2017).**

Given the demand for membranes to be used for versatile and specific purposes, the development of new membrane materials has an important role in the growth of membrane separation technology **(Lv et al., 2017).** However, most of the non-biodegradable synthetic polymer membranes cause environmental problems in their production and operation. Biodegradable polymers can overcome these problems **(Yang et al., 2019).** Soto-Salcido et al. obtained cellulose acetate by applying Ethanosolv pre-treatment to agave bagasse biomass by reacting with acetic acid. Cellulose acetate membranes were obtained by evaporation-precipitation method. Maximum cellulose recovery of 68.1 % was obtained under 170 °C, 30% (w/w) Ethanol, 0.7% (w/w) H_2SO_4, and 15 min of residence time **(Soto-Salcido et al., 2018).**

Today, many researches around the world focus on identifying economically viable and commercially successful methods for the conversion of biomass into useful organic chemicals. Cellulose is naturally abundant in the structure of the biomass and can be obtained by a suitable pretreatment. In addition, many studies have shown that cellulose has been successfully converted to high value-added products, including different cellulose derivatives such as cellulosic ethanol, hydrocarbons, lactic acid, ferulic acid, and cellulose acetate. Research in the literature has focused on the synthesis of cellulose acetate from renewable sources using low-cost, environmentally friendly methods for versatile applications **(Goswami et al., 2019).**

CONCLUSIONS

Recent studies in the literature have focused on the production of membrane material using environmentally friendly biopolymers to ensure the sustainability of membrane-based technologies in wastewater treatment. The suitability of biopolymers obtained from fermentation products such as PLA, PHA, PBS, cellulose-based polymers, alginate, polyisoprene, starch as well as chitosan, collagen, and sericin obtained from animal sources have been investigated gradually in various membrane-based wastewater treatment applications. Cellulose-based membranes are an important class of membranes used in desalination because of their high permeability and desalination capability. Biopolymers such as chitosan, alginate, and PHA are also preferred in different membrane applications such as pervaporation, gas separation and water filtration. In this study, membrane-based technologies used in wastewater treatment and recent developments regarding the use of biopolymers for membrane production have been evaluated with the possibility of making the technology more sustainable.

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THE SONOCATALYTIC AND SONOPHOTOCATALYTIC DEGRADATION OF 2,4-DICHLOROPHENOXYACETIC ACID (2,4-D) HERBICIDE USING TAGUCHI EXPERIMENTAL DESIGN

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ABSTRACT

Recently, the most commonly used herbicide for cleaning weeds in agricultural areas has been based on 2,4-Dichlorophenoxyacetic acid (2,4-D), and increases in its production is particularly alarming for the whole ecological system, especially in terms of human health, and it needs to be removed from sources of water. To achieve this, 2,4-D removal by a batch sonocatalytic (sonolysis with a TiO_2 catalyst) and sonophotocatalytic method (sonolysis and UV with a TiO_2 catalyst) has been investigated. In sonocatalytic, the individual and synergic effects of a TiO_2 dose, the pH, the time and initial 2,4-D concentration factors were investigated and for sonophotocatalytic, the individual and synergic effects of a TiO_2 dose, the pH, the time, H_2O_2 concentration and initial 2,4-D concentration factors were investigated. In addition, a Taguchi statistical method was applied to optimize the effective parameters. According to the Taguchi method, optimum conditions for the sonocatalytic method obtained as pH 2, TiO_2 0.5 g/L, initial concentration 75 mg/L and time 60 minutes. In the sonophotocatalytic method, the optimum conditions obtained as pH 3, TiO_2 1 g/L, initial concentration 50 mg/L, time 60 minutes and hydrogen peroxide 250 mg/L. In addition to these studies, in order to examine the pesticide mineralization, the parameter of chemical oxygen demand (COD) has analysed. According to results, 6 hours kinetic study carried out with the optimum parameters determined in the laboratory-scale sonocatalytic and sonophotocatalytic reactor. After 6 hours of kinetic studies, the highest yield obtained at the 5th hour. According to these results, the treatment efficiency of 12.92% in sonocatalytic method increased to 49.12% in sonophotocatalysis.

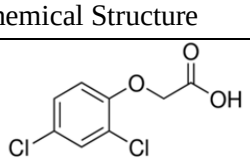
Keywords: *2,4-Dichlorophenoxyacetic acid (2,4-D), degradation rate, sonophotocatalysis, sonocatalysis, Taguchi method*

MATERIALS AND METHODS

Chemicals

In the experiments, TiO_2 (Sigma-Aldrich Inc., St. Louis, MO; Art. No. 14021) was used as the catalyst. The commercial Amin EXT 500 SL 2,4-D amine salt $C_{10}H_{13}C_{l2}N0_3$, MW: 266.12 $gmol^{-1}$ (equivalent to 500 g/L 2,4-D), which is the pesticide being removed by the treatment, was obtained from the Agrofarm® Company. The chemical properties of 2,4-D are given in the Table 1. Other chemicals such as NaOH and H_2SO_4 (97%) used to adjust the pH were obtained from Merck (Darmstadt, Germany). All chemicals were used as received without additional treatment. Purified water was used in all solutions and reaction mixtures (Specific Resistance: 18.2 MΩ cm^{-1}; Merck Millipore, Burlington, MA).

Table 1. Chemical structure of 2,4-D

Name	Molecular structure	Chemical Structure
2,4-Dichlorophenoxyacetic Acid	$C_8H_6Cl_2O_3$	

Experimental procedure and analysis

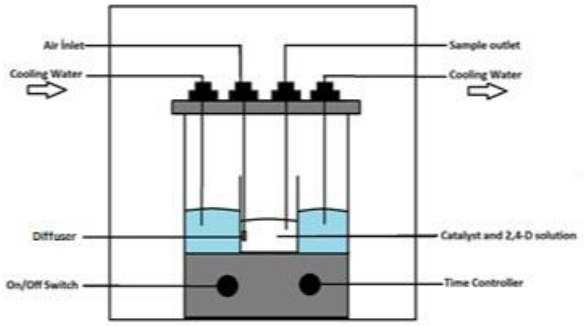


Figure 1. Schematic diagram of the sonocatalytic reactor

In the sonocatalytic and sonophotocatalytic experiments, an ultrasonic sound bath (Bandelin DT 106) was used. The device has a cylindrical structure with a total volume of 5.6 L (an operating volume of 1 L), with an operating frequency of 35 kHz (220V). In the study, the reactor was run in batch mode, and the reactor temperature was kept constant at 35 ± 1°C with a continuous water bath and cold water pump. During the experiments, air was supplied to the system with the help of a diffuser with a capacity of 3.5 L/min. For the experiments, the preferred concentrations of 2,4-D solution were prepared daily in amber-glass volumetric flasks from a 1000 mg/L stock solution. The pH of the reaction mixture was adjusted by the addition of 1 N of NaOH and 1 N of H_2SO_4. The samples were centrifuged at 5000 rpm for 15 minutes to remove TiO_2 from the solution, followed by filtration through a 0.45 mm syringe filter. Optimization of the conditions for sonocatalysis was obtained by measuring the optical density (OD) of the samples at 283 nm, the maximum wavelength of 2,4-D**,** using a spectrophotometer (Shimadzu, PharmaSpec UV-1700). A calibration plot based on Beer-Lambert's law was established by relating the absorbance to the concentration. This was also confirmed by a spectrum reading from a spectrophotometer. The percentage of degradation of 2,4-D was calculated using Eq. 1:

$$\text{Degredation percentage of 2,4-D} = (Ci - Cf)/Cf \quad (1)$$

Ci = Initial 2,4-D concentration
Cf = Final 2,4-D concentration

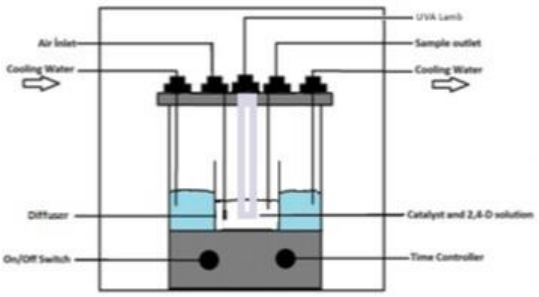


Figure 2. Schematic diagram of the sonophotocatalytic reactor

Experimental design

The Taguchi design was developed by Genichi Taguchi to study multiple factors with various factor levels based on an orthogonal sequence (Narenderan et al., 2019). The Taguchi method uses systematic orthogonal arrays (OA) to design experiments. The OA is a method where the columns for the independent variables are "orthogonal" to one another. This design recommends three steps to achieve an optimal design (concept design, parameter design and tolerance design (Taguchi, 2011). The main purpose of the Taguchi method is to find the best combination of design parameters.

Table 2. Process parameters and levels for sonocatalytic method

Parameters	Symbol	Level 1	Level 2	Level 3	Level 4	Level 5
pH	A	2	4	6	8	10
TiO_2 concentration (g/L)	B	0	0.5	1	1.5	2
2,4-D concentration (mg/L)	C	10	25	50	75	100
Time	D	60	120	150	180	210

In sonocatalytic method, a Taguchi experimental design technique was applied to optimize the 4 parameters (pH, initial 2,4-D concentration, treatment time and initial TiO_2 concentration) to be used for the treatment of 2,4-D. In order to find the optimum conditions, 25 parameters (a total of 50 with the control set) were tested and the optimum values for removing 2,4-D were obtained.

In sonophotocatalytic method, a Taguchi experimental design technique was applied to optimize the 5 parameters (pH, initial 2,4-D concentration, treatment time, initial H_2O_2 concentration and initial TiO_2 concentration) to be used for the treatment of 2,4-D. In order to find the optimum conditions, 16 parameters (a total of 32 with the control set) were tested and the optimum values for removing 2,4-D were obtained.

Minitab software (version 17-trial edition) was used for the Taguchi experimental design and the signal-to-noise ratio (S / N) was recorded at all levels for various factors. The desired value for the output was termed as the signal (S) while noise (N) represented the value that was not needed for the output characteristic. The S/N ratio i.e. the ratio of the signal to the noise was used to quantify how a specific quality characteristic deviated from the desired value (Soltani, 2016)

Table 3. Process parameters and levels for sonophotocatalytic method

Parameters	Symbol	Level 1	Level 2	Level 3	Level 4
pH	A	3	5	7	9
2,4-D concentration (mg/L)	B	25	50	75	100
TiO_2 concentration (g/L)	C	0	0.5	1	1.5
H_2O_2 oncentration (mg/L)	D	0	250	500	1000
Time	E	60	90	150	180

RESULTS AND DISCUSSION

Determination of optimal conditions using the Taguchi Method

In sonocatalytic method, Taguchi's L25 design was used and the test results are presented in Table 4. In the experiments, the range of 2,4-D removal efficiency was between 0% and 91.45%. The Taguchi design is considered a method with an accurate estimation rate. The controlled variables in these experiments are pH, initial 2,4-D concentration, TiO_2 concentration and time. S/N ratios were determined using these variables and optimum 2,4-D removal results were obtained.

Table 4. Full factorial design with Taguchi L_{25} (5^4) orthogonal array

Exp. no.	Factor A	Factor B	Factor C	Factor D	Response (%)	S/N (dB)	Mean Value
1	1	1	1	1	54.67	21.86	54.67
2	1	2	2	2	91.45	36.58	91.45
3	1	3	3	3	77.10	30.84	77.10
4	1	4	4	4	87.84	35.13	87.84
5	1	5	5	5	42.85	17.14	42.85
6	2	1	2	3	52.41	20.96	52.41
7	2	2	3	4	71.66	28.66	71.66
8	2	3	4	5	71.77	28.70	71.77
9	2	4	5	1	86.26	34.50	86.26
10	2	5	1	2	0	0	0
11	3	1	3	4	22.14	8.85	22.14
12	3	2	4	5	67.42	26.96	67.42

13	3	3	5	1	52.76	21.10	52.76
14	3	4	1	2	0	0	0
15	3	5	2	3	0	0	0
16	4	1	4	5	25.83	10.33	25.83
17	4	2	5	1	50.51	20.20	50.51
18	4	3	1	2	0	0	0
19	4	4	2	3	0	0	0
20	4	5	3	4	0	0	0
21	5	1	5	1	8.03	3.21	8.03
22	5	2	1	2	12	4.8	12
23	5	3	2	3	51.75	20.7	51.75
24	5	4	3	4	23.4	9.6	23.4
25	5	5	4	5	14.75	5.9	14.75

In sonophotocatalytic method, Taguchi's L16 design was used and the test results are presented in Table 5. In the experiments, the range of 2,4-D removal yield was between 42.82% and 94.20%.

Table 5. Full factorial design with Taguchi L_{16} (4^4) orthogonal array

Exp. no.	Factor A	Factor B	Factor C	Factor D	Factor E	Response (%)	S/N (dB)	Mean Value
1	1	1	1	1	1	56.04	22.42	56.04
2	1	2	2	2	2	81.51	32.60	81.51
3	1	3	3	3	3	94.20	36.48	94.20
4	1	4	4	4	4	67.25	26.90	67.25
5	2	1	2	3	4	76.92	30.77	76.92
6	2	2	1	4	3	76.56	30.63	76.56
7	2	3	4	1	2	67.68	27.07	67.68
8	2	4	3	2	1	75.17	30.07	75.17
9	3	1	3	4	2	50.55	20.22	50.55
10	3	2	2	3	1	34.90	13.96	34.90
11	3	3	1	2	4	21.01	8.40	21.01
12	3	4	4	1	3	70.47	28.19	70.47
13	4	1	4	2	3	65.93	26.37	65.93
14	4	2	3	1	4	54.69	21.88	54.69
15	4	3	2	4	1	70.02	28.01	70.02
16	4	4	1	3	2	42.82	17.13	42.82

The desired value for the output is referred to as signal (S), while noise is expressed as (N). The S/N ratio, i.e. the ratio of signal to noise, is used to measure how a certain quality property deviates from the desired value (Sreeja & Sosamony, 2016). In this study, the aim was to determine the maximum treatment efficiency for 2,4-D herbicide. Therefore, "The larger the feature the better" formula was applied to define the S/N ratios.

$$\frac{S}{N}[dB] = -10log\left[\frac{1}{n}\sum_{i-1}^{n} {}^{1}/_{yi2}\right] \quad (2)$$

yi: characteristic property
n: number of experiments

The average S/N ratio for each level of the parameters is summarized as the S/N response shown in Table 6.

Levels	**Control factors**

	% removal of 2,4-D			
	A	B	C	D
Level 1	**36.64**	26.78	11.27	**28.87**
Level 2	29.34	**33.64**	21.63	25.92
Level 3	19.59	28.72	25.70	25.91
Level 4	12.46	20.93	**32.78**	16.94
Level 5	23.25	11.20	29.90	23.65
Delta	24.18	22.44	21.51	11.93
Rank	1	2	3	4

*Bold values shows the optimal levels for control factor

Table 6. S/N response table for % removal of 2,4-D in sonocatalytic method

The optimum co Control factors are A1, B2, C4 and D1. Using these optimal control factors: (A) a pH of 2 at level 1, (B) a TiO_2 concentration 0.5 g/L at level 2, (C) an initial concentration of 75 mg/L of 2,4-D at level 4 and (D) a time of 60 minutes at level 1, it is estimated that treatment can be carried out to achieve 100% removal of the herbicide.

Table 7. S/N response table for % removal of 2,4-D in sonophotocatalytic method

Levels	Control factors				
	% removal of 2,4-D				
	A	B	C	D	E
Level 1	**37.04**	34.50	34.13	31.05	31.09
Level 2	35.78	**34.86**	34.48	**36.40**	**36.38**
Level 3	31.52	34.54	**36.03**	35.87	35.94
Level 4	33.68	34.13	33.39	34.70	34.67
Delta	5.52	0.73	2.64	5.35	1.87
Rank	1	4	3	5	2

*Bold values shows the optimal levels for control factors

Process parameters in the removal of 2,4-D are shown in Figures 3 and 4. As depicted in Figure 3, the pH concentration plays an important role in the sonocatalysis process. In the study, 5 different values of pH between 2 and 10 were tested. The S/N value was found to be larger at a pH value of 2 as shown in Figure 3 and Figure 4 After this point, the S/N ratio decreases at a faster rate, which means the degradation of the herbicide is more efficient at lower pH value.

Another parameter examined after pH was the TiO_2 concentration. Five different TiO_2 concentration values were tested between 0 g/L and 2 g/L as shown in Figure 3, with the catalyst concentration increasing in 0.5 g/L steps. The degradation of 2,4-D increases with increasing concentration because, with an increasing amount of catalyst, more 2,4-D molecules are adsorbed onto the catalyst surface and herbicide removal in the area of treatment increases.

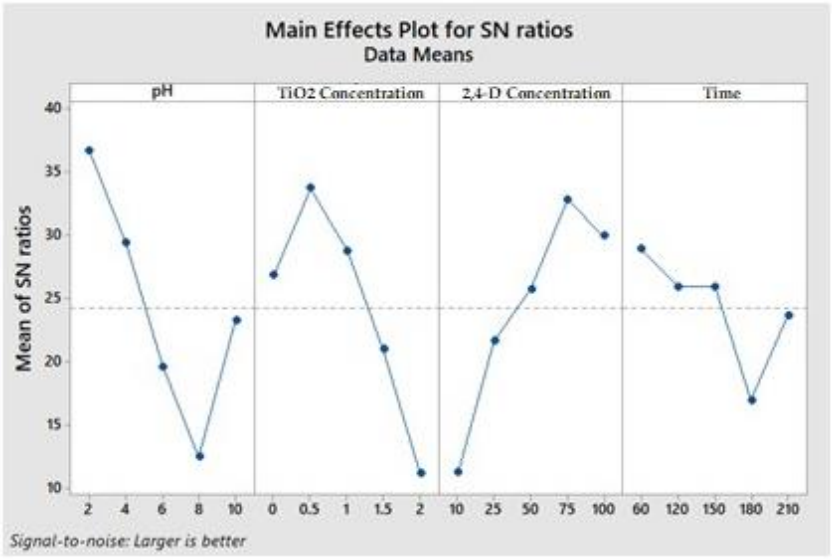


Figure 3. Effects of process parameters on S/N in the sonocatalysis process

Another parameter studied was the 2,4-D initial concentration. The experiment tested the initial concentration of 2,4-D in the range from 10 to 100 mg/L. As seen in Figure 3, the S/N ratio decreased as the concentration increased, and this rate reached a maximum 2,4-D concentration of 75 mg/L.

The last parameter examined was the treatment time. As shown in Figure 3, the study period was chosen from between 60 to 210 minutes and the highest yield was obtained after 60 minutes. After 60 minutes, the efficiency of 2,4-D removal was sharply reduced.

Process parameters in the removal of 2,4-D are shown in Figures 3. As depicted in Figure 4, the pH concentration plays most important role in the sonophotocatalysis process. In the study, 4 different values of pH between 3 and 9 were tested. The S/N value was found to be larger at a pH value of 2 as shown in Figure 2.

Another parameter examined after pH was the TiO_2 concentration. As shown in Figure 4, the study period was chosen from between 60 to 180 minutes and the highest yield was obtained after 60 minutes. After 60 minutes, the efficiency of 2,4-D removal was reduced.

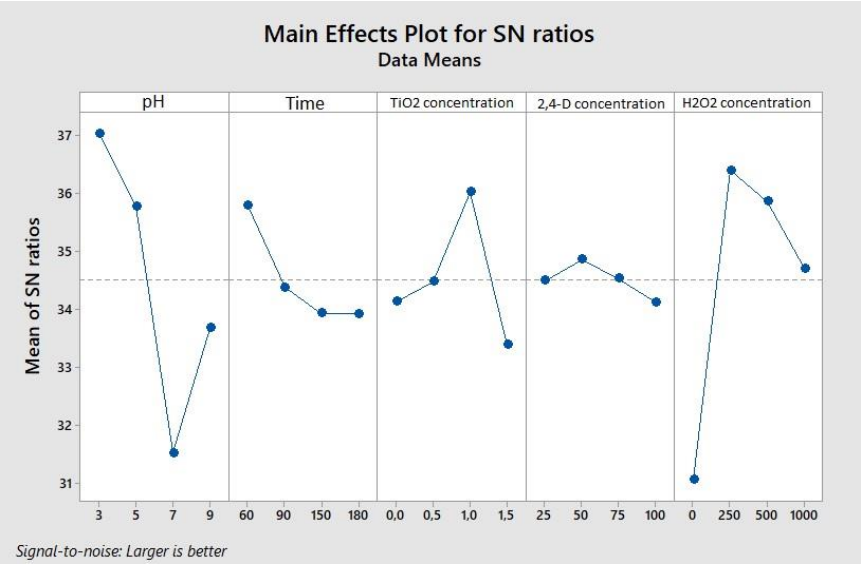


Figure 4. Effects of process parameters on S/N in the sonophotocatalysis process

Another parameter examined after pH was the TiO_2 concentration. 4 different TiO_2 concentration values were tested between 0 g/L and 1,5 g/L as shown in Figure 4, with the catalyst concentration increasing in 1.5 g/L steps and after 2,4-D removal decreases.

Another parameter studied was the 2,4-D initial concentration. The experiment tested the initial concentration of 2,4-D in the range from 25 to 100 mg/L. As seen in Figure 4, firstly the S/N ratio increases and after the 50 mg/L decreases.

Another parameter studied was the H_2O_2 initial concentration. The experiment tested the initial concentration of 2,4-D 4 different concentration in the range from 0 to 1000 mg/L. As seen in Figure 4, 0 mg/L is worst point and after 0 mg/L increases sharply to 250 mg/L.

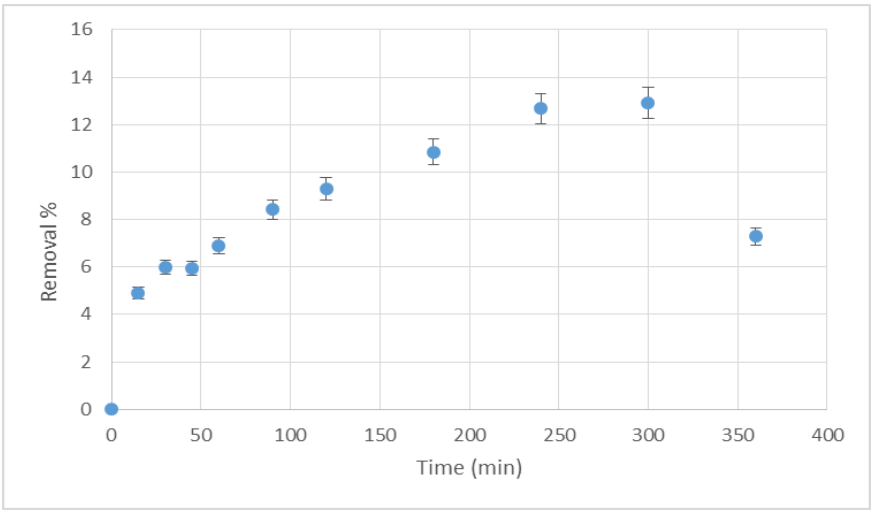


Figure 5. COD degradation in the sonocatalysis process

The mineralization test was performed for 360 minutes and the maximum degradation efficiency for COD at 300 minutes was 12.92% for sonocatalysis. Soltani et al. treated the Basic Red 46 in the sonocatalysis and they found COD removal approximately 44%(Soltani , 2016).

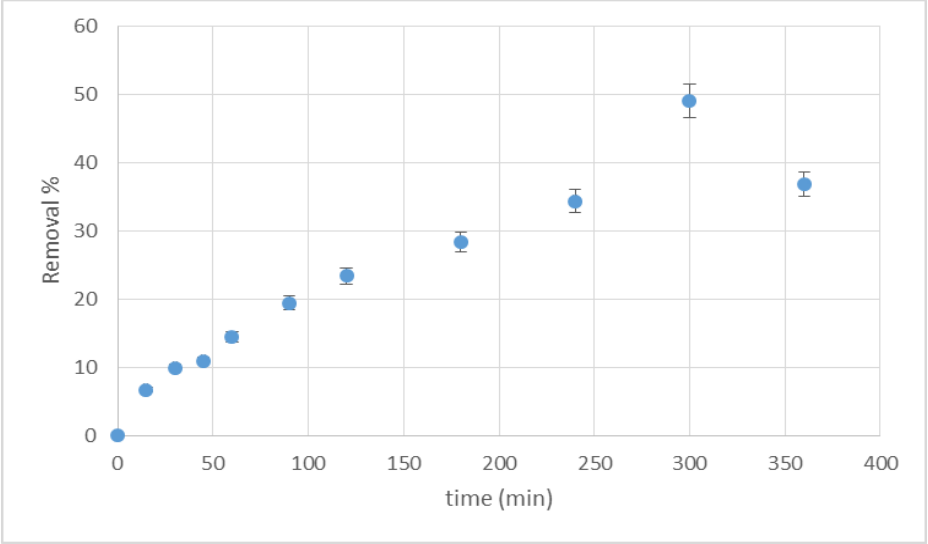


Figure 6. COD degradation in the sonophotocatalysis process

The mineralization test was performed for 360 minutes and the maximum degradation yield for COD at 300 minutes was 49.12% for sonocatalysis. Shokri in his study of Acid Red 14 treated by sonocatalysis and sonophotocalysis methods in 2016. The COD values found in this study were 25.4 for sonocatalysis and 55.5 for sonophotocatalysis(Shokri, 2016).

CONCLUSIONS

The results obtained in this study proved that 2,4-D, one type of herbicide, can be removed by sonocatalysis and sonophotocatalysis. The optimum conditions for the treatment of 2,4-D, according to the Taguchi method for sonocatalysis, are A (pH) with a value of 2 at level 1, B (TiO_2 concentration) with a value of 0.5 g/L at level 2, C (initial 2,4-D concentration) with a value of 75 mg/L at level 4 and D (time) with a value of 60 minutes at level 1. It shows that pH is more effective than the other experimental parameters. The mineralization test was performed for 360 minutes and the maximum degradation efficiency for COD at 300 minutes was 12.92% for sonocatalysis. The optimum conditions for the treatment of 2,4-D, according to the Taguchi method for sonophotocatalysis, are A (pH) with a value of 2 at level 1, B (Time) with a value of 60 minute at level 2, C (TiO_2 concentration) with a value of 1 g/L at level 3, D (2,4-D concentration) with a value

of 50 mg/L at level 2 and E (H_2O_2 concentration) with a value of 250 mg/L at level 2. The mineralization test was performed for 360 minutes and the maximum degradation efficiency for COD at 300 minutes was 49.12% for sonophotocatalysis. According to results sonophotocatalysis is more efficient than sonocatalysis.

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A CASE OF WELL-DIFFERENTIATED FIBROSARCOMA IN A GOLDEN BREED DOG

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ABSTRACT

In this report, a case of well differentiated fibrosarcoma in 11 years aged Golden breed dog were described. According to the anamnesis, the tumor structures started from the right armpit and spread to the sternum. In addition, rapidly growing masses were detected in the right anterior leg over 4 months. When the condition was poor, total extirpation was performed and the samples were sent to the Pathology Laboratory of Selcuk University Faculty of Veterinary Medicine. The dimensions of the masses were 12x5x4,5 cm and 8x7x4 cm. On macroscopic examination, the tumor was reddish in color, with a soft consistency and irregular borders. Cut section were grayish-whitish. Microscopic examination revealed that the spindle-shaped cells were atypical and formed vortex shaped. Nuclear polymorphism was prominent in tumor cells and mitotic figures and a few multinucleated tumor giant cells were observed. The tumor is rich in cells and necrosis was observed in some places. Fibrosarcoma is a common tumor in cats and dogs. The tumor can occur at any anatomic site. Golden and Doberman breeds have been reported to be more risky for the tumor. In this case, a well-differentiated fibrosarcoma case with significant cellularity was described in a Golden dog.

Keywords: *Fibrosarcoma, Golden, Well-Differentiated, Histopathology*

GOLDEN IRKI BIR KÖPEKTE IYI DIFERENSIYE FIBROSARKOM OLGUSU

Özet

Bu sunumda 11 yaşlı dişi, Golden ırkı bir köpekte iyi diferensiye fibrosarkom olgusu tanımlandı. Anamnez bilgilerine göre, tümör yapıları sağ koltuk altından başlamış ve sternuma doğru yayılmıştır. Ayrıca, 4 aylık süreçte sağ ön bacakta hızla büyüyen kitleler tespit edilmiştir. Bunun üzerine total ekstirpasyon yapılmış ve örnekler Selçuk Üniversitesi Veteriner Fakültesi Patoloji Laboratuarına gönderilmiştir. Gelen kitlelerin ölçüleri 12x5x4,5 cm ve 8x7x4 cm idi. Makroskobik muayenede, sınırları belirsiz, yumuşak kıvamda ve kırmızımsı, kesit yüzleri ise gri-beyazımsı renkteydi. Mikroskobik incelemelerde belirgin atipik özelliklere sahip mekik şekilli hücrelerin belirgin girdap ve anafor yapıları oluşturduğu dikkati çekti. Tümör hücrelerinde nükleer polimorfizm belirgin olup, mitotik figürler ve az sayıda çok çekirdekli tümör dev hücreleri görüldü. Tümör hücreden zengin olup yer yer nekrozlara rastlandı. Fibrosarkom kedi ve köpeklerde yaygın tümörlerdir. Golden ve Doberman ırkı köpeklerin tümör için daha riskli ırklar olduğu bildirilmiştir. Bu vakada da Golden ırkı yaşlı bir köpekte selülaritesi belirgin, iyi diferensiye fibrosarkom olgusu tanımlanmıştır.

Anahtar Kelimeler: *Fibrosarkom, Golden, İyi Differensiye, Histopathology*

INTRODUCTION

Fibrosarcoma is a type of soft tissue sarcoma that begins in fibrous tissue. Although it is occur in all domestic species the tumor is most common in adult and aged dogs and cats. Over the last decade, Fibrosarcoma incidence has increased. There are no breed or sex predisposition in the cat, but in dogs, golden retrievers and doberman pinschers are at increased risk (Goldschmidt and Hendrick, 2002). In recent studies, the account of skin and subcutaneous tumors of dog was reported as 4.5% of all neoplasms of the skin and 20.3% of malignant neoplasms (Hohenhaus et al. 2016).

Soft-tissue sarcomas constitutes approximately 15% and 7% of all skin and subcutaneous tumors of dog and cat, respectively (MacEWan et al., 2001). In recent studies, the account of skin and subcutaneous tumors of dog was reported as 4.5% of all neoplasms of the skin and 20.3% of malignant neoplasms (Hohenhaus et al. 2016). Fibrosarcoma, one of the soft tissue sarcomas is classified as low to moderate metastatic rate (Thrall and Gilette, 1995; Enhart, 2005).

The aim of this study is to present a well differentiated fibrosarcoma because of its rapid and wide spread in 11 years aged Golden dog.

CASE HISTORY

According to the anamnesis, the tumor structures started from the right armpit and spread to the sternum. In addition, rapidly growing masses were detected in the right anterior leg over 4 months. When the condition was poor, total extirpation was performed and the samples were sent to the Pathology Laboratory of Selcuk University Faculty of Veterinary Medicine.

Tissue samples were fixed by 10% buffered formalin solution for histopathological examination,. After the alcohol-xylol routine histopathology process, tissue samples were embedded in paraffin. Microtome sections of 4-5 microns were taken and stained with hematoxylin-eosine.

On macroscopic examination, the dimensions of the masses were 12x5x4,5 cm and 8x7x4 cm. the tumor was reddish in color, with a soft consistency and irregular borders (Figure 1a). Cut section were grayish-whitish.

The tumor is rich in cells and necrosis was observed in some places in microscopy (Figure 1b). in many tumor areas, spindle-shaped cells were atypical and formed vortex shaped (Figure 1c). Nuclear polymorphism was prominent in tumor cells and there were many mitotic figures (Figure 1d). Few multinucleated tumor giant cells were observed in some microscopic areas.

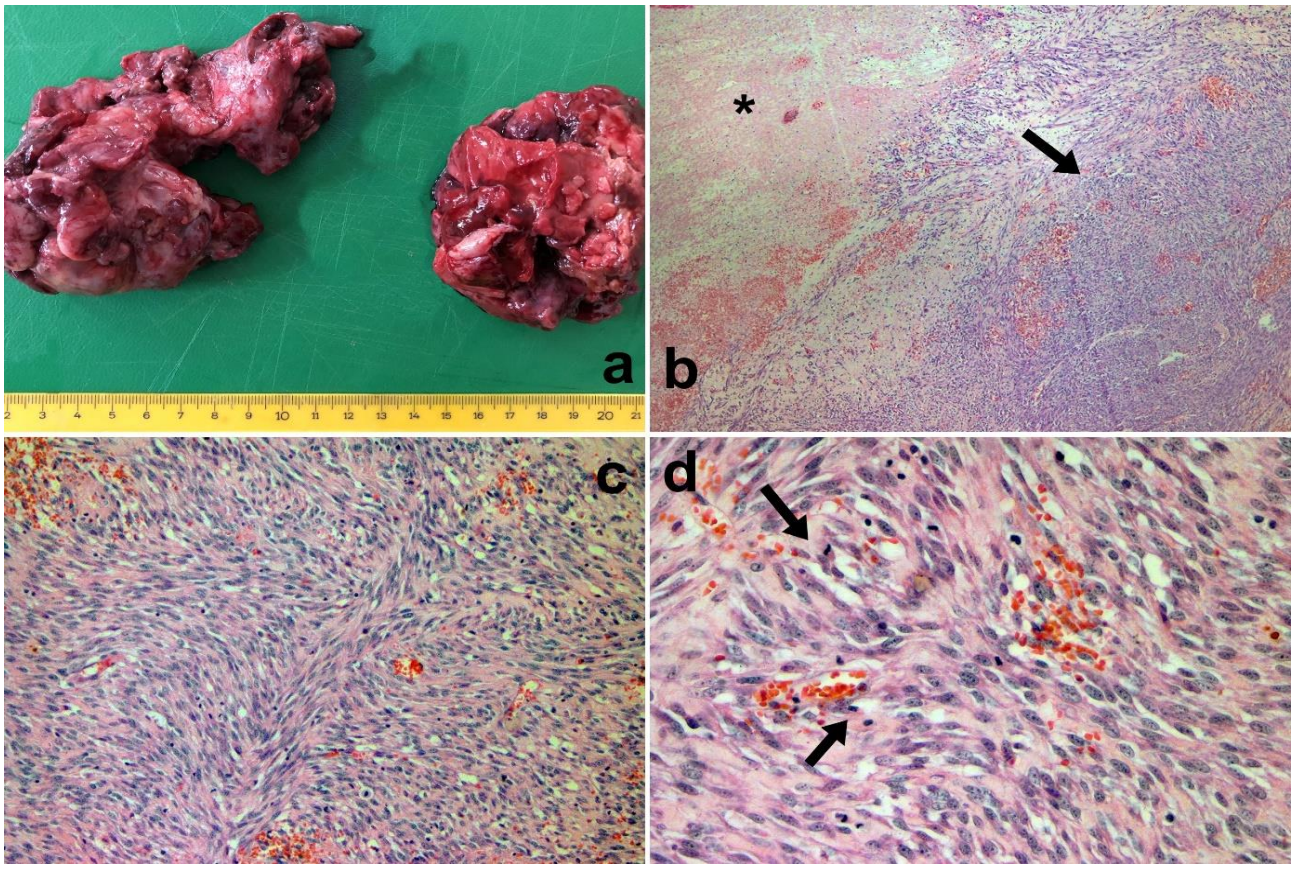

Figure 1.a) reddish tumor masses with a soft consistency and irregular borders, **b)** necrosis (*) and rich cellular formation (arrow), **c)** atypical spindle-shaped cells and vortex appearance, **d)** nuclear polymorphism and mitotic figures (arrows).

DISCUSSION AND CONCLUSION

Fibrosarcoma is a common tumor in cats and dogs. The tumor can occur at any anatomic site. Many cases of fibrosarcoma of internal organs or subcutaneous origin have been reported in dogs and other mammalian animals (Sonada et al. 1970; Sartin et al. 1988; Hohenhaus et al. 2016). Especially, oral/maxillar fibrosarcomas in dogs were more common (Martano et al. 2018). Golden breeds have been reported to be more risky for the tumor (Ciekot et al.1994). We detect this tumor in a golden dog and it is located subcutaneous tissue of right armpit to the sternum and the right anterior leg.

Histopathology of this case were compatible with fibrosarcoma according to the previous research (Goldschmidt and and Hendrick, 2002; Martano et al. 2018). In this case, a well-differentiated fibrosarcoma

case with significant cellularity, mitosis and necrosis was described in a Golden dog. The rapid spread and growth of the tumor can be attributed to the age of the animal and its low immune resistance.

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OSTEOCHONDROMATOSIS IN A TEKIR MALE CAT

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ABSTRACT

In this report, we describe a case of osteochondromatosis in a 2,5-year-old Tekir male cat. Lameness, painful and irregular gait in the posterior extremities have been reported for 3 months. Radiological examination; swelling in the left cubuti joint and abnormal bone growth around the processus olecrani. Tissue samples, 0.5x0.5x1 cm in size, were sent to Selçuk University Veterinary Faculty Pathology Laboratory. In macroscopic examination; the masses had a hard consistency and the cross-sectional surfaces were gray-white. Microscopic examination; in both parts, prominent hyaline cartilage structures at the margins of the periosteum, calcification, and bone marrow consisting of fatty tissue and hematopoietic tissue in the the center of the tumor mass, and surrounding bone trabeculae were observed. According to the findings, the case was defined as Osteochondromatosis. Osteochondromas have been reported to develop after trauma in most species, and are associated with FeLV (feline leukaemia virus) infections in cats. Although FeLV relationship of osteochondromatosis observed in the presented case could not be investigated, it was found appropriate to present the case to draw attention to the relationship between FeLV and osteochondromatosis in cats.

Keywords: *Osteochondromatosis, Tekir Cat, Histopathology, Oncology*

TEKIR IRKI ERKEK BIR KEDIDE OSTEOKONDROMATOZIS OLGUSU

ÖZET

Bu sunumda 2,5 yaşlı tekir ırkı erkek bir kedide osteokondromatozis olgusu tanımlandı. Yaklaşık 3 ay önce arka ekstremitelerde başlayan topallık ve yürüyüşte ağrı üzerine radyolojik muayenesi yapılan kedinin sol cubuti ekleminde şişkinlik ve processus olecrani civarında anormal kemik üremelerinin görülmesi üzerine, bölgeden alınan 0.5x0.5x1 cm büyüklüğünde doku örneği Selçuk Üniversitesi Veteriner Fakültesi Patoloji Laboratuvarına gönderilmiştir. Makroskobik incelemede; kitlelerin sert kıvamda, kesit yüzlerinin ise gri-beyaz renkte olduğu görülmüştür. Mikroskobik incelemelerde; her iki parçada da, periosta yakın kenar bölgelerde belirgin hiyalini kıkırdak yapıları, yer yer kireçlenme alanları ile tümörün merkezine yakın kısımlarda ortada yağ doku ve hematopoietik dokudan oluşan belirgin kemik iliği ve çevresinde kemik trabekülleri gözlendi. Elde edilen bulgular doğrultusunda vaka, Osteokondromatozis olarak tanımlandı. Osteokondromların çoğu türde travma sonrasında geliştiği, kedilerde ise daha çok FeLV (feline leukaemia virus) enfeksiyonları ile ilişkili olduğu bildirilmektedir. Sunulan vakada gözlemlenen Osteokondromatozis olgusunun FeLV ilişkisi üzerine araştırma yapılamamış olmakla birlikte, kedilerde FeLV ve osteokondromatozis ilişkisine dikkat çekmek için vakanın sunulması uygun bulunmuştur.

Anahtar Kelimeler: *Osteokondromatozis, Tekir Kedi, Histopatoloji, Onkoloji*

INTRODUCTION

Osteochondroma is known as the most common benign bone tumor which occurs as a cartilage-capped bony projection on the outer surface of the bone. It includes a continuous marrow cavity with the underlying bone (Bovée and Hogendoorn, 2002; Khurana et al. 2002; Kitsolis et al, 2008). Solitary and multiple forms of osteochondromas have been reported in the cats. Solitary osteochondroma is rare and mainly seen in mature cats. It occurs only on the axial skeleton. There hasn't been found a relationship with the feline leukemia virus in solitary osteochondroma. Osteochondromatosis (multiple osteochondromas) are more common in the cat and known as multiple cartilaginous exostoses (Turrel and Pool, 1982).

In this report, we describe a case of osteochondromatosis in a 2,5-year-old Tekir male cat.

MATERIAL AND METHOD

Study material was a tissue sample submitted to our laboratory **(**Selçuk University, Faculty of Veterinary Medicine, Department of Pathology). In case history, lameness, painful and irregular gait in the posterior extremities have been reported for 3 months in this 2.5-year-old Tekir male cat. Swelling in the left cubuti joint and abnormal bone growth around the processus olecrani were reported in radiological examination.

For histopathological examination, tissue samples were fixed by 10% buffered formalin solution, after the routine histopathology process (alcohol-xylol), tissue samples were embedded in paraffin. Microtome sections of 4-5 microns were taken and stained with hematoxylin-eosine.

RESULTS

Grossly; tissue sample were 0.5x0.5x1 cm in size and had a hard consistency. The cut-sectional surfaces were gray-white.

In microscopic examination; in both parts, prominent hyaline cartilage structures at the margins of the periosteum (Figure 1a and b), calcification, and bone marrow consisting (Figure 1c) of fatty tissue and hematopoietic tissue in the center of the tumor mass, and surrounding bone trabeculae (Figure 1d) were observed.

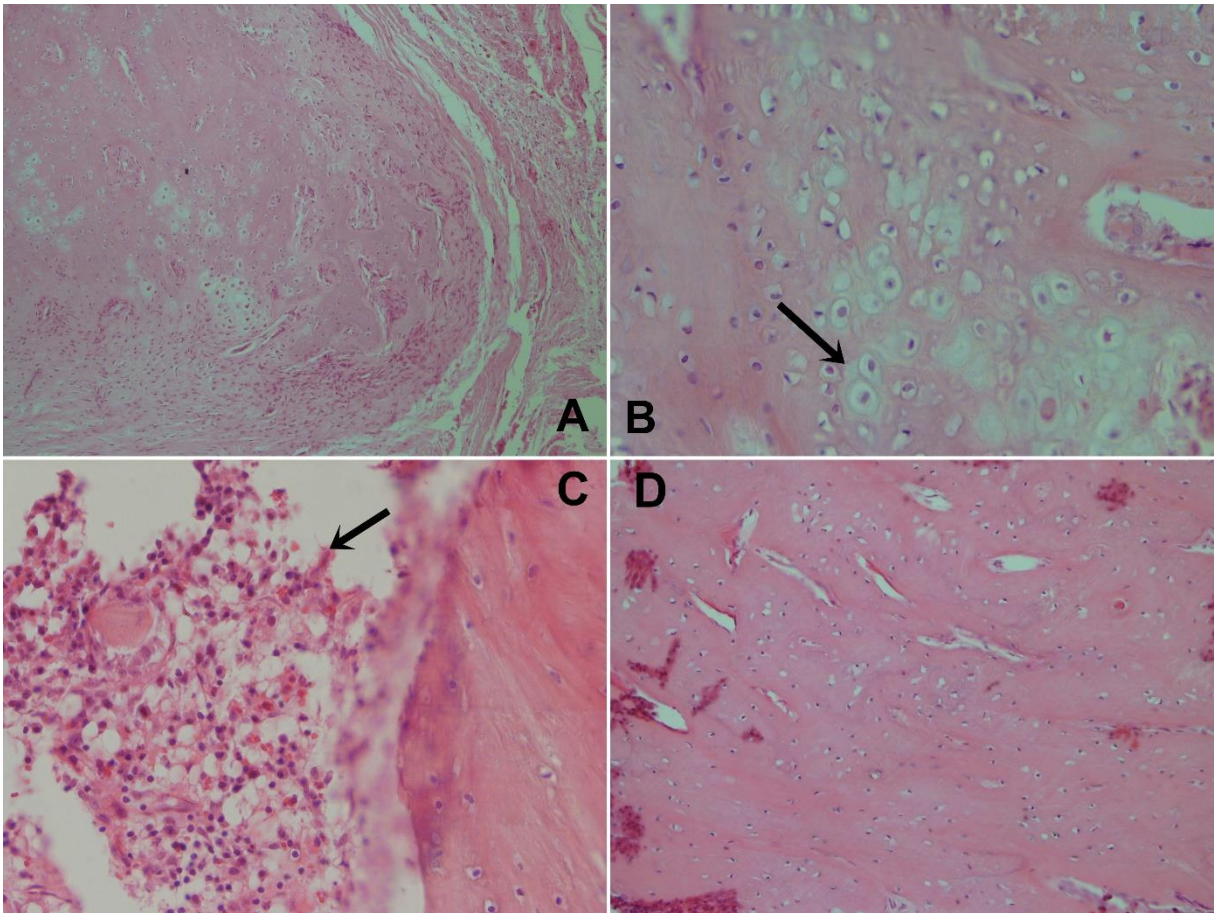

Figure 1. a) prominent hyaline cartilage structures at the margins of the periosteum, **b)** large magnification of hyaline cartilage (arrow), **c)** bone marrow with fatty and hematopoietic tissue (arrow) Figure 1c), **d)** compact bone tissue.

DISCUSSION

Feline osteochondromatosis is a disease that accounts for 20% of primary bone tumors in cats and has a poor prognosis (Cullen, 2002; Levitin et al., 2003; Nolff et al., 2014). Osteochondromas have been reported to develop after trauma in most species, and are associated with FeLV (feline leukaemia virus) infections in cats. The tumor occurs in animals 1.3-8 years of age in cats (Turrel and Pool, 1982; Rosa and Kirberger, 2012). In our case, the cat is 2,5-year-old.

Osteochondromas generally arise in the perichondrium of flat bones and the number and size of the masses that develop after skeletal maturation increase with the aging of the cat. Multiple osteocartilaginous outgrowths were seen at sternum, scapulae, ribs, pelvis and vertebrae (Nolff et al., 2014).

There were prominent hyaline cartilage structures at the margins of the periosteum, calcification, and bone marrow consisting of fatty tissue and hematopoietic tissue in the the center of the tumor mass, and surrounding bone trabeculae in histopathologic examination. According to the references, gross and histopathologic examination of osteochondroma were shown that the lesions covered by a cap of cartilage and

bone and there are bony trabeculae in underlying mass comprises (Turrel and Pool, 1982; Levitin et al, 2003; Kitsolis et al, 2008).

Although FeLV relationship of osteochondromatosis observed in the presented case could not be investigated, it was found appropriate to present the case to draw attention to the relationship between FeLV and osteochondromatosis in cats.

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THE EFFECT OF MICROBIAL FERTILIZATION ON AMOUNT OF WEED

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ABSTRACT:

This study was carried out in 2018 in the trial parcels of Akoren Ali Rıza Ercan Vocational School. The study was planned as a randomized block design with 4 replications, weeds were collected and dried at 3 different times with an interval of 20 days. The most common weeds were identified in the region. The experiment was planned with and without microbial fertilizer and 3 different phosphorus (0, 2, 4 kg / da) doses were used. In this study, a total of 19679.15 g of green herba weeds were obtained. 11935.45 g of weeds were obtained from the parcels where microbial fertilizer was applied. There was 7743.7 g of weed from the parcels without microbial fertilizer application. It was observed that microbial fertilization increased the amount of weeds in the field.

Keywords: *Microbial Fertilizer, Weed, Phosphorus*

EFFET DE LA FERTILISATION MICROBIENNE SUR LA QUANTITÉ DE MAUVAISE HERBE

ABSTRAIT

Cette étude a été réalisée en 2018 dans les parcelles expérimentales de l'école professionnelle Akoren Ali Rıza Ercan. L'étude était planifiées sous forme de bloc randomisé avec 4 répétitions, les plantes adventices ont été collectées et séchées à 3 reprises avec un intervalle de 20 jours. Tout au long de leur période végétative les plantes adventices les plus courantes de la région ont été identifiées. L'expérience était planifiée avec et sans engrais microbien et 3 différentes doses de phosphore (0, 2,4 kg / da) ont été appliquées. Dans cette étude, un total de 19679,15 g de plantes adventices vertes a été obtenu. 11935,45 g de plantes adventices ont été obtenus dans les parcelles où de l'engrais microbien a été appliqué. Il y avait 7743,7 g de plantes adventices provenant des parcelles sans application d'engrais microbien. Il a été observé que la fertilisation microbienne augmentait la quantité de plantes adventices dans le champ.

Mots clés: *Engrais Microbien, Plantes adventices, Phosphore*

INTRODUCTION

Une *plante adventice* qualifie une plante herbacée ou une plante ligneuse indésirable à l'endroit où elle se trouve. En général les plantes adventices sont des plantes à croissance spontanée dans une zone non agricole. Selon leur morphologie, il existe des plantes adventices à feuillage étroit et à feuilles larges. En fonction de leur cycle de vie, elles sont classées en plantes annuelles ou pérennes.

Afin d'éliminer ou au moins d'atténuer les dommages causés par les plantes adventices, la lutte contre ces plantes dans les zones agricoles se fait de plus en plus important, entraînant de lourdes pertes de main-d'œuvre et financières. Par conséquent, de nouvelles méthodes sont développées au jour le jour afin de déterminer le moment idéal du contrôle des plantes adventices et de réduire les coûts au minimum (Malaslı, 2010). Des facteurs biologiques et écologiques jouent un rôle important dans la sélection du contrôle des plantes adventices. Du coup, il est plus important de déterminer les points critiques qui peuvent aider au contrôle de ces plantes en examinant la biologie et l'écologie de ces dernières. Bien qu'une seule méthode soit suffisante pour lutter contre une plante adventice déterminée, elle peut ne pas l'être contre d'autres. (Güncan, 1982) les plantes adventices et les plantes cultivées rivalisent dans la prise de certains éléments de croissance tels que: eau, nutriments et lumière, ce qui entraîne un retard de croissance des plantes cultivées et une diminution de leur qualité et la quantité de leur production (Güncan, 1993).

Lorsque l'on compare les pertes de récoltes causées par divers facteurs, on observe que les pertes causées par les plantes adventices sont plus importantes. En plus, les effets néfastes causés par les plantes adventices sont supérieurs à ceux causées par d'autres facteurs. En effet les pertes de récoltes causées par les insectes nuisibles et des maladies dépendent des conditions écologiques, alors que celles causées par les plantes adventices tant pendant des années pluvieuses que sèches sont très élevées (Özer, 1993). Les engrais microbiens sont des produits contenant des microorganismes vivants qui jouent un rôle important dans la

fourniture des substances nutritives nécessaires au développement des plantes, augmentant le bénéfice en éléments nutritifs pour les plantes et / ou en corrigeant les sols (Anonyme, 2018).

Comme alternative à la fertilisation au phosphore, ils existent certains microorganismes présents dans le sol qui ont la capacité de dissoudre le phosphore afin de le rendre assimilable par la plante, des tels microorganismes peuvent être produits à l'état pur et inoculés dans des milieux de culture de plantes afin de répondre à la nutrition en phosphore en dissolvant le phosphore insoluble du sol. L'inoculation des microorganismes capables de dissoudre le phosphore est une méthode moins coûteuse et moins risquée pour l'environnement par rapport à l'ajout d'engrais phosphoré. Ces micro-organismes peuvent être facilement utilisés, en particulier en agriculture organique, car ils sont considérés comme des micro-organismes qui favorisent la croissance des plantes. Cependant, ces microorganismes capables de dissoudre le phosphore ne sont pas seulement utilisés dans l'agriculture organique, mais peuvent également être utilisés dans d'autres cultures (Tulukcu et Dan Baba 2019).

Les plantes adventices sont généralement considérées comme des plantes auxquelles il faut s'attaquer. Cependant, la présence de ces herbes est importante pour montrer la vitalité des sols. La richesse du sol en substances organiques et inorganiques augmente la diversité de ces herbes. Mais ces plantes adventices croient et se répandent principalement dans des zones arides et dans des sols pauvres. Selon la diversité d'espèces des plantes adventices présentent dans une zone agricole, on détermine si elle est riche ou pauvre en matières minérales. Les plantes adventices réagissent rapidement aux changements dus aux conditions d'une zone cultivée.

Dans cette étude, on a déterminé les effets de la fertilisation microbienne (bactéries dissolvant le phosphore) et différentes doses de phosphore sur l'apparition et la germination des plantes adventices dans le sol.

MATERIEL ET METHODE

Les recherches du terrain ont été menées sur le site expérimental de l'école professionnelle d'Akören Ali Rıza Ercan dans les conditions écologiques de Konya. Le terrain a été labouré premièrement en mars 2018 et après en avril de la même année. Au début du mois de juin, le terrain a été préparé à nouveau, des travaux tels que le nivelage et lotissement des parcelles ont été effectués. 5 kg / ha d'azote pur ont été appliqués dans l'ensemble des parcelles.

Le 4 juin, les cultures de microorganismes obtenues des laboratoires de l'école professionnelle de Çumra de l'université de Selçuk ont été inoculées avec de l'eau dans toutes les parcelles à parts égales. L'étude a été planifiée dans la conception d'expérience sur blocs randomisés avec 4 répétitions. Toute la zone expérimentale a été irriguée uniformément, le surplus d'eau utilisée pour les parcelles pendant la fertilisation microbienne a été corrigé. Apres aucune irrigation n'a été faite tout au long du cycle végétatif des plantes.

Les parcelles sont divisées en deux groupes, les parcelles avec et sans fertilisation microbienne; trois doses de phosphore (0, 2, 4 kg / da) ont été appliquées dans chaque groupe. Une première apparition remarquable des plantes adventices a été observée le 29 juin dans toutes les parcelles. Elles ont été collectées à 3 reprises avec 20 jours d'intervalle environs et sont séchés sur des tables basses à l'ombre. Apres chaque collecte la biomasse verte des plantes adventices de chaque parcelle a été pesée, ensuite un deuxième pesage est fait après le séchage.

RÉSULTATS ET DISCUSSION

L'étude a été menée en 2018 dans les parcelles expérimentales de l'école professionnelle d'Akören Ali Rıza Ercan. Cette recherche a été effectuée dans l'objectif de déterminer l'effet de la fertilisation microbienne sur la masse de plantes adventices.

Dans cette étude, 14 espèces différentes de plantes adventices ont été identifiées dans la zone expérimentale, les espèces les plus communes étaient *Sinapis arvensis, Cheponodium album* et *Amaranthus retroflexus*. Il n'est pas sans savoir que ces espèces sont les plus courantes de la région de Konya, en particulier dans le district de Çumra, dans les champs des plantes cultivées telles que le blé et la betterave à sucre (Koçak et Tulukcu, 2018).

Les plantes adventices les plus courantes dans notre pays serait, *Papaver rhoeas* L. (pavot), *Galium aparine* L. (adventice collante), *Lactuca serriola* L. (laitue sauvage), *Sonchus arvensis* L. (laitue de campagne), *Cirsium arvense* (village migrateur), *Capsella bursa-pastoris* (L.) Med. (bourse du berger), *Centaurea cyanus* L. (métamorphose), *Urtica urens* L. (petite ortie), *Amaranthus retroflexus* (coq), *Convolvulus arvensis* (lierre terrestre), *Lamium amplexicaule* L. (Ephéméride), *Equisetum arvense* L. (Ephéméride), *Sinapis arvensis* L. ((moutarde sauvage), *Cheponodium album* (pied de biche), *Ranunculus arvensis* L. (renoncule), *Solanum*

nigrum L. ((cassis), *Avena sativa* (folle avoine), *Echinochloa crus-galli* (Narrower), *Atriplex hastata* L. (carapace), *Rumex acetosella* L.(petite oreille d'agneau) ve *Thlaspi arvense* L. (érable des prés) (Gürsoy 1987).

Tableau 1. Masses (g) de plantes adventices verte et sèches collectées à 3 reprises dans les parcelles avec et sans fertilisation microbienne et a différentes doses de phosphore.

	Première Collecte		**Deuxième Collecte**		**Troisième Collecte**	
	Matière verte (g)	**Matière Sèche (g)**	**Matière verte (g)**	**Matière Sèche (g)**	**Matière verte (g)**	**Matière Sèche (g)**
1	100	23	55	15	17	11
2	32	9	77	20	8	7
3	69	14	195	44	8	7
4	216	40	584	107	35	20
5	49	11	585	35	28	17
6	22	6	586	44	7	6
7	43	12	587	60	82	35
8	164	28	729	109	118	47
9	71	16	589	68	56	30
10	38	10	590	56	63	35
11	79	14	768,3	78	191	49
12	82	17	592	94	187	63
13	88	14	919	109	237	112
14	108	17	802	82	144	72
15	199	24	863	101	289	90
16	106	21	596	71	194	62
17	149	28	597	71	172	65
18	100	19	598	107	71	32
19	105	21	599	102	75	24
20	192	39	600	62	107	41
21	243	41	601	125	215	61
22	214	39	602	98	32	13
23	312	41	814	155	81	32
24	301	59	604	83	48	18
Total	**3082**	**563**	**14132**	**1895**	**2465**	**948,97**

Les résultats des masses des matières vertes et sèches de plantes adventices dans les parcelles traitées et non traitées à différentes doses de phosphore sont présentés dans le tableau 1. Les masses totales de plantes adventices collectées à trois reprises sont données dans le tableau 2. On obverse dans le tableau 1 que la plus grande et la plus petite masse verte de plantes adventices varient entre 14132 g obtenue pendant la deuxième collecte et 2465 g obtenue lors de la troisième. En ce qui concerne la masse sèche, le résultat le plus élevé a été obtenu pendant la deuxième collecte (1895 g) et le plus petit a la première 563 g. Si on observe le tableau 1, on constate la perte d'eau la plus importante lors du séchage de la deuxième collecte avec 86% de perte, suivi de la première avec 82% et de la troisième avec 62%. Selon ces résultats, la meilleure période de séchage était la deuxième période de collecte, qui correspond au mois de juillet. On pourrait conclure que dans la région de Konya le temps de séchage devrait être élargi pour des collectes ultérieures à cette période.

Comme la montre le tableau 2, la masse totale d'herbe était de 19679,15 g. 67% de cette masse 11935,45 g proviennent des parcelles avec fertilisation microbienne et 33% de la masse 7743,7 g des parcelles non appliquées.

Tableau 2: Masses (g) et pourcentages de plantes adventices verte et sèches collectées à 3 reprises dans des parcelles avec et sans fertilisation microbienne et a différentes doses de phosphore

	Masse totale de plantes adventices (g)	**Avec Application Microbien (g)**	**Sans Application Microbien (g)**	**Pourcentage (%)**
Première Collecte	3081,83	1979,53	1102,3	0,64
Deuxième Collecte	14132,27	8299,97	5832,3	0,59
Troisième Collecte	2465,05	1655,95	809,1	0,67
Totales	**19679,15**	**11935,45**	**7743,7**	**0,61**

Tableau 3 Les masses moyennes (g) de plantes adventices vertes et sèches collectées à 3 reprises dans des parcelles avec et sans fertilisation microbienne et a différentes doses de phosphore

	Première Collecte		**Deuxième Collecte**		**Troisième Collecte**	
	Matière verte (g)	**Matière Sèche (g)**	**Matière verte (g)**	**Matière Sèche (g)**	**Matière verte (g)**	**Matière Sèche (g)**
0	72,25	17,05	457,00	52,00	102,28	32,10
APM 0	151,00	34,01	594,50	119,44	106,04	49,00
2	111,75	24,00	464,25	57,75	48,50	22,5
APM 2	158,00	34,13	595,50	94,71	152,59	53,76
4	87,00	18,50	492,50	49,25	51,50	25,00
APM 4	127,50	25,49	596,50	134,33	155,36	54,89
Moyenne	**707,50**	**153,18**	**3200,25**	**507,47**	**616,26**	**237,24**
0	72,25	17,05	457,00	52,00	102,28	32,10
2	111,75	24,00	464,25	57,75	48,50	22,50
4	87,00	18,50	492,50	49,25	51,50	25,00
Moyenne	**90,33**	**19,85**	**471,25**	**53,00**	**67,43**	**26,53**
APM 0	151,00	34,01	594,50	119,44	106,04	49,00
APM 2	158,00	34,13	595,50	94,71	152,59	53,76
APM 4	127,50	25,49	596,50	134,33	155,36	54,89
Moyenne	**145,50**	**31,21**	**595,50**	**116,16**	**138,00**	**52,55**

- APM: Application Microbienne

Le tableau 3 montre les résultats et les valeurs moyennes des masses vertes et sèches de plantes adventices collectées à 3 reprises dans les parcelles avec et sans la fertilisation microbienne et a différentes doses de phosphore. Comme on peut l'observer dans le tableau 3, la plus grande masse de plantes adventices dans toutes les applications était dans la deuxième collecte (3200,25 g), suivie de la première (707,50 g) et de la troisième (616,26 g). On a obtenu la plus grande masse de plantes adventices fraîches: 906,09 g avec l'application d'engrais microbien et à la dose phosphore de 2 kg / ha. Pour toutes les doses de phosphore les masses moyennes des plantes adventices des parcelles avec l'application d'engrais microbien sont supérieures à celles des parcelles non appliquées. La moyenne la plus élevée des plantes adventices a été obtenue lors de la deuxième moyenne collecte (595,50 g - 471,25 g). De toutes les collectes, le temps de séchage des plantes adventices le plus efficace en perte d'eau était lors de la deuxième période de collecte en juillet (tableau 3).

Tableau 4 Les masses moyennes (g) de plantes adventices vertes et sèches collectées à 3 reprises dans des parcelles avec fertilisation microbienne et à différentes doses de phosphore.

	Première Collecte		**Deuxième Collecte**		**Troisième Collecte**	
	Matière verte (g)	**Matière Sèche (g)**	**Matière verte (g))**	**Matière Sèche (g)**	**Matière verte (g)**	**Matière Sèche (g)**
1	216,00	40,00	584,00	107,00	35,00	20,00
2	163,68	28,00	729,12	109,12	117,8	47,12
3	82,00	17,00	592,00	94,00	187,00	63,00
4	88,35	14,00	919,15	108,5	237,15	111,6
5	108,00	17,00	801,90	82,00	144,45	71,55
6	198,65	24,00	862,75	100,70	288,55	89,90
7	149,00	28,00	597,00	71,00	172,00	65,00
8	100,00	19,00	598,00	107,00	71,00	32,00
9	105,00	21,00	599,00	102,00	75,00	24,00
10	243,00	41,00	601,00	125,00	215,00	61,00
11	214,00	39,00	602,00	98,00	32,00	13,00
12	311,85	41,00	814,05	155,25	81,00	32,40
Totale	**1979,53**	**329,00**	**8299,97**	**1259,57**	**1655,95**	**630,57**

Le tableau 5 montre les résultats et les valeurs moyennes de plantes adventices vertes et sèches collectées à 3 reprises dans des parcelles avec et sans fertilisation microbienne sans aucune doses de phosphore. Comme le montre le tableau 5, un total de 6767,25 g de plantes adventices a été obtenu dans les parcelles sans application de phosphore. 4055,55 g d'herbe fraîche ont été collectés dans les parcelles avec application d'engrais microbien et 2711,7 g dans les parcelles appliquées. Dans cette étude, la masse moyenne obtenue de plantes adventices dans les parcelles avec application d'engrais microbien représentait environ 60% de la masse totale obtenue sur le terrain expérimental. Selon cette étude, il a été constaté que l'application d'engrais microbien augmentait la masse de plantes adventices de 67% par rapport à d'autres non traités.

Tableau 5 Les masses totales (g) et pourcentages de plantes adventices vertes collectées à 3 reprises dans des parcelles avec et sans fertilisation microbienne et sans doses de phosphore (0 doz)

	Total (0) doz	**SAPM (g)**	**APM (g)**	**APM /TL (%)**
1. Période	1013,50	297,30	716,20	70,66
2. Période	4920,50	2005,30	2915,20	59,24
3. Période	833,25	409,10	424,15	50,901
Totale	**6767,25**	**2711,70**	**4055,55**	**59,92**

- APM: Application Microbienne
- SAPM: Sans Application Microbienne

RECOMMANDATIONS:

En 2018, la recherche a été effectuée dans l'objectif de déterminer l'effet de l'application de fertilisation microbienne sur la germination, l'émergence et le développement de graines de plantes adventices dans le sol de l'école professionnelle Akören Ali Rıza Ercan. Dans cette étude, les trois espèces de plantes adventices les plus courantes sur le terrain étaient *Sinapis arvensis, Cheponodium album* ve *Amaranthus retroflexus*.

Il a été constaté que la fertilisation microbienne augmentait la germination et la croissance des plantes adventices sur le terrain expérimental avec un effet positif durant toute la période végétative. La fertilisation microbienne a démontré la présence des différents grains de semences de plantes adventices dans la zone expérimentale. Quarante jours après l'application d'engrais microbiens, on a constaté qu'ils avaient un effet plus positif sur l'émergence et le développement des graines de plantes adventices dans le sol.

Les plantes adventices sont généralement considérées comme des plantes auxquelles il faut s'attaquer. Cependant, la présence de ces herbes est importante pour montrer la vitalité des sols. La richesse du sol en substances organiques et inorganiques augmente la diversité de ces herbes. Mais ces plantes adventices croient et se répandent principalement dans des zones arides et dans des sols pauvres. Selon la diversité d'espèces des

plantes adventices présentent dans une zone agricole, on détermine si elle est riche ou pauvre en matières minérales. Les plantes adventices réagissent rapidement aux changements dus aux conditions d'une zone cultivée.

Les engrais microbiens sont devenus plus importants pour accroître les techniques de production sans impact environnemental. Les effets des engrais microbiens sur la productivité des cultures utilisées dans la production agricole doivent être étudiés, ainsi que leur relation avec d'autres facteurs environnementaux. En conséquence, ces études doivent être approfondîtes.

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EFFECT OF MICROBIAL FERTILIZATION AND DIFFERENT PHOSPHORUS DOSES ON THE MACRO CONTENT ELEMENT IN THE SESAME PLANT (*Sesamum indicum* L.)

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ABSTRACT:

This research was conducted with the objective of determining the effect of microbial fertilization and different phosphorus doses on macronutrient content in the sesame plant (Sesamum indicum L.). The study was conducted in 2018 in the experimental plots of Akören Ali Rıza Ercan vocational school. The study was planned in randomized block design with 4 repetitions. Before harvest, samples were taken from each plot and their percentages of nitrogen, phosphorus and potassium were determined. The results of the average percentages of nitrogen, phosphorus and potassium of the plants cultivated in the plots with the microbial application are respectively 0.97%, 0.45% and 2.16%. And the average percentages of nitrogen, phosphorus and potassium of the plants grown in the plots without microbial application are respectively 0.93%, 0.44% and 2.14%. Average amounts of nitrogen, phosphorus and potassium were higher in microbial fertilization plots than in unapplied plots. In addition, the percentages of nitrogen, phosphorus and potassium in the sesame plant varied according to the phosphorus doses applied. This study demonstrated that microbial fertilization has a positive effect on nitrogen, phosphorus and potassium content.

Keywords: *Semi-arid, Phosphorus, Sesame*

EFFET DE LA FERTILISATION MICROBIENNE ET DIFFÉRENTES DOSES DE PHOSPHORE SUR LE CONTENU DES MACRO ÉLÉMENTS (NPK) DANS LA PLANTE DE SESAME (*Sesamum indicum* L.)

ABSTRAIT

Cette recherche a été effectuée dans l'objectif de déterminer l'effet de la fertilisation microbienne et de différentes doses de phosphore sur le contenu en macronutriments dans la plante de sésame (Sesamum indicum L.). L'étude a été menée en 2018 dans les parcelles expérimentales de l'école professionnelle d'Akören Ali Rıza Ercan. Elle a été planifiée dans la conception d'expérience sur blocs randomisés avec 4 répétitions. Avant la récolte, les échantillons ont été prélevés dans chaque parcelle et leurs pourcentages d'azote, de phosphore et de potassium ont été déterminés. Les résultats des pourcentages moyens d'azote, de phosphore et de potassium des plantes cultivées dans les parcelles avec l'application microbienne sont respectivement les suivants 0,97%, 0,45% et 2,16%. Et les pourcentages moyens d'azote, de phosphore et de potassium des plantes cultivées dans les parcelles sans application microbienne sont respectivement les suivants 0,93%, 0,44% et 2,14%. Les quantités moyennes d'azote, de phosphore et de potassium étaient plus élevées dans les parcelles avec fertilisation microbienne que dans les parcelles non appliquées. En plus, les pourcentages d'azote, de phosphore et de potassium dans les plantes de sésame ont variés selon les doses de phosphore appliquées. Cette étude a démontré que la fertilisation microbienne a un effet positif sur la teneur en azote, en phosphore et en potassium.

Mots-clés: *Semi-aride, Phosphore, Sésame*

INTRODUCTION

Malgré une importance indéniable dans le cycle du vivant, l'approvisionnement en P à partir du milieu reste toutefois une contrainte majeure pour de nombreux organismes vivants du sol, en particulier pour les plantes. Ceci est dû au fait que seuls les ions orthophosphates ($H_2PO_4^-$ et HPO_4^{2-}) notés Phosphore inorganique peuvent être absorbés par les êtres vivants. Ainsi, quelle que soit la richesse en P total d'un sol, seule une infime fraction de ce P est disponible pour les organismes vivants lors de leur cycle de développement. Ce P disponible est soit dans la solution du sol avec des concentrations très faibles en ions orthophosphates libres (de 0,1 à 10 µM) (Hinsinger, 2001), soit sous des formes de P qui vont pouvoir alimenter rapidement le pool de Phosphore inorganique de la solution du sol. De nombreux processus gouvernent la libération de Phosphore inorganique vers la solution du sol comme la sorption ou l'immobilisation de P, mais également les

interactions avec les cations et la matière organique. Tous ces processus limitent drastiquement la disponibilité et la mobilité de Phosphore inorganique comparativement à d'autres éléments nutritifs comme l'azote (N) et le potassium (K). Ainsi, les modèles de nutrition ont identifié très tôt que la vitesse de diffusion des ions orthophosphates est le facteur limitant majeur de l'acquisition de P par les végétaux (Barber, 1995 ; Fardeau, 1993). Or, les plantes, en interagissant avec les microorganismes du sol, peuvent largement modifier l'environnement au voisinage des racines, c'est-à- dire la rhizosphère qui est une zone « bio-influencée » par la plante, à la base du concept de « biodisponibilité » (Harmsen, 2007). La biodisponibilité du P dans le sol peut ainsi varier considérablement d'une espèce végétale à l'autre selon ses capacités à modifier elle-même la disponibilité de Phosphore inorganique ou *via* les organismes naturellement présents dans sa rhizosphère.

Plusieurs études ont montré que les racines émettent différents composés carbonés et différents signaux chimiques dans leur rhizosphère qui attirent sélectivement des populations microbiennes capables de métaboliser ces molécules et qui se multiplient préférentiellement dans la rhizosphère (e.g. (Drogue et al. 2012)). Ces communautés microbiennes associées aux racines formant le « rhizomicrobiome » (Chaparro et al. 2013) ont une composition différente de celle du sol non colonisé par les racines. Des études ont également montré que la composition des exsudats racinaires peut changer le long du système racinaire (Berg et Smalla, 2009), ce qui expliquerait pourquoi le rhizo-microbiome est modifié par le stade de développement de la plante. Parmi les populations microbiennes du rhizomicrobiome, les bactéries dites promotrices de la croissance des plantes (PGPR pour «Plant Growth Promoting Rhizobacteria ») sont largement représentées. Ces populations bactériennes PGPR forment une « symbiose associative » (Drogue et al. 2012) et doivent être très compétitives pour coloniser la zone racinaire. Une fois la colonisation établie, les bactéries PGPR peuvent stimuler la croissance de la plante à travers divers mécanismes. On peut notamment distinguer les mécanismes indirects comme la production de phytohormones ou de régulateurs de croissance (Dodd et al., 2010) ou la capacité des bactéries à modifier l'équilibre hormonal de la plante (Vacheron et al., 2013). L'ensemble de ces propriétés conduisent finalement à une augmentation de la croissance racinaire et donc à une meilleure prospection du sol par les racines. Les bactéries PGPR peuvent aussi modifier directement la disponibilité en P par la production d'anions organiques ou d'enzymes et finalement l'absorption de P par la plante (Richardson et al. 2009).

Outre leurs effets sur la dissolution/précipitation de des minéraux phosphatés, les variations de pH dans la rhizosphère engendrées par les racines ou les micro-organismes peuvent fortement modifier le potentiel d'adsorption des minéraux, et donc la disponibilité de Phosphore inorganique (Geelhoed et al. 1999), conduisant finalement à la libération de Phosphore inorganique au profit de compartiments plus disponibles pour la plante. Devau et al. (2010) ont développé une approche de modélisation mécaniste qui a révélé que l'augmentation du pH dans la rhizosphère de blé dur a également affecté la charge de surface des minéraux argileux dans les sols neutres, et par conséquent la désorption de Phosphore inorganique adsorbé sur ces minéraux qui sont abondants dans la plupart des types de sols. De plus, ces auteurs ont montré que la concentration en Ca affectait fortement les charges de surface des minéraux argileux, charges qui sont donc susceptibles de changer à la suite de l'absorption de Ca par les racines. Finalement, cette approche de modélisation a permis de montrer qu'une augmentation, aussi bien qu'une diminution, de pH pouvait entraîner une augmentation de la disponibilité du P du sol (Devau et al. 2011). Les racines des plantes peuvent augmenter ou diminuer le pH de la rhizosphère jusqu'à trois unités pH selon le pouvoir tampon du sol (Hinsinger, 2013), principalement *via* un efflux ou un influx de protons. Résultant de l'absorption d'un excès de charges positives ou négatives par les cellules de la racine (Hinsinger et al. 2003). Ces procédés sont rapides et présentent une variabilité spatiale et temporelle considérable au voisinage des racines actives (Blossfeld et al. 2013). L'alimentation azotée des plantes influence très fortement les variations de pH dans la rhizosphère car l'absorption d'ammonium induit toujours une acidification (absorption d'un excès de cations) alors que l'absorption de nitrate induit plutôt une alcalinisation (absorption d'un excès d'anions).

Comme alternative à la fertilisation au phosphore, ils existent certains microorganismes présents dans le sol qui ont la capacité de dissoudre le phosphore afin de le rendre assimilable par la plante, des tels microorganismes peuvent être produits à l'état pur et inoculés dans des milieux de culture de plantes afin de répondre à la nutrition en phosphore en dissolvant le phosphore insoluble du sol. L'inoculation des microorganismes capables de dissoudre le phosphore est une méthode moins coûteuse et moins risquée pour l'environnement par rapport à l'ajout d'engrais phosphoré. Ces micro-organismes peuvent être facilement utilisés, en particulier en agriculture organique, car ils sont considérés comme des micro-organismes qui favorisent la croissance des plantes. Cependant, ces microorganismes capables de dissoudre le phosphore ne sont pas seulement utilisés dans l'agriculture organique, mais peuvent également être utilisés dans d'autres cultures (Tulukcu et Dan Baba 2019).

Dans cette étude, les effets de la fécondation microbienne et de différentes doses d'application de phosphore sur le sésame (*Sesamum indicum* L.) Le contenu en macroéléments ont été étudiés.

MATERIEL ET METHODES

Les recherches du terrain ont été menées sur le site expérimental de l'école professionnelle d'Akören Ali Rıza Ercan dans les conditions écologiques de Konya. L'étude a été planifiée dans la conception d'expérience sur blocs randomisés avec 4 répétitions. Des graines de sésame locales (*Sesamum indicum* L.) ont été utilisées comme semences. Le terrain a été labouré premièrement en mars 2018 et après en avril de la même année. Au début du mois de juin, le terrain a été préparé à nouveau, des travaux tels que le nivelage et lotissement des parcelles ont été effectués. 5 kg / ha d'azote pur ont été appliqués dans l'ensemble des parcelles. Le 4 juin, les cultures de microorganismes obtenues des laboratoires de l'école professionnelle de Çumra de l'université de Selçuk ont été inoculées avec de l'eau dans les douze (12) parcelles où l'application microbienne a été planifiée et à parts égales. Toute la zone expérimentale a été irriguée uniformément, le surplus d'eau utilisée pour les parcelles pendant la fertilisation microbienne a été corrigé. Apres aucune irrigation n'a été faite tout au long du cycle végétatif des plantes. Les parcelles sont divisées en deux groupes, les parcelles avec et sans fertilisation microbienne; trois doses de phosphore (0, 2, 4 kg / da) ont été appliquées. Le contrôle des plantes adventices a été effectué manuellement à trois 3 reprises avec 20 jours d'intervalle environs. Le sol d'Akören est un sol argileux, argileux-sableux avec un pH compris entre 6,9 et 8 et un pH moyen de 7,7 légèrement alcalin. Selon les échantillons, la moyenne de sel est de 0,2%, la moyenne de carbonate de calcium est de 12% et la moyenne de matière organique est d'environ 1% (Celebi et al. 2011).

Le pourcentage de phosphore, d'azote et de potassium dans les plantes de sésames (ensemble feuille et tige) a été déterminé. Pour cela des échantillons de plantes ont été prélevés au début de la floraison et par la suite ont été envoyés au laboratoire pour les analyses.

RÉSULTATS ET DISCUSSIONS

Dans cette étude, les effets de la fertilisation microbienne et de différentes applications de dose de phosphore sur la teneur en macroéléments du sésame (*Sesamum indicum* L.) sont présentés à la Figure 1.

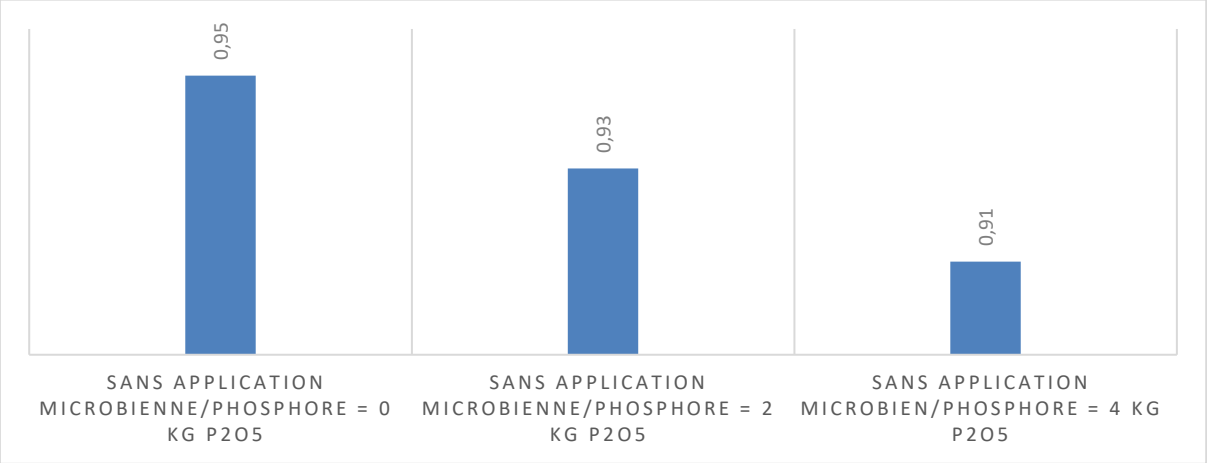

Figure 1: Pourcentages moyens d'azote dans les plantes des parcelles sans application de fertilisation microbienne

Comme le montre la figure 1, dans les parcelles sans application d'engrais microbien, les pourcentages d'azote dans le sésame montrent des valeurs décroissantes avec l'augmentation de la dose de phosphore (P_2O_5). En moyenne, la plus forte teneur en azote (0,95%) a été obtenue à une dose de 0 kg / da P_2O_5 et la plus petite valeur d'azote (0,91%) à une dose de 4 kg / da.

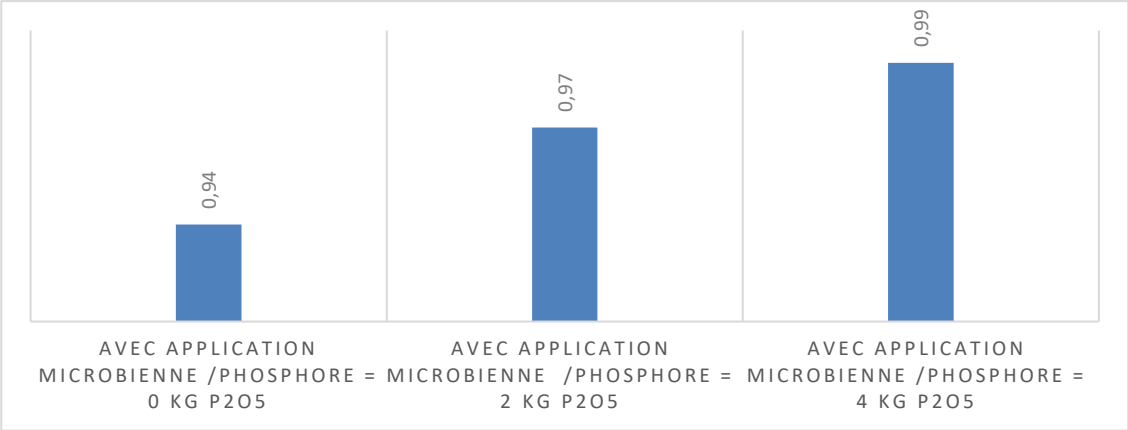

Figure 2: Pourcentages moyens d'azote dans les plantes des parcelles avec application de fertilisation microbienne

Comme le montre la figure 2, dans les parcelles avec application d'engrais microbien, les pourcentages d'azote dans le sésame montrent des valeurs croissantes avec l'augmentation de la dose de phosphore (P_2O_5). En moyenne, la plus forte teneur en azote (% 0,99) a été obtenue à une dose de 4 kg / da P_2O_5 et la plus petite valeur d'azote (% 0,94) à une dose de 0 kg / da.

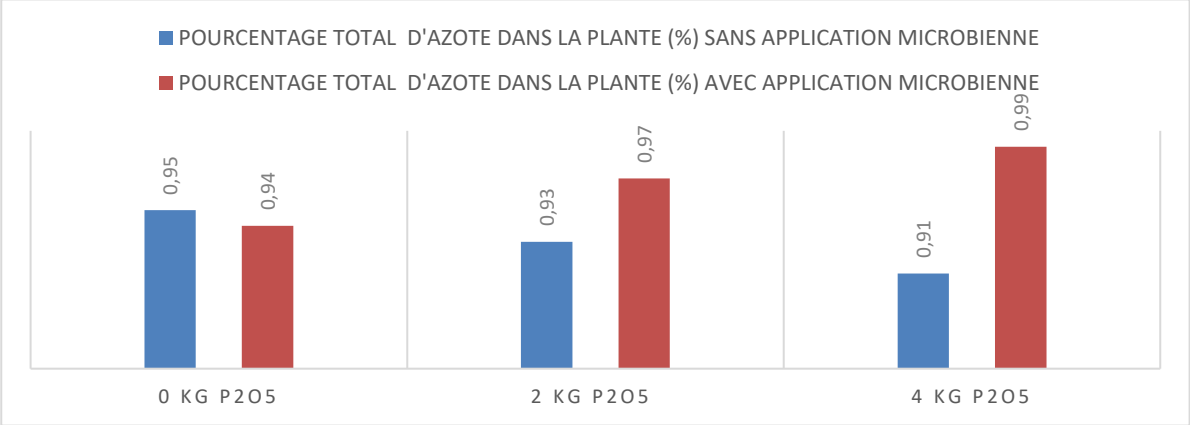

Figure 3: Pourcentages moyens d'azote dans les plantes des parcelles avec et sans application de fertilisation microbienne et a différentes doses de P_2O_5

Dans la figure 3, les valeurs les plus élevées des moyennes des pourcentages d'azote dans les plantes ont été obtenues dans les parcelles où l'application d'engrais microbiens a été effectuée, tandis que les valeurs les plus basses ont été obtenues dans les parcelles sans application d'engrais microbiens excepté a la dose 0 kg / da P_2O_5. La plus grande valeur (0,99%) a été obtenue dans les parcelles avec application microbien et à une dose de 4 kg / da P_2O_5 et la plus petite valeur (0,91%) dans les parcelles sans application microbien et à une dose de 4 kg / da P_2O_5.

Figure 4: Moyennes totaux des pourcentages d'azote dans les plantes des parcelles avec application de fertilisation microbienne et non appliquée

Comme le montre l'analyse de la figure 4, La valeur moyenne des pourcentages d'azote dans les plantes des parcelles où l'application d'engrais microbiens a été effectuée est 0,97% et dans les parcelles où l'application d'engrais microbiens n'a pas été effectuée est 0,93%. La valeur moyenne des pourcentages d'azote dans les plantes des parcelles où l'application d'engrais microbiens n'a pas été effectuée est inférieure à celle des parcelles avec engrais microbien.

Comme le montre la figure 5, dans les parcelles sans application d'engrais microbien, les pourcentages de phosphore dans le sésame montrent des valeurs décroissantes avec l'augmentation de la dose de phosphore (P_2O_5) excepté a la dose 2 kg / da P_2O_5 où on observe la plus petite valeur. En moyenne, la plus forte teneur en phosphore (0,47%) a été obtenue à une dose de 0 kg / da P_2O_5 et la plus petite valeur de phosphore (0,42%) à une dose de 2 kg / da.

Comme le montre la figure 6, dans les parcelles avec application d'engrais microbien, les pourcentages de phosphore dans le sésame montrent des valeurs croissantes avec l'augmentation de la dose de phosphore (P_2O_5). En moyenne, la plus forte teneur en phosphore (% 0,49) a été obtenue à une dose de 4 kg / da P_2O_5 et la plus petite valeur de phosphore (% 0,42) à une dose de 0 kg / da.

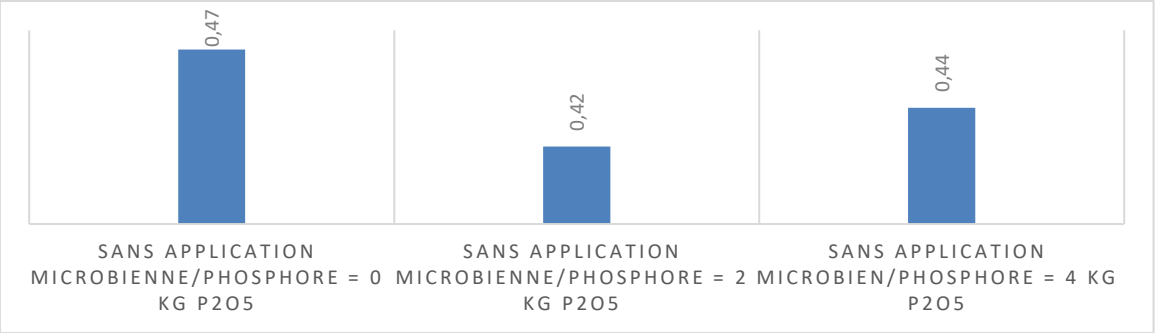

Figure 5: Pourcentages moyens de phosphore dans les plantes des parcelles sans application de fertilisation microbienne

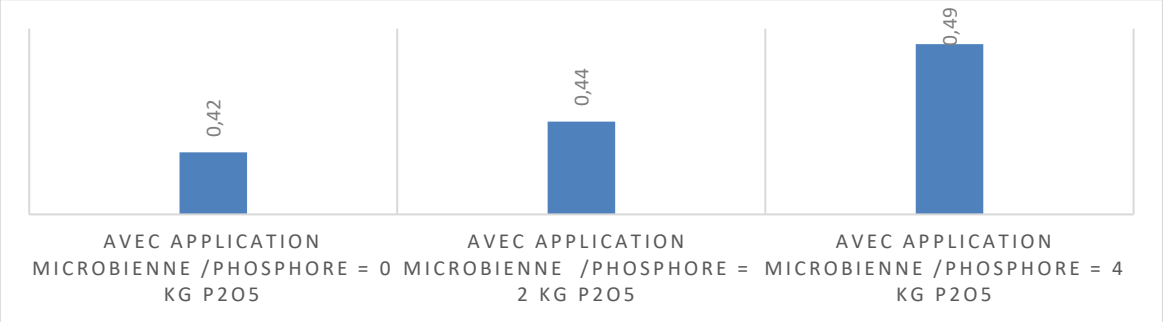

Figure 6: Pourcentages moyens de phosphore dans les plantes des parcelles avec application de fertilisation microbienne.

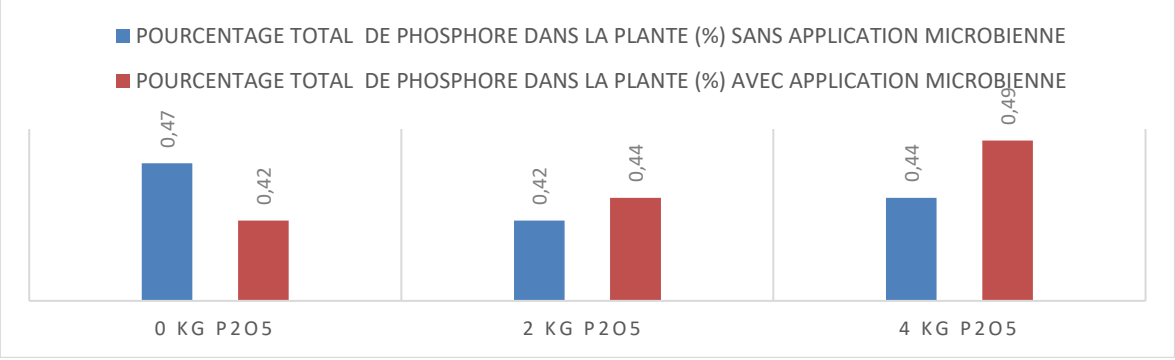

Figure 7: Pourcentages moyens de phosphore dans les plantes des parcelles avec et sans application de fertilisation microbienne et a différentes doses de P_2O_5

Dans la figure 7, les valeurs les plus élevées des moyennes des pourcentages de phosphore dans les plantes ont été obtenues dans les parcelles où l'application d'engrais microbiens a été effectuée, tandis que les valeurs les plus basses ont été obtenues pour les parcelles sans application d'engrais microbiens. La plus grande valeur (0,49%) a été obtenue dans les parcelles avec application microbien et à une dose de 4 kg / da P_2O_5. Dans ce cas on observe la plus petite valeur (0,42%) dans les parcelles sans application microbien et à la dose de 2 kg / da P_2O_5 et aussi dans les parcelles avec application microbien mais à la dose de 0 kg / da P_2O_5.

Comme le montre l'analyse de la figure 8, la valeur moyenne des pourcentages de phosphore de toutes les plantes des parcelles où l'application d'engrais microbiens a été effectuée est (0,45%) et des celles où l'application d'engrais microbiens n'a pas été effectuée est (0,44%). La valeur moyenne des pourcentages de phosphore dans les plantes des parcelles où l'application d'engrais microbiens n'a pas été effectuée est inférieure à celle des parcelles avec engrais microbien.

Figure 8: Moyennes totaux de pourcentages de phosphore dans les plantes des parcelles avec application de fertilisation microbienne et non appliquée

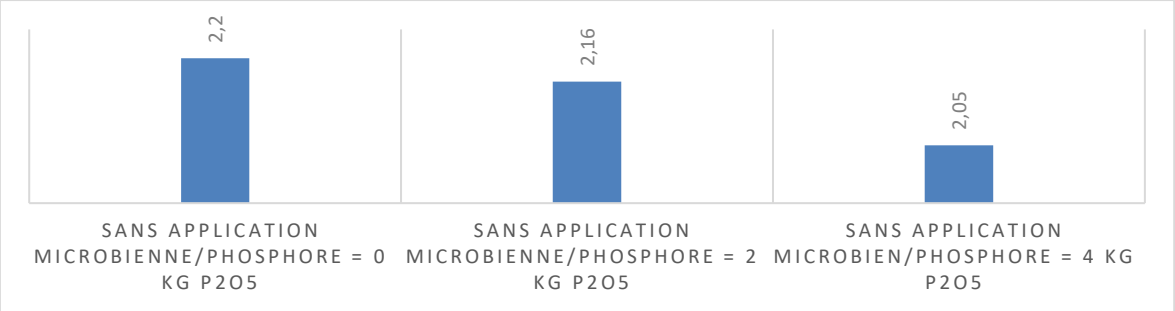

Figure 9: Pourcentages moyens de potassium dans les plantes des parcelles sans application de fertilisation microbienne.

En interprétant la figure 9, dans les parcelles sans application d'engrais microbien, les pourcentages du potassium dans le sésame montrent des valeurs décroissantes avec l'augmentation de la dose de phosphore (P_2O_5). En moyenne, la plus forte teneur en potassium (2,2%) a été obtenue à une dose de 0 kg / da P_2O_5 et la plus petite valeur en potassium (2,05%) à une dose de 4 kg / da.

Comme le montre la figure 10, dans les parcelles avec application d'engrais microbien, les pourcentages en potassium dans le sésame montrent des valeurs croissantes avec l'augmentation de la dose de phosphore (P_2O_5). En moyenne, la plus forte teneur en potassium (% 2,2) a été obtenue à une dose de 4 kg / da P_2O_5 et la plus petite valeur de potassium (% 2,1) à une dose de 0 kg / da.

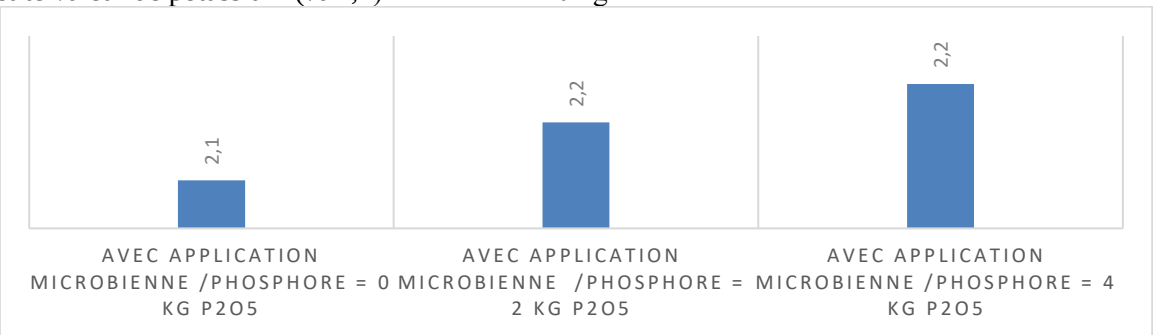

Figure 10: Pourcentages moyens de potassium dans les plantes des parcelles avec application de fertilisation microbienne.

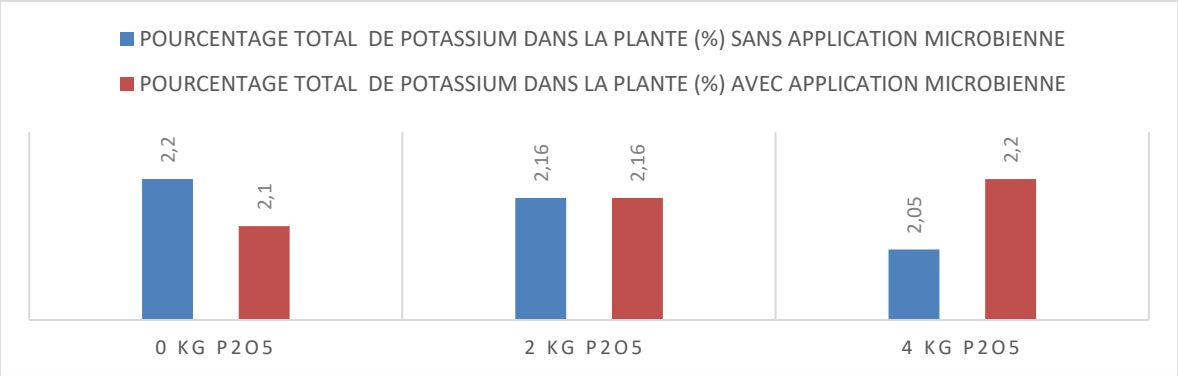

Figure 11: Pourcentages moyens de potassium dans les plantes des parcelles avec et sans application de fertilisation microbienne et a différentes doses de P_2O_5

Dans la figure 11, la même plus grande valeur des moyennes des pourcentages de potassium dans les plantes (2,2%) a été obtenues dans les parcelles avec application microbien et à la dose de 4 kg / da P_2O_5 et aussi dans les parcelles sans application mais à la dose de 0 kg / da P_2O_5. Egalement à la dose de 2 kg / da P_2O_5 la même valeur (2,16%) a été obtenue dans les parcelles avec application d'engrais microbien et non appliquée. La plus petite valeur est 2,05% dans les parcelles sans application microbien et à la dose de 4 kg / da P_2O_5.

Figure 12: Moyennes totaux des pourcentages de potassium dans les plantes des parcelles avec application de fertilisation microbienne et non appliquée

En analysant la figure 12, la valeur moyenne des pourcentages en potassium dans les plantes des parcelles où l'application d'engrais microbiens a été effectuée est (2,16%) et des parcelles où l'application d'engrais microbiens n'a pas été effectuée est (2,14%). La valeur moyenne des pourcentages de potassium dans les plantes des parcelles où l'application d'engrais microbiens n'a pas été effectuée est inférieure à celle des parcelles avec engrais microbien.

La valeur moyenne des pourcentages de phosphore dans les plantes des parcelles où l'application d'engrais microbiens a été effectuée est 0,45% et des parcelles où l'application d'engrais microbiens n'a pas été effectuée est 0,44%. La valeur moyenne des pourcentages de phosphore dans les plantes des parcelles où l'application d'engrais microbiens n'a pas été effectuée est inférieure à celle des parcelles avec engrais microbien (Tableau2). Les résultats obtenus dans cette étude sont similaires aux conclusions des suivants chercheurs : Les microorganismes qui solubilisent le phosphore développent des mécanismes leur permettant de fournir du phosphore à la plante. Bacillus sp. # 189 augmente de manière significative à la fois le contenu en P des plantes et le phosphore de la rhizosphère (Ögüt et Fatih, 2016). Certaines bactéries du sol sont capables d'assimiler le phosphore à partir de minéraux très peu solubles de phosphates naturels (Tardieux-Roche 1966a) et d'immobiliser ainsi une partie sous forme de phosphates condenses (Tardieux-Roche 1966b). Ces cellules microbiennes peuvent ainsi transférer le phosphore du minerai à la plante (Tardieux-Roche et Tardieux 1970).

La valeur moyenne des pourcentages obtenue d'azote dans les plantes des parcelles où l'engrais microbien a été appliqué est 0,97% ; dans les parcelles non appliquées la valeur moyenne est 0,93%. La valeur moyenne des pourcentages obtenue de potassium dans les plantes des parcelles où l'engrais microbien a été appliqué est 2,16 % ; dans les parcelles non appliquées la valeur moyenne est 2,14 %. Les valeurs moyennes d'azote et de potassium dans les plantes se sont avérées plus élevées dans toutes les doses de P_2O_5 dans les parcelles traitées avec un engrais microbien (Tableau 1). Nos résultats sont aussi similaires aux résultats d'études précédentes de Majeed et al. (2015) et Ul Hassan et Bano (2015) les rôles multidimensionnels des

microorganismes qui solubilisent le phosphore contribuent également à une absorption accrue d'éléments nutritifs par les plantes, ce qui entraîne une plus grande teneur en azote et en phosphore dans les parties aériennes des plantes (Kuan et al. 2016). La croissance des racines en réponse à l'inoculation des microorganismes qui solubilisent le phosphore conduit également à une meilleure absorption des nutriments par les plantes (Bhattacharyya et Jha, 2012). Vikram (2007) a également signalé une amélioration assistée par l'auxine dans les racines, entraînant une augmentation de la teneur en azote et en phosphore des parties aériennes de la plante. Selon Ayten et al. (2017) en présence des microorganismes dans le sol les teneurs en azote et en phosphore dans les parties aériennes des plantes de blé augmentent de manière significative.

Table 1: Les Moyennes des Pourcentages des Eléments NPK dans les Plantes

Doses Appliquée (kg/da P_2O_5)	**Pourcentage Total d'Azote (%)**	**Pourcentage Total de Phosphore (%)**	**Pourcentage Total de Potassium (%)**
0	0,95	0,47	2,2
2	0,93	0,42	2,16
4	0,91	0,44	2,05
Moyenne	**0,93**	**0,44**	**2,14**
B0	0,94	0,42	2,1
B2	0,97	0,44	2,16
B4	0,99	0,49	2,2
Moyenne	**0,97**	**0,45**	**2,16**

B: Avec Application d'Angrais Microbien

CONCLUSION

Le but de cette étude est de déterminer l'effet de la fertilisation microbienne et de différentes doses de phosphore sur le contenu en macronutriments dans la plante de sésame (*Sesamum indicum* L.). Les quantités moyennes d'azote, de phosphore et de potassium étaient plus élevées dans les parcelles avec fertilisation microbienne que dans les parcelles non appliquées. En plus, les pourcentages d'azote, de phosphore et de potassium dans les plantes de sésame ont variés selon les doses de phosphore appliquées. Cette étude a démontré que la fertilisation microbienne a un effet positif sur la teneur en azote, en phosphore et en potassium. De ce fait nous pourront conclure que l'inoculation des microorganismes capables de dissoudre le phosphore est une alternative moins coûteuse et moins risquée pour l'environnement par rapport à l'ajout d'engrais phosphoré. Ces micro-organismes peuvent être facilement utilisés, en particulier en agriculture organique, car ils sont considérés comme des micro-organismes qui favorisent la croissance des plantes.

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APPLICATION OF ARTIFICIAL NEURAL NETWORK TO PREDICT SOME WATER HYDRAULIC FUNCTIONS AND PARAMETERS FOR SOME SOILS IN NINEVEH PROVINCE / IRAQ

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ABSTRACT

Four implementation of Artificial Neural Networks ANNs models were applied to Predict the soil hydraulic function (θ_s and θ_r) and two parameters (α and n) in Van Genuchten equation, independently of each other. which was output from (ANNs) then a multi-layer ANNs architecture of error Back- propagation was built and Levenberg-Marquardt algorithms was used to learn the network dependent on the input data of soil depending on the input data from some soil characteristics soil particle-size distribution (clay, silt and sand) and bulk density with the geometric mean particle-size diameter from Eleven soil samples.

The results showed the ability of constructing ANNs and possibility of using neural networks the could estimate soil hydraulic function (θ_s and θ_r) and two parameters (α and n). Test the network and compare its output with the measured data, two performance functions determination coefficient (R^2)and mean square errors (MSE) to find the adequacy between estimated data and the outputs of neural network, the values of(R2) ranged (0.832 and0.672) ,(0,81and0.581) while evaluate of (MSE) ranged (0.0033 and 0,0066) , (0.0038 and 0.0097) soil hydraulic function (θ_s and θ_r) and parameters (α and n) respectively .

INTRODUCTION

Interpreting and understanding the movement of water and salts during unsaturated flow in soil is an important and complex topic and one of the challenges facing researchers in the field of soil science and irrigation today that requires considerable time and effort and is linked to the surrounding conditions (Van Genuchten, 1980). The modern trend in this field is the development of mathematical models for the purpose of predicting some soil water characteristics such as diffusivity and unsaturated hydro-conductivity the accuracy of these equations is highly dependent on water functions such as moisture content at saturation (θ_s), residual moisture content (θ_r) and water functions constants represented by Van Genuchten model constants (α m ، n ,).

Artificial Neural Networks has emerged as one of the methods of artificial intelligence that represent mathematical techniques and a processing system based on mathematical models designed to simulate modest action, shape and content of the way in which a person's neural system (neural system) performs a particular task. Interest in artificial neural networks (ANN) has arisen because of its distinctive characteristics and its ability to override the limitations of the traditional solution and characterized by the property of parallelism, the ability of networks to process data at high speed no matter how large the data as well as not requiring clear knowledge as the network can train on inputs without have knowledge of the application which makes it suitable for complex applications, as well as high generalizability as the training is based on specific inputs, and the test is done on trained and untrained data, i.e. the network includes all data (Kohzadi et al., 1995). The researchers agreed to exploit this phenomenon in mathematical modeling processes for various physical and chemical problems, which were difficult to solve by traditional modeling methods.

Therefore, this study aims at using artificial neural networks in estimating the values of water functions (θ_s , θ_r) and constant (α ,) and comparing them with their actual measured values to determine the n efficiency of artificial neural network models.

MATERIALS AND METHODS

Eleven soil samples were selected for different locations in Nineveh Governorate with different textiles located within the arid and semi-arid areas of northern Iraq.

Table (1) illustrates these sites and some of their characteristics as stated in Baruh and Barthakur (1999).

The construction of the proposed artificial neural networks was determined by utilizing the MATLAB version (a2011) and using its NN-Tool. The geometry of the proposed network, , the input and output layers and the hidden layers, are selected and constructed to obtain the best structure of the artificial neural network.

Multilayer artificial neural networks (ANNs) have been used for Back Propagation (BP), as the actual output of the network is compared with the intended output (target), The difference in their values is also called error, as the network disseminates this error between the output layer passing through the hidden layers towards the input layer, ie, an obsolete reversal of what happens in the output calculation phase where the calculation direction is forward and they are a type of network that does not contain delay elements as shown in Figure 1.

The artificial neural network included a single input layer consisting of five neurons: the percentage of soil saplings (clay, silt and sand), bulk density and geometric mean particle-size diameter ((actually measured for all study site soils) (Minasny and McBratney, 2002). Calculate (dg) from the following equation:

$$dg = \exp[-0.0692(clay) - 0.0452(silt) + 0.01] \text{ ----------(1)}$$

The outputs are $(\theta_r)^{\frac{1}{2}}$ $\ln(\alpha)$ ، θ_s ، and $\ln(n-1)$, the reason of transforming θ_r n and α ، to θ_s $\ln(\alpha)$ ، and $\ln(n-1)$ is because they showed non normal distributions and were therefore converted to fit the work of artificial neural networks (Minasny and McBratney, 2002). While the output layer was confined to a single layer with a single neuron representing one of the predicted values of the water functions (θ_s and θ_r) and constant (n and α), four independent networks were constructed.

Table (1) Some Physical Characteristics of Study Soils

location	texture	Intial volumetric water content	Saturated hydraulic conductivity cm.h^{-1}	Bulk density mg.m^{-3}	Total porosity cm^{-1}.cm	Organic matter gm.kg^{-1}	Soil texture gm.kg^{-1}		
							sand	silt	clay
Hay alghfran	Clay loam	٠,١٩	٠,١٤٦٤	١,٣٨٩	٠,٤٧٦	١٠,٦٤	٢٤٥	٤٧٠	٢٨٥
alkubba	clay	٠,٢١٢	٠,٠٨٤	١,٢١١	٠,٥٤٤	٢٤,١٤	١٢٥	٣٢٥	٥٥٠
College1	Sandy clay loam	٠,١٤	٠,٣٤٨	١,٣٧٣	٠,٤٨٢	٦,٢٠	٥٤٠	٢٥٠	٢١٠
rashedia	Silty loam	٠,١٨٥	٠,٢١٠	١,٣٣٠	٠,٤٩٩	٨,٦٦	٢٤٢,٥	٥٢٢,٥	٢٣٥
hghawe	Silty clay loam	٠,١٨٩	٠,٠٧٢٠	١,٣١٧	٠,٥٠٣	٥,١٧	١١٠	٥٢٠	٣٧٠
alshlalat	Silty clay	٠,٢٠١	٠,٠١٩٥	١,٣٠١	٠,٥١٠	٣,٤٤	٣٧,٥	٤٧٥	٤٨٧,٥
alshamsiat	Sandy loam	٠,١٣٣	٠,٨٤٨٧	١,٣٥٠	٠,٤٩١	٦,٥٥	٥٣٠	٢٩٠	١٨٠
Hamam alil	loam	٠,١٤٦	٠,٢٧٤١	١,٣٧٠	٠,٤٨٣	١٠,٣٤	٣٠٠	٤٥٠	٢٥٠
owaina	Sandy loam	٠,٠٦٥	٣,٧١٣٧	١,٥٥٩	٠,٤١٢	١,١٧	٨٠٠	١١٢,٥	٨٧,٥
College2	Silty clay	٠,١٩٥	٠,٠٢٢٢	١,٣٤٤	٠,٤٩٣	١٥,٥٢	٧٥	٤٧٥	٤٥٠
zimmar	clay	٠,٢٢٢	٠,١٠٦٨	١,٢٠٥	٠,٥٤٦	٦,٨٩	٥٠	٣٧٥	٥٧٥

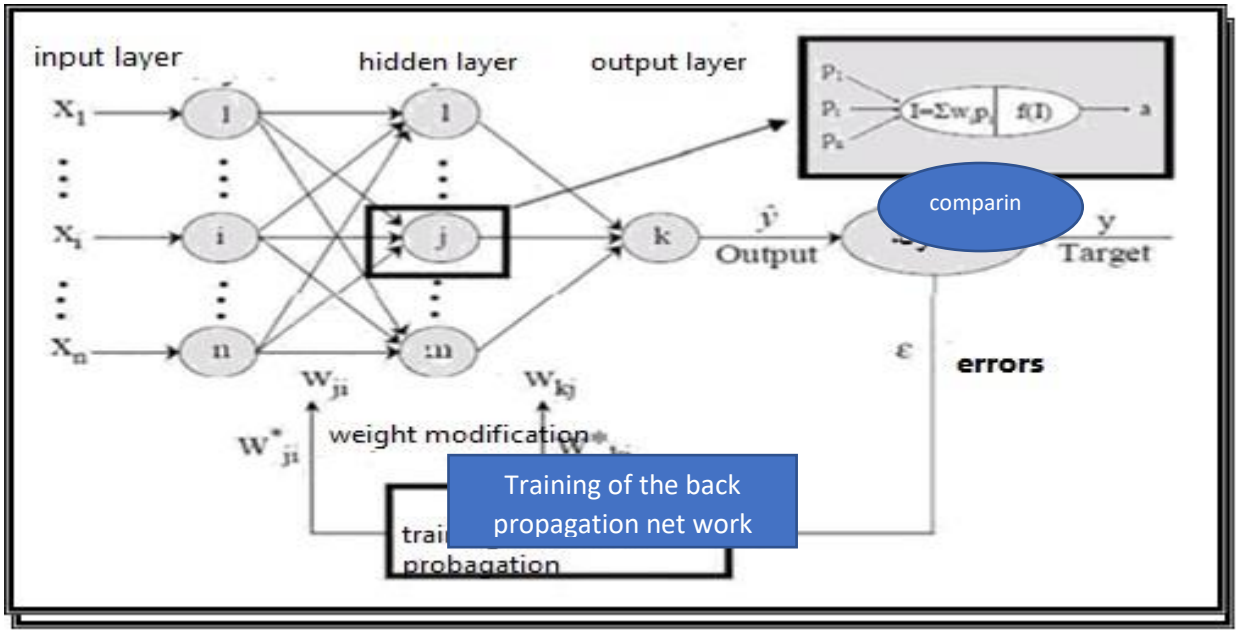

Figure 1: An ideal model for a back propagation network.

The use of this method came after several attempts to obtain the best results. The Hidden Layer of the network was determined in an experimental manner until the lowest MSE (Mean square error) was obtained. 10 Hidden Layer layers were used to construct the artificial neural network, as the small number of hidden layers caused under-fitting any less match. A large number of these units cause over fitting, it means noise in the data (Schaap et al., 1998).

The training group takes a number of input data randomly, including input values (clay, silt, sand, bulk density and geometric diameter of soil particles). Output values are represented by the actual measured values of (θ_s).The training process of the proposed artificial neural network in the training group includes three stages: the forward feeding stage, second stage the error calculation and the back propagation of the output error. The third stage involves updating the weights and re-training the number of times until the lowest error rate is reached or reaching comparable results to the values in Target matrix . The validation group and the testing group for testing the proposed artificial neural network training included data entry in the form of mathematical matrices. The first matrix represents the evaluation group, which includes random data for inputs that were not used from the network during the training phase to achieve the best performance of the artificial neural network, while the second matrix Which represents the testing group for random data not included in the training process also for the purpose of ensuring the performance compatibility of the training and evaluation groups. The evaluation and testing process is for the purpose of ensuring the performance compatibility of the network and to prevent over-training of the proposed network in order to reach the weights that connect the network inputs with its outputs to the optimum compatibility. The evaluation group guides the network during the training phase and when increasing the quadratic error rate of performance evaluation for a specific number of repetitive courses, at that point the training is stopped and Figure 2 (Hrsitev, 1998) illustrates this.

Reducing the error of the evaluation group coincides with the training group from the beginning and after a period of time the error starts to increase for the evaluation group, which leads to exaggeration in training. The last part, All, represents all points or values in the network.

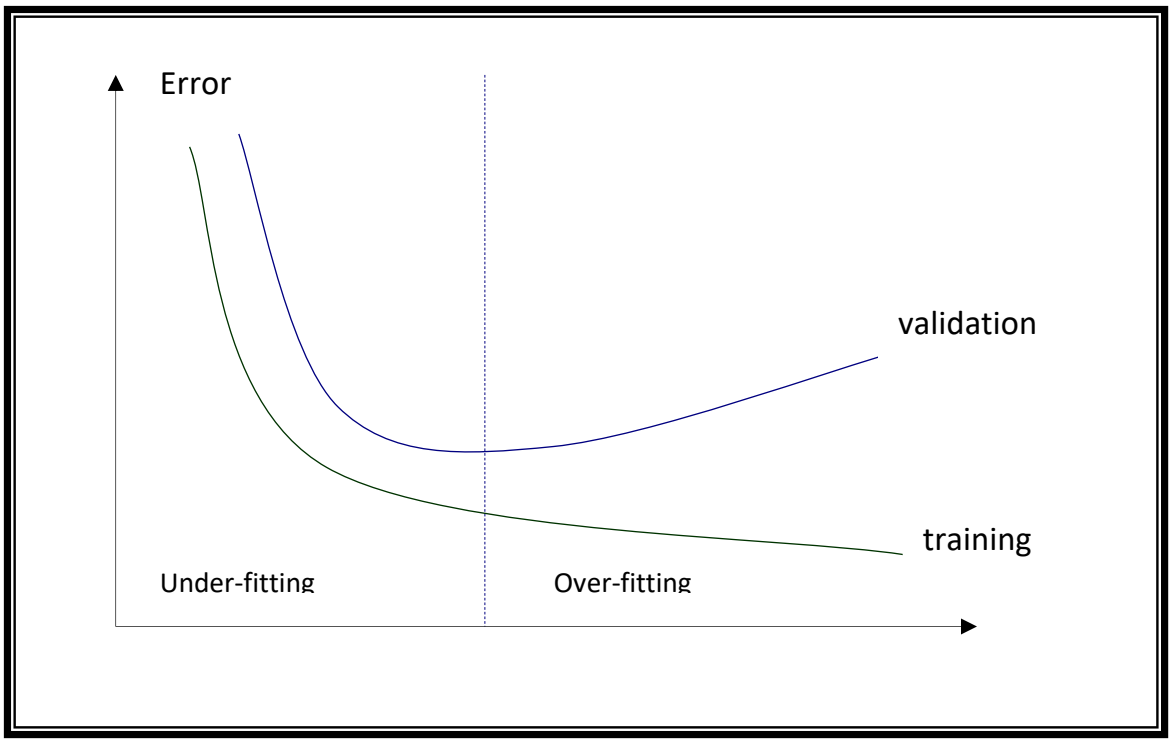

Figure 2 The idea of early discontinuation. According to Hristev (1998)

The Levenberg- Marquardt (LM) algorithm was used to train back propagation network of error to construct and train predictive models in order to obtain the best structural neural network architecture. The data were randomly divided into three groups, the training group was 64% of the data and the test and verification groups were 18% of the data each. The aim of the training of the network is to change or update the network weight (Weight Updating) to obtain the desired output (target) of the inputs given. The matrix is entered in full and in one batch (Batch Mode) and weights updated once a time. During the training process, the output values are calculated and compared with the desired output values at each step. The error spread is inversely layer by layer starting from the output layer towards the input layer so that weights for all layers occur at the same moment after All training inputs given are presented (Demuth and Beale, 2002).

The obtained error signal representing the difference between the real output (Output) and the target output (Target) is adjusted after each training session (Epochs) until the error value reaches the lowest value at which the training stops. It was noted that the use of the activation function in the hidden layer of the sigmoid function of the tangent of the Tan-sigmoid Transfer Function with the activation function of the output layer of the linear function transfer function gave the lowest values (MSE), Figure (3) . Not all layers have The activation function itself, but each layer has its own activation function (Jain and sing, 2003). To measure network performance and test the best predictive network, statistical evidence from the coefficient of determination (R^2) and quadratic error rate (MSE) is used.

The training process stops when an acceptable level of error is reached or until stable results are achieved when the MSE value is at the lowest and the highest values of (R^2), or when a decrease in (MSE) value or an increase in (R^2) is not touched to the desired level with an increase the number of repetitions (Iterations), so that the network has been completed and ready for the next stage, the actual test of the network through the simulation of the network that was built, and if these results have values equal to the values chosen, then the network can be adopted as an artificial neural network (Alani, 2007). In order to achieve the training objective of the proposed artificial neural network, a balance had to be struck between its ability to respond correctly to the input data used in the training stored in the network for the recall process and its ability to give a good response to similar but not identical inputs used in Training process (guessing process).

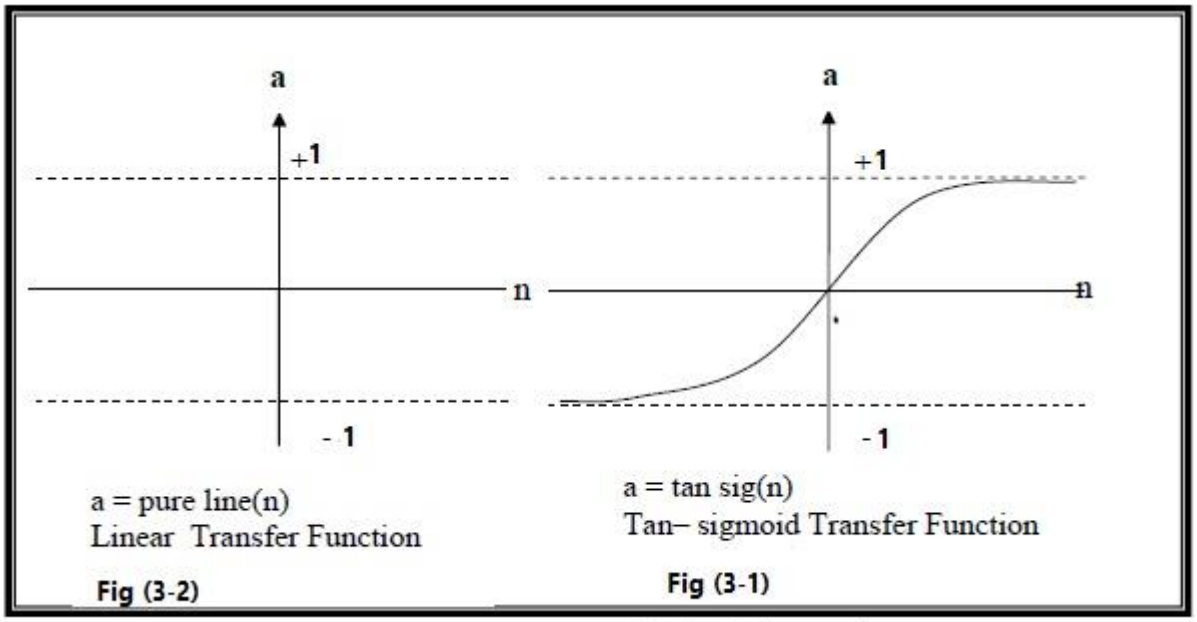

Figure 3: Some types of activation functions used, according to Demuth (Beale, 2002)

RESULTS AND DISCUSSION

The predicted results were shown when making one network with five inputs: volumetric distribution of soil texture (clay, silt and sand), bulk density and geometric diameter rate and four outputs are functions (θ_s R^2 of the coefficient of determination (). The statistical index values n , α) and constant (θ_r ،) were 0.35, 0.26, 0.32 and 0.17, while the MSE was 1.22, 1.94, 1.47 and 3.68 for each (θ_s) n و α ، θ_r ، respectively. After training and testing the network showed that the correlation between the predicted values in ANNs was weak with the actual measured values. This is consistent with McClendon and Hoogenboom, 1996, and Minasny and McCBratney, 2002, who, when studying soil hydraulic functions using artificial neural networks, indicated that the greater the number of data used increase predicted accuracy. Therefore, four independent artificial neural networks were constructed with five inputs each: percentage of clay, silt and sand, bulk density, geometric mean rate and one output (target) for each of (θ_s α ، θ_r ، and n). A Hidden Layer was used which have been determined by trial and error to reach The lowest quadratic error rate, as recommended by (Schaap et al., 2001).

The network model for predicting moisture content at saturation (θ_s) will be discussed to demonstrate the extent and quality of the performance of the networks used during the training phases and to know the results of training and testing in artificial neural networks. The reason for choosing (θ_s) to express neural network models is because the output of the neural network model to predict (θ_s) does not need to convert as shown at figure (4) while the output of the rest of the neural network models is in a format $(\theta_r)^{\frac{1}{2}}$ $\ln(\alpha)$ ، normal -) because they showed non n and α ، θ_r , which needs to be converted to ($\ln(n-1)$ و distributions (Minasny and McBratney, 2002).

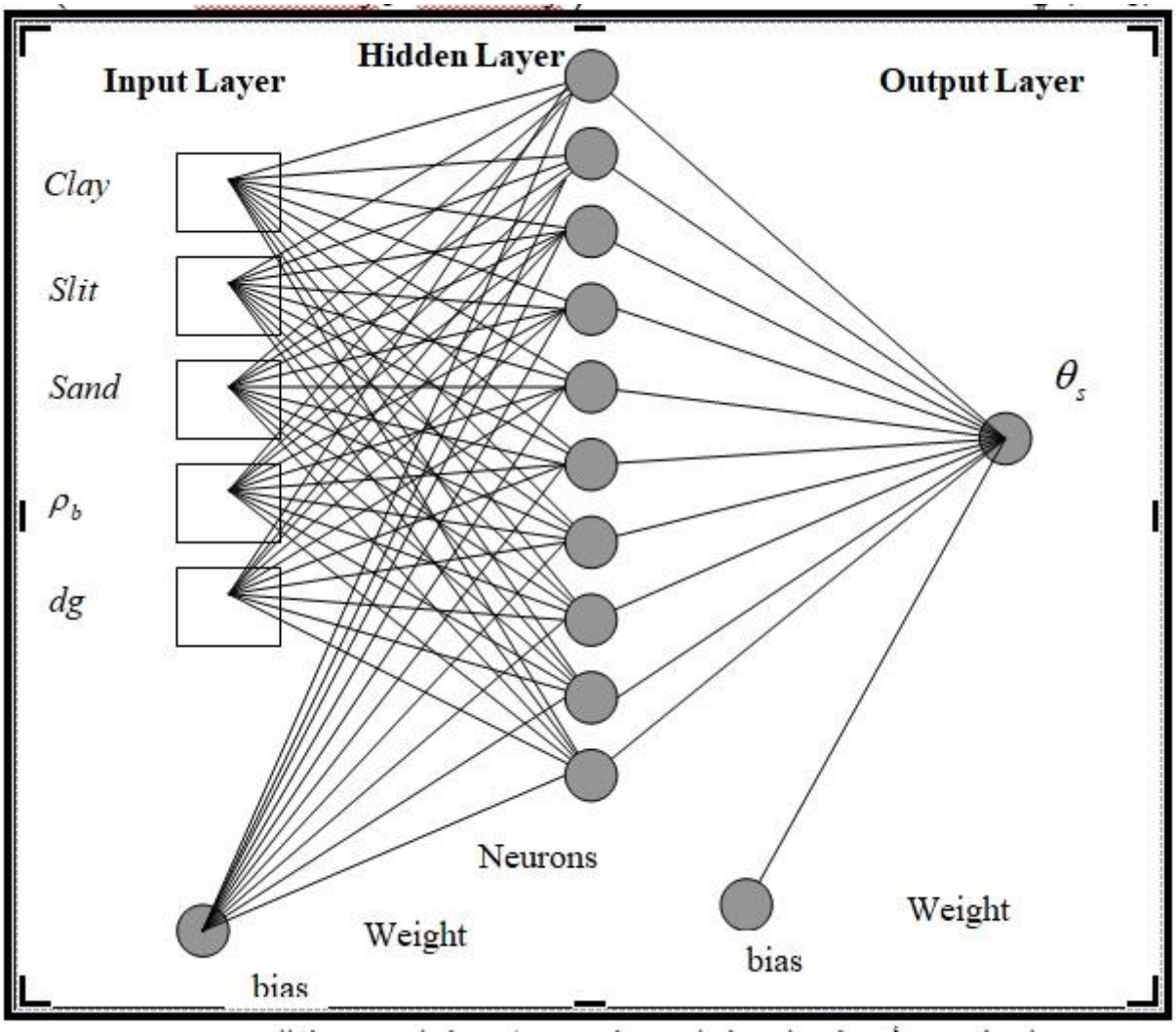

Figure 4: The model of artificial neural network used to predict (θ_s).

Figure (5) shows the results of the training stages of the artificial neural network model and the performance of the neural network by the relationship between the number of epochs and the MSE of the values of Train, Validation and Test groups. The results showed that the squared error rate remained constant after a few cycles. After completing the training of the network on the input data and the desired targets , the artificial neural network with the error of reverse spread is applied and simulated from the final weights reached in the training phase.

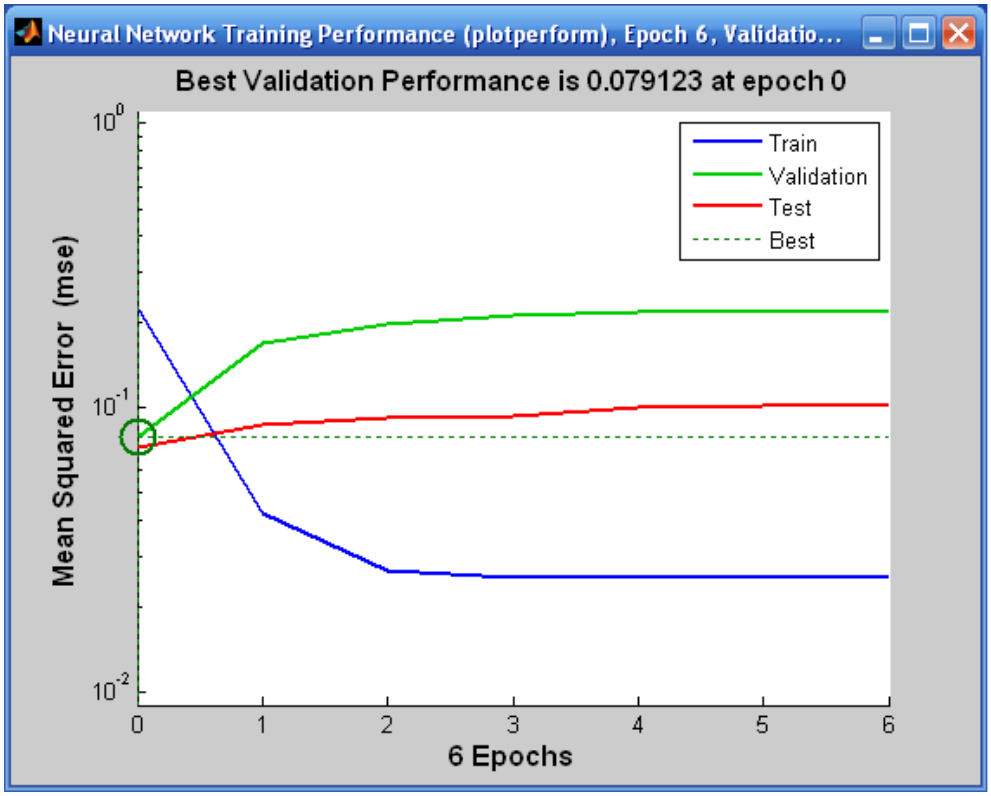

Figure 5: Training Stages of the Artificial Neural Networks Model.

The results shown in Figure (6) showed that the best values of the coefficient of determination (R^2) obtained during the training courses were (0.831, 1, 1 and 0.929) for (Training, Validation, Test and All) respectively. These results from the

validation values of 1 validate that the network performance was good and that the performance compatibility of the training and evaluation groups was high with the value of Testing of 1 These good values give credibility to build an independent

network and can be used to predict values (θ_s) in new data.

For the purpose of testing networks constructed on data not entered in the training processes to demonstrate the reliability of built-up network models, the simulated predicted values of water functions (θ_s -) were simulated using ANNs with their values measured in previous studies (Al n و α) and constant (θ_r ، Wazzan, 2000).

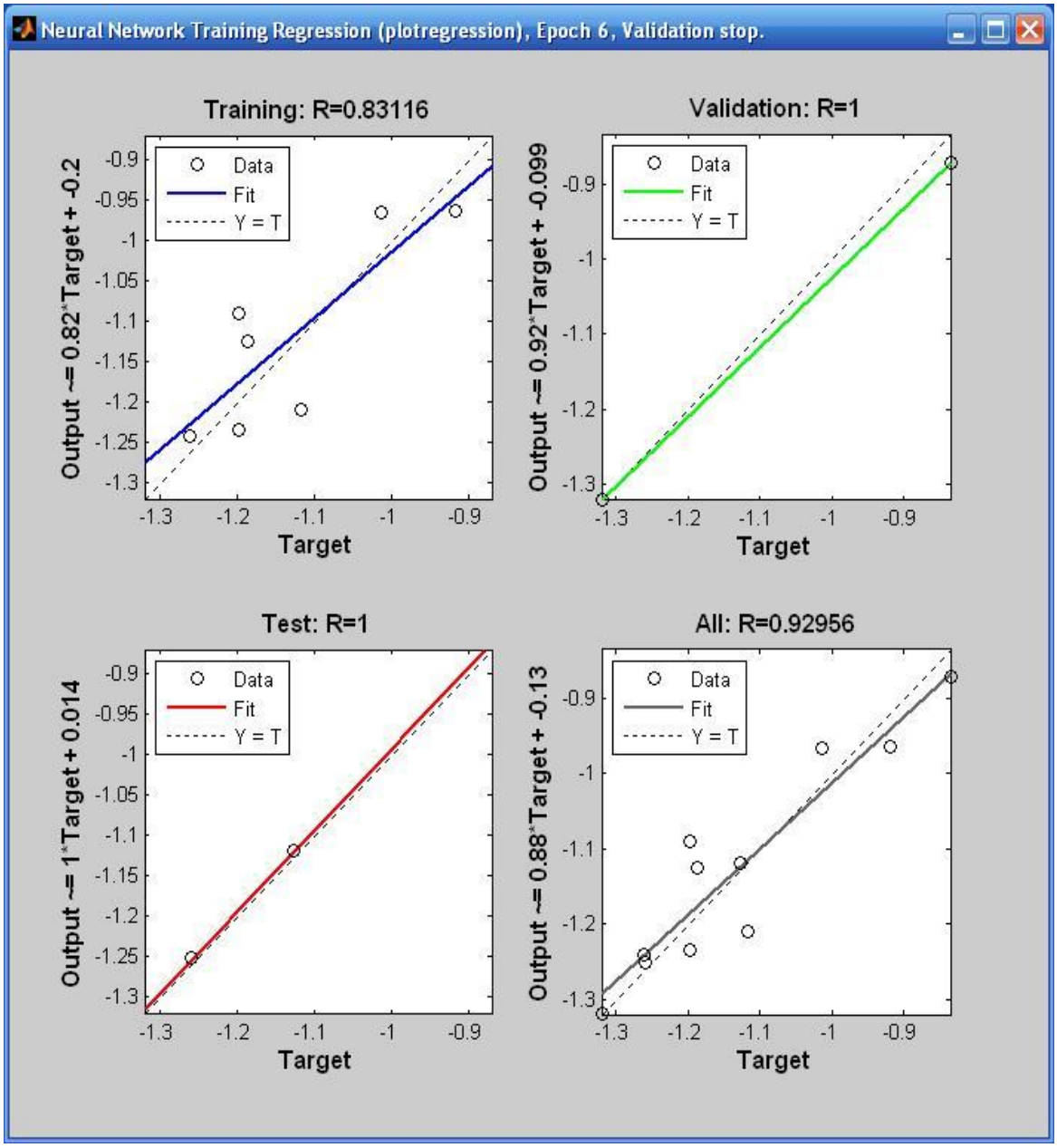

Figure 6: Results of training and validation of the Artificial Neural Networks Model.

The simulation results showed that ANNs can estimate the values of water functions on each side and approximate the predicted values with their measured values. Statistical evidence values from the coefficient of determination (R^2) compare the predicted values using ANNs with their measured values 0.832, 0.667 , ٠. ٨١٠٩, ٠.٥٨١. The values of MSE are 0.0033, 0.0066, 0.0038 and 0.0097 for the water functions (θ_s) θ_r, and constant (α) respectively. When the comparison was made using the percentage of difference between n, the predicted values and the measured values, it was observed that the percentage difference was (10% and 14%) for the water functions (θ_s) respectively, n, α)while it reached (8% and 17%) for the constant (θ_r, so that the water functions can be arranged according to the accuracy Estimate using ANNs as follows:

Moisture content at saturation (θ_s), constant (α), residual moisture content (θ_r) and static (n).These results are acceptable as a quick predictive method that can be utilized .These findings were consistent with

Wu, 1995, Vogel et al. 1996, Hopmans et al. 2002, Minasny and McCBratney 2002, who indicated that ANNs provide good and fast predictive results no matter how many data and that artificial neural networks are efficient in predicting some hydrulic functions , when limited available information on Soil hydraulic characteristics.

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DESIGN PRINCIPLES OF HEALING GARDENS FOR DISABLED CHILDREN

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ABSTRACT

The garden doesn't just mean open space. The garden is a part of nature; it can be defined as the safe areas that people choose to relax, have fun, feel good, engage in active or passive activities, satisfy the need for believing, and fulfill their belief rituals comfortably. It is a known fact that green spaces reduce the negative energy of the environment. Therefore, green areas support the healing of sick individuals by reducing stress on people. Healing gardens designed and implemented for this purpose contribute to this process and increase the welfare of the individual. A healing garden designed for children with mental and physical disabilities can be defined as natural areas where children can play a controlled area for play, as well as relieve children's physical symptoms, reduce stress, and thus make them feel healthier. Sick children who use this kind of gardens are constantly exploring different environments and becoming more cheerful and sharing. Within the scope of this study, design principles of rehabilitation gardens for children with disabilities have been put forward by literature research. Healing gardens designed for children with physical and mental disabilities will improve the quality of life of children with disabilities and provide healing properties such as self-esteem, self-esteem, positive effect on personality and personality development.

Keywords: *Design, Garden, Disabled Child, Healing Garden, Landscape*

INTRODUCTION

The use of the natural environment has varied over the centuries and reflected the beliefs and values of each culture. Historically, humans have always used nature as a powerful source of healing (Adevi and Lieberg, 2012). Natural elements such as natural open spaces, forests, parks, trees and gardens are known to provide opportunities to enhance public health and well-being (Nilsson et al., 2011).

Natural areas beautify the environment and reduce the stress of daily life, contribute to the development of individuals and promote socialization, but prevent much of the damage of the developing city. As well as improving air quality, it has different functions such as noise reduction, hosting wildlife and providing calmness to individuals. Even the design of most of the home gardens, which are the smallest but most attractive areas among Nature environment, as meadows, allows children and adults to rest, while reducing the negative impact of the environment. Gardens attract individuals with the natural elements they contain; being outdoors with plants and animals reduces the stress of individuals and supports their recovery (Keçecioğlu, 2014).

Healing Gardens, which mostly support the healing process and stress reduction, are often located next to or adjacent to maintenance establishments. It is mainly in the areas where Alzheimer's, schizophrenia, learning disabilities, burning-related disorders are addressed and where necessary sub classifications such as disabled, elderly and children are designed according to different target groups and needs are met (Elings, 2006).

As a result, the garden can be curative for people who use it efficiently (Akın, 2006). In this study, the concept of "healing garden" was given and the criteria for healing garden design for children with disabilities were determined on the basis of the data obtained from the literature.

HEALING GARDENS

Definition of healing Garden

Gardens can be curative and therapeutic through many mechanisms. The most obvious is the aesthetics of nature. Being outdoors in natural or natural environments, feeling sunlight, watching trees and flowers, listening to water and bird sounds, noticing the combination of these and other factors that decorate the garden, has a major stress and anxiety-reducing effect (Akın, 2006; Pouya and Demirel, 2015).

The most important feature of the healing garden is that it is an environment where the staff and visitors who take care of the patients as well as the patients feel good about themselves. In order for an area to be described as a "garden" it must contain the products of nature.

The aim here is to demonstrate the therapeutic and beneficial effects on those who use these areas to apply the title" healing". The use of the term" healing ", in terms of health care gardens, allows its designer to second-guess personal tastes and approach the subject with a user-centered understanding of design (Marcus and Barnes, 1995).

Attempts by experts in the field to introduce nature into the health system environment have been variously described as eyewitness Gardens, restorative Gardens, healing gardens, and therapeutic gardens (Hebert, 2003).

2.2. Benefits of healing Gardens

According to Hill and Relf, (1983); Beer, (2003); and Caspersen et al (1991), recent studies suggest that regulated natural areas have positive effects on humans (Elings, 2006; Pouya and Demirel, 2015).

The benefits of healing gardens can be listed as follows (Bulut and Göktuğ, 2006; Serez, 2011):

- Healing gardens provide individuals with the opportunity to socialize, as well as opportunities for activities in a wide area (lawn mowing, gardening, scion planting).
- It allows older people to be reminded and stimulated of their previous home lives. It also helps to refresh their memory, increase their feelings and stay cautious.
- Patient's participation in various activities increases their communication with other individuals.
- The exercises performed in the natural field contribute positively to the health status of the patients both physically and psychologically. For example, it contributes positively to reduce the risk of developing various chronic diseases.
- Outdoor activities help increase the physical activity and motivation of the patients.
- Healing gardens provide an increase in self-confidence, respect, authenticity and capacity, especially for children. Children are happy with active or passive activities in the garden.
- The Health Council of the Netherlands designed for children outdoors, encourages them to do physical activities, and this activity is their positive contribution on children with physical or psychological disorder; in particular, these activities children Nov-supports skeletal development, and obesity minimize ailments such as announced.
- The most important effect on all individuals is to reduce stress.

Types Of Healing Gardens

✓ **Healing Gardens for the Elderly**

In old age, when the individual's movements are limited due to health problems, especially when he or she needs help, it has been seen that working in the garden and spending time have many benefits both psychologically and physically. According to Sherman et al (2005); as a result of recent research on healing gardens, it was found that the human mechanism is related to nature, and a link between life stress and psychological tremors and nature was established and it was understood that nature acts as a buffer in human life (Whitehouse et al., 2001; Bulut and Göktuğ, 2006).

✓ **Healing Gardens for Disabled Children**

Designed for children with mental and physical disabilities, a healing garden, to create a space for children to play controlled, as well as children the physical symptoms of soothes, reduces stress, and hence the children feel more healthy psychologically in the form of natural areas that can be defined (Şakar, 2011).

✓ **Healing Gardens for Cancer Patients**

In order to reduce the effect of certain chemotherapy drugs on the patient, canopy areas formed from plants should be made away from the sun and more, fragrant plants and restaurants should not be used in the area because their smell sensitivities are quite intense. Walkways, relaxing water sounds, attractive plant materials, areas where patients can socialize by sitting alone or in groups should be designed (Pouya and Demirel, 2015).

✓ **Healing Gardens for AIDS / HIV Patients**

Canopy spaces should be created as it is very important for such patients to be protected from direct sunlight (Pouya and Demirel, 2015).

✓ **Healing Gardens for Alzheimer's and Mental Disorders Patients**

According to Carpman and Grant, (2003), the appropriate design criteria are different compared to other diseases as they have more impact on the consciousness of patients with Alzheimer's and mental disorders. This type of gardens offers a variety of activities. Alzheimer's is a disease that responds more to appropriate design than other diseases. By using plants and their features, long-term use of memory can be achieved,

helping to revive childhood memories or remembering the events of today and yesterday (Bulut and Göktuğ, 2006; Şakar, 2011; Arslan and Ekren, 2017)

✓ **Healing Gardens for Hospitals**

The main purpose of healing Gardens for hospitals is to design gardens that aim to greatly reduce stress. Patients should be provided with conditions that will allow those to move and exercise, feel comfortable and safe and socialize places should be established (Şakar, 2011).

✓ **Healing Gardens for Veterans**

In every battle, hundreds of veterans return with severe injuries, called multiple traumas that have persisted over the years. Overcoming these traumas is not as easy as thought. When the positive impact of nature on human beings is reduced, there should be areas where our veterans can be socialized, fully accessible, and feel safe both physically and psychologically (Marcus and Sachs, 2013).

DESIGN PRINCIPLES OF HEALING GARDENS FOR DISABLED CHILDREN

In the design of the healing garden; when designing hard floor elements, shadow elements and seating units, psychological and physical benefits should be taken into consideration. In the selection of plants, both visual and sensory properties and improvement properties of plants should be taken into consideration by design (Şakar, 2011).

Design Principles of Healing Gardens for Mentally Handicapped Children

The following are the design principles of healing gardens for children with intellectual disabilities (Whitehouse et al., 2001; Özgüner, 2004; Bulut and Göktuğ, 2006; Sakıcı and Var, 2014; Pouya and Demirel, 2015; Açıksöz et al., 2016; Anonymous, 2018c);

- The plan should use simple lines and avoid complex concepts.
- Can be viewed from the interior to the exterior.
- Walkways should be arranged as simple paths and fixed flooring materials should be used.
- Evening lighting should be provided.
- Accessible, seating / urban accessories should be provided.
- Spaces should be designed for solo time, one-on-one work with a therapist, small group work and large group work, and spatial arrangement should be used to create a special space "Corner world" where the child can take a "sensory break" and get rid of the demands of the world.
- A variety of opportunities can be provided in a therapeutic garden to develop gross motor skills or large novices. Challenges can be created through activities that require balance. Children can be climbed on logs, rocks, nets, ladders or other areas that offer varying degrees of difficulty. Equipment requiring coordination and judgment, such as horizontal ladders, escalators and tunnels, can be incorporated into the Therapeutic Garden.
- The child should be given the opportunity to experience nature. Rocks, a rotting log, the branches of shrubs and trees, areas for all wildlife (lizards, worms, insects, spiders, bees, frogs, snails, butterflies, birds and squirrels) habitat provides.
- According to Kaplan and Kaplan(1989) and Marcus (2001), instead of very quiet environments in the place, nature sounds (bird sounds, wind sounds, plants formed by wind sound, water sound, rain sound) should be located in the environment.
- Plants should be selected for their ability to attract seasonal plants and wildlife such as leaf color, flower, fruit and peanut production. Water features, bird houses, bird baths and bird feeders encourage wildlife to visit and stay.
- Due to the fact that their sensory systems are acute or overly sensitive, care must be taken to provide visual relief from the sun's glare. To reduce the effect of the sun's bright ray's filtered sun, shade stained to create spaces with courtyards, loggia, pergolas, hanging domed cages are gazebo, shade trees, and other methods can be used.
- The garden for therapeutic purposes should be accessible to all children. Wheelchair-height ramps, smooth surfaces, planters and tables are examples of barrier-free design. A variety of surfaces (brick, concrete, slate, bark, pea gravel, sand, grass, asphalt, and others) can be used to indicate the transition from one area to another.
- Furniture; durability, ease of maintenance, function, safety and design should be chosen for the purpose. It should be light, mobile and multi-purpose.

- The therapeutic garden should provide flexibility as children's needs change as they learn and grow, and as the needs of the dedicated educator / therapist change, such as new ideas and therapies.
- Seating areas with special forms should be designed to encourage social interaction.
- Physical elements that can be changed and moved must be included in the garden. Lightweight portable systems and modular hardware elements (water tables, sand bags, foldable tables, inflatable materials, lawn furniture, watering cans, hoses, pulleys, ropes, hammocks, tree swings, natural objects, and garden accessories) should be placed in.
- Vegetation and other elements should be used to reduce or eliminate excessive visual or auditory stimuli.
- Water-themed decoration items should be used with caution. For example, sprinklers that feel like a constantly dripping faucet or the smell of dense algae and moisture can disturb people rather than relieve them.
- Mask unwanted sounds with soothing water sounds.
- Places to prevent sun, shade, wind and rain should be kept.
- Opportunities for planting and harvest should be provided.
- In addition to natural landscape features, plant design should include perennial, fragrant, poisonous/non-stinging ornamental plants that attract butterflies and birds to appeal to five senses, including renewable landscaping.
- Elements such as wind chimes activated by the sun or air, hanging crystals, recognizable colors or shadows on Earth, flowing features, or rain chains should be considered.
- Avoid artistic elements that have no meaning for children.
- According to Zeisel and Tyson, (1999), instead of the intense and uncomfortable lighting that will be directly on children, the water and roadsides should be provided with a shadow effect using light and low lighting elements.
- If there are play features in the garden, playgrounds should be created for children who are cautious, shy or disabled, where they can feel comfortable and care for themselves.
- Curious or comforting elements should be presented to a sick child.

Design Principles of healing Gardens for Children with Physical Disabilities

Below are the design principles of healing gardens for children with physical disabilities (Whitehouse et al., 2001; Özgüner, 2004; Bulut and Göktuğ, 2006; Şakar, 2011; Sakıcı and Var, 2014; Pouya and Demirel, 2015; Açıksöz et al., 2016)

- When gardening, functionality should be at the forefront for physical reliability and therapeutic benefits, and garden design should constitute continuity.
- In terms of security, a ramp should be created instead of high stairs and slightly inclined transportation should be provided.
- An alarm system should be set up in the outdoor area where they can ask for help in case of emergency.
- Landmark and directional signs should be used.
- According to Bowers, (2003), in order to prevent negative social behavior, exposed, visible and visible spaces should be designed.
- Care should be taken not to use plants that attract bees and insects in these gardens.
- Large crowned trees and shrubs should be used in the background and small crowned trees and shrubs should be used in the foreground to enable children to enjoy the sun.
- Multi-Sense (multisensory) experience spaces should be created.
- Shade elements and seating units should be created that provide the possibility to rest or linger in the space, have protective properties from the sun and other climatic factors.
- Greenhouse/winter garden should be designed to increase the duration of outdoor activities seasonally.
- According to Marcus, (2001), plant elements with a variety of textures and colors should be preferred in order to store images that are bad and disturbing to patients.
- In the part of the garden facing the road, precautions should be taken against dust, noise, wind, etc. by using appropriate plants
- Various forms, textiles, seasonal striking colors, such as the elements of the place, diversity in the garden design should be provided.

- In order to get rid of the tension of the child through the water and to make him feel confident, ponds should be placed within the recreation area which will allow the child to have short-term contact with the water.
- Animals bring healthy relationships and self-confidence, not just the necessity of feeding them. For this reason, pet units can also be included in the garden.
- Garden arrangement should be designed with round, curvilinear and smooth transitions instead of hard, dense and straight lines.
- When designing roads, elements should be included that urge a child to recover from surgery or to walk in the garden of their temporary disability, giving them a sense of autonomy.
- The textural features of the flooring coverings should be jagged and variable and there should be differences in the floor to find ways for disabled patients.
- Playgrounds should have a swing to accommodate a stroller or wheelchair.

CONCLUSION AND SUGGESTIONS

Research in medicine and Environmental Psychology has shown that garden layouts are related to different health protection services. Considering the positive physical and psychological effects of healing Gardens on humans, it is seen that healing garden design is a comprehensive and unique study. In the design of healing Gardens, different professional disciplines such as landscape architect, architect, therapist, and psychologist need to be in cooperation (Bulut and Göktuğ, 2006).

It should be noted first that healing gardens have no purpose in treating. The goal of Healing Gardens is to contribute to healing processes only by interacting with nature in the healing process of patients with different diseases.

When planning healing Gardens, an approach that matches and resembles the design principles of other gardens is taken, but these criteria are applied to improve gardens in a way that gives them distinctive meanings. Improve gardens edit files, basically the requirements of the patient group should be taken into consideration that appeals, and health requirements of workers and visitors, and patient - companion patient-visitor relations, design direction should be given by considering (Bulut and Göktuğ, 2006).

The most important feature of the healing garden is to positively affect patients, visitors, staff and those concerned and to ensure consistent stress reduction.

Despite the increasing importance given to healing gardens within the scope of our country, these gardens have not reached enough level yet. However, although there are many different types of patients and their relatives mentioned in the study in Turkey, there are no examples of gardens made in this style. In this respect, healing gardens can be designed together with professional groups in different disciplines (Architects, Landscape Architects, psychologists, engineers, and regional planners).

Healing garden design for elderly people, Alzheimer's patients, disabled people and hospitals should be designed to reduce stress factor, prevent the progression of existing disease or speed up the healing process, eliminate the risk of developing new diseases. For this reason, the general principles that should be considered in Garden Design have been determined and the use of medicinal plants in plant selection and the design of a healing garden serving spiritual and physical health has been realized (Şakar, 2011).

The need for spaces and gardens designed for our future children has been increasing in recent years with the development of technology. Because the times when children can go out and spend time are left in the hands of technological tools. healing gardens designed as a result of special design and research for children with disabilities who require more care are becoming a need. Exercise and activities in these gardens have been described according to literature studies in which many contributions have been made to the treatment processes applied on children with physical disabilities. Many children with intellectual disabilities are known to be overly sensitive to introverted external factors. This healing is implemented according to the design principles within the gardens of children with mental disabilities in social activities, people, flora and fauna and provides to socialize with children to instill a sense of self confidence to be nested. Unfortunately, there are no examples for children in our country. The fact that our work topic, which we have prepared in order to support this issue, is a sample literature to the relevant institutions and organizations will contribute to the application of the required healing gardens. Therefore, the healing gardens designed to support our disabled children in their safe and treatment processes will be an important step in the upbringing of more vigorous and confident children.

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^{222}RN AS TRACER TO IDENTIFY GROUNDWATER SALINIZATION OF THE PLIO-QUATERNARY UNCONFINED AQUIFER OF JERBA ISLAND, SOUTHEASTERN TUNISIA

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ABSTRACT

The present study integrates hydrochemical and radiogenic data of groundwater samples taken from the Plio-Quaternary unconfined aquifer in Jerba Island, southeastern Tunisia, to identify the main hydrogeochemical factors responsible for the high ion concentrations and ^{222}Rn content in the groundwater. Thirty-nine groundwater samples were collected from open wells widespread on the island. Physical parameters (EC, pH, TDS and T) were measured in the field, major ions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, SO_4^{2-}, HCO_3^{-} and NO_3^{-}) were analysed; ^{222}Rn concentrations were determined using a RAD7-H_2O equipment. Hydrogeochemical characterisation revealed that groundwater from the Jerba aquifer has several origins. Mainly, two water types exist in the island. One, with high salinity, dominated by Na-K-Cl type, as observed in coastal zones and parts with low topographic and piezometric levels. These zones seem to be affected by the seawater intrusion process. The second water type characterized by a low to moderate salinity with a chemical facies Ca-Mg-Cl-SO_4, characterizes the central part of Jerba (recharge area) due to carbonate and gypsum dissolution. The ^{222}Rn concentration in groundwater samples in Jerba varied from nil to 2.860 Bq.L^{-1} averaging 867 Bq.L^{-1}. The highest values were registered in the western coastal wells and near the geological faults. Nevertheless, the central and eastern wells showed low ^{222}Rn levels. Compared to ^{222}Rn activity in some countries with the same lithology, ^{222}Rn concentrations in the Jerba unconfined aquifer have higher values influenced by ascending rich ^{222}Rn groundwater flow and by seawater inflow enriched with ^{222}Rn resulting from the decay of uranium derived from phosphogypsum artificial deposits in the gulf of Gabes. The EC and ^{222}Rn spatial variability in the study area were mapped using ARC Map 10.3 software. Hydrochemical results in addition to geological data and radon activities confirm the existence of vertical communication between a Miocene aquifer beneath and the unconfined Plio-Quaternary aquifer through a fault system, and by lateral communication with the sea via seawater intrusion.

Keywords: *Geochemistry, ^{222}Rn, Unconfined aquifer, Fault system, Seawater intrusion, Jerba*

INTRODUCTION

Jerba Island, located in southeastern Tunisia, is characterized by a high evaporation, low natural recharge rates and a constant increase of water requirements due to excessive consumption by the population. The excessive pumping leads to the depletion of water and a decline in water quality. ^{222}Rn is a radioactive noble gas produced by the decay of ^{238}U, this gas is present in soil, rock and water; its solubility in water depends on various factors such as mineral characteristics of the aquifer rock formations, water-rock interaction, mineral Ra content, etc. (Nikolopoulos et al., 2009). ^{222}Rn is released from minerals in different ways, including the ejection from the surface during the decay process or the diffusion through pores, fractures and joints (Hashemi et al., 2013; Akawwi, 2014). It has been demonstrated that ^{222}Rn in groundwater can be used as a tracer of seawater intrusion due to desorption in high ionic strength. Ra, ^{222}Rn's parent, has salinity dependent desorption behaviour (Spizzico and Sciannamblo, 2005). The aim of this study has been to determine the main factors and groundwater flow mechanisms controlling the chemistry and radioactive content of water of the Plio-Quaternary unconfined aquifer of Jerba and to identify the hydrochemical processes occurring in the area by using coupled groundwater chemistry and ^{222}Rn activity as tracers.

METHODOLOGY

This study was carried out on the island of Jerba (Fig. 1). The climate is semiarid with an average annual rainfall of 220 mm and an evapotranspiration of about 487 mm. The geological features of Jerba (Fig. 1) can be described by the outcropping of Mio-Pliocene and Quaternary sediments, overlaying a Tertiary, Mesozoic and Paleozoic substrate (Davaud et al., 1996).

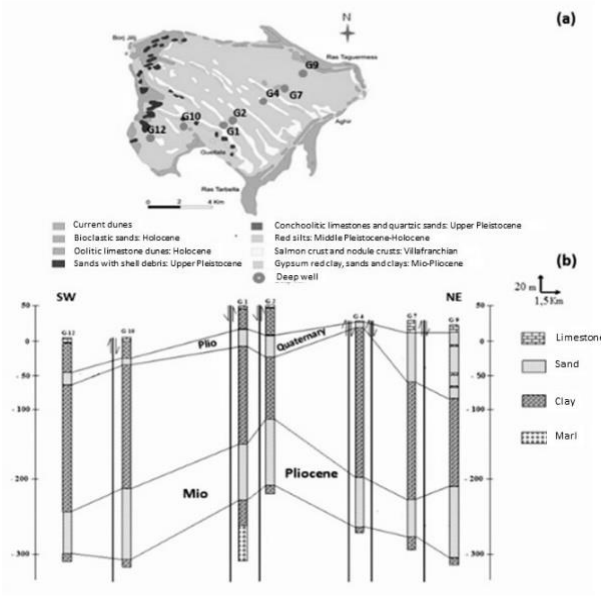

Fig. 1 [**a]** Geological map of Jerba Island and **[b]** Geological cross-section

The quaternary sediments consist of the superposition of two components: a quartz-rich unit and a carbonate rich one (Jedoui et al., 2002). A system of faults strikes NW–SE affects the island (Fig. 2). The Plio-Quaternary aquifer is registered in different sandy levels of the Pliocene rocks as well as in marine limestone of the Tyrrhenian Formation; the depth to the water-table is less than 10 m at the coastal zones and reach 30 m towards the center, suggesting discharge and recharge conditions respectively.

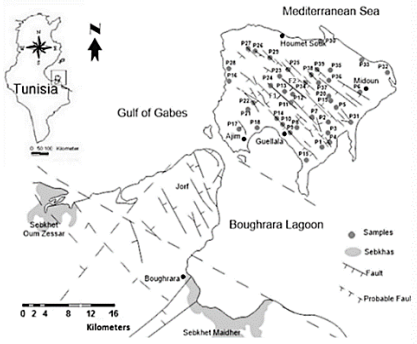

Fig. 2 Structural map of study area including sample locations

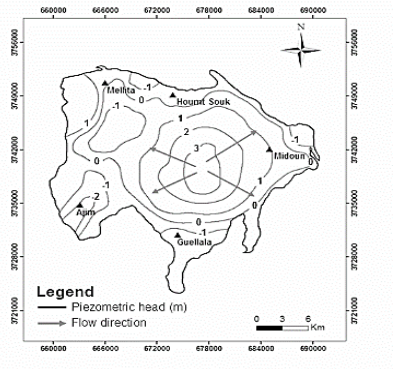

Fig. 3 Piezometric map of the Plio-Quaternary aquifer

Classic hydrogeological results show that groundwater flows in the island of Jerba follow the surface geomorphology (Telahigue et al., 2018). The piezometric surface shown by the contour lines in figure 3 shows a water-table height between −2 and 3 m a.s.l. and demonstrates that considerable recharge occurs in the center of the island and that groundwater flows toward the sea. The groundwater flow system is local as the recharge and the discharge areas are adjacent to each other. This needs to be confirmed by isotopic techniques (stable isotopes (^{2}H and ^{18}O) and tritium (^{3}H) and ^{13}C-^{14}C). In the study area, the unconfined aquifer is recharged by the infiltration of rainfall, and by a vertical ascending inflow of deep water coming from a confined aquifer (Jeffara aquifer) in the Mio-Pliocene sandstones from a depth of 320 m. A total of thirty nine water samples were collected for chemical analysis and ^{222}Rn measurement from open wells in December 2013 (Fig. 2), using submersible pumps after the flushing of stagnant water in the wells for about 20 min. Samples for chemical analysis were collected in airtight polyethylene bottles of 1 L and in 40-mL vials for radon measurement. Prior to sample collection, those latter were rinsed with the water of the corresponding sample then entirely filled with the sampled water and immediately closed to avoid any chemical reactions and radon loss by degassing

during transport to the laboratory. After collecting a sample, the sample vial was inverted to check for air bubbles. The date and time of sampling were recorded and samples stored in a cooler. ^{222}Rn levels were determined within 3 h after sample collection in order to minimize the influence of radioactive decay. ^{222}Rn concentrations were measured using RAD7-H_2O at the Integrated Laboratory in the Higher Institute of Water Sciences and Techniques of Gabes-Tunisia. The results were corrected to account for radon activity decline due to radioactive decay from the time of sampling to analysis by multiplying them by the Decay Correction Factor (DCF) = 1.023 (DURRIDGE Company Inc. 2000). The concentrations of major ions were measured by ion chromatography (Methrohm 850 Professional IC) and HCO_3^- were determined by the volumetric method. The precision of the chemical analyses was checked by calculating the ionic balance error (ε). All the analysed samples had ε ≤ 5%. *In situ* measurements of EC, pH and TDS were taken using a pre-calibrated C933 Multi-Parameter probe and water temperature was taken using a digital thermometer.

RESULTS AND DISCUSSION

TDS values are ranging from 1.880 to 19.920 mg.L^{-1}. Temperature ranges from 13.5 to 22 °C reflecting the recent origin of these waters. The pH is neutral to slightly alkaline and its values are increasing with flow path. The major ionic species obtained from the geochemical analysis are plotted on the Piper diagram (Fig. 4). The spatial distribution of water types shows a dominance of a Ca-Mg-Cl-SO_4 water type in the central parts of the island, where the substratum is mainly composed of gypsum clay. However, in the coastal zones and in some parts having low topographic and piezometric levels, the dominated water type is Na-K-Cl (Fig. 4). The Na^+-Cl^-–Ca^{2+}-SO_4^{2-} abundance in groundwater is probably due to the leaching of evaporitic minerals coupled to seawater intrusion in coastal zones (Kharroubi et al., 2012a). However, the other groundwater types (Ca-Mg-Cl-SO_4) are mainly related to cation-exchange reactions (Maoui et al., 2009) as there are flows upward from the deep aquifer.

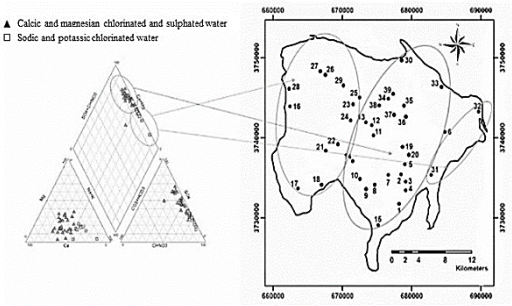

Fig. 4 Piper diagram and spatial distribution of groundwater types

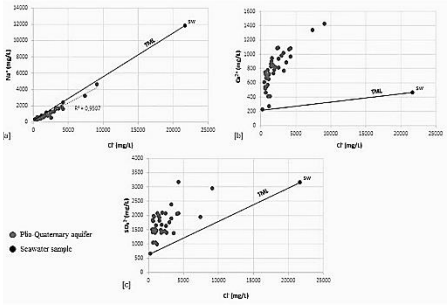

Fig. 5 Correlation between **(a)** Na-Cl, **(b)** Ca-Cl and **(c)** SO_4-Cl

The hydrochemical correlations were realised using the relationship of Na^+, SO_4^{2-}, Ca^{2+} versus Cl^- concentration. The Na^+ and Cl^- concentration plot along and close to the mixing line between seawater and freshwater (Fig. 5a). Samples used for fresh water are samples number 6 (EC: 3.65 mS/Cm; Cl^-: 553 mg/L), 12 (EC: 3.75 mS/Cm; Cl^-: 636 mg/L) and 33 (EC: 2.86 mS/Cm; Cl^-: 669 mg/L) picked from the recharge area. Nevertheless, the relationship of Ca^{2+} and SO_4^{2-} with that of Cl^- diverges from the mixing line (Fig. 5b and c), suggesting that other hydrochemical processes (dissolution/precipitation, ion exchange) must also occur in the aquifer. The high concentrations of Cl^- (exceeding 500 mg/L) in groundwater of this aquifer can be explained by seawater intrusion in the coastal regions, septic tanks and untreated sewage and by the dissolution of chloride-rich marine aerosols. The spatial distribution of EC in groundwater (Fig. 6) shows high levels along the western and the southern coastal zones, implying seawater intrusion and the dissolution of gypsum and anhydrite. The concentrations of ^{222}Rn for all the samples were in the range 0–2,860 Bq.L^{-1} with the mean value of 866 Bq.L^{-1}. It was recognized that high levels of radon in drinking water may constitute a major health hazard as ^{222}Rn is a known as the number one cause of lung cancer among non-smokers and is responsible for some thousand cancer deaths every year (USEPA, 2008). The study area, which is heavily polluted by anthropogenic activities, is particularly well known for a significantly higher rate of cancer than the national average (Tunisia). The World Health Organization (WHO) Guideline for Drinking Water Quality limits the concentration of ^{222}Rn for drinking water in domestic drinking water supplies originating from different types of groundwater sources and wells in different geological areas to 0.1 Bq.L^{-1}. The spatial distribution of ^{222}Rn (Fig. 7) shows that wells located in the east and in the center of the Island (the recharge zone) have the lowest radon activities ranging from nil to 340 Bq.L^{-1}. It also shows that the highest ^{222}Rn activities have been registered near the fault system, because groundwater flows through zones with high ^{222}Rn concentration.

However, some samples collected from coastal wells, with high EC levels, also showed high ^{222}Rn values. This fact may be related to seawater intrusion in those zones. It is to mention the fact that the Gulf of Gabes and the Boughrara lagoon receive effluent discharge coming from Gabes chemical industries generating 106 kg day^{-1} of phosphogypsum waste enriched with heavy metals, including uranium which drains to the seawater without any treatment (Kharroubi et al., 2012b). The seawater intrusion may cause the enhancement of ^{222}Rn concentration in groundwater by the decay of uranium introduced by the phosphogypsum pollution. Additional radioactivity is due to the absorption of the ^{226}Ra and ^{222}Rn from clayey sediments present in the aquifer and from the Jeffara coastal aquifer showing high uranium concentrations (Hadj Ammar et al., 2010), and mixing with the fresh groundwater, making them more radioactive.

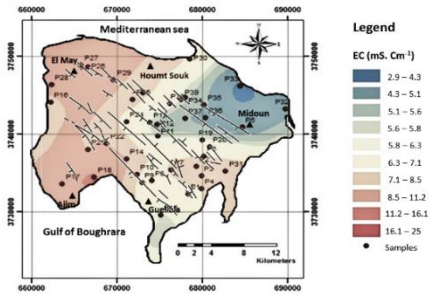

Fig. 6 Spatial variation of EC

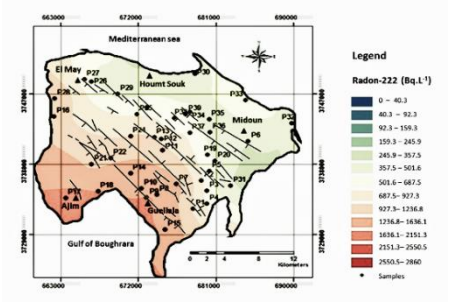

Fig. 7 Spatial variation of ^{222}Rn

CONCLUSION

Based on geochemical composition, two groups of water salinity were found in the Jerba unconfined aquifer. A zone in the North-eastern part and in the centre of the Island, both with low to moderate salinity values; a second one, characterized by saline to highly saline waters, in the western coast. The spatial distribution of groundwater salinity and ^{222}Rn concentration were investigated showing that the highest radon activities were registered near the fault system confirming vertical upward migration of ^{222}Rn due to deep ascending groundwater flow from a deep aquifer, via the faults system. The actual source of ^{222}Rn is another challenge. As to determine if the source is the deep confined aquifer or from a regional flow that uses this aquifer as a path to reach the surface. Samples from coastal wells (western and southwestern coast) with high EC levels confirm the lateral enhancement of EC by seawater intrusion by the absorption of the ^{226}Ra and ^{222}Rn from clayey sediments and potentially by the transport of uranium from the phosphogypsum deposit in the gulf of Gabes.

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A CASE OF FELINE ABDOMINAL ANGIOSARCOMA IN A 10 MONTH-OLD MALE CAT

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ABSTRACT

In this report, a case of abdominal angiosarcoma was described in a 10-month-old mixed breed male cat. A soft subcutaneous mass was found to grow in the ventral abdomen for a while and this mass was removed by total extirpation. On macroscopic examination, the mass was soft and yellowish in color. The cut section was edematous and hemorrhagic. Microscopic examination revealed vascular formation in the form of slits and channels within subcutaneous connective and adipose tissue. While newly formed vessel lumens were generally empty, some vessel lumens were filled with erythrocytes. Among these vessels were connective tissue cells with prominent collagen formations and a small number of inflammatory cells. In some areas, atypical features, especially polymorphism and anisonucleosis, were observed in endothelium. Mitotic figures were also seen in some places. While some of the new vessels formed had blood vessel characteristics, the walls of some of them were quite thin and resembled lymph vessels. Numerous mononuclear cell infiltrations in the connective and adipose tissue adjacent to the tumor were noted. The use of the term angiosarcoma is reported to be more appropriate in cases where endothelial cell proliferation is of blood or lymphatic vessel origin. In this case, the presentation of this case is found appropriate in order to contribute to veterinary oncology as endothelial structures and vascular formation resemble both blood and lymph vessels and this tumor structure is defined only in cats.

***Keywords**: feline, abdominal, angiosarcoma, pathology, cat*

ON AYLIK ERKEK BIR KEDIDE FELINE ABDOMINAL ANJIOSARKOM OLGUSU

ÖZET

Bu sunumda 10 aylık melez ırk erkek bir kedide abdominal anjiosarcoma olgusu tanımlandı. Bir süredir abdomenin ventralinde deri altı yerleşimli yumuşak bir kitlenin büyüdüğü tespit edilmiş ve sonrasında total extirpasyonla alınmıştır. Makroskobik incelemede yumuşak kıvamlı, sarımsı renkte, kesit yüzü ödemli ve yer yer kanamalı görünümdeydi. Mikroskobik incelemelerde deri altı bağ doku ve yağ doku içerisinde yarıklar ve kanallar şeklinde damar oluşumları dikkati çekti. Yeni oluşan damar lümenleri genelde boş görünürken bazı damar lümenleri eritrositlerle dolu olduğu dikkati çekti. Bu damarlar arasında bağ doku hücreleri belirgin kollagen oluşumları ve az sayıda yangı hücreleri vardı. Bazı alanlarda endotellerde polimorfizm ve anizonükleozis başta olmak üzere atipik özellikler dikkati çekti. Ayrıca yer yer mitotik figürler de görüldü. Oluşan yeni damarların bazıları kan damarı özellikleri gösterirken bazılarını duvarları oldukça ince görünümde olup lenf damarlarına benzemekteydi. Tümöre bitişik bağ ve yağ dokuda içerisinde çok sayıda mononükleer hücre infiltrasyonları dikkati çekti. Endotel hücre proliferasyonunun kan veya lenfatik damar orijinli olup olmadığının tam olarak belirlenemediği durumlarda anjiyosarkom terimini kullanılmasının daha uygun olduğu bildirilmektedir. Bu olguda da endotel yapılarının ve damar oluşumlarının hem kan hem de lenf damarlarına benzemesi ve bu tümör yapısının sadece kedilerde tanımlanması sebebiyle veteriner onkolojiye katkı sağlaması amacıyla bu olgunun sunumunun uygun bulunmuştur.

***Anahtar kelimeler**: Feline, abdominal anjiosarkom, patoloji, kedi,*

INTRODUCTION

There is controversy over whether this tumor is of blood vessel or lymphatic origin. The term angiosarcoma is therefore preferred (Goldschmidt and Hendrick 2002). These are rare tumors in all species, but are most commonly reported in dogs, cats, and horses. A somewhat unique manifestation of this tumor, seen in the caudoventral abdominal wall of cats, was previously called "feline ventral abdominal angiosarcoma" (Goldschmidt and Goldschmidt 2017). This rare tumor is seen only in the cat, where it presents as a distinctive lesion on the caudoventral abdominal wall. It has now been identified as a lymphangiosarcoma

by immunohistochemical analysis (Goldschmidt and Goldschmidt 2017, Galeotti, et al. 2004, Sugiyama, et al. 2007)

The caudoventral abdominal wall and mammary region has a diffuse "bruised" appearance, as if there were dermal and subcutaneous hemorrhage. When cut, the region is discolored red/black and oozes a serosanguineous fluid. A distinct mass is usually not discernible, but the area can vary in texture from soft and gelatinous to firm (Goldschmidt and Goldschmidt 2017, Thongtharb et al 2015).

Histologically, the subcutis in this area is diffusely edematous, hemorrhagic, and infiltrated by neoplastic endothelial cells that form clefts and channels. Most neoplastic cells hug the collagen and show moderate to marked nuclear pleomorphism. Although there is extensive hemorrhage throughout the area, the vascular channels of the neoplasm usually contain only a few erythrocytes. Scattered throughout the tumor and the adjacent soft tissues are lymphocytes, plasma cells, and hemosiderophages. It is controversial whether the endothelial cell proliferation in this syndrome is of blood or lymphatic vessel origin. Therefore, the diagnosis of lymphangiosarcoma is favored by some authors, based on light microscopic evidence of the close association of the neoplastic cells with collagen bundles and on the lack of a continuous basal lamina ultrastructurally (Galeotti et al., 2004, Goldschmidt and Hendrick 2002, Goldschmidt and Goldschmidt 2017).

Factor VIII immunostaining is positive in some tumors, negative in others. The use of the term angiosarcoma avoids this controversy and may be a more appropriate name for this entity at this time (Galeotti et al., 2004, Goldschmidt and Goldschmidt 2017). The extensive infiltrative growth of this neoplasm leads to frequent recurrences. Metastasis is rare. Repeated surgical excision has been the only recognized treatment (Goldschmidt and Goldschmidt 2017, Thongtharb et al. 2015).

CASE HISTORY

In this report, a case of abdominal angiosarcoma was described in a 10-month-old mixed breed male cat. A soft subcutaneous mass was found to grow in the ventral abdomen for a while and this mass was removed by total extirpation. On macroscopic examination, the mass was soft and yellowish in color (Fig. 1-A). The cut section was edematous and hemorrhagic.

Microscopic examination revealed vascular formation in the form of slits and channels within subcutaneous connective and adipose tissue. While newly formed vessel lumens were generally empty, some vessel lumens were filled with erythrocytes (Fig. 1-B). Among these vessels were connective tissue cells with prominent collagen formations and a small number of inflammatory cells (Fig. 1-C). In some areas, atypical features, especially polymorphism and anisonucleosis, were observed in endothelium. Mitotic figures were also seen in some places. While some of the new vessels formed had blood vessel characteristics, the walls of some of them were quite thin and resembled lymph vessels (Fig. 1-D). Numerous mononuclear cell infiltrations in the connective and adipose tissue adjacent to the tumor were noted.

CONCLUSION

The use of the term angiosarcoma is reported to be more appropriate in cases where endothelial cell proliferation is of blood or lymphatic vessel origin. The tumour was previously called "feline ventral abdominal angiosarcoma", but it has now been identified as a "lymphangiosarcoma" (Goldschmidt and Goldschmidt 2017, Lenard et al. 2007). The presentation of this case is found appropriate in order to contribute to veterinary oncology as endothelial structures and vascular formation resemble both blood and lymph vessels and this tumor structure is defined only in cats.

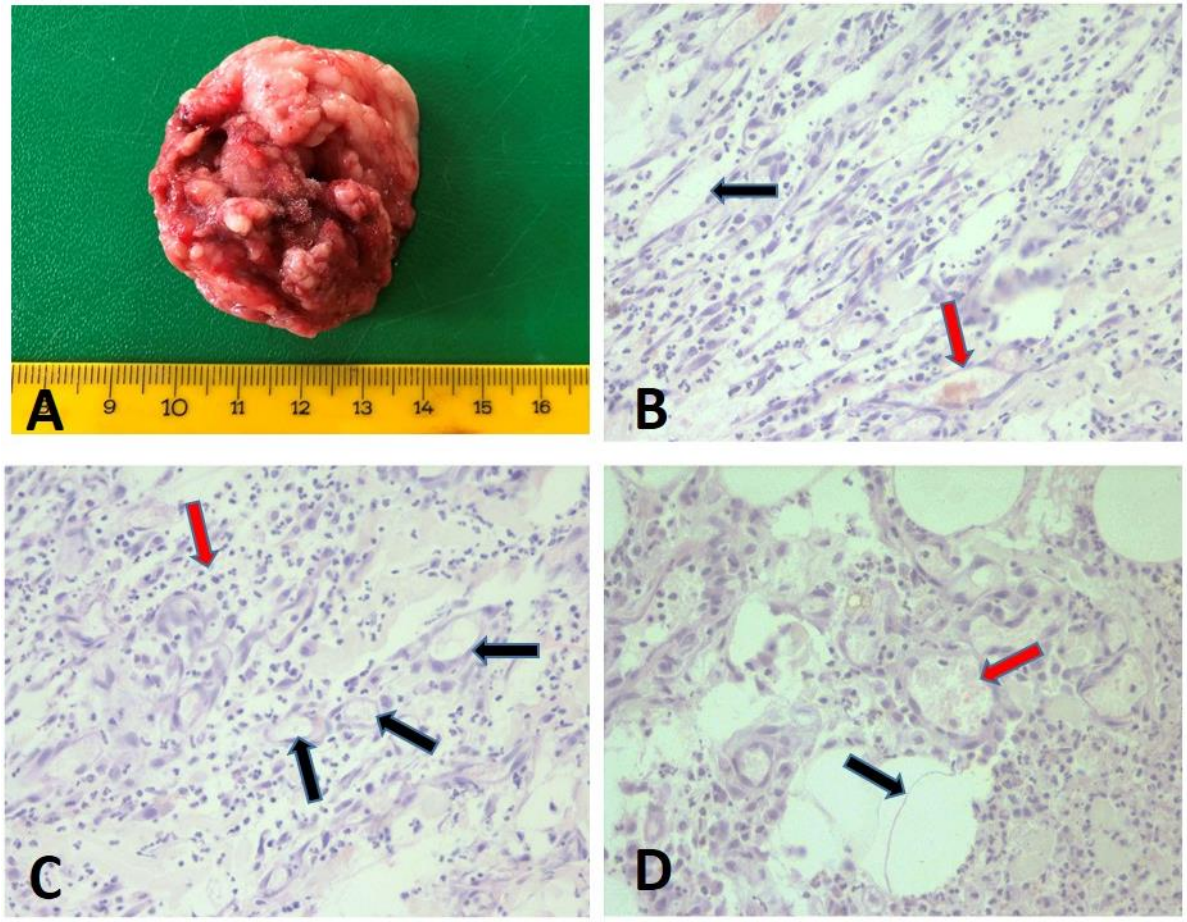

Figure 1. A. Tumour mass, soft and yellowish in color. B. Newly formed vessel lumens were generally empty (black arrow), some vessel lumens were filled with erythrocytes (red arrow), C. Inflammatory cells (red arrow) and newly formed vessel vessels (black arrows), D. Some of the new vessels formed had blood vessel characteristics (red arrow), the walls of some of them were quite thin and resembled lymph vessels (black arrows). H&E.

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ACANTHOLYTIC AND SPINDLE CELL VARIANTS OF OCULAR SQUAMOUS CELL CARCINOMA IN A SIMMENTAL COW

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ABSTRACT

In this presentation, acantholytic and spindle cell variants of ocular squamous cell carcinoma (OSCC) were identified in a mass taken from the right eyelid of a 4-year-old Simmental cow. The mass, which rapidly grew as a thick band in the right lower eyelid within 4 months, caused vision problems and was totally extirpated and brought to pathology laboratory. On macroscopic examination, the mass was 7x2,5x1,5 cm in size and had a hard consistency and a reddish colored cross-section. Microscopic examination revealed proliferating oval or polygonal spinosum cells with vesicular and hyperchromatic nuclei extending from epidermis to dermis. It was noted that the spinosum cells in the middle of the tumor islets in these proliferation and dermis were separated from each other (dyshesion) and lysis (acantholysis) occurred in these areas. Atypia, mitosis and intercellular bridges were prominent in tumor cells. In some sections, it was noted that some of the tumor cell proliferation were seen as spindle-like cells with hyperchromatic nuclei located parallel to each other and these cells seemed to be flowing. Squamous cell carcinomas are seen all over the skin, but are more common in non-pigmented areas and in mucocutaneous junction in cattle and horses. Ocular squamous cell carcinoma is the most common neoplasm of the eye and economically important in cattle. The tumor is identified histologically by spinosum cell proliferation and the formation of keratin pearls. In this case, both spindle cell and acantholytic variants, the rare forms of squamous cell carcinoma, were detected in the same tumor the eyelid of a cow and presented for the purpose of contributing to the literature.

Keywords: *Squamous cell carcinoma, Acantholytic, Spindle cell, Ocular, Cow*

SIMMENTAL IRKI BIR İNEKTE OKÜLER YASSI HÜCRELI KARSINOMUN AKANTOLITIK VE SPINDLE HÜCRELI VARYANTLARI

ÖZET

Bu sunumda 4 yaşlı dişi bir Simental inekte sağ göz kapağından alınan kitlede spindle cell and akantolitik oküler skuamöz cell carcinoma tanımlanmıştır. Sağ tarafta alt göz kapağında kalın bir bant şeklinde 4 ay içerisinde hızla büyüyerek görme problemine yol açan kitle total ekstirpe edilerek patolojiye getirilmiştir. Makroskobik incelemede kitlenin 7x2,5x1,5 cm ebatlarında sert kıvamlı, kesit yüzünün kırmızımsı renkte olduğu görüldü. Mikroskobik incelemede epidermisten dermise doğru uzanan, oval yada poligonal şekilli sitoplazmaları belirgin, veziküler ve hiperkromatik çekirdekli spinozum hücrelerinin oluşturduğu proliferasyonlar dikkati çekti. Bu proliferasyonların ve dermisteki tümör adacıklarının ortalarında spinozum hücrelerinde ayrılma ve erimeler dikkati çekti. Tümör hücrelerinde atipi, mitoz ve interselüler köprüler belirgindi. Bazı kesitlerde tümör hücre prolifersyonlarının bir kısmının iğ şeklinde birbirine paralel yerleşimli hiperkromatik çekirdekli hücreler şeklinde görüldüğü ve bu hücrelerin akıntı görünümünde olduğu dikkati çekti. Yassı hücreli karsinomlar derinin her yerinde görülmekle birlikte daha çok pigmentsiz bölgeleri, sığır ve atlarda mukokutanöz birleşim yerlerinde sık görülürler. Tümör histolojik olarak spinozum hücre proliferasyonu ve keratin incileri oluşumuyla tanımlanması yapılır. Bu vakada ise tümörün az rastlanan spindle hücreli ve akontolitik formları aynı anda tespit edilmiş ve literatüre katkı amacıyla sunulmuştur.

Anahtar Kelimeler: *Yassı hücreli kanser, Akantolitik, Spindle hücre, Göz, Sığır*

INTRODUCTION

Squamous cell carcinoma (SCC) is a malignant neoplasm of epidermal cells in which the cells show differentiation to keratinocytes. It is one of the most common malignant skin tumors of all domestic animals, including chickens. There are several factors that are associated with the development of SCC, including prolonged exposure to ultraviolet light, lack of pigment within the epidermis at the sites of tumor development, and lack of hair or a very sparse hair coat at the affected sites. Therefore, geographic location and climate (ultraviolet light exposure) and anatomic location (conjunctiva, vulva and perineum) will greatly influence the incidence. Recent studies have linked papillomavirus with SCC in several species (Goldschmidt and

Goldschmidt 2017). When exposed to solar radiation and higher altitude, cattle breeds at increased risk are those that lack circumocular or mucocutaneous pigmentation, including the Hereford and Simmental. In horses and cattle, SCC occurs primarily at mucocutaneous junctions, particularly the eyelids and conjunctiva, vulva, and perineum. SCC of the eyelid often is associated with a purulent conjunctivitis, while epistaxis, sneezing, ulceration, or swelling are the clinical signs associated with neoplasms arising from the planum nasale. In well-differentiated neoplasms there is the formation of distinct keratin "pearls" (Dubielzig 2017, Goldschmidt and Goldschmidt 2017).

Ocular squamous cell carcinoma (OSCC) is easily the most common and economically important neoplasm of the eye in cattle. SCC is reported throughout the world. In the United States the tumor is more common in the southwest and areas with high sunlight exposure. SCC increases in incidence in older animals. Although all breeds are affected, Hereford cattle are the most frequently with an incidence estimated at 0.08%. The tumor most commonly begins on the lateral bulbar conjunctiva near the cornea. The lower lid and nictitans are also common but the medial canthus is less common (Ceylan et al. 2012, Dubielzig 2017, Gharagozlou et al. 2007, Goldschmidt and Goldschmidt 2017, Yakan et al. 2017).

Several uncummon variants of SCC have been described. Spindle cell SCCs consist of a proliferation of elongated cells arranged within whorls or bundles. The spindle cell variant is often difficult to differentiate from the surrounding stromal cells. However, the neoplastic cells stain positive with antikeratin antibodies on immunohistochemical evaluation. Other histological subtypes that have been described in domestic animals include adenosquamous and adenoid (also known as acantholytic) *SCCs*. Acantholytic SCCs are characterized by marked dyshesion of the neoplastic cells, which results in a pseudoglandular pattern. Both subtypes are best considered variants of conventional SCCs and are comprised predominantly of infiltrative trabeculae of anaplastic keratinizing epithelial cells (Dubielzig 2017, Goldschmidt and Goldschmidt 2017, Gu et al. 2012, Kiani et al. 2010, Rinker et al. 2001).

CASE HISTORY

In this presentation, acantholytic and spindle cell variants of ocular squamous cell carcinoma (OSCC) were identified in a mass taken from the right eyelid of a 4-year-old Simmental cow. The mass, which rapidly grew as a thick band in the right lower eyelid within 4 months, caused vision problems and was totally extirpated and brought to pathology laboratory. On macroscopic examination, the mass was 7x2,5x1,5 cm in size and had a hard consistency and a reddish colored cross-section. Microscopic examination revealed proliferating oval or polygonal spinosum cells with vesicular and hyperchromatic nuclei extending from epidermis to dermis (Fig 1-A). Atypia, mitosis and intercellular bridges were prominent in tumor cells (Fig 1-B). It was noted that the spinosum cells in the middle of the tumor islets in these proliferation and dermis were separated from each other (dyshesion) and lysis (acantholysis) occurred in these areas (Fig 1-C). In some sections, it was noted that some of the tumor cell proliferation were seen as spindle-like cells with hyperchromatic nuclei located parallel to each other and these cells seemed to be flowing (Fig 1-D).

CONCLUSION

Squamous cell carcinomas are seen all over the skin, but are more common in non-pigmented areas and in mucocutaneous junction in cattle and horses (Goldschmidt and Goldschmidt 2017). Ocular squamous cell carcinoma is the most common neoplasm of the eye and economically important in cattle The tumor is identified histologically by spinosum cell proliferation and the formation of keratin pearls (Dubielzig 2017, Gharagozlou et al. 2007). In this case, both spindle cell and acantholytic variants, the rare forms of squamous cell carcinoma, were detected in the same tumor the eyelid of a cow and presented for the purpose of contributing to the literature.

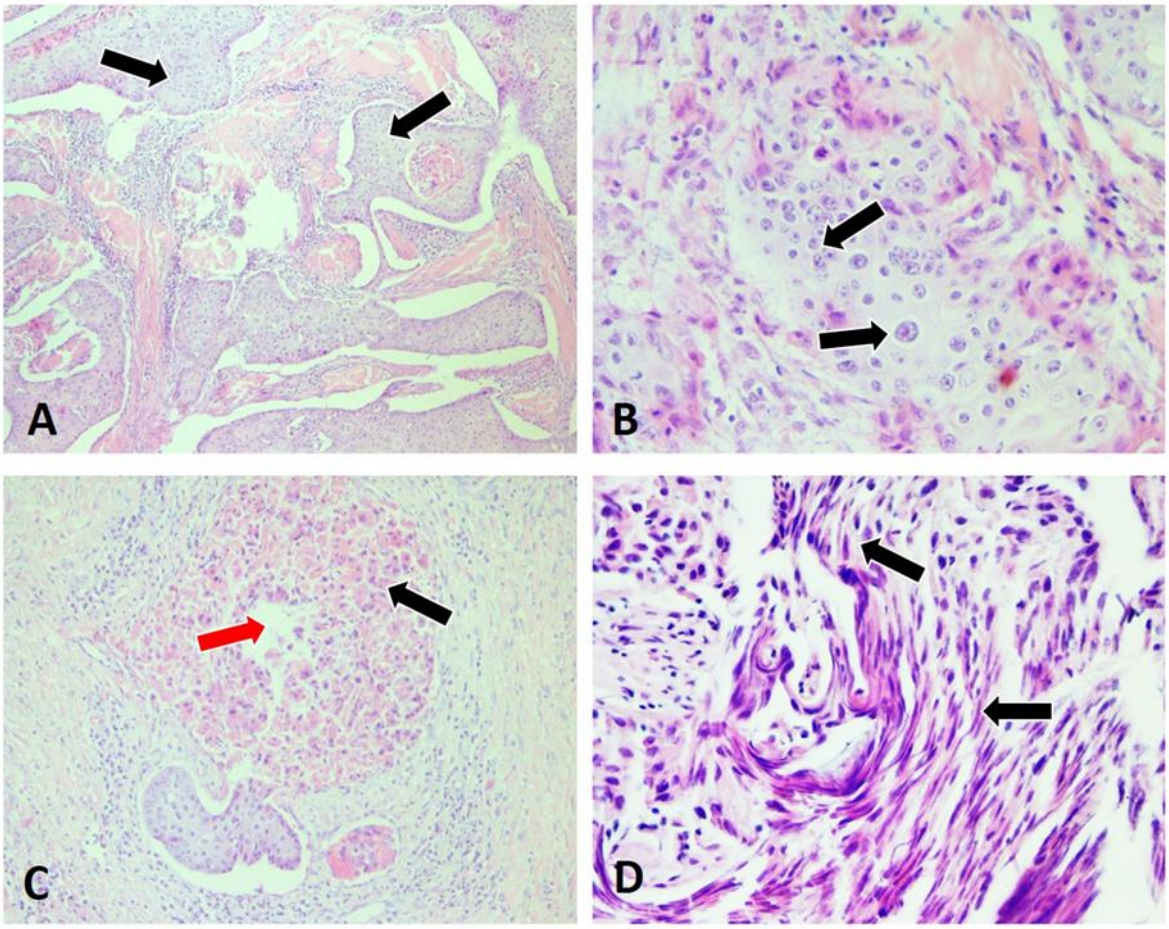

Figure 1. A. Proliferating spinosum cells extending from epidermis to dermis (arrows), B. Vesicular and hyperchromatic nuclei and atypical features (arrows), mitosis and intercellular bridges in tumor cells. C. Spinosum cells separated from each other (dyshesion) (black arrow), and lysis (acantholysis) (red arrow) in the middle of the tumor islets, D. Spindle-like cells with hyperchromatic nuclei (arrows) located parallel to each other and these cells seemed to be flowing. H&E

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AMPELOGRAPHIC CHARACTERISTICS OF KARAZDAĞI AND ÇAVUŞ GRAPE VARIETIES

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ABSTRACT

My country, which is regarded as the homeland of cultivation and viticulture, has a very wide variety and type of richness and thus a great potential for hanging genes due to its very favorable ecological conditions. This research was carried out in Manisa Viticulture Research Institute on two varieties found in Aegean Region suspended genetic resources parcels. Karazdağı and Çavuş grape varieties were examined in the study. The ampelographic characteristics of the cultivars studied were determined according to the Descriptors for Grape norms prepared by IBPGR (International Plant Genetic Resources Center). In the study conducted, it was determined that all of the varieties belonged to Vitis vinifera L. strain. In addition, it was determined that all the varieties examined had a native flower structure and seeds. It was determined that the varieties had different cluster size, cluster length and bunch weight in terms of grain weight, grain shape and grain size.

INTRODUCTION

In country is in terms of viticulture in the most favorable climatic zone of the world and at the intersection of the gene centers of the hill. At the same time, our country is in the geography of the first cultures of vine (Oraman, 1970; Mullins *et al.,* 1992). For this reason, viticulture has a long history of 5-6 thousand years in our country, Anatolian people have an important place in the social and economic life. Due to the civilization changes in Anatolia throughout history, different ecological conditions as well as different taste and consumption habits have increased the richness of varieties of grapes over time (Boz ve Çelik, 1998; Çelik, 1998; Ağaoğlu, 1999). On the other hand, the heterozygous hereditary structure and mutations of lead vine to the spreading of a large grapevine gene potential in our country during this long history period (Dokuzoğuz, 1964; Fidan, 1985; Mullins *et al.,* 1992; Eriş, 1995; Ağaoğlu, 1999; Diri and Ağaoğlu, 1999).

MATERIAL

This research was carried out in the period of 2015-2016 from the time of the eyes to the harvesting period under the vineyards of the Manisa Viticulture Research Institute. The specimens of the varieties studied were taken from healthy vines which grow on yield and on their own roots. In general, the characteristics of terrestrial Mediterranean climate are dominant. The research was carried out on two grape varieties grown in the region and named by the people of the region as Karazdağı and Çavuş grapes.

METHOD

The International Board for Plant Genetic Resources (IBPGR), the OIV (Offices International de la Vigne et du Vin) and the UPOV (International Union for the Protection of New Varieties of Plants) have been established jointly to provide international methodology for determining the ampelographic characteristics of grape varieties. In 1983, descriptive norms, which consist of two complementary descriptors, were published under the title "Descriptors for Grape" (Anonymous, 1983). In this study, the ampelographic characteristics of the grape varieties studied were determined based on the criterions of the "Identification and Preliminary Evaluation" data which constitute the first step of the above mentioned method.

RESULTS:				
Characteristics	**OIV Code**	**Descriptions**	**Karazdağı**	**Çavuş**
Young shoot	001	Openness of tip	Wide open	Very open
	003	Anthocyanin coloration of hairs of tip	Medium	None or very sparse
	004	Density of prostrate hairs on tip	Dense	Very Dense
	005	Erect hairs on tip	None or very sparse	Dense
Shoot	006	Attitude (before tying)	Semi erect	Semi erect
	007	Color of dorsal side of internodes	Green and red	Green and red
	008	Color of ventral side of internodes	Green	Green and red
	009	Color of dorsal side of nodes	Green and red	Green and red
	010	Color of ventral side of nodes	Green	Green and red
	012	Erect hairs on internodes	None or very sparse	Dense
	017	Length of tendrils	Short	Long
Young leaf	051	Color of upper side of blade	Green with anthocyannin spots	Light copper - red
	053	Prostrate hairs between main veins on lower side of blade	None or very sparse	Very Dense
	056	Density of erect hairs on main veins on lower side of blade	None or very sparse	Dense
Mature leaf	065	Size of blade	Small	Very large
	067	Shape of blade	Pentagonal	Pentagonal
	068	Shape of blade	Five	Seven
	070	Proportion of main veins on upper side of blade with anthocyanin coloration	Low	Absent or very low
	076	Shape of teeth	Both sides convex	Both sides convex
	077	Length of teeth	0,59 Medium	0,59 Medium
	078	Ratio length/width of teeth	0,80	0,61
	079	Arrangement of lobes of petiole sinus	Half open	Closed
	082	Arrangement of lobes of upper lateral sinuses	Slightly overlapped	Slightly overlapped
	084	Prostrate hairs between main veins on lower side of blade	Dense	Dense
	087	Erect hairs on main veins on lower side of blade	None or very sparse	None or very sparse
	605	Depth of upper lateral sinuses	49,7mm Deep	46,1 mm Deep
Flower	151	Sexual organs	Fully developed stamens and fully developed gynoecium	Fully developed stamens and fully developed gynoecium
Bunch	202	Size	15,8 cm Medium	18,0 cm Medium
	204	Density	Medium	Medium
	206	Length of peduncle	1,7 cm Very short	4,3 cm Very short
Berry	220	Size	19,80 Long	23,61 Long
	223	Shape	Globose	Ovoid
	225	Color of skin	Dark red-violet	Yellow-green
	242	Seed length	5,39 mm Short	6,35 mm Medium
	243	Seed weight	24 mg Low	25 mg Low
	503	Single berry weight	3,78 g Medium	5,70 g Medium

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MALIGNANT GIANT CELL TUMOR OF SOFT TISSUE IN A FEMALE ORANGE TABBY CAT

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ABSTRACT

In this report, in an orange tabby cat, soft tissue tumor with dense giant cells was identified in the mass taken from the dorsal region.

A rapidly growing mass within 2 months was detected in the dorsal region of an 8-years-old female tabby cat and was brought to the pathology laboratory after total extirpation. The mass was 5x4x2 cm in size with a hard consistency and the cross-section was yellowish. Tissue samples were fixed in 10% formaldehyde, followed by routine tissue procedure and stained with Hemotoxylin & Eosin and examined under light microscope.

Histopathologically, dense pleomorphic histiocytes and fibroblasts, occasional inflammatory cells, and multinucleated giant cells with some oval-round and some spindle-shaped hyperchromatic nuclei were observed. While there were no bone and cartilage formation in the tumor areas, occasional hyalinizing areas were detected. Necroses were found in some areas.

The cause of this tumor, also known as malignant fibrous histiocytoma (giant cell type) in cats has not been fully revealed, howewer it has been reported that it may develop due to vaccine applications. It is also reported to be confused with giant cell tumors of the bone and tendon sheaths. In this case, the tumor was defined as a giant cell tumor of soft tissue because of the development in the dorsal region where the vaccines have been performed frequently, and the absence of cartilage and bone structures within the tumor, and presented for contribution to literature.

Keywords: *Malignant Giant cell tumor, Soft tissue, Tabby cat, Pathology*

DİŞİ BİR SARMAN TEKİRDE YUMUŞAK DOKUNUN DEV HÜCRELİ TÜMÖRÜ

ÖZET

Bu sunumda, turuncu renkli (sarman) bir tekir kedide, sırt bölgesinden alınan kitlede yoğun dev hücrelerinin görüldüğü yumuşak doku tümörü tanımlandı.

8 yaşlı, dişi bir tekir kedinin sırt bölgesinde 2 ay içerisinde hızla büyüyen bir kitle tespit edilmiş ve total ekstirpe edilerek patoloji laboratuvarına getirilmiştir. Getirilen kitle 5x4x2 cm ebatlarında sert kıvamlı ve kesit yüzü sarımtırak renkliydi. Alınan doku örnekleri %10 luk formolde tespit edildikten sonra rutin doku takibi yapıldı ve Hemotoksilen Eozin (HE) ile boyanarak, ışık mikroskobunda incelendi.

Histopatolojik incelemede yoğun pleomorfik fibroblastlar ve histiyositler, tek tük yangı hücreleri, bazılarının çekirdekleri oval-yuvarlak bazılarının ise mekik şekilli olan çok çekirdekli hiperkromatik dev hücreleri görüldü. Tümöral alanlarda kemik ve kıkırdak oluşumuna rastlanmazken, yer yer hiyalize alanlar tespit edildi. Bazı alanlarda nekrozlara rastlandı.

Kedilerde malignant fibröz histiositom (dev hücreli tip) olarak da bilinen bu tümörün nedeni tam olarak ortaya konulamamış, ancak aşı uygulamalarına bağlı gelişebileceği bildirilmiştir. Ayrıca kemiğin ve tendo kılıflarının dev hücreli tümörleriyle karışabildiği belirtilmektedir. Bu vakada da tümörün aşıların sık yapıldığı sırt bölgesinde gelişmesi, tümör içerisinde kıkırdak ve kemik yapılarının bulunmaması neticesinde yumuşak dokunun dev hücreli tümörü olarak tanımlanmış ve literatüre katkı amacıyla sunulmuştur.

Anahtar kelimeler: *Malignant Giant cell tumor, yumuşak doku, Sarman kedi, Patoloji*

INTRODUCTION

Giant cell tumors may occur in bone, joints or soft tissue (Fletcher ve ark., 2002). In the past, it has been accepted that the malignant fibrous histiostoma has the same meaning as the giant cell variant (Enzinger ve Weiss, 1995). Recently, tumors with similar histological features; A population of mononuclear cells mixed with osteoclast-like giant cells but without significant cytological atypia and mitotic activity was defined as a

soft tissue giant cell tumor with low malignant potential (Folpe ve ark., 1999). Giant cell tumor of soft tissue is a malignant tumor resembling a giant cell tumor of bone, often consisting of a mixture of multinucleated giant cells, mononuclear histiocytes and fibroblasts, and often growing multinodularly (Christopher, 1926; Fine ve Stout, 1956; Enzinger ve ark., 1969). Two morphologically similar giant cell tumors that occur in bone and soft tissue are giant cell bone tumor (GCTB) and giant cell tumor of soft cells (GCTST) (Fletcher ve ark., 2002). GCTST is a rare soft tissue tumor that histologically closely resembles GCTB (Fletcher ve ark., 2002). It occurs as a superficial or deep soft tissue lesion in the thigh, trunk or upper extremity. GCTST, which occurs in deep soft tissue, is eroded in the bone as in other giant cell rich soft tissue lesions such as giant cell tumor of tendon sheath and causes significant osteolysis (Fujikawa ve ark., 1996; Massey ve Flanagan, 1999).

CASE HISTORY

A rapidly growing mass within 2 months was detected in the dorsal region of an 8-years-old female tabby cat and was brought to the pathology laboratory after total extirpation. The mass was 5x4x2 cm in size with a hard consistency and the cross-section was yellowish. Tissue samples were fixed in 10% formaldehyde, followed by routine tissue procedure and stained with Hemotoxylin & Eosin and examined under light microscope. Histopathologically, dense pleomorphic histiocytes and fibroblasts, occasional inflammatory cells, and multinucleated giant cells (Fig 1 C-D) with some oval-round and some spindle-shaped hyperchromatic nuclei were observed. While there were no bone and cartilage formation in the tumor areas, occasional hyalinizing areas (Fig 1 A-B) were detected. Necroses were found in some areas.

CONCLUSION

The cause of this tumor, also known as malignant fibrous histiocytoma (giant cell type) in cats has not been fully revealed, howewer it has been reported that it may develop due to vaccine applications. It is also reported to be confused with giant cell tumors of the bone and tendon sheaths. In this case, the tumor was defined as a giant cell tumor of soft tissue because of the development in the dorsal region where the vaccines have been performed frequently, and the absence of cartilage and bone structures within the tumor, and presented for contribution to literature.

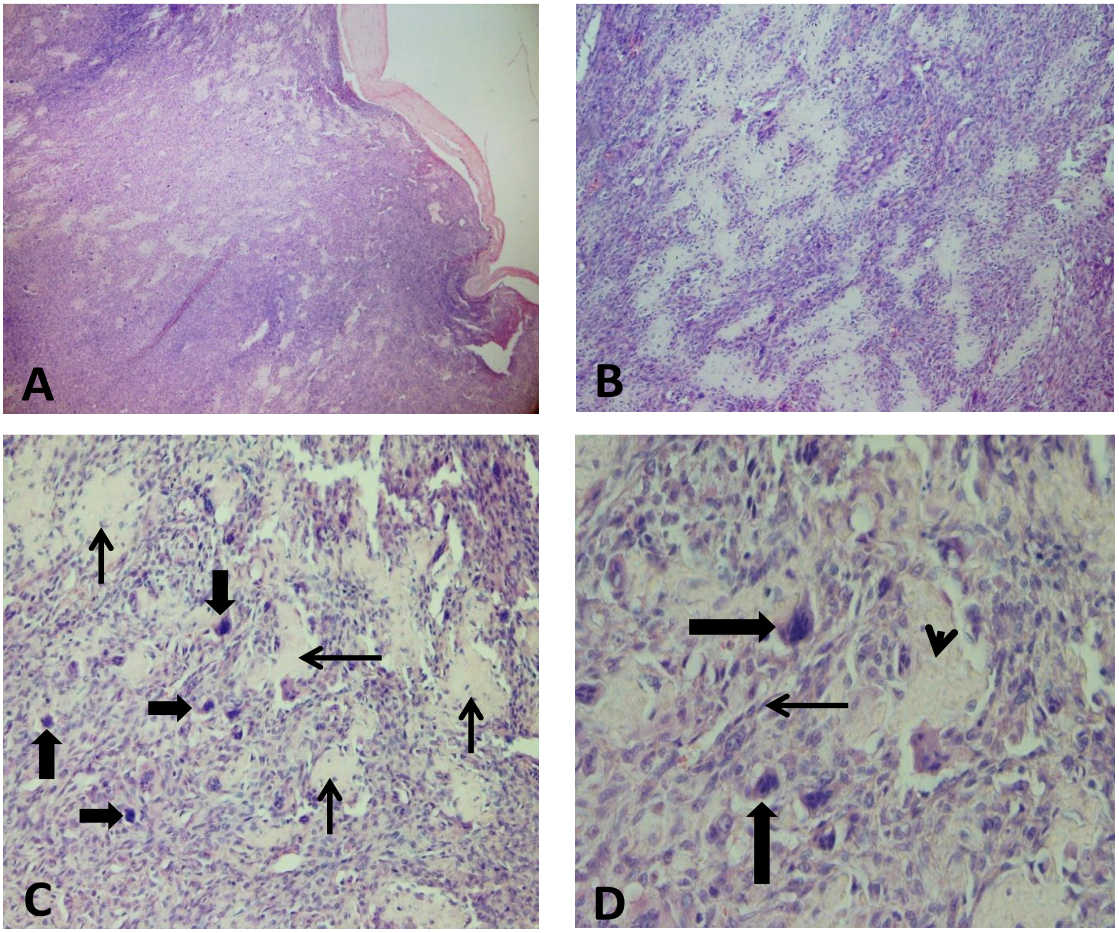

Figure 1. A. General hyalinizing area of tumor tissue, H&E, x 40. **B.** Giant cells and general hyalinizing field, H&E, x100. **C.** Hyperchromatic giant cells (arrows) and hyalinizing field (thin arrows), H&E, x200. **D.** Dense pleomorphic histiocytes and fibroblasts(thin arrow), hyperchromatic giant cells and hyalinized field (arrowhead), H&E, x400.

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A CASE OF PARASPLENIC HEMANGIOSARCOMA IN A GERMAN SHEPHERD DOG

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ABSTRACT

In this report, a case of parasplenic hemangiosarcoma in a 10-year-old male German shepherd dog was described pathologically. It was informed that experimental laparotomy was performed on the dog brought to the clinics of Veterinary Faculty with the complaint of loss of appetite and weight loss for a while, and the spleen was taken with the accompanying mass and then sent to pathology laboratory.

In macroscopic examination, the mass was 6x3x3 cm in size, soft consistency and adjacent to the serosa of the spleen. Cross section of the mass revealed a dark red and bloody surface, and intense bleeding. Tissue samples taken from the tumor were fixed in 10% formaldehyde solution, followed by routine tissue procedure and stained with Hemotoxylin-Eosin and examined under light microscope.

Histopathological examination showed that round or oval endothelial cells with hyperchromatic and pleomorphic nuclei occasionally form vascular lumen. Numerous mitotic figures, large necrosis and bleeding areas, and inflammatory cells were observed in the tumoral areas. There was no tumor invasion within the spleen parenchyma.

In dogs, visceral hemangiosarcoma has been reported to originate from differentiated vascular endothelial cells or bone marrow stem cells with hemangioblastic potential. Although hemangiosarcoma is the most common splenic neoplasm of dogs, no tumor in the splenic parenchyma was observed in this case, and it was intended to present for contributing the oncology literature.

Keywords: *parasplenic hemangiosarcoma, dog, oncology*

ALMAN KURDU BİR KÖPEKTE PARASPLENİK HEMANGİOSARKOM OLGUSU

ÖZET

Bu sunumda 10 yaşında erkek Alman kurdu bir köpekte parasplenik hemangiosarkom olgusu patolojik olarak tanımlandı.

Bir süredir iştahsızlık, kilo kaybı şikayeti ile kliniklere getirilen köpeğe deneysel laparotomi yapılmış ve dalak beraberindeki kitle ile alınarak patoloji laboratuvarına gönderilmiştir. Kitlenin makroskobik incelemesinde 6x3x3 cm büyüklüğünde, yumuşak kıvamda ve dalağın kapsulasına bitişik görünümde olduğu görüldü. Kesit yüzü koyu kırmızı renkte ve yüzeyden kan sızıyordu. Alınan doku örnekleri %10 luk formolde tespit edildikten sonra rutin doku takibi yapıldı ve Hemotoksilen Eozin (HE) ile boyanarak, ışık mikroskobunda incelendi.

Histopatolojik incelemede yuvarlak yada oval yapıda, çekirdekleri hiperkromatik ve pleomorfik görünümde endotel hücrelerinin yer yer damar lümeni oluşturduğu dikkati çekti. Tümöral alanlarda çok sayıda mitotik figür, geniş nekroz ve kanama alanları ile yer yer yangı hücreleri görüldü. Dalak içerisinde tümöral infiltrasyon yoktu.

Köpeklerde viseral hemangiosarkomun, farklılaşmış vasküler endotel hücreleri veya hemangioblastik potansiyeli olan kemik iliği kök hücrelerinde köken aldığı bildirilmektedir. Hemangiosarkom köpeklerin en sık görülen splenik neoplazması olmasına karşın bu vakada dalak parankimi içerisinde tümörün bulunmaması sebebiyle ve literatüre katkı sağlaması amacıyla sunulmuştur.

INTRODUCTION

Hemangiosarcoma (HSA) has historically been classified as a vascular tumor and specifically as a tumor originating from malignant endothelial cells (Fosmire ve ark., 2004). The etiological and cellular origins of HSA are not fully understood (Dobson, 2013; Tonomura ve ark., 2015). In general, tumor-associated blood vessels are crimped and malformed, and blood cells tend to aggregate and coagulate (Ruoslahti, 2002).

Splenic hemangiosarcoma, a highly metastatic neoplasm originating from vascular endothelium, is one of the most common and fastest fatal cancers in dogs (Prymak ve ark., 1988; Johnson ve ark., 1989; Kim ve ark., 2007; Tonomura ve ark., 2015). The most common site of HSA is spleen (28 to 50%), right atrium /

auricle (3 to 50%) and skin or subcutaneous tissue (13%), respectively (Aronsohn, 1985; Ogilvie ve Moore, 1995; Withrow, 2007; Bonagura ve Twedt, 2008). The spleen is the most common primary site, accounting for 35 to 62% of all primary hemangiosarcomas (Aronsohn, 1985; Srebernik ve Appleby, 1991). The overall prevalence has been reported to be 0.3 to 2.0% of all tumors in dogs; German shepherd dog, Golden retriever and Labrador retriever are frequently seen (Brown ve ark., 1985; Srebernik ve Appleby, 1991; Bonagura ve Twedt, 2008). The tumor is often ruptured, which in turn can cause acute hemoabdomens and result in clinical symptoms (Prymak ve ark., 1988; Johnson ve ark., 1989; Wood ve ark., 1998; Kim ve ark., 2007). Metastasis and local infiltration occur early in disease progression. Liver, omentum and lungs with splenic HSA are the most common sites of metastasis that may occur following hematogenous spread or tumor rupture (Brown ve ark., 1985; Ogilvie ve Moore, 1995; Bonagura ve Twedt, 2008)(Withrow, 2007).

CASE HISTORY

It was informed that experimental laparotomy was performed on the dog brought to the clinics of Veterinary Faculty with the complaint of loss of appetite and weight loss for a while, and the spleen was taken with the accompanying mass and then sent to pathology laboratory.

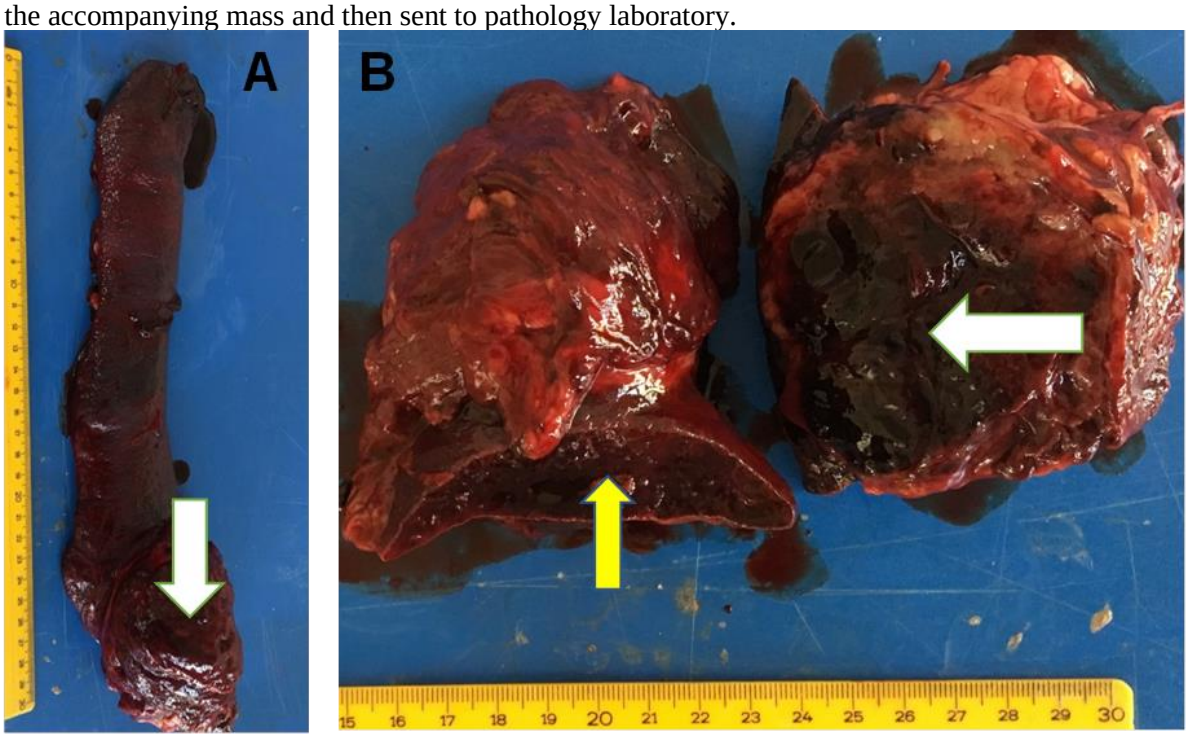

Figure 1. A. Parasplenic tumoral tissue. **B.** Hemorrhagic appearance (white arrow) on cut surface of the tumoral masses (yellow arrow).

In macroscopic examination, the mass was 6x3x3 cm in size, soft consistency and adjacent to the serosa of the spleen (Fig 1). Cross section of the mass revealed a dark red and bloody surface, and intense bleeding (Fig 2). Tissue samples taken from the tumor were fixed in 10% formaldehyde solution, followed by routine tissue procedure and stained with Hemotoxylin-Eosin and examined under light microscope.

Histopathological examination showed that round or oval endothelial cells with hyperchromatic and pleomorphic nuclei occasionally form vascular lumen (Fig 3A-B). Numerous mitotic figures (Fig 3A-F), large necrosis (Fig 3E) and bleeding areas (Fig 3C-D), and inflammatory cells were observed in the tumoral areas. There was no tumor invasion within the spleen parenchyma.

CONCLUSION

In dogs, visceral hemangiosarcoma has been reported to originate from differentiated vascular endothelial cells or bone marrow stem cells with hemangioblastic potential. Although hemangiosarcoma is the most common splenic neoplasm of dogs, no tumor in the splenic parenchyma was observed in this case, and it was intended to present for contributing the oncology literature.

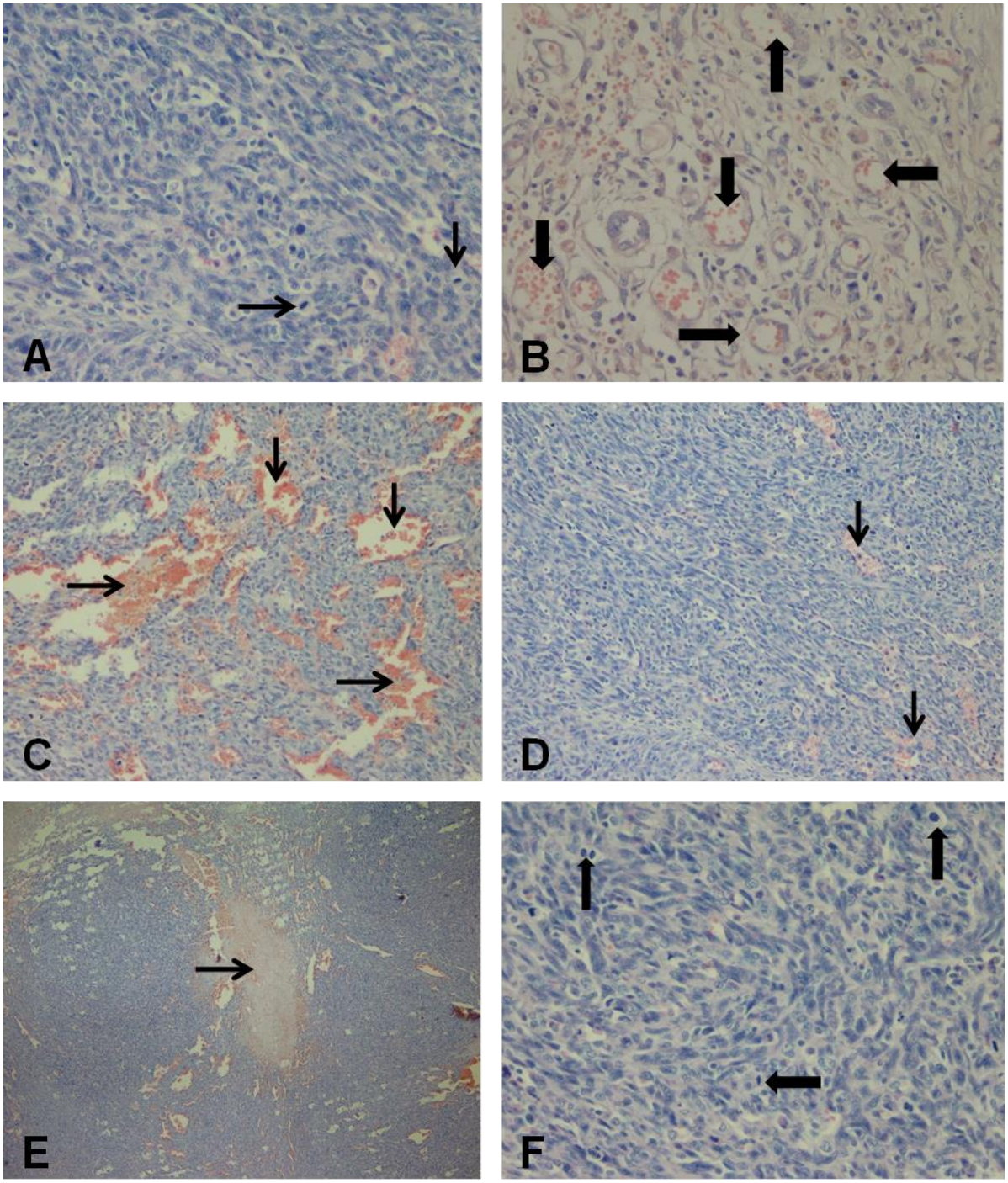

Figure 3. A. Tumor cells showed significant atypia and mitoses (arrows), H&E, x400. **B.** Round or oval endothelial cells with hyperchromatic and pleomorphic nuclei occasionally form vascular lumen (arrows), H&E x200. **C.** Hemorrhage (arrow) in tumor tissue H&E, x200. **D.** Hemorrhage and mitosis in tumoral endothelial cells, H&E x200. **E.** Necrosis in the tumoral area (arrow), H&E, x200. **F.** Numerous mitotic figures in the tumoral area (arrows), H&E, x200.

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A NATURAL APPROACH TO CONTROL SOILBORNE DISEASES: BIOFUMIGATION

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ABSTRACT

Soil-borne plant pathogens cause significant losses in yield and quality of important agricultural crop. Causing agents of soilborne diseases are fungi (Sclerotium rolfsii, Rhizoctonia solani, Fusarium spp, Pythium, Phytophthora etc.), bacteria (Erwinia, Raltsonia, Rhizomonas, Agrobacterium, Streptomyces etc.) and nematodes (Meloidogyne, Heterodera, Longidorus, Paratrichodorus etc.). They can be able to survive for long years in different forms e.g. hyphae, microsclerotia, sclerotia, chlamydospores, oospores in plant debris and soil matrix. As a synthetic fumigant, methyl bromide has been widely used for soilborne disease control for long time. Since, Methyl Bromide was taken to list of ozone-depleting substance under the Montreal Protocol in 1992, the usage of methyl bromide was phased out. Afterwards, the control of these pathogens became more difficult and insufficient in some cases with the chemicals available on the market. One of the solution approaches to overcome the soilborne disease problems is 'biofumigation' which basically based on the process of growing, cruching and admixing plants belonging to Brassicaceae into the soil, leading to the release of isothiocyanate compounds (ITCs) through the hydrolysis of glucosinolate (GSL) in the plant tissues. Brown mustards, white mustards, radishes and rocket species are mostly used as biofumigant plants and the GSLs contents are varied based on plant species. Although, some soilborne plant diseases are suppressed through the use of biofumigant plants, the levels of control may vary depending on different target organisms and their life cycle stages. When the right biofumigant plant is used at the right time, biofumigation can be considered as a 'natural' alternative to control soilborne diseases.

Keywords: *biofumigation, nature friendly, combat, soilborne, disease,*

INTRODUCTION

One of the most important biotic factors limiting agricultural production is soil-borne diseases. Soil-borne plant diseases are defined as diseases caused by surviving pathogenic agents e.g. fungi, bacteria in soil matrix and plant residues in soil. The soil is a shelter of many microorganisms including phytopathogens. The control of such soil-borne diseases would be possible by chemicals, e.g., seed applications. Although, chemical protection with fungicides is highly efficient, they do not control for long in some cases besides their hazardous effects for environment and living organisms.

In 1987, the World Commission on Environment and Development (WCED) published a book entitled "Our Common Future" that emphasized everyone needs sustainable development. The basic principles of sustainability in agriculture are based on soil protection. Some of the factors that threaten the sustainability of land use in agricultural production are chemical fertilizers as well as synthetic pesticides applied for controlling of soil-borne diseases. Since the 1950s, chemicals, in particular, Methyl Bromide (MeBr) have been used effectively in the controlling of soil-borne diseases and pests. However, in 1992, the MeBr was identified as a risk for ozone layer and the phasing out of its use was decided by the Montreal Protocol. The fact chemicals have many side effects and the prohibition of the use of an effective chemical such as MeBr has led researchers to seek an alternative control method. Numerous studies have been conducted on fumigants obtained from non-synthetic biological products. The plants, especially those belonging to the Cabbage family have been the focus of the biofumigation studies (Motisi et al., 2013; Wang et al., 2014; Rios et al., 2012).

PREDOMINANT SOILBORNE PATHOGENS AND THEIR SURVIVAL IN THE SOIL

Soilborne diseases are caused by a group of fungi (*Sclerotium rolfsii, Rhizoctonia solani, Fusarium, Pythium, Phytophthora* etc), bacteria (*Erwinia, Raltsonia, Rhizomonas, Agrobacterium, Streptomyces* etc.) and nematodes (*Meloidogyne, Heterodera, Longidorus, Paratrichodorus* etc.). The pathogens cause diseases include root rots; stem, collar and head rots; wilts; seedling blights and damping off which are accounted for economical yield loss in crop plants.

Soilborne pathogens survive as soil inhabitants (survive in soil for relatively longer periods), soil invaders or soil transients (survive in the soil for relatively shorter periods). Soilborne pathogens also survive

as non-pathogenic and generally in the form of saprobes (organisms that live on decaying organic matter). Under certain congenial conditions these saprobes will turn into pathogenic form. The distribution of soilborne pathogens depends on production practices, cropping history, and a variety of other factors. Along a vertical axis, the inoculum of most root pathogens lies within the top 10 inches of the soil profile, the layers where host roots and tissues and other organic substrates are present.

Biofumigantion and Mechanism of Biofumigant Crops

Biofumigation has been described by some researchers as **fumigation of soil with toxic volatile substances released by decomposition of animal material or plants belonging to *Brassicaceae* family containing Glucosinolates (GSLs)** (Halberendt, 1996; Kirkegaard ve Sarwar, 1998)**.** The first study of biofumigation was performed by Angus et al. (1994). Brassicas produce glucosinolates, which can be converted to chemicals that exhibit biofumigant activity. The application of such plants as biofumigants not only controls soilborne diseases and pests, but also contributes greatly to the combat with weeds, to prevent soil erosion, and to led to increase the organic matter in the soil (Griffiths et al., 2011).

Brown mustards, white mustards, radishes and rocket species are most common used biofumigant plants. Their different content of GSLs amounts or profiles can be varied depending on cultivars, temperature, soil depth, or plant parts resulting in different ITCs being released (Table 1). For instance, 2 phenylethyl GSL is mainly produced in the roots of *B. napus* (Youssef, 2015). Brassicas are mainly used for biofumigation, but plants in the Moringaceae, Salvadoraceae and Tropaeolaceae families also have biofumigant properties.

Table 1. Some commonly used biofumigant crops and their respective GSLs and ITCs (Clarkson et al., 2015)

Common name	**GSLs**	**ITCs**
Brown mustard (*Brassica juncea)*	Sinigrin	2-propenyl-ITC (= allyl-ITC)
Black mustard *(Brassica nigra)*	Sinigrin	2-propenyl-ITC (= allyl-ITC)
White mustard (*Sinapsis alba)*	Sinalbin	4-hydroxybenzyl-ITC
Radish (*Raphanus sativus)*	Glucoraphenin	4-methylsulfinyl-3-butenyl-ITC
Rocket (*Eruca sativa)*	Glucoerucin	4-methylthiobutyl-ITC

Many cruciferous species produce significant levels of glucosinolates. When glucosinolates come in contact with water and a family of enzyme myrosinase, contained in plant cells, they are transformed in another group of compounds called “isothiocyanate” (Vig et al., 2009). ITCs have a wide range of biocidal characteristics and are acutely toxic to a variety of pests and pathogens (Chew, 1987). These compounds have shown promise against a number of soilborne plant parasites including *Meloidogyne* spp. (Lazzeri et al., 2009). A liquid formulation has been developed from *B. carinata* seed meal against *Meloidogyne incognita* (De Nicola et al., 2013). Other products based on pellets of dried-high GSL plants have also been developed and showed good activity *in vitro* against *Pythium* and *Rhizoctonia* (Lazzeri et al., 2004). Fresh Brassica tissues and Brassica pellets provided good control for soil-borne pathogens *Phytophthora nicotianae and Phytophthora cinnamoni* (Morales-Rodriguez et al., 2014; Morales-Rodriguez et al., 2015). Simple drying of biofumigant plants can also be effective at conserving GSLs/myrosinase as Michel (2014) reported that dried brown mustard plants inhibited the number of *Verticillium dahliae* microsclerotia in a greenhouse soil.

USE OF BIOFUMIGANT CROPS

Biofumigant plants can be used in various ways for disease control;

Intercropping and rotations with biofumigant crops

When the relevant literature is examined, it is seen the studies are generally focused on the rotation of crop plants with plants from Brassica family (Motisi et al., 2013; Wang et al., 2014; Rios et al., 2012). In the application of biofumgant crop rotation, the activity against plant pathogens rely on GSLs, ITCs or other compounds released from leaf washes or root exudates of harvested aboveground plant material. GSLs and ITCs can influence the composition of rhizosphere communities which may also suppress soilborne plant

diseases and some common beneficial microbial species such as Trichoderma show high tolerances to ITCs (Galetti et al., 2008; Gimsing and Kirkegaard, 2009, Smith and Kirkegaard, 2002).

Incorporation of biofumigants crops

This is the most common applicaiton of biofumigation in which a biofumigant plant grown specifically for intermixing to convert GSLs into ITCs in soil. To achieve high levels of ITC release, maceration of plant tissue is required followed by rapid incorporation into soil and addition of water if required to ensure complete hydrolysis (Matthiessen and Kirkegaard, 2006; Kirkegaard, 2009). As some ITCs are quite volatile, sealing/smearing the soil with a plastic mulch may be beneficial (Kirkegaard and Matthiessen, 2004).

Seed meals and other processed biofumigant crops

Defatted seed meal produced after the processing of brassica seeds for oil (e.g. in mustard crops) also offer a convenient source of high GSL material for soil amendment as the myrosinase required for hydrolysis to ITCs remains intact (Brown and Mazzola, 1997). Pellets of dried-high GSL Brassica plants have also been developed and showed good *in vitro* and *in vivo* activity against soil-borne pathogens *Pythium* and *Rhizoctonia Phytophthora nicotianae and Phytophthora cinnamoni* (Lazzeri et al., 2004; Morales-Rodriguez et al., 2014; Morales-Rodriguez and Vannini, 2015). These materials gave promise against a number of soilborne plant pathogens. The main advantages of nature-frienly approach are that these products can be used throughout of the year when bio-fumigant plant grown is restricted (e.g. in winter), more easily integrated in rotations and more favorable to production systems where there is only a short non-cropped.

MEASURES FOR AN ACCOMPLISHED BIOFUMIGATION

Biofumigant crop cultivation requires good management and attention to detail similar to other crops as those biofumigant crops may need fertilizer and irrigation. Clarkson et al. (2015) recommended a comprehensive plan should be taken into consideration to get maximum biofumigation action from biofumigant crops for suppression of the soilborne pathogens, respectively: i) Choosing the right biofumigant plant variety. There are several varieties available, each with specific requirements and benefits. ii) Optimising agronomical practices. Have the necessary equipment to manage the crop correctly iii) Planting at the best time within your rotation. Test soils to ensure appropriate nutrient management for the biofumigant crop as well as subsequent crops in your rotation. iv) Growing and incorporating high amounts of biofumigant biomass. v) Maximizing incorporation efficacy and ITC release. Cell disruption is key to efficient conversion of GSLs to ITCs and equipment for pulverising and crushing plant material is superior to chopping. Immediate incorporation is then required with addition of water to maximise GSL hydrolysis and sealing the soil or tarping will maximise ITC retention. vi) Allowing 1-2 weeks before planting following crops. ITCs and other products of GSL hydrolysis can be phytotoxic.

LIMITATIONS OF BIOFUMIGATION

Biofumigation gives promise for suppression of soilborne pathogens, however, its broad spectrum toxicity might harm non-target beneficial soil organisms such as biocontrol agents or pest egg parasites (Ramirez et al., 2009). Henderson et al. (2009) reported that biofumigation disrupted the biological control of *Meloidogyne chitwoodi* by the entomopathogenic nematodes *Steinernema feltiae* and *Steinernema riobrave*. Biofumigants are volatile, thus, it does not provide a long term control option for pests. Farmers might have to integrate the biofumigation with other crop protection practices.

CONCLUSION

Since the usage of MeBr was banned due to its harmful effect risk on ozone layer, Soilborne diseases became difficult to control. Seeking for less hazardous and effective commercial crop protection product in equivalent has been increased by supermarkets, farmers and other users. In addition, many of the traditional chemicals for soil-borne disease control have been banned or restricted. In this case, biofumigation seems to be the most natural and sustainable approach to control soil borne diseases. Despite its side effects on beneficial organisms, biofumigation has many advantages in compare with synthetics if only considering the comprehensive plan including right plant choice, appropriate timing for planting (for both biofumigant plants and crop plants), proper agronomical practices, and right application for getting maximum efficacy.

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PLANT GROWTH PROMOTION BY PHYTOHORMONE PRODUCING RHIZOBACTERIA

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ABSTRACT

Plant Growth Promoting Rhizobacteria (PGPR) is a group of microorganisms which colonize the plant rhizospheric area (soil surrounding the root zone) and boost the plant growth in the ways of both directly and indirectly including synthesis of plant hormones. Phytohormones for plant-growth promotion by PGPRs include bacterial synthesis of auxins, cytokinins, and gibberellins. Microbial synthesis of the phytohormone auxin has been known for a long time. The auxin group of phytohormones has been reported in many of microorganisms isolated from the rhizosphere of various crops. Auxins mainly active in plant roots, leading to an increase nutrient exchange in soil, thereby improving plant nutrition and growth capacity. Auxins synthesized by the plant and the microorganisms differ only in the biosynthetic pathway, depending on the plant and/or microorganism. Cytokinins can be produced by PGPRs are purine derivatives that promote and maintain plant cell division in cultures and are also involved in various processes such as shoot formation, primary root growth, and callus formation. High levels of cytokinins increase the resistance of plants to some pathogens and herbivores. Gibberellins production by PGPR promotes the growth and yield of crop plants, deconjugation of gibberellin-glucosyl conjugates exuded by the roots, or in the plant. However, the production of gibberellins by PGPRs is rare, only a few strains, belonging to Bacillus and Pseudomonas genera, produce gibberellins were reported. PGPRs producing plant hormones can also trigger defense mechanisms such as systemic acquired resistance (SAR) and induced systemic resistance (ISR) against pathogenic stress factors as well as elicit induced systemic tolerance (IST) to abiotic stress. The phytohormone producing rhizobacteria have considerable contribution to plant growth through different mechanisms including root system architecture modulation, increased shoot growth, trigger defense mechanism under stress conditions.

Keywords: *rhizobacteria, phytohormone, plant, promotion*

INTRODUCTION

In the part of the soil defined as rhizosphere, the density of microorganism population is reasonably high. The physicochemical activities in the soil are completely dependent on these microorganisms. Bacteria constitute the largest part of soil microorganisms. It has been shown that a group of bacteria living in the rhizosphere support the plant development in many ways with different mechanisms of action. These beneficial bacteria were first named as Plant Growth Promoting Rhizobacteria by Kloepper et al. (1980) and they are also known as "Probiotic Rhizobacteria" because of their many benefits to the plant (Ram et al., 2003). Altın and Bora (2005), in their articles about the general characteristics and effects of root bacteria stimulating plant growth, mentioned the direct and indirect effects of PGPRs. The researchers described PGPRs, which can promote plant growth and also act as biological control agents in suppressing the disease agent, as two-sided medallions. The first commercial preparation of rhizobacteria as a biological control agent was produced in the United States in 1985 from *Bacillus subtilis* A-13 strain (Broadbent et al., 1977). The other mechanism of PGPR in suppressing stress factor in plants is ISR (Induced Systemic Resistance). ISR, which is based on root colonization, has been successful when coating a high number of bacteria to seed or when applied to the soil by planting (Kloepper, 1996). PGPRs promote plant growth through mechanisms of action such as nitrogen fixing, solubilisation of phosphorus and degradation of heavy metals, phytohormone production, increasing water and mineral uptake, supporting root growth, increasing enzyme activity in plants. Investigations on the wide use of rhizobacteria have been carried out by many researchers. These studies include detoxification of heavy metals in rhizobacteria (Ma et al., 2011; Wani and Khan, 2010), breakdown of pesticides (Ahemad and Khan, 2012), tolerance to salinity (Mayak et al., 2004), biological control of plant diseases and pests (Hynes et al., 2008; Tozlu et al., 2012; Ünlü and Aysan, 2016), increasing the use of nutrients and minerals by plants (Çakmakçı, 2009), and promoting plant growth by production phytohormone and enzymes (Dejordjevic et al., 1987; Ferreira et al., 1987). Kloepper (1994) characterized PGPRs with some distinctive features. These are; i. being able to colonize the root surface and plant rhizosphere, ii. being able to maintain population, proliferate and compete with other microorganisms to protect the plant against stress factors such as pathogen attack iii.

being able to promote plant growth. Somers et al. (2004) divided PGPRs into 4 groups based on their action characteristics including biofertilizer group (making the nutrients ready for plant use), plant stimulator group (promoting plant growth), rhizoremediator group (degrading organic pollutants) and the biopesticide group (bio-controlling of diseases and pests by producing some compounds such as antibiotics and hydrogen cyanide). Ram et al. (2013) were divided PGPRs into two groups on the basis of their direct and indirect effect mechanisms on plant. One of the direct mechanisms of PGPRs is phytohormone production. Some bacterial strains directly regulate plant physiology by mimicking synthesis of plant hormones such as auxins, cytokinins and gibberellins (Jha and Saraf, 2012).

Hormones such as indole-3-acetic acid (IAA), cytokinin and giberellin are of great importance in plant growth. IAA, in other words, auxins are known for their effects such as cell division, root growth, expansion of root surface area, assisting the plant with the introduction of nutrients. Similarly, cytokinin plays a role in physiological and growth functions such as cell division, seed germination, root growth, chlorophyll accumulation, leaf growth and delay of aging. Gibberellins are known to be effective in functions such as elongation of the stem, germination, dormancy, initiation of enzyme function, and maturating of leaves and fruits. Fallik et al. (1989) reported as the major hormone produced by PGPRs is indole-3-acetic acid followed by indole lactic acid (Tien, 1979) , indole-3-butyric acid (Fallik et al., 1989), indole-3ethanol, indole-3-methanol (Crozier et al., 1988) unidentified indole compounds (Bashan and Levanony, 1990), some gibberellins (Bottini et al., 1989) and some cytokinins (Horemans, 1986).

Auxines

Auxins are derived from tryptophan metabolism and their effects depend on concentration, the affected organ and the physiological state of the plant. Auxins synthesized by plants and microorganisms differ only in the biosynthetic path depending on the plant and / or microorganism. IAA is the most known of auxins and can be synthesized by 80% of microorganisms isolated from soil (Patten and Glick, 2002)]. IAA is involved in many growth-related functions in plants acting as a signal molecule in gene expression in some microorganisms. Auxins produced by PGPR activate biosynthetic signaling pathways (Roy et al., 2010). Since the level of auxins present in the plant environment critically affects plant development so it is speculated that microbial auxin production by PGPR may alter the level of auxins and affects all the physiological processes regulated by auxins thus promoting plant height, biomass and grain yield etc. (Khan and Doty, 2009). Most of the Rhizobium species produce IAA (Ahemad and Khan, 2012) which has a significant task in the basic processes of plant nodule formation such as cell division in the plant, formation and exchange of vascular tissue (Hannin et al., 2003; Spaepen et al., 2007). IAA synthesis by indole-pyruvic acid and indole-3-acetic acid was identified in *Erwinia herbicola*, some saprophytic *Pseudomonas* and *Agrobacterium, Bardyrhizobium, Rhizobium, Azospirillum, Klebsiella* and *Enterobacter*. In addition, IAA derived from Tryptophan is found in Cyanobacteria ba*cteria, whereas IAA production independent of Tryptophan has been detected in* Azopirilla as well as Cyanobacteria (Ahemad and Kibret, 2013). Recent evidence suggests that the auxin pathways act in a mutually antagonistic manner during plant defense. Auxin also affects disease outcomes indirectly through effects on development (Kazan and Manners, 2009).

Cytokinins

Cytokinins (CKs) are purine derivatives that support and maintain plant cell division in cultures and are also involved in a variety of differentiation processes, including shoot formation, primary root growth and callus formation. Plants constantly use cytokinins to protect totypotent stem cell pools in their shoots and stem meristems. Endogenous cytokine overproduction in transgenic plants causes pleiotropic phenotypic changes involving the cytokinin-oxotropic growth of calli in vitro (Howell et al. 2003). The chemical structures of major cytokinins are as follows: i^6Ade [6-(3-methyl-2-butenylamino)purine]; *trans*-zeatin [6-(4-hydroxy-3-methyl-trans-2-butenylamino) purine] *cis*-zeatin [6-(4-hydroxy-3-methyl-cis-2-butenylamino) purine]; dihydrozeatin [6-(4-hydroxy-3-methyl-butylamino)purine] (Murai, 2014). The pathways for cytokinin biosynthesis and metabolism have been characterized by the identification of isopentenyl pyrophosphate transferase, cytokinin oxidases, cytokinin hydroxylase, zeatin cis-/trans-isomerase, cytokinin phosphoribosyl hydrolases, cytokinin-specific riboside phosphorylase, and others enzymes. Loss of function mutant phenotypes of cytokinin degradation/activating enzymes indicate the regulation of concentration and spatial distribution of bio-active cytokinin plays a pivotal role in the increase in panicle size, in the numbers of floral organs, and eventually in seed yield (Murai, 2014). Recent studies confirmed that, a number of bacterial species mostly associated with the plant rhizosphere, are found to be associated with cytokinins production including

Flavobacterium, Acinetobacter, Bacillus, Arthrobacter, Aerobacter, Azospirillum and *Pseudomonas* sp. (Perrig et al., 2007; Arkhipova et al., 2007; OrtizCastro et al., 2008).

Giberellins

Giberellins (GAs) are ubiquitous plant hormones that induce various metabolic functions required during plant growth, such as seed germination, root elongation, sex expression, flowering, fruit formation and senescence (Hedden and Kamiya, 1997). A small number of rhizobacteria (PGPR) are known to produce gibberellins. *Bacillus pumilus and Bacillus licheniformis* were reported as producers of gibberellins. These bacteria were isolated from the rhizosphere of *A. glutinosa* and have shown a capacity to produce large quantities of gibberellins GA1, GA3, GA4, and GA20 *in vitro* (Gutiérrez Manero et al., 2001). GAs were identified and isolated from higher plants, fungi and bacteria. The gibberellin characterization in bacteria using physico-chemical methods was first reported by Atzorn et al. (1988), who demonstrated the presence of GA1, GA4, GA9, and GA20 in gnotobiotic cultures of *Rhizobium meliloti*. Apart from *Azospirillum* sp. and *Rhizobium* sp., production of gibberellin-like substances has also been claimed in different bacterial genera. Gibberellins has been confirmed in *Acetobacter diazotrophicus, Herbaspirillum seropedicae* (Bastia ´n et al. 1998) and *Bacillus* sp. Kang et al. (2014) isolated, detected and quantified different GAs in *Leifsonia soli* namely; GA1, GA4, GA7, GA8, GA9, GA12, GA19, GA20, GA24, GA3 and GA53 by chromatographic analysis. The authors emphasised GA secretion by *L. soli* SE134 might prove advantageous for its ameliorative role in crop growth and the potential of this strain as a PGP bacterium. Patel and Saraf (2017) identified novel three bacterial isolates producing phytohormones such as indole 3-acetic acid (IAA), gibberellic acid and cytokinin. In their study, IAA was detected in all the three isolates, where in highest production was found in *Stenotrophomonas maltophilia* MTP42 followed by *Pseudomonas stutzeri* MTP40 and *Pseudomonas putida* MTP50. Gibberellic acid production was found highest in MTP40 followed by MTP42 and MTP50. The cytokinin production from the isolates was max in MTP40 and followed by MTP42 and MTP50 were respectively.

The balance between auxins and cytokinin is a key regulator of in vitro organogenesis. Exposure of callus cultures to a high auxin / cytokine ratio leads to root formation, while a low ratio of these hormones promote shoot growth. Many experiments have demonstrated the presence of synergistic, antagonistic, or additional interactions between auxins and cytokinins, suggesting complex instantaneous interactions involved in the modulation of root and shoot architecture (Jha and Saraf, 2012).

Boosting Plant Growth by Phytohormone Producing Microorganisms

Microorgonisms producing small amount of phytohormones improve tolerance and plant growth under stress conditions including salinity, temperature, drought, metal toxicity, pathogen/pest attacks. The beneficial effect of phytohormone producing microbes on suppression of biotic and abiotic stressor influences was reported in numerous studies. In Table 1, there are several studies reported for phytohormone producing bacteria and their ability to mitigate abiotic stress.

Pre-treatment of plants with plant growth-promoting bacteria can provide significant protection to plants against various damage caused by pathogen infection as well as abiotic factors e.g. water deficit (Amutharaj et al., 2012; Nascimento et al., 2013). However, available biocontrol agents in some cases fail in the field. Some factors can affect biocontrol agent efficacy in the field, e.g., environmental factors, ecological factors, formulation type, application method. Großkinsky et al. (2016) identified the ability of *Pseudomonas fluorescens* G20-18 to efficiently control *P. syringae* infection in *Arabidopsis* and cytokinin production which was identified as a key determinant for this biocontrol effect on the hemibiotrophic bacterial pathogen, allowing maintenance of tissue integrity and ultimately biomass yield. Naseem and Dandekar (2012) also reported that cytokinin confers protection to Arabidopsis against infection with *Pseudomonas syringae* pv. *tomato* (Pto).

C**ONCLUSION**

PGPRs live in plant rhizosphere, endosphere and polysphere as their habitat. These features add the potential for easy applicability and sustainability to PGPRs to be used in the agricultural production systems. Some bacteria may produce several types of phytohormones in plant tissue that interact to crucial processes in plants, including hormonal balance. Auxins and cytokinins interact in many important processes in plants,

particularly apical predominance. Gibberellins production by PGPR promotes the growth and yield of many crop plants. However, understanding the interactions between PGPR and plants can improve the quality and quantity of crops. Bioagents are important components of integrated approaches to stress factors limiting crop production. Although there is an enourmes number of researches on PGPRs, including rhizobacteria producing phytohormone, there are still many factors that can affect biocontrol agent efficacy to be studied e.g. environmental factors, ecological factors, formulation type, application method.

Table 1. IAA, CK, GA producing bacteria and their ability to mitigate abiotic stress

Microorganisms	**Phytohormone**	**Host plant, abiotic stress**
Pseudomonas sp., *Bacillus* sp.	IAA	*Sulla carnosa* (Desf.), Salt stress
Bacillus licheniformis	IAA	*Triticum aestivum* L., Salt stress
Bacillus subtilis, Arthrobacter sp.	IAA	*Triticum aestivum* L., Salt stress
Pseudomonas putida, Bacillus megaterium	IAA	*Trifolium repens*, Drought stress
Marinobacterium sp., *Pseudomonas* sp., *Rhizobium* sp., *Sinorhizobium* sp.	IAA	*Triticum aestivum* L., Salt stress
Serratia plymuthica, Stenotrophomonas rhizophila, Pseudomonas fluorescens, Pseudomonas extremorientalis	IAA	*Cucumis sativus*, Salt stress
Acinetobacter faecalis, Bacillus cereus, Enterobacter hormaechei, Pantoea agglomerans	IAA	*Triticum aestivum* L., Salt stress
Curtobacterium flaccumfaciens, Ensifer garamanticus	IAA	*Hordeum vulgare*, Salt stress
Streptomyces coelicolor, Streptomyces geysiriensis	IAA	*Triticum aestivum* L., Salt stress
Bacillus subtilis	IAA	*Acacia gerrardii* Benth., Salt stress
Pseudomonas sp.	IAA	*Zea mays*, Salt and heat stresses
Serratia sp.	IAA	*Cicer arietinum* L., Nutrient stress
Achromobacter xylosoxidans	IAA	*Brassica juncea*, Cu stress
Pseudomonas putida	IAA	*Glycine max* (L.) Merr., Salt stress
Leifsonia sp., *Bacillus* sp.	IAA	*Zea mays*, Cd stress
Burkholderia sp.	IAA	*Solanum lycopersicum* L., Cd stress
Bacillus subtilis	IAA	*Brassica juncea* L., Ni stress
Bacillus megaterium	IAA	*Vinca rosea* L., Ni stress
Micrococcus luteus	CK	*Zea mays*, Drought stress
Arthrobacter sp., *Bacillus* sp., *Azospirillum* sp.	CK	*Glycine max* (L.) Merr., Salt stress
Bacillus subtilis	CK	*Platycladus orientalis*, Drought stress
Azospirillum lipoferum	GA	*Triticum aestivum* L., Drought stress
Bacillus aryabhattai	IAA, GA	*Glycine max* (L.) Merr., Heat stress

*The table is adapted from Egamberdieva et al.(2017).

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EFFECTS OF DEPYHTINIZED CEREAL BRANS AND ENZYMES ON PHYSICAL AND SENSORY QUALITY OF NOODLE

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ABSTRACT

In this research, cereal brans (rice, rye, wheat and oat) were depyhtinized by two different methods (phytase enzyme and malt flour) and used in noodle formulation (at 20% level) with different enzyme applications (xylanase and transglutaminase). Cereal brans decreased the brightness (L) and increased the redness (a*) values of noodle compared to the control samples ($p<0.05$). The weight increase, volume increase and cooking loss values of noodle samples containing different cereal brans varied between 159.62-170.65%, 222.56-232.68% and 9.36-9.50%, respectively. The highest weight increase value was obtained with wheat bran and the lowest volume increase value was obtained with oat bran samples. The cooking loss values of noodle samples containing rice, rye, wheat and oat bran were not found statistically different from each other. Transglutaminase and 'transglutaminase + xylanase' enzyme applications increased the weight increase and decreased the cooking loss values of noodle samples. The firmness values of noodle samples ranged from 324.90 to 850.30 g. The use of cereal bran increased firmness in noodle samples compared to control samples. According to the sensory analysis results, noodles containing rice bran had lower appearance and taste scores than other varieties. Oat and wheat bran noodles were more appreciated by the panelists.*

Keywords: *Noodle, dephytinization, bran, cereal.*

INTRODUCTION

Noodle has an important place in our traditional products. While it is a cereal product which is frequently consumed in rural areas and villages in our country, it is produced commercially and started to take its place in the markets (Tülbek, 1999; Eyidemir, 2006). It was generally produced from soft wheat flour, salt and egg as the major ingredients. Mixing the ingredients, sheeting of dough, cutting and drying are the main production steps of the noodle (Özkaya et al. 2001).

Bran is the outer layer of the grain and is removed from the grain during grinding and refining of the grain (Elgün and Ertugay, 1995). Cereal bran obtained from wheat, rice, oats, rye, barley and corn is generally considered animal feed. Cereal bran is a rich source of non-starch carbohydrates, phenolic acids, flavonoids, fats, vitamins, oligosaccharides, folates and sterols (Patel, 2015).

In this research, cereal brans were dephytinized by 2 different methods (the use of malt flour and phytase enzyme). After dephytization process cereal brans were used in noodle production. The effects of cereal brans and enzyme applications on the noodle quality were evaluated.

MATERIALS AND METHODS

Materials

The ingredients refined wheat flour was provided by Golda Gıda San. A.Ş. in Karaman, Turkey. Eggs and salt were purchased from local markets in Karaman. Malt flour was obtained from Ireks Gıda A.Ş., rice bran was obtained from Başhan Tarım Ürünler A.Ş. (Balıkesir) and rye, wheat and oat bran were obtained from Sağlık Tarım Ürünleri (Konya). Vıtal wheat gluten and transglutaminase enzyme were provided by Sinerji Gıda Kimya Tekstil San. ve Tic. A.Ş., İstanbul, Turkey and FMI Gıda ve Kimya, İzmir, Turkey, respectively. Xylanase and phytase enzymes were obtained from Orba Biokimya San. ve Tic. A.Ş.

Methods

Refined wheat flour was replaced with cereal brans dephytinized by 2 methods at 20% levels in noodle formulation. Noodle samples were prepared according to the methods given by Bilgiçli (2009) with some modification. In noodle samples, xylanase and transglutaminase enzyme were used in noodle formulation at 0.01% and 0.5% levels (on flour basis), respectively.

Color values were determined using Minolta CR-400 (Konica Minolta, Inc., Osaka, Japan). Weight increase, volume increase and cooking loss values of noodle samples were determined as cooking properties (Oh et al., 1985; Özkaya and Kahveci, 1990).

Firmness analysis was performed on nutritional and technologically superior noodle samples. It was measured in noodle samples using TAXT Plus Texture Analyzer (Stable Microsystems, Surrey, UK).

Sensory properties of noodles samples were determined by 22 panelists (25-55 years). Panelists were asked to evaluate noodle samples in terms of colour, appearance, hardness, stickiness, taste, odor and overall acceptability. A scale of 1-7 (1: extreme bad, 7: excellent) was used to evaluate sensory characteristics (Epler et al., 1998).

JMP statistical program, version 10.0 (SAS Institute Inc., Cary, NC, USA) was used for statistical analysis.

RESULTS AND DISCUSSION

When the results were evaluated in terms of bran type factor, average L * value in noodle samples ranged from 84.13 to 86.45. The L*, a* and b* values of control samples were 93.46, 0.02 and 10.17, respectively. The use of cereal brans in noodle formulation decreased L* and increased a* and b* values of noodle samples. Phytase enzyme and malt flour application did not affect the L * values of noodle samples statistically. When the averages were compared according to the bran type factor, rye bran gave lower redness value in noodle samples compared to wheat and rice bran. When the redness value was evaluated according to the enzyme application factor, noodle samples without enzyme gave lower redness value than the noodle samples produced with other enzyme applications. Niu et al. (2017), evaluated the effect of different enzymes and emulsifiers on whole wheat flour noodles and reported that xylanase increased the product redness and yellowness value. When the comparison of means was evaluated according to bran types, C* and hue values in noodle samples ranged between 13.35 and 14.44, 86.03 and 88.10, respectively.

Table 1. The comparison of the averages of the color measurement results of the noodle samples

	L*	a*	b*	C*	hue
Type of bran					
Rice	84.38b	0.94a	14.40a	14.44a	86.26b
Rye	86.45a	0.55b	13.34b	13.35b	88.10a
Wheat	84.13b	0.99a	14.07ab	14.11ab	86.03b
Oat	85.23ab	0.80ab	13.77ab	13.80ab	86.76b
Dephytinization method					
Phytase enzyme	85.24a	0.80a	13.75a	13.78a	86.78a
Malt flour	84.85a	0.84a	14.04a	14.07a	86.79a
Enzyme application					
NEA	88.04a	0.36b	12.76b	12.75b	88.43a
X	84.15a	0.97a	14.03a	14.07a	86.47b
T	84.26a	0.95a	14.28a	14.31a	86.25b
X+ T	83.74a	1.01a	14.53a	14.56a	86.02b

The means with the different letter in column are significantly different ($p<0,05$); NEA: No enzyme application; K: Xylanase; T:Transglutaminase

Table 2 shows the cooking test results of rice, rye, wheat and oat bran noodles. Weight and volume increase values ranged from 159.62 to 170.65% and 222.56 to 232.68%, depending on the type of bran used in the noodle. The highest weight increase values were found in wheat bran noodles, while the lowest weight increase values were found in rye bran noodles. Noodles should maintain their integrity during cooking; there must be a minimum loss of solids in the cooking water during boiling (Wu and Corke, 2005). Ertaş (2014) reported that weight increase and volume increase values of noodles increased with the use of rice bran (0-25%) compared to the control sample and the highest weight and volume increase value was obtained at 25% usage level. When weight and volume increase values were compared in terms of enzyme application factor, the highest weight increase values were found in transglutaminase (169.42%) and xylanase + transglutaminase (172.26%) and the highest volume increase value was found in xylanase + transglutaminase (233.56%). The amount of cooking loss ranged from 9.36% to 9.50% depending on the type of bran used in noodles (Table 2). The amount of cooking loss of the control noodles prepared with wheat flour was found to be 6.90%, and the use of cereal bran in the production of noodles increased the amount of cooking loss. There was no statistically

significant difference between cooking loss values of noodle samples according to type of bran. Noodle samples without enzyme were the highest cooking loss values (9.94%). The transglutaminase and xylanase + transglutaminase enzyme had a positive effect on noodle cooking properties by reducing the amount of cooking loss in noodle samples. Jyotsna et al. (2004) reported that noodles prepared with xylanase enzyme at a ratio of 0.012% had less cooking loss value.

Table 2. The comparison of the averages of cooking test results of noodle samples

	Weight increase (%)	Volume increase (%)	Cooking loss (%)
Type of bran			
Rice	167.03b	228.57b	9.39a
Rye	159.62c	229.34ab	9.36a
Wheat	170.65a	232.68a	9.45a
Oat	164.65b	222.56c	9.50a
Dephytinization method			
Phytase enzyme	165.12a	228.35a	9.39a
Malt flour	165.85a	228.22a	9.46a
Enzyme application			
NEA	156.38c	223.95c	9.94a
X	163.88b	225.88c	9.58b
T	169.42a	229.76b	9.18c
X+ T	172.26a	233.56a	9.00c

The means with the different letter in column are significantly different ($p<0,05$); NEA: No enzyme application; K: Xylanase; T:Transglutaminase

The firmness values of noodle samples varied between 324.90-850.30 g. The use of cereal bran in noodle samples increased the firmness values compared to the control samples ($p<0.05$). The highest firmness value was obtained in rye bran noodles.

Table 3. The results of firmness analysis of nutritional and technologically superior noodle samples

	Firmness (g)
Control	324.90±29.13d
Rice bran noodle	677.80±21.92b
Rye bran noodle	850.30±13.46a
Wheat bran noodle	549.50±28.71c
Oat bran noodle	602.80±44.83bc

The means with the different letter in column are significantly different ($p<0,05$);

The sensory analysis results of noodle samples which are superior in nutritional and technological aspects are given in Figure 1. As a result of sensory evaluation, rice bran noodles samples had the lowest appearance and taste scores. Yılmaz Tuncel et al. (2017) used rice bran (10, 20 and 30%) in the production of noodles and reported that the use of more than 10% rice bran adversely affected noodle sensory scores. The use of rye bran in noodle samples decreased color, appearance and taste scores compared to the control sample. Wheat and oat bran noodles were scored equivalent to control in terms of appearance, hardness, stickiness, taste, odor and overall acceptability.

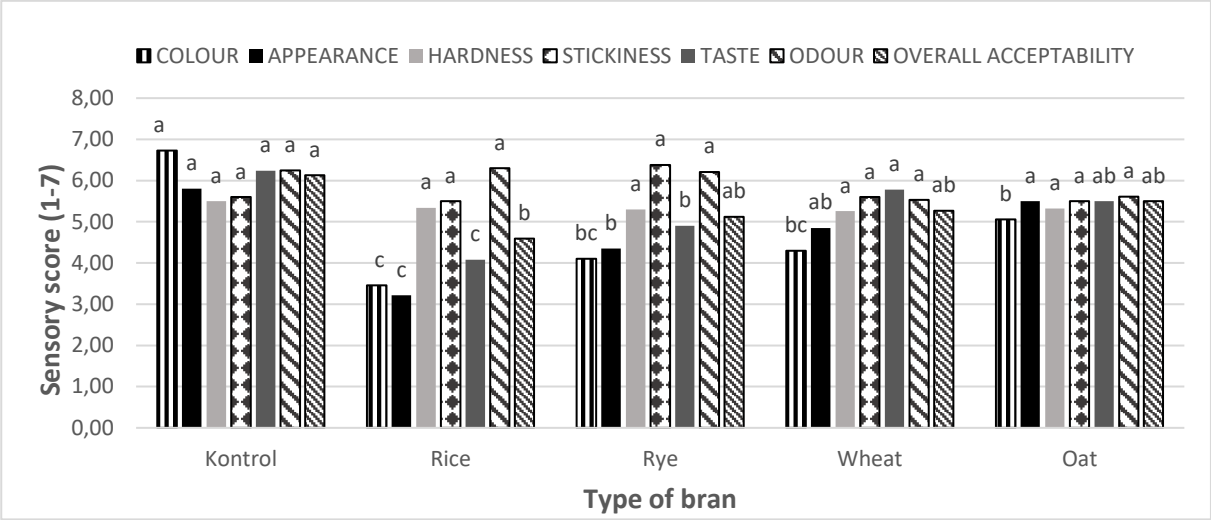

Figure 1. Sensory properties of noodle samples

CONCLUSION

The use of cereal brans in the production of noodles a decreased L * (brightness) and increased a* (redness) and b* (yellowness) values compared to the control sample. Dephytinization method was not significant on colour values of noodle samples. The highest weight increase values were found in wheat bran noodles. The transglutaminase and xylanase+ transglutaminase enzyme reduced the cooking loss values of noodle samples. When the firmness values of the noodle samples were examined, the use of cereal bran caused an increase in the firmness value of the noodle samples. Rice bran noodles scored lower in terms of appearance and taste than other noodle varieties.

ACKNOWLEDGEMENT

The authors would like to thank the Turkish Scientific and Technological Research Council (TÜBİTAK) for supporting this research (Project No. 118O2385).

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TRADITIONAL FOOD 'TARHANA' FROM PAST TO PRESENT: ITS PLACE IN HEALTHY NUTRITION

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ABSTRACT

Tarhana, one of the traditional products in Turkey, is produced by fermentation of wheat flour, yoghurt, yeast, vegetables and spice mixture. Wheat flour and yoghurt are major ingredient in tarhana formulation. Tarhana fermentation lasts 1-7 days and the fermented dough is dried, ground and used to make soup. Fermentation is an important production stage of tarhana production. It increases riboflavin, niacin, pantothenic acid, ascorbic acid and folic acid content and mineral bioavalibility in tarhana. Furthermore, by fermentation, lactic acid bacteria and yeasts produce lactic acid, ethanol, carbon dioxide and some other organic compounds that give the characteristic flavor and taste to tarhana. Food components such as carbohydrates, proteins and fats are broken down by microorganisms into low molecular components during fermentation. Tarhana is known as kishk and kushuk in the Middle East, trahana in Greece, atole in Scotland, talkuna in Finland and thanu in Hungary. Tarhana is a good source of B-group vitamins, organic acids and free amino acids and has an important place in healthy nutrition. Different ingredients can be added to tarhana formulation to improve nutritional profile such as whole wheat meal, wheat germ, bran, barley, oat, corn flour, legumes, buckwheat, quinoa, carob flour, resistant starch, kefir, tomato seed, whey concentrate, cherry laurel, citrus albedo, etc. While homemade tarhanas are generally consumed, they are now also being produced industrially.

Keywords: *Traditional food, tarhana, fermentation, cereal.*

INTRODUCTION

There have been many fermented products made from cereals throughout human nutrition history. The different characteristics of the developed products are mainly due to the fermentation process (Özdemir et al., 2007). One of these products, tarhana, is a Turkish traditional cereal-based lactic acid fermented food product, mostly produced at home. It is also commercially made on small and large scales (Settanni et al., 2011).

Tarhana is based on lactic acid fermentation of a mixture of wheat flour, yoghurt (stirred or set yoghurt), and depending on the consumed region, raw or cooked vegetables (tomatoes, onions, peppers, etc.), spices (mint, basil, dill, tarhana herb), yeast and salt. This product is generally allowed to ferment at ambient temperature for one week and the microbial composition is predominantly represented by lactic acid bacteria (LAB) and yeasts. The resulting product is one of the acidic fermented foods characterized by acidic taste and yeast aroma (İbanoğlu and İbanoğlu, 1999; Şengün et al., 2009). At the end of the fermentation, wet tarhana is usually dried in the sun and laid on the ground. It is widely used in soup making because of its high nutritional value. In addition, it is consumed as a snack when dried as thin layer after fermentation (Erbaş et al., 2005).

Tarhana is identified in Turkish Standardization Institute (TSE), Tarhana standard (TS 2282) as '***A foodstuff obtained by drying, grinding and sieving of a mixture that formed by wheat flour and semolina (or both), yoghurt, pepper, salt, onion, tomatoes and flavors, fragrant and harmless herbal substances after mixing***' (Anonymous, 2004).

Tarhana is a form of preservation of yoghurt which has an important place in Turkish cuisine. The word 'tar' is used in the meaning of yoghurt stored from summer to winter in 'Divanü Lügati't Türk'. It was first written as 'tarhanah' in the phrases of Kipchak and Egyptian Mamluk inscriptions (Coşkun, 2014).

In the past, kurut, a similar food to tarhana, was among winter food types prepared with precipitate, salt, flour, dried meat (Ögel, 1982; Oğuz, 2002). Tarhana, known as 'kishk' in Egypt, is prepared by adding chicken to the sour milk-wheat mixture. The 'kushuk' consumed in Iraq is prepared by adding turnip to the milk-sour dough mixture. The 'trahanas', known in Greece, is mainly produced from curd cheese, produced by lactic acid fermentation from sheep and goat milk, and wheat flour. 'Tarhonya', a tarhana like product in Hungary, is prepared by mixing white flour with enough eggs. The mixture is kneaded and dried and passed through a sieve. In Finland's 'talkkuna', other cereal flours such as oats, barley rye and peas are mixed. It is baked and dried with very little salt. It is stored dry and highly diluted form in pouches (Coşkun, 2014).

It is reported that there are 50 kinds of tarhana in Turkey. This diversity is due to the changes in the raw materials used locally and the presentation (Coşkun, 2014).

COMPOSITION OF TARHANA

In addition to yoghurt as a starter, sour milk or skimmed milk curd can be added to Tarhana composition. The lactic acid bacteria Streptococcus thermophilus and Lactobacillus bulgaricus are mainly responsible for the development of acidity during tarhana fermentation. In addition, bread yeast (Saccharomyces cerevisiae) is added to the dough in the production in Central Anatolia and Aegean Region. The nutritional value of tarhana may vary due to differences in content and production (Aktaş, 2018; Özçelik and Özdoğan, 2008).

Tarhana standard (TS 2282) specifies that; The percentage of protein should be at least 12%, the percentage of humidity should be at most 1%, the percentage of salt should be at most 1% in dry matter (Anonymous, 2004).

There are four types of tarhana in TS 2282 numbered tarhana standard; 'flour tarhana', 'göce tarhana, 'semolina tarhana', and 'mixed tarhana'. These tarhana types were determined depending on the use of wheat flour, ground wheat grain and semolina in production. These tarhana types were determined depending on the use of wheat flour, ground wheat grain and semolina in the production. Semolina is used instead of flour in semolina tarhana production. In the production of mixed tarhana, at least two of wheat flour, ground wheat grain or semolina are used (Anonymous, 2004).

Although the basic production is the same in almost every country and region, there may be differences in the composition of tarhana depending on tradition, customs and eating habits. The main reason why tarhana is called with different names the fermentation progresses in different ways and therefore has different sensory properties such as taste and odor (Erbaş et al., 2004; İbanoğlu et al. 1995). Here are some local tarhana types consumed in different geographical regions and provinces in Turkey:

Ege tarhana: This is a kind of flour tarhana. It is a product obtained by mixing the vegetable mixture obtained by boiling tomatoes, peppers, onions and aroma-giving herbs called mortar after cooling with yoghurt and flour, and allowing the dough prepared in this way to be fermented at different times (Evangelos et al., 1993).

Göce tarhana: It is commonly consumed in Ankara, Kahramanmaraş, Muğla and Aydın provinces. In the production of Göce tarhana, the cracked wheat is cooked raw or with a little water and salt, and mixed with plenty of oily or skimmed yoghurt in warmly and left to fermentation (Evangelos et al., 1993).

Trakya tarhana: In Edirne, the composition of this tarhana is formed by yoghurt, red pepper, onion, wheat flour, sour dough, salt, tomato and paste (pepper or tomato). In Kırklareli, spices, gravy, butter and cheese can be mixed additionally. Since the rate of red pepper is very high, the color of tarhana can be quite red (Coşkun, 2002).

Ak tarhana: Wheat flour, yeast yoghurt, red pepper, mint, salt, hot pepper and tomato are used as materials in the ak tarhana made in Kütahya region (Coşkun, 2014).

Gediz tarhana: It is produced by adding red pepper, onion, yoghurt, mint, salt, flour and sour yeast obtained from the previously made tarhana. The feature of Gediz tarhana is that it is packaged one month after production (Coşkun, 2014).

Tarhana with mince: For the production of this tarhana, commonly consumed in the Trakya region, tomato paste, red pepper, tomato, onion, milk, mince, salt, cheese, yoghurt, yeast bread, tarhana and flour made in previous years are used (Coşkun, 2014).

Kiren tarhana (Cranberry tarhana): Its composition consists of wheat flour or göce and cranberry. Unlike other types of tarhana, it is a product prepared with mixture of wheat flour or barley göce and cranberries (Yücecan et al., 1988).

Beyşehir tarhana: Its composition consists of butter, milk and water, as well as göce and ayran obtained from strained yoghurt (Coşkun, 2014).

Göçmen tarhana: It is commonly consumed in Marmara Region. Göçmen tarhana is composed of curd cheese, tomato, tomato paste, green pepper, egg, salt, yeast and various spices (powdered cloves, powdered cinnamon, black pepper, chili pepper, cumin) besides the wheat flour and yoghurt which are the main raw materials (Coşkun, 2014).

Some of the other local tarhana types were Kastamonu wet tarhana, Sivas tarhana, Maraş tarhana, milk tarhana (Gelibolu), dough tarhana (Gölhisar), meat tarhana (Ermenek), grape tarhana (Tokat), and sweet tarhana (Malatya).

THE NUTRITIVE VALUE OF TARHANA

Flour and yoghurt, two main elements of tarhana, complement each other in terms of amino acid profile: Flour is a source of low-quality protein because it is poor from amino acids such as lysine and threonine, on the other hand these amino acids are found in high amounts in yoghurt. Therefore, tarhana, a balanced product in terms of essential amino acids, has an important place in healthy nutrition (Hançer, 2010).

When the mineral content of tarhana is examined, the combination of basic components 'wheat flour and yoghurt' complemented each other, as in the amino acid profile. Flour is rich in iron, while calcium-rich yoghurt is poor in iron. Besides, addiction of other ingredients also contributes to the enrichment of mineral content of tarhana, that is a more balanced product in terms of calcium and iron (Hançer, 2010). Tarhana is also an important source of vitamins. In a study examining the effect of fermentation and drying processes on some water-soluble vitamins in tarhana, it was reported that fermentation causes an increase in the amount of riboflavin, niacin, pantothenic acid, ascorbic acid and folic acid. On the other hand, this process did not affect thiamine and pyridoxine amounts significantly ($p>0.05$). In the same study, it was stated that the drying process decreased vitamin levels ($p<0.05$) (Ekinci, 2005).

In a study, conducted by Yücecan et al. (1988), tarhana samples were collected from 15 different regions and the range of some nutritional parameters were reported. The percentage ranges of humidity, protein, and fat were %9.0-12.1, %12.5-18.6, and %4.0-7.2, respectively. Also, the calcium, iron, sodium, and potassium contents were 59-191 mg/100 g, 2.1-5.9 mg/100 g, 296-1130 mg/100 g, and 60-182 mg/100 g, respectively.

According to the standard recipe (Nutrition Information System, 2004) 1 bowl (200 g) tarhana soup contains 15 g tarhana, 165 g water, 1 g salt, 7 g sunflower oil, 0.3 g dry mint, and 0.1 g red powdered pepper. Here is nutrient composition of 1 bowl tarhana soup (Table 1):

Table 1. Nutrient composition of tarhana soup (Nutrition Information System, 2004)

Content	Amount
Energy	120.0 kcal
Water	177 g
Protein	1.8 g
Carbohydrate	10.5 g
Fat	7.9 g
Dietary fiber	1.0 g
Vitamin A	12.0 µg
Vitamin E	4.8 mg
Folate	4 µg
Vitamin C	1.6 mg
Sodium	570 mg
Potassium	50.0 mg
Calcium	28.0 mg
Iron	0.5 mg

The nutrient content of tarhana varies considerably due to the fact that the raw materials in the formulation are not standard and varies according to the region. But it is known that the raw materials such as tomato, pepper, cereals and dill are rich in antioxidant vitamins; and chickpeas, beans, onions, bulgur and other grains are rich in dietary fiber. So, it is possible to consider tarhana in the functional food category (Esimek, 2010).

CONCLUSION

It is thought that further studies are needed to increase the nutritional properties of tarhana which is one of the indispensable flavors in Turkish cuisine and to develop a more valuable product in terms of healthy elements.

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BEET CURLY TOP VIRUS

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ABSTRACT

About 80% of the sugar produced in the world is provided from sugarcane and 20% from beet (Beta vulgaris var. saccharifera). While approximately 20 million tons of sugar beet are grown annually in our country, 2 million tons of sugar is produced from these crops. As in all plants, sugar beet cultivation has many pests and disease agents that cause negative effects on the yield and quality of the crop. Disease and pest problem have increased in sugar beet cultivation especially due to the global warming seen in recent years. Diseases that did not cause any economic problems previously, they started to be a problem such as virus diseases. One of the important viruses that cause economic loss of product in sugar beet production is Beet curly top virus (BCTV). It was detected firstly in Nebraska (USA) in 1888. Nowadays, the virus is seen in Africa, Europe, Asia, America and Mediterranean Basin where the world's arid and semi-arid climate prevails. In Turkey, emerging from time to time since 1955, the disease was detected in Şereflikoçhisar (Ankara) and Kozaklı (Nevşehir) in 2008 and in some fields in the Haymana district of Ankara in 2009 has led to up to 50% root yield losses. This virus is only transmitted from plant to plant by leafhoppers. It couldn't be transmitted by sugar beet seed or by mechanical means. It can be advised some control methods of the disease such as; cultivating resistant sugar beet varieties, adjusting the sowing time in order to prevent sugar beet plants from being exposed to the outbreaks of vectors in the early period, and spraying insecticides against vectors when necessary, or a combination of these methods. In this review; general information about genome structure, epidemiology, symptoms, transmit and control methods of the virus is given.

STRUCTURE of the GENOME

BCTV is a type member of the genus Curtovirus from the Geminiviridae family. The virus has the ssDNA genome. Curtoviruses have a 3-kb single-part genome and seven reading frames (ORFs) duplexed from the 450 bp intergenic region, which forms the origin of viral DNA replication (Baliji et al., 2004; Briddon et al., 1998; Klute et al., 1996; Stanley et al., 1986; Stenger, 1994).

The virions of the BCTV consist of an uncoated capsid. Capsid is long and double and shows icosahedral symmetry. Capsid is composed of a total of 22 capsomer, 18 nm diameter and 30 nm length. The genome is non-compartmental and contains a round, ambisense, single-stranded molecule of a closed circle. The entire genome is 2993 nucleotides in length.

Diagnosis of BCTV

BCTV can be diagnosed in sugar beet plants and insects by Enzyme Linked-Immunosorbent Assay (ELISA), Tissue-Blot Immunoassay (TBIA), Electron microscope (Brlansky and Derrik, 1979; Wintermantel et al., 2003; Farzadfar et al., 2006; Heydarnejad et al., 2007), PCR, Southern Blot, Western Blot (Hauser et al., 2000; Soto and Gilbertson, 2003; Soto et al., 2005; Farzadfar et al., 2006; Heydarnejad et al., 2006). Since there is no commercial ELISA kit for serological diagnosis, other methods are used in the diagnosis.

Economic Losses Because of BCTV

About 80% of the sugar produced in the world is produced from cane and 20% from beet (*Beta vulgaris var. saccharifera*). Approximately 20 million tons of sugar beet are grown annually in our country, while 2 million tons of sugar is produced from these products. As in the cultivation of all cultivated plants, sugar beet cultivation has many harmful and disease factors that cause negative effects on the yield and quality of the product. Disease and pest problem have increased in sugar beet cultivation especially due to the global warming seen in recent years. In the previous years, diseases that did not cause any economic problems started to be a problem. Virus diseases are among these diseases, too. One of the important viruses that cause economic loss of product in sugar beet production is *Sugar beet curly top virus* (BCTV) and it is called curly top because it causes curling especially on the young leaves. BCTV has been detected first in Nebraska in 1888.It is seen in Africa, Europe, Asia, America and Mediterranean Basin where the world's arid and semi-arid climate prevails. In Turkey, BCTV has been emerge occasionaly since 1955, the disease was seen in, Şereflikoçhisar

(Ankara) and Kozaklı (Nevşehir) district in 2008 and it caused up to 50% root yield losses in some fields in the Haymana (Ankara) district in 2009.

Symptoms

Leaves of susceptible cultivars are dwarfed, crinkled, rolled inward, and cupped upward. Veins on the underside of leaves are roughened and often produce swellings or spine-like outgrowths. Roots are stunted and may exhibit a proliferation of secondary rootlets. Phloem tissues become necrotic and appear as dark rings when taproots are viewed in cross section. Delayed infection results in milder plant symptoms (Figure 1).

Figure 1: Symptoms of BCTV on beet leaves

Transmission ways

Sugar beet curly top disease is transmitted from plant to plant with vectors only (Bennett, 1971). It is also spread by transporting both vector and diseased plant materials to healthy areas. Depending on the host species can be carried with three dodder (*Cuscuta* spp.) species (Bennett, 1944) (Figure 2). Although the scum grows in infected plants, it contains a high concentration of virus and shows phloem necrosis, but the scum itself is not infected. The virus is not transported by sugar beet seed (Bennett and Esau, 1936), nor is it carried by mechanical means such as touch or physical contact.

Figure 2: *Cuscuta spp*.

Control of BCTV

Since *Sugar beet curly top virus* has a complex epidemiology, effective combat strategies remain limited (Wang et al., 1999). In the fight against this disease in the world, cultivation of resistant varieties of sugar beet (Martin and Thomas, 1986; Lewellen, 1989), not to be exposed to the outbreak of vectors in the early period of sugar beet plants and for this purpose to adjust the sowing time, when necessary to apply insecticides to the vectors (Duffus, 1986) or a combination of several of them.

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IMPROVING SOIL QUALITY CARD FOR SOIL SUSTAINABILITY IN KONYA, TURKEY

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ABSTRACT

Indicators of soil quality have been defined from an ecological, economic, and social development standpoint; they usually take into consideration soil properties or associated crops that can be used in response to the dynamic changes in agroecosystems. Soil quality card-based method is required for environmental resources management and sustainable agriculture. Soil quality cards can be a good benchmark for assessing soil health and monitoring change over the years. In order to evaluate and improve the effects of different management and clipping systems, quality indices should be selected. In this context, there are 3 steps necessary for the integration of indicators to soil quality cards. These are the selection of indicators, the scoring of indicators and the creation of total quality cards. As a first step, for the selection of indicators, principal component analysis and expert opinion were applied to the results of the analysis of physical, chemical and biological properties of different soils. The indicators selected according to the principal component analysis were scored using 3 different (increasing soil quality as decreasing, increasing soil quality as increasing, and optimum soil quality) scoring curves. Finally, after scoring processing, soil quality cards have been established for monitoring and sustaining soil quality. The developed soil quality cards include the following information: land location, soil type, cultivated plant and short- and long-term solutions. Soil quality cards have an additional advantage over routine soil testing in order to provide information on the health status of the soil affected by different management practices and improvement proposals.

Keywords: Soil Quality, Indicator Selection, Soil Quality Card

1. INTRODUCTION

Soil is a dynamic living system that supports agricultural productivity and ecosystem function (Doran and Jones, 1996; Doran and Zeiss, 2000). Given the modern concerns of climate change and the growing global population, extensive research has been focused on supporting natural ecosystem functions, while at the same time feeding more people than ever, and also focusing on how to manage our land to mitigate climate change (Janzen, 2006).

Globally, soils face significant and diverse threats arising from land use change, land degradation and intensive management. Soil carbon loss, infiltration of nutrients, salinization, acid deposition, heavy metal pollution, erosion, compression and water storage capacity were identified as the most important challenges (Smith et al., 2016).

In recent years, the concept of soil quality has been developed to solve these problems and increase productivity. Soil quality is defined as the capacity of the functions that arise from the nature of the soil within a certain ecosystem and that arise due to its use under a certain management. This capacity may be affected positively or negatively depending on the management in particular. In determining soil quality, data from three basic dynamic properties of soil are used. These are the physical, chemical and biological properties of soils. It is stated in various sources that using minimum data set to determine soil quality factors gives the best results in terms of economy, labor and data quality produced. Physical properties of soil; soil texture, water holding capacity, aeration, compaction, density, hydraulic properties, aggregation status, surface crusting, etc. ; chemical properties; pH, salt content, total nitrogen, mineral nitrogen, available phosphorus, potassium, calcium, magnesium, microelements, pollutant elements, cation exchange capacity, etc. ; biological properties; total carbon, active carbon, potentially mineralizable nitrogen, microbial carbon, microbial nitrogen, soil respiration, enzyme activities and etc. are counted among soil quality factors (Şeker et al., 2017; Tesfahunegn et al., 2011; Yang et al., 2010).

For this reason, in this study, it is aimed to create soil quality cards from selected quality indicators in line with principal component analysis and expert opinions.

2. MATERIALS AND METHODS

As a result of the analyzes, the soil properties that can be used to determine and monitor the quality among the many features in this study were selected by factor analysis. For this purpose, in the formation of the minimum data set from the total data set obtained as a result of the study, the total data set was first divided into three groups. The first group had physical properties, the second group had chemical properties, and the third group had biological properties. In the second step, factor analysis was applied to all three data groups and correlation matrices of the data sets were formed to form the minimum data set. Thus, in determining the parameters that can be included in the minimum data set, component data determined by factor analysis, correlation load totals, correlations between data, and minimum data sets recommendations were prepared for each series.

After determining the soil quality MDS, each soil indicator was converted to a transformed scores ranging from 0.00 to 1.00 using linear and nonlinear scoring function methods (Andrews et al., 2002; Andrews et al., 2004; Askari and Holden, 2015). Appropriate scoring algorithms for the values of scoring indicators were selected and interpreted according to the aim of soil fertility and sustainability. An earth indicator was applied in ascending order (more is better), descending order (less is better) and optimum curve scoring curves were applied (Figure 1).

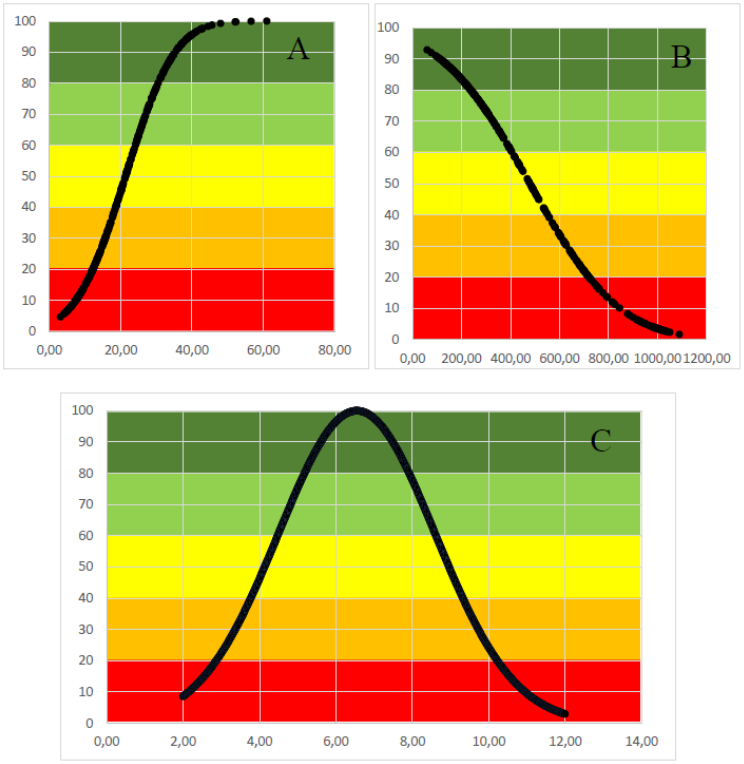

Figure 1. General scoring curve types

3. RESULTS AND DISCUSSION

Factor analysis helps to reduce excess soil data to factor components that best explain the variability in soil quality. Initially analyzed 12, 15 and 12 physical, chemical and biological soil properties were subjected to factor analysis in order to determine soil quality indicators. As a result, by using principal component analysis, the principal component factor of field capacity, bulk density, aggregate stability, penetration resistance, active carbon, root health value, potentially mineralizable nitrogen, organic matter and available phosphorus, manganese, potassium, copper and pH which best describes the changes in physical, chemical and biological soil quality, respectively, was allocated. The main components were indicators selected from physical properties, chemical properties and biological properties.

The average score card of the selected indicators is given in Table 1. According to this, the physical properties of soils are low, biological properties are medium and chemical properties are high. When the score card is examined, it is seen how much each selected feature affects the total quality. In addition, if each indicator is scored low, the soil properties and short- and long-term solutions are written.

Table 1. Soil quality card

Indicator		Average Value	Average Score	Limitations
Physical	FC	0.32	0.33	Water retention and availability
	Pb	1.28	0.57	Rooting, water transmission
	AS	22.89	0.53	Subsurface pan/deep compaction, deep rooting, water and nutrient access
	PR	1352	0.36	Aeration, infiltration, rooting, crusting, sealing, erosion, runoff
Biological	AC	832	0.78	
	RHV	5.15	0.54	
	PMN	12.06	0.66	Organic matter quality, Organic N storage, N mineralization
	OM	1.48	0.57	Nutrient and energy storage, ion exchange, C sequestration, water retention
Chemical	AP	16.95	0.97	
	Mn	16.16	0.95	
	K	572	0.89	
	Cu	1.82	0.76	
	pH	8.09	0.75	
Total Quality Scores			0.67	MEDIUM

4. CONCLUSION

In this study, indicators required for determination and monitoring of soil quality have been determined for our region and scoring equations have been established for these indicators. As a result of these operations, total quality scores of each land can now be obtained, and in the light of these data, sustainability will be ensured through land management practices. However, it is necessary to expand this data with more and different fields and examine, as well as interpret the yield values accordingly. In order to realize high yield and quality crop production without damaging the ecosystem at the upper limits of the yield potential of our soils, it is recommended to implement the soil quality approach in the formulation of agricultural policies as in developed countries.

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THE EFFECTS OF ALFALFA ON USING POSSIBILITIES AND WEED CONTROL IN VITICULTURE

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ABSTRACT

Grape is a valuable product which has an important place in the agriculture of in country with its variety of evaluation forms, domestic market consumption and exports and therefore it is the field of activity of a big farmer and direct income source. The fact that the same plants are constantly contained in a crop system causes the physical and chemical properties of soils to deteriorate. At the beginning of the necessary measures to improve soil structure and gain nitrogen with organic matter to the soil; leguminous plants for green fertilizer. In our study, it was stated that weed control can be used as the main N source of viticulture and that grape yield and quality depends on the N intake of grapevine and competitive ground cover plants can be used as a tool that manages excessive viability in vineyards. In this research, the biggest vineyard area and grape production of Manisa province, the effect of alfalfa on the weed control was investigated by using alfalfa in the region and the fact that alfalfa was resistant to the form is very important in terms of its competitiveness and its effect on allelopatics it is possible to use in the control of weeds.

Keywords: *Viticulture, grape, weed, Medicago sativa L.*

CHECK LIST AND NEWLY RECORDED CRABRONID WASPS (HYMENOPTERA: CRABRONIDAE) FOR THE FAUNA OF TOZEUR PROVINCE, TUNISIA

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ABSTRACT

In this study, based on data published on literature and newly collected specimens, the list of Crabronid wasps which are considered as important element for the management and monitoring of biodiversity in ecosystems, in Tozeur Province (Southern Tunisia) was established and new species were recorded for the first time. A total of 37 species belonging to 18 genera, 9 tribes and 5 subfamilies: Astatinae Lepeletier de Saint Fargeau 1945; Bembicinae Latreille, 1802; Crabroninae Latreille, 1802, Dinetinae W. Fox, 1895 and Philanthinae Latreille, 1802 are listed from published literature. For newly collected materials, 2 species belonging to Crabronidae Latreille, 1802: Liris haemorrhoidalis (Fabricius, 1804) and Trypoxylon scutatum Chevrier, 1867 were reported for the first time for the fauna of Tozeur Province. Furthermore, with this study, repartition air of these two identified species in Tunisia was clarified and so the fauna of Tozeur province on Crabronid wasps was increased to 39 species. Morphological characters of taxonomic importance of newly recorded species were illustrated and photographed. For each identified species, taxonomic account, geographical distribution in Tunisia and in the world were provided.

Keywords: *Crabronidae, Morphology, New records, Taxonomy, Tozeur, Tunisia.*

INTRODUCTION

Crabronid wasps are small to medium sized hymenopteran insects with colour variation of their body from the yellow and red to black completely. They are fossorial but they can nest in plant stems and various pre-existing cavities (Bohart & Menke, 1976).They belong to Apoidea superfamily. Worldwide, fauna of this group is presented by 9005 species divided into 8 subfamilies and 243 genera (Pulawski, 2019). Due to their predation behavior, Crabronid wasps contribute to maintain the equilibrium between arthropod populations and so participating to the sustainability and biodiversity of ecosystem (Vieira et al., 2011). Furthermore, they can be a valuable management tool to assess and evaluate habitat quality and structure. In this way, faunistic studies on this fauna and establishment of species lists are necessary because this kind of studies are considered as a basis and necessary work to make and disseminate important decisions for conservation of biological diversity (Renner & Ricklefs, 1994). Additionally, a lot of Crabronidae species prefer Saharan climate and they are active during high temperature (de Beaumont 1964). Tozeur province situated in Southern Tunisia is characterized by this type of climate and can be so rich on Crabronid wasps.

For this reason, we aim in this study to establish a check list of species and to report new taxa for this province.

MATERIAL AND METHODS

Literature online as well as old documents hosted in the Museum National d'Histoire Naturelle (MNHN), Paris, France were used to establish the check list of Crabronid wasps in Tozeur. Systematic and nomenclature of recorded taxa follow mainly Pulawski (2019).

Newly collected materials from Tozeur province in Southern Tunisia during Summer 2018 using insect nets was evaluated. Collected specimens were preserved in 70 % alcohol prior to identification. Then they were pinned, mounted and labelled. For each specimen, collected place, date, altitude and name of collector were mentioned on the label.

Specimens were identified using Leica EZ4 stereomicroscope following diverse identification keys proposed in the literature and then identification confirmed by comparison with well identified species hosted in the Museum National d'Histoire Naturelle (MNHN), Paris, France.

For each newly identified species, records cited in the literature, general distribution and redescription are given.

Identified materials are deposited in the personal collection of BEN KHEDHER, in laboratory of Entomology and Insect Ecology in Regional Research Center for Horticulture and Oragnic Agriculture in Chott Meriem (CRRHAB Chott Meriem-Sousse, Tunisia).

RESULTS

1. Check list of Crabronid wasps:

Family Crabronidae Latreille, 1802

Subfamily Astatinae Lepeletier de Saint Fargeau, 1845

Genus *Astata* Latreille, 1797

1.1. *Astata fumipennis* (E. Saunders, 1910)

Distribution in Tunisia: Sfax (von Schulthess, 1926), Tozeur (von Schulthess 1926; Pulawski, 1957).

General distribution: Algeria, Egypt, Tunisia (Pulawski, 2019).

Subfamily Bembicinae Latreille, 1802

Tribe Bembicini Latreille, 1802

Genus *Bembix* Fabricius, 1775

1.2. *Bembix chlorotica* Spinola, 1839

Distribution in Tunisia: Kairouan, Tozeur (von Schulthess, 1926).

General distribution: Algeria, China, Egypt, Jordan, Libya, Saudi Arabia, Tunisia, Western Sahara, Yemen (Pulawski, 2019).

1.3. *Bembix galactina* Dufour, 1854

Distribution in Tunisia: Sfax (Schulz, 1905), Tozeur (von Schulthess, 1926).

General distribution: North Africa (Pulawski, 2019).

1.4. *Bembix integra* Panzer, 1801

Distribution in Tunisia: Tozeur (von Schulthess, 1926).

General distribution: Russia, Western Europe, Southern Europe, Eastern Europe, Iran, Turkmenistan, Kazakhstan (Antropov et al., 2017), Tunisia (von Schulthess, 1926).

1.5. *Bembix oculata oculata* Panzer, 1801

Distribution in Tunisia: Kairouan, Monastir, Tozeur (von Schulthess, 1926).

Remark: This species is mentioned by Smits van Burgst (1913) but without specific locality.

General distribution: North Africa, Russia, Western Europe, Southern Europe, Eastern Europe, Abkhazia, Azerbaijan, Syria, Jordan, Lebanon, Israel, Saudi Arabia, United Arab Emirates, Oman, Iran, Afghanistan, Pakistan Central Asia, Kazakhstan, Mongolia, China (Antropov et al., 2017).

Genus *Bembecinus* A. Costa, 1859

1.6. *Bembecinus discolor* (Handlirsh, 1892)

Distribution in Tunisia: Tozeur (Schmid-Egger, 2009).

General distribution: Algeria, Morocco, Tunisia (Schmid-Egger, 2009).

1.7. *Bembecinus tridens tridens* (Fabricius, 1781)

Distribution in Tunisia: Bizerte, Douz, Gabes, Gafsa, Jendouba, Tozeur (Schmid-Egger, 2004).

General distribution: Palearctic region excluding: Libya, Egypt and Arabian Peninsula (Schmid-Egger, 2004).

Genus *Stizus* Latreille, 1802

1.8. *Stizus tricolor* Handlirsch, 1892

Distribution in Tunisia: Tozeur (von Schulthess, 1926).

General distribution: Algeria, Cyprus, Egypt, Iran, Israel, Socotra, Sudan, Syria, Tunisia, Turkey (Pulawski, 2019).

Subfamily Crabroninae Latreille, 1802

Tribe Crabronini Latreille, 1802

Genus *Lindenius* Lepeletier de Saint Fargeau and Brullé

1.9. *Lindenius effrenus* (Kohl, 1915)

Distribution in Tunisia: Kebili, Tozeur (Dollfuss, 2006), Kairouan (de Beaumont, 1956)

General distribution: Algeria, Canary Islands, Morocco, Tunisia (Pulawski, 2019).

1.10. *Lindenius pygmaeus* (Rossi, 1794)

Distribution in Tunisia: Jendouba, Tozeur (Dollfuss, 2006), Nabeul (Leclercq, 1975).

General distribution: North Africa, Russia, Western Europe, Northern Europe, Southern Europe, Eastern Europe, Turkey, Syria, Jordan, Israel, Iran, Afghanistan, Central Asia, Kazakhstan (Antropov et al., 2017).

Tribe Larrini Latreille, 1810

Genus *Prosopigastra* A. Costa, 1867

1.11. ***Prosopigastra handlirschi*** Morice, 1897

Distribution in Tunisia: Kairouan, Kasserine, Sfax, Tozeur (von Schulthess, 1926; Pulawski, 1979), Medenine, Tunis (Pulawski, 1979).

Remark: This species was mentioned by Gussakovskij (1933) but without specific locality. According to Pulawski (1979) determination of specimen reported from Tozeur by von Schulthess (1926) is not certain.

General distribution: North Africa, Spain, Eritrea, Arabian Peninsula, Palestine, Turkey (Pulawski, 2019).

Genus *Tachysphex* Kohl, 1883

1.12. ***Tachysphex incertus*** (Radoszkowski, 1877)

Distribution in Tunisia: Jendouba (Pulawski, 2007), Sfax (von Schulthess, 1926), Tozeur (von Schulthess, 1926; Pulawski, 2007).

General distribution: Europe North to Southern France, Northern Italy, Hungary, Slovakia, Central Ukraine, and Southern Russia, Africa South to Southern Egypt and Mali, Asia including Arabian Peninsula North to Turkey and Northern Kazakhstan, East to Pakistan (Pulawski, 2007).

1.13. ***Tachysphex panzeri*** (Vander Linden, 1829)

Distribution in Tunisia: Kairouan (von Schulthess, 1926), Monastir (von Schulthess, 1926; Pulawski, 2007), Tozeur (von Schulthess, 1926; Pulawski, 1971, 2007), Tunis (Graeffe, 1906, von Schulthess, 1926), Medenine, Kebili, Gabes, Gafsa, Nabeul, Kasserine, Sousse, Sfax, Jendouba (Pulawski, 2007).

Remark: This specie was mentioned by Costa A. (1893) but without specific locality.

General distribution: Africa from Mediterranean coast to Southern Sahara, Europe North to North Sea in Holland, to Baltic Sea in Poland and Lithuania, Asia east to Kazakhstan, Sri Lanka, Mongolia (Pulawski, 2007).

Genus *Tachytes* Panzer, 1806

1.14. ***Tachytes freygessneri*** Kohl, 1881

Distribution in Tunisia: Gafsa, Sfax, Tozeur (von Schulthess, 1926).

Remark: This specie was mentioned by Costa A. (1893) but without specific locality.

General distribution: North Africa, Russia, Western Europe, Northern Europe, Southern Europe, Eastern Europe, Turkey, Iraq, Iran, Tajikistan, Uzbekistan, Kazakhstan, China (Antropov et al., 2017).

Genus *Larra* Fabricius, 1793

1.15. ***Larra anathema*** (Rossi, 1790)

Distribution in Tunisia: Tozeur (von Schulthess 1926).

Remark: It is mentioned by Schmid-Egger (2014) from Tunisia but without specific locality.

General distribution: Southern Europe, North Africa, Western and Central Asia, China (Schmid-Egger, 2014).

Tribe Miscophini W. Fox, 1894

Genus *Miscophus* Jurine, 1807

1.16. ***Miscophus pseudomimeticus*** de Andrade, 1960

Distribution in Tunisia: Tozeur (de Andrade, 1960).

General distribution: Canary Islands, Egypt (Pulawski, 2019).

Tribe Oxybelini Leach, 1815

Genus *Belomicrus* A. Costa, 1867

1.17. ***Belomicrus schulthessi*** Kohl, 1924

Distribution in Tunisia: Tozeur (Guichard, 1991).

General distribution: Iran, Kazakhstan, Libya, Morocco, Saudi Arabia, Tunisia, Turkmenistan, United Arab Emirates (Pulawski, 2019).

Genus *Oxybelus* Latreille, 1797

1.18. ***Oxybelus fischeri*** Spinola, 1839

Distribution in Tunisia: Kairouan (von Schulthess, 1926), Gabes, Kebili, Tataouine, Tozeur (Dollfuss, 2008).

General distribution: Algeria, Canary Islands, Egypt, Israel, Italy, Jordan, Libya, Morocco, Saudi Arabia, Spain, Tunisia, Turkey, Yemen (Pulawski, 2019).

1.19. ***Oxybelus lamellatus andalusiaticus*** Spinola, 1843

Distribution in Tunisia: Kebili, Medenine, Sousse, Tozeur (Dollfuss, 2008), Tunis (Graeffe, 1906), Monastir (von Schulthess, 1926).

Remark: The distribution of *Oxybelus lamellatus* Olivier, 1812 given by Dollfuss (2008), Graeffe (1906) and von Schulthess (1926) may referred to *O. lamellatus andalusiaticus* Spinola, 1843 because this subspecies is common to North Africa. Also, this subspecies is cited by de Beaumont (1950) and Bitsch & Leclercq (1993) to be occurred in Tunisia but without specific locality.

General distribution: South West Europe, North West Africa, Bahrain (Pulawski, 2019)

1.20. ***Oxybelus lubricus*** de Beaumont, 1950

Distribution in Tunisia: Tozeur (Dollfuss, 2008).

General distribution: Algeria, Tunisia (Pulawski, 2019).

1.21. ***Oxybelus mucronatus moricei*** (de Beaumont, 1950)

Distribution in Tunisia: Gafsa, Kebili, Sousse, Tataouine, Tozeur (Dollfuss, 2008).

General distribution: Algeria, Canary Islands, Libya, Morocco, Tunisia (Pulawski, 2019)

1.22. ***Oxybelus quatuordecimnotatus*** Jurine, 1807

Distribution in Tunisia: Gafsa, Kasserine, Kebili, Sousse, Tozeur (Dollfuss, 2008).

General distribution: North Africa, Russia, Western Europe, Northern Europe, Southern Europe, Eastern Europe, Saudi Arabia, Oman, Yemen, Turkey, Syria, Jordan, Israel, Iran, Afghanistan, Pakistan, Central Asia, Kazakhstan, Mongolia, China (Antropov et al., 2017).

Genus *Pseudomicroides* Antropov, 2001

1.23. ***Pseudomicroides nitidus*** Antropov, 2001

Distribution in Tunisia: Tozeur (Antropov, 2001).

General distribution: Tunisia (Pulawski, 2019).

Tribe Palarini Schrottky, 1909

Genus *Palarus* Latreille, 1802

1.24. ***Palarus bernardi*** de Beaumont, 1949

Distribution in Tunisia: Tozeur (Pulawski & Prentice, 2008).

General distribution: Nortwest Africa to Mauritania, Burkina Faso, Sudan (Pulawski & Prentice, 2008).

1.25. ***Palarus fulviventris*** Latreille, 1812

Distribution in Tunisia: Tozeur (Pulawski & Prentice, 2008).

General distribution: North Africa, Israel, Arabian Peninsula, Iran, Central Asia, Western China (Pulawski & Prentice, 2008).

1.26. ***Palarus laetus*** Klug, 1845

Distribution in Tunisia: Tozeur (von Schulthess, 1926; Pulawski & Prentice, 2008).

General distribution: North Africa South to Benin, Togo and Ethiopia, Middle East, Arabian Peninsula, Pakistan, India (Pulawski & Prentice, 2008).

1.27. ***Palarus rufipes*** Latreille, 1812

Distribution in Tunisia: Gabes (Pulawski & Prentice, 2008), Gafsa (de Beaumont, 1949d; von Schulthess 1926), Kairouan, Medenine (de Beaumont, 1949d); Tozeur (von Schulthess 1926; de Beaumont, 1949); Nabeul (Pulawski & Prentice, 2008).

General distribution: Morocco to Tunisia (Pulawski & Prentice, 2008).

Subfamily Dinetinae W. Fox, 1895

Genus *Dinetus* Panzer, 1806

1.28. ***Dinetus dentipes*** E. Saunders, 1910

Distribution in Tunisia: Tozeur (de Beaumont, 1960).

General distribution: Algeria, Egypt, Kazakhstan, Morocco, Tunisia, Turkmenistan, United Arab Emirates (Pulawski, 2019).

Subfamily Philanthinae Latreille,1802

Tribe Cercerini Lepeletier, 1845

Genus *Cerceris* Latreille, 1802

1.29. ***Cerceris capito*** Lepeletier de Saint Fargeau, 1845

Distribution in Tunisia: Kebili (Dollfuss, 2018), Tozeur (von Schulthess, 1926), Tunis (de Beaumont, 1951).

General distribution: Algeria, Egypt, Libya, Morocco, Tunisia (Pulawski, 2019).

1.30. ***Cerceris chlorotica*** Spinola, 1839

Distribution in Tunisia: Medenine (Schmidt, 2000), Sfax (de Beaumont, 1951; Dollfuss, 2018), Tozeur (von Schulthess, 1926; Schmidt, 2000).

General distribution: North Africa, Sudan, Israel, Iraq (Schmidt, 2000).

1.31. ***Cerceris quadricincta*** (Panzer, 1799)

Distribution in Tunisia: Beja, Jendouba, Gafsa, Kasserine, Sousse, Tunis, Zaghouan (Dollfuss, 2018), Tozeur (von Schulthess, 1926; Dollfuss, 2018).

General distribution: Southern and Central Europe, North to Great Britain and Northern Germany, Northwest Africa until Tunisia, Turkey, Israel, Iraq, Iran, Afghanistan, Central Asia, Kazakhstan (Schmidt, 2000).

1.32. ***Cerceris rutila*** Spinola, 1839

Distribution in Tunisia: Gafsa, Sfax, Tozeur (von Shulthess, 1926), Gabes, Kasserine, Medenine, Tataouine, Le Kef, Nabeul, Sidi Bouzid (Dollfuss, 2018), Tunis (Graeffe, 1906), Sfax (de Beaumont, 1951).

Remark: This species was mentioned by Schletterer (1889) but without specific locality.

General distribution: Egypt to Tunisia (Schmidt, 2000).

1.33. ***Cerceris spinipectus teterrima*** Gribodo, 1894

Distribution in Tunisia: Sfax (Schulz, 1905; von Schulthess, 1926; de Beaumont, 1951), Sidi Bouzid (de Beaumont, 1951), Tozeur (von Schulthess, 1926; de Beaumont, 1951), Tunis (Gribodo, 1894; de Beaumont, 1951).

General distribution: Algeria, Libya, Tunisia (Schmidt, 2000).

Tribe Philanthini Latreille, 1802

Genus *Philanthus* Fabricius, 1790

1.34. ***Philanthus coarctatus*** Spinola, 1839

Distribution in Tunisia: Monastir (von Schulthess, 1926)**,** Kebili, Sousse, Tataouine, Tozeur (Dollfuss, 2017).

General distribution: North Africa, Chad, Ethiopia, Mali, Sudan, Turkey, Uzbekistan, Iraq, Iran, Israel, Syria, Saudi Arabia, United Arab Emirates, Oman, Italy (de Beaumont, 1958; Schmid-Egger, 2014; Dollfuss, 2017; Gülmez & Can, 2017; Jahantigh et al., 2017).

1.35. ***Philanthus triangulum*** (Fabricius, 1775)

Distribution in Tunisia: Monastir (von Schulthess, 1926), Gafsa, Jendouba, Le Kef, Monastir, Nabeul, Sousse, Tozeur, Tunis (Dollfuss, 2017).

Remark: This species was mentioned by Schulz (1905) and Smits van Burgst (1913) but without specific locality. Generally, the subspecies *Philanthus triangulum abdelcader* Lepeletier, 1845 is known to be very spread in North Africa.

General distribution: North Africa, Russia, Western Europe, Northern Europe, Southern Europe, Eastern Europe, Abkhazia, Georgia, Azerbaijan, Turkey, Syria, Jordan, Israel, Saudi Arabia, Yemen, Iraq, Iran, Afghanistan, Pakistan, Central Asia, Kazakhstan, China (Antropov et al., 2017).

Tribe Pseudoscoliini Menke, 1967

Genus *Pseudoscolia* Radoszkowski, 1876

1.36. ***Pseudoscolia berlandi*** (de Beaumont, 1949)

Distribution in Tunisia: Gabes, Tataouine, Tozeur (Dollfuss, 2017).

General distribution: Algeria, Egypt, Israel, Tunisia, United Arab Emirates (Pulawski, 2019).

1.37. ***Pseudoscolia dewitzi*** (Kohl, 1889)

Distribution in Tunisia: Medenine (Schmid-Egger, 2014), Tozeur (von Schulthess, 1926; Dollfuss, 2017).

General distribution: Algeria, Canary Islands, Egypt, Jordan, Libya, Morocco, Oman, United Arab Emirates, Tunisia (Pulawski, 2019).

2. Newly recorded species

Taxonomic account:

Family: Crabronidae Latreille, 1802

Subfamily: Crabroninae Latreille, 1802

Tribe: Trypoxylini Lepeletier de Saint de Saint Fargeau, 1845

Genus *Trypoxylon* Latreille, 1796

Trypoxylon scutatum Chevrier, 1867 (Figure 1. A, B, C)

Examined material: Tozeur: Tozeur center, Oasis Tibebsa, 35 m, N 33º55'27,3" E 8º08'44,5", 27.VI.2018, 1 ♀.

Redescription: Female. Body length: 10 mm. Black, collar with decolored band posteriorly; tarsi slightly cleared. **Head** densely and regularly punctate and intervals between points microcoriaceous; inner orbital eyes highly notched; front with a characteristic shield: completely surrounded by thin carina, apically with obtuse angle, basally hug shaped having central point placed between antennal insertions and outward branch carina short and slightly penetrating into eyes emargiantions; space between lateral sides of frontal shield and orbital inners approximatively equal to width of eyes emarginations; ocelli transparent and anterior ocellus included in frontal shield; clypeal median lobe protruding triangle shaped and laterally sinuated; clypeus and orbital inners covered with appressed silvery pilosity. **Thorax** moderately punctate with smooth intervals, but scutum distinctly punctuated; collar simple not emarginated medially; propodeal dorsal area transversely distinctly carinated. **Gaster** elongated, pygidal plate absent.

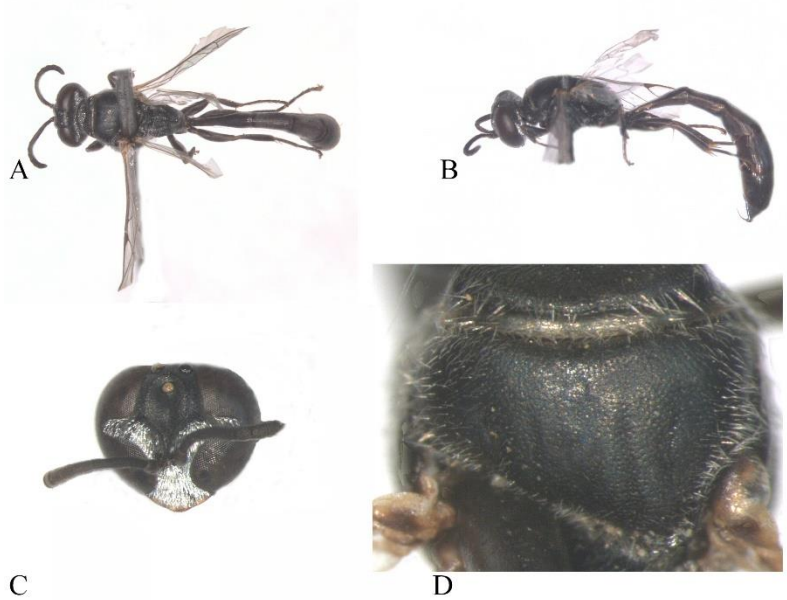

Figure 1: ***Trypoxylon scutatum*** Chevrier, 1867. Female: A: Dorsal view; B: Lateral view; C: Frontal view; D: Scutum.

Distribution in Tunisia: This species is known to be occured in Tunisia but it is not cited in literature and has not specific locality. It is firstly reported from Tozeur.

General distribution: North Africa, Western Europe, Southern Europe, Eastern Europe, Turkey, Syria, Israel, Iran, Afghanistan, Turkmenistan, Tajikistan, Kazakhstan (Antropov et al., 2017).

Tribe Larrini Latreille, 1810

Genus *Liris* Fabricius, 1804

Liris haemorrhoidalis (Fabricius, 1804) (Figure 2. A, B, C; Figure 3. A, B, C, D)

Examined material: Tozeur: Nefta, Nefta oasis, 56 m, N 33º52'39,1" E 7º52'34,9", 28.VI.2018, 1 ♂, Tozeur center, oasis Tibebsa, 35 m, N 33º55'27,3" E 8º08'44,5", 27.VI.2018, 1 ♀.

Redescription:Female. Body length: 13 mm. reddish ferruginous are : scape, pedicel, tarsa, tibiae, apical parts of femora, pygidial plate; dark ferruginous are: antennal articles 3 and 4, tegulae, tergal apical parts and mandibular basal part; rest of body black. Gastral terga covered with golden pubescence. Fore wings hyaline with tinge slightly orange with blackish apices, hind wings hyaline, and veins ferruginous. **Head** with inner orbits converging to vertex, front and vertex with densely small punctuates; posterior ocelli tiny and narrow and their major axes formed a straight line; front, inner orbits and upper part of clypeus with dense golden pubescence, vertex and head posteriorly with sparsely golden pubescence; clypeus densely punctate, its free margin medially slightly emarginate; antennal sockets closely to fronto-clypeal suture; mandibular inner margin not notched. **Thorax** having scutum and scutellum with densely small punctures; scutum with sparsely golden pubescence, scutellum glabrous; propodeal dorsal area finely striated, its medial part glabrous with longitudinal carina and lateral margins with golden short hairs; posterior side of propodeum sharply and covered with sparse golden short hairs; propodeal lateral surface dull, curly striated; mesopleuron covered with

short mixture of white and gloden hairs and dull with densely small punctures; episternal sulcus and mesopleural suture are distinct; metapleuron, finely striated; legs having lower surface of femora I et II covered with appressed golden pilosity, fore and hind coxae simple, mid coxa with median carina elevation on dorsal surface; claws simple. **Gaster** with terga having many short and suberect golden hairs at posterior margin; pygidial plate setose and rounded posteriorly; second gastral sternum basally with short carina medially, gastral sterna II-V with short and golden hairs mixed with many stout, erect and medium length hairs at posterior margin and with sparse punctures.

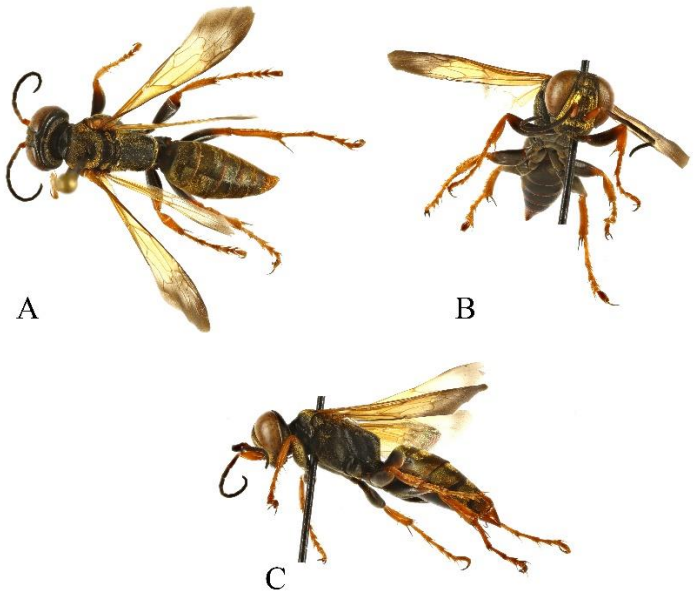

Figure 2: ***Liris haemorrhoidalis*** (Fabricius, 1804). Female: A: Dorsal view; B: Frontal view; C: Lateral view.

Male. Body length 14 mm; colour similar to female except femora totally reddish ferruginous. Head as in female but vertex and head posteriorly with dense golden pubescence. Flagellomeres 2-9 with placoides starting as small oval shaped and becoming wide last flagellomere. Further description as similar to female with exception: propodeal dorsal area with woolly golden setae, gastral terga totally covered with appressed golden setae, pygidial plate emarginate posteriorly and tarsomere 2 of hind tarsus enlarged.

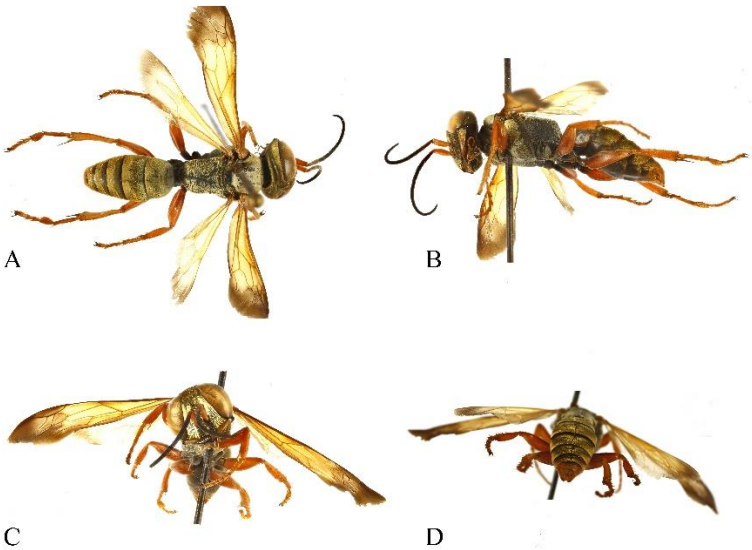

Figure 3: ***Liris haemorrhoidalis*** (Fabricius, 1804). Male: A: Dorsal view; B: Lateral view; C: Frontal view; D: Pygidial plate

Distribution in Tunisia: de Beaumont (1961) mentionned that Tunisia is one of the repartition area of *L. haemorrhoidalis* but did not precise a specific locality**.**

General distribution: Africa, Egypt, Iraq, Mediterranean (Li et al., 2009).

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TREATMENT OF OILY CUTTING FLUID FORMED FROM CNC MACHINES BY SEQUENTIAL OZONATION AND FENTON OXIDATION

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ABSTRACT

The cutting fluid which is also known as Boron oil in Turkey, have been used as coolant and lubricant specifically for metalworking processes such as cutting and drilling operations in CNC machines to prevent corrosion on surfaces by forming an interface between metal surface and fluid. It is classified as dangerous pollutant due to high oil and COD content after useful life.

In this study, the treatability of metal cutting fluid wastewater was investigated. Sequential ozone and Fenton processes were used as the treatment process. Measured parameters during the study were chemical oxygen demand (COD), phosphate, oil-grease, total solids.

The effects of different pH and ozonation times on COD removal efficiency were determined. Pre-treated samples with ozone oxidation (ozonation time:10-150 min; pH: 4-11.5) were treated with Fenton process (1530 mg/L Fe (II); 25,500 mg/L H_2O_2; pH: 3). Removal efficiencies were obtained between 66-89% and 86-96% for ozone and Fenton processes, respectively.

Keywords: *Boron oil, cutting fluid, Fenton, ozone.*

INTRODUCTION

Boron oil have been used for cooling, lubrication and removing of metal turnings from surface in metal processing industries. It has been formulated with various properties to function required by different metal working operation. Metal cutting fluids (MCFs) have been produced as water-based or oil-based in order to meet all of these requirements. Both of oil-based fluids and water-based fluids have been classified into two groups. While oil-based fluids are categorized as pure cutting oils and water-soluble oils, water-based fluids are considered in groups of oil-based fluids and synthetic or semi-synthetic cutting fluids. This classification is based on the mineral content of the MCFs. Therefore, classification is important for both the selection of intended use and the determination of treatment methods of MCFs (Çiftçi, 2007). The using of MCFs has become necessary because of the higher cost of mechanical methods used in manufacturing process (Deluhery ve ark., 2005).

The using of MCFs has many advantages such as preventing friction and wearing between surfaces, ensuring smooth surface formation, extending the useful life of the tools used, removing of metal turnings and improving operating efficiency and quality. Treatment of these fluids is an significant problem since the finished useful life of metal cutting fluids found in the group of hazardous chemicals. MCFs may present in different forms (emulsified, free and dispersed) in wastewater. The most important factor in this classification is the size of the oil droplets.

The treatment of oils from wastewaters are directly associated with the size of oil droplets in water (Fouad, 2013). However, the complexity of the structures of waste metal cutting fluids causes major problems during treatment. Therefore, it may be necessary to use a combination of one or more suitable processes for their treatment.

Some researcher investigated treatability of MCFs with treatment processes such as microfiltration and ultrafiltration (Benito et al., 2004; Hilal et al., 2004, Belkacem et al., 1995), adsorption (Solisio et al., 2002) chemical coagulation (Rios and Pazos, 1998) and biological (aerobic and anaerobic process) (Christopher and Thompson, 2005; Schrever and Coughlin, 1999; Kim et al., 1994; Chen et al., 2006) and electrocoagulation (Kobya et al., 2008).

The aim of this study is determination of treatability of refractory MCFs by combined ozone and Fenton oxidation.

MATERIALS AND METHODS

Ozone Processes

Ozone used as powerful oxidizing have been produced by ozone generator with lab-scale in the study. Capacity of ozone generator is 13 g/h. Concentration of oxygen taken from air have been increased via oxygen

concentrator. Then oxygen produced are feed to ozone generator for O_3 production. Gas ozone is given with diffuser to closed batch reactor as seen in Fig. 1. System is designed as two reactors for both prevent foaming problem and increase to contact of ozone with wastewater. Waste ozone which is unused in treatment have been measured with potassium iodide (KI) solution to determine the ozone used by the wastewater during operation (Figure 1).

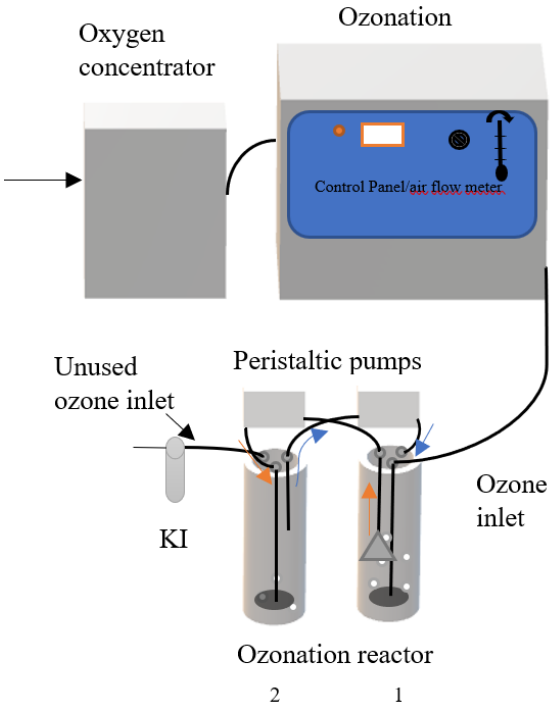

Figure 1. Schematic illustration of ozone process

Samples and Analyzes

Ozonation experiments were carried out by using wastewater of oily metal cutting fluids formed from CNC machines in metal processing industry. Samples was filtered to micron level before treatment. MCF wastewater has been formed after six months of use in the CNC machines.

Experimental working conditions were designed by surface response method (Design Expert Program 11). Both ozonation time and pH were selected independent variable (Table 1). All of pre-ozonated samples in different conditions were treated with optimum experimental condition determined for Fenton process in our previous study (Fe of 1.53 g/L, H_2O_2 of 25.5 mg/L, pH of 3 and time of 60 min). 10N NaOH and 5N H_2SO_4 were used to adjust pH of samples.

In the scope of this study, the parameters of chemical oxygen demand (COD), phosphate, oil-grease and total solids were analyzed. COD (closed reflux methods), phosphate (colorimetric), oil-grease (the liquid/liquid partition-gravimetric method), total solids were analyzed according to APHA methods (APHA, 2005). pH and conductivity measurements were conducted by pH meter (WTW Multi 340i).

Table 1. Treatment conditions for ozone

Run	Ozone Time (min)	pH
1	80	4.0
2	31	5.1
3	129	5.1
4	80	7.8
5	80	7.8
6	80	7.8
7	10	7.8
8	150	7.8
9	129	10.4
10	31	10.4
11	80	11.5

RESULTS AND DISCUSSION

Characterization of MCF was given in Table 2. Values of COD and oil-grase were determined as very high compared to the other wastewater like domestic wastewater or landfill leachate.

Table 2. Characterization of the metal cutting fluid

	pH	Conductivity (ms/cm)	COD (mg/L)	Oil-grase (mg/L)	Total Solid (mg/L)	Phosphate (mg/L)	Suspended Solid (mg/L)
Raw MCF	9.28	3.14	241200	177700	49700	48	6800

According to obtained ANOVA results, ozone time was determined as the most significant parameter on treatment. p value for both model and pH were calculated as 0.0389 and 0.0284, respectively. It was determined that synergistic effect of pH and ozone time also was significant (p value of 0.0561). Removal efficiencies of ozonation changed between 55 and 89%. Additionally, removal efficiency was increased up to 96% after Fenton process. Both direct (O_3) and non-direct (O_3 and $^{\bullet}OH$) ozonation is dominant in low/neutral pH ozonation. Affective removal of COD was provided with long contact time of ozone and MCF. COD removal was low in high pH compared to low pH with ozonation because of $^{\bullet}OH$ radicals was nonselective oxidant. There was not significant contribution of Fenton process used after ozone oxidation. Therefore, it would seem reasonable using of Fenton process after short reaction time in ozonation for treatment of MCF. The model is showing a quadratic distribution for both COD and phosphate (Figure 2 and 3).

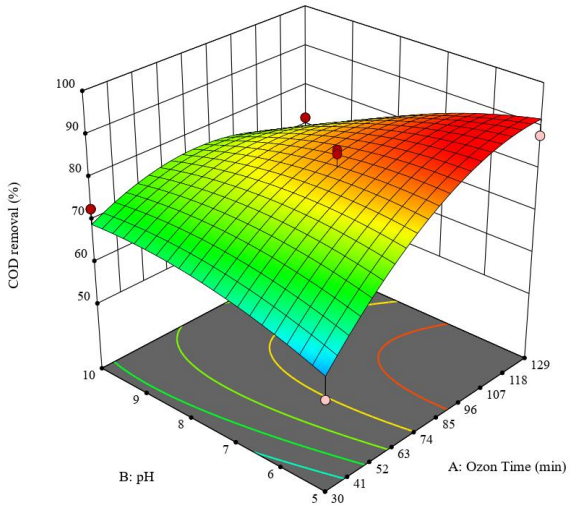

Figure 2. Relationship between COD removal and independent variables after ozonation

Removal of phosphate was obtained among % 90 and %99 with sequential ozonation and Fenton processes. Low-solubility complex such as $Fe_3(PO_4)_2 \cdot 8H_2O$ and $FePO_4$ form by reacting divalent metal salts with phosphate (Haas et al, 2000). Ferric ions formed during redox reactions provided removing the remaining pollutants through coagulation and precipitation with adjusting of samples to pH 8 after oxidation (Figure 3).

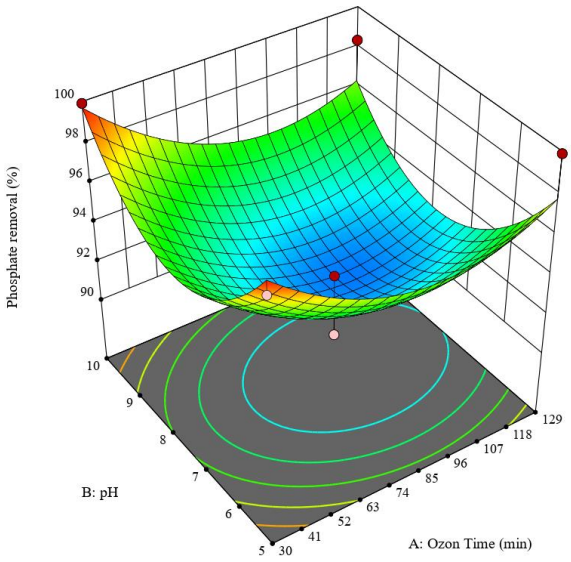

Figure 3. Relationship between phosphate removal and independent variables after sequential ozonation and Fenton

COD value was decreased maximum from 241200 mg/L to 10680 mg/L with sequential ozonation and Fenton oxidation. COD value could not be reduced to discharge limit due to its higher level compared to literature. The phosphate was reduced to below 1 mg / L in most of the experiments (Table 3). Additionally, oil-grase and total solid removal were determined above 95% and 40% after sequential ozonation and Fenton oxidation (Figure 4).

Table 3. Obtained values for COD and phosphate

Experiment No	Effluent COD (mg/L)		Effluent phosphate (mg/L)
	Ozonation	Fenton	Sequential ozonation and Fenton processes
1	27026	12,816	0,0374
2	108438	15,664	0,437
3	28480	16,233	0,0499
4	28480	34,604	3,8
5	31328	10,680	3,101
6	53542	31,684	4,583
7	107228	22,784	0,208
8	48846	27,359	3,509
9	68000	25,276	0,791
10	65220	23,140	0,0416
11	81617	27,412	0,957

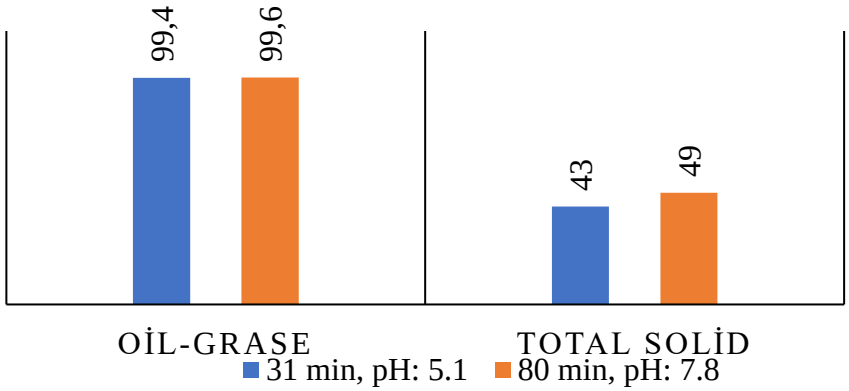

Figure 4. Removal of oil-grase and total solid after sequential ozonation and Fenton oxidation

CONCLUSION

Removal efficiencies of ozonation changed between 55 and 89%. Then removal efficiency was increased up to 96% by Fenton process. However, COD value could not be reduced to discharge limit due to its higher level compared to literature.

According to ANOVA test, ozone time and synergistic effect of pH and ozone time were determined as an important variable in COD removal with ozonation. Phosphate removal ranged between 90 and 99% in different operating conditions. It was concluded that pH adjusting increased removal of phosphate after oxidation.

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BIOLOGICAL CONTROL AGENTS IN INSECTS AND HOST DEFENSE MECHANISMS

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ABSTRACT

Biological control is a method which has been developed by taking advantage of living things in nature and has less negative effects. This study includes; parasitoids, predators and entomopathogens general features and the possibilities for use in biological control. Parasitoids; they feed on a single host their during lifetime and do not kill their host immediately. Adult female parasitoids lay eggs on or in host body then, parasitism ends with the host's death. Then the parasitoid leaves the host's body cavity comes out as adult. Predators are one of the biological control agents that feed many hosts during their lifetime. They kill hosts immediately. Predators search for their prey effectively, find and kill as soon as possible. Entomopathogens; like fungi, bacteria, viruses and protozoa have as an effective pressure on the insect populations.

Effectiveness of biological factors on harmful insects and as a result the defense mechanism in insects were reviewed. Biological factors exceed physicochemical barriers of the insect and enter its body cavity. Then these factors expose to immune responses of host insects as a result of the insect's perception foreign organisms.The immune system of host insects is examined in two part as humoral and cellular. Humoral immune system is called extracellular immunity that occurs in host insect blood.Humoral immune system consists of hemolymph coagulation, antimicrobial peptide sythesis and melanization. Cellular immune system consists of morphological and structural changes of hemocytes in host insects. Hemocytes in insects are mainly; phagocytosis, nodule formation and encapsulation. These immune responses in host insects are undwanted because they make the biological control difficult.

Keywords: *Biological Control Agents, Insect Pests, Humoral Immunity, Cellular Immunity*

INTRODUCTION

Biological control is a method of control which has been developed by taking advantage of living things in nature and has little negative effects. The characteristics of biological control agents and their interaction with their hosts provide a successful control against pests. Determining the metabolic and physiological effects of these factors on target pest species is very important in terms of economic, ecological, environmental and human health as well as physiological. Therefore, the secretions transmitted by biological control agents, which constitute a natural source of biological control, to the hosts and how these secretions affect the host immune system are the basis of many studies. In this review, the general characteristics of parasitoids, predators and entomopathogens which are biological control agents, and their usage possibilities and activities in biological control are given.

PARASITOIDS

Parasitoids; they are nurtured with a single host throughout their life and do not kill their host immediately. The hosts exhibit a number of defense mechanisms such as shaking the head and abdomen, secreting toxic viscous fluids from the body in response to parasitoids. Ectoparazitoids do not encounter any obstacles in laying eggs on their hosts since they paralyze their hosts before they lay eggs (Kılınçer et al., 2010). Endoparazitoite is; lays eggs in the host, biochemical changes are observed in the host and the host dies at the end of this period (Reed at al., 1998).

PREDATORS

Another important factor is predators. These are creatures that find and kill their hosts that feed on many hosts during their lifetime. Monophage predators are the most preferred predator species in biological control. The best example of this is *Rodolia cardinalis*, which is used in biological control against *Icerya purchasi*. Polyphag predator species are effective in maintaining the natural balance and reducing the populations of many harmful species. (Kılınçer et al., 2010).

ENTHOMOPATHOGENS

Other biological control agents that are effective on pest populations are entomopathogens. Examples of entomopathogens are fungi, bacteria, viruses, nematodes, protozoa.

FUNGI

Fungi; Hypocreales and Entomophthorales are the most widely used teams in biological control. The fungus spores attach to the insect cuticle and initiate infection by forming a penetration structure. The fungus proliferates in the hemolymph and the host's death occurs. Finally, the fungus shows hyphae development in the host.

BAKTERIA

Bacterial species prominent in biological control are *Bacillus thuringiensis, B. sphaericus*. Bacteria enter their hosts by mouth. It forms a crystal structure during the infection, activates endotoxins, prevents the feeding of the crystals, disintegrates the cell and insect death occurs.

VIRUSES

Viruses that are important for microbial control are the species in the Baculoviridae family. Viruses often enter their hosts through the digestive tract orally, and some mechanically with parasitoid. Viruses cause a decline in development, a decrease in life and fertility, and a general weakening of insects. The process between the virus and the host proceeds as follows; insect feeds on virus dish with leaves. The host's digestive tract is blocked, the virus multiplies in the insect cells, and the insect dies (Kılınçer et al., 2010).

NEMATODES

Entomopathogenic nematodes refers to nematodes that can kill their hosts in a short time with the help of mutualistic bacteria. (Adams et al., 2006). Nematodes benefit from the bacterial killing of the host with its pathogenic properties. Bacteria also make insect tissue suitable for the growth and reproduction of the nematode. It also prevents the host of the nematodes from the other microorganisms in the soil to settle in the body of the host. (Boemare,2002; Griffin et al., 2005).

IMMUNE SYSTEM OF HOST INSECTS

Species that are effectively used to combat insects encounter the insect's immune system. The immune system of insects is examined in two groups as natural and acquired.

NATURAL İMMUNİTY

Natural immunity has an innate resistance that protects the organism against infection organisms (Er,2011). Natural immunity is effective in stimulating acquired immunity. They do not develop a certain memory in this mechanism, they show the same reaction every time encounter a microorganism.

ACQUİRED İMMUNİTY

In acquired immunity, the host develops an immunological memory(Er,2011). Acquired immunity is divided into two as humoral and cellular immunity. Humoral immunity is non-cellular immunity that occurs in host insect body blood. There are three types of reactions in the humoral defense process: melanization, hemolymph coagulation and synthesis of antimicrobial peptides. The task of melanization is to gain resistance to and neutralize pathogens (Sevgili,2017). Hemolymph coagulation is a mechanism developed to prevent insect blood loss and to prevent the spread of microorganisms. The synthesis of antimicrobial peptides allows the target microorganism to break down and die (Er,2011). Cellular immunity; is a hemocyte mediated immune response as a result of morphological and structural changes of hemocytes. Phagocytosis consists of nodule formation and encapsulation. Phagocytosis is an essential immune response of insects to small organisms such as bacteria, viruses, fungi and protozoa. (Lavine,2002; Er,2011). Adhesion to the organism after recognition of the foreign organism, the initiation of signal transduction for the ingestion of the organism, the formation of false feet, the ingestion of foreign matter and the breakdown of the foreign particle are among the stages of phagocytosis. (Lavine,2002;Er,2011). Nodules are extracellular clot and hemocyte aggregates, usually having a melanized necrotic center, which are located around a large number of foreign particles. Encapsulation is described as non-self-perception of the foreign pathogen, formation of very densified flattened hemocyte layers around it, and killing of the pathogen as a result of partial or complete melanization in the hemocyte layers (Er,2011). Hemocytes contact the foreign object, granulocytes attach to the foreign object. Plasmatocytes drawn into the medium become flattened by adhering to the capsule and form a plurality of cell layers. The resulting capsule is covered with a thin layer of granulocytes. The capsule melanizes (Levin,2007, Er,2011).

CONCLUSION

As a result, as a result of a mechanism realized between the host and biological control agents, the host tries to defend himself and to reduce the effect of the biological control factors. In order to use biological

control agents more effectively, the mechanism of action of the host against biological control agents should be well known.

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TREATMENT OF DOMESTIC WASTEWATER WITH SUPERCRITICAL WATER OXIDATION AND COMPARISON TO CONVENTIONAL METHODS

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ABSTRACT

Domestic wastewater is generally treated with biological treatment systems. Oxidation and some other treatment systems can be integrated to the treatment plants as an additional treatment process for achieving desired water quality.

In this study, the usage of supercritical water oxidation (SCWO) after physical pretreatment as an advanced oxidation process was investigated to be alternative to conventional treatment systems for domestic wastewater. One of another important aim of this study was to examine the decomposition of organic matter of wastewater in a short reaction time under the supercritical water conditions by providing high temperature (374°C) and pressure (22.1 MPa). Different reaction time and oxidant doses were used as independent variables in the study. In the scope of this study, chemical oxygen demand (COD), phosphate, UV-visible range absorbance, pH and conductivity parameters were analyzed.

The highest removal efficiencies for COD and phosphate were determined as 80% (time: 15 min; DOD: 2) and 99% (time: 17.1 min; DOD: 1.25), respectively. According to obtained results, high treatment efficiency (81%) were achieved in a short reaction time (0.16 h). SCWO can be recommended for the treatment of wastewaters including higher COD, toxicity and lower biological degradation.

Keywords: *COD removal, phosphate removal, supercritical water oxidation, wastewater treatment.*

INTRODUCTION

Domestic wastewater generally has been treated via conventional treatment processes consisting of biological systems. Search on innovative treatment system is ongoing as an alternative to conventional treatment because of some disadvantages such as large areas for plant, personnel and labor force requirements, long reaction time for treatment units and higher chemicals requirement of conventional systems.

Advanced oxidation and filtration processes have been generally preferred for recalcitrant and toxic organic/inorganic pollutants while biological processes were used for treatment of biodegradable organic pollutants. (Stasinakis 2008). Most of these treatment processes for higher water quality have integrated to conventional wastewater treatment plants (WWTPs).

The properties of liquids highly changeover near its critical point (Table 1). The dielectric constant, viscosity and density are much lower, and the number and persistence of hydrogen bonds are both diminished. Its properties are between gas and liquid phase. Therefore, supercritical fluids can be extremely suitable for processing of a wide variety of matrices. As a result, organic compounds can be completely soluble in near-critical water like many organic solvents and complete miscibility with SCW.

Table 1. Comparison of liquid and supercritical conditions of the water

Some properties	Liquid condition	Supercritical condition
Density (kg/m^3)	994,160	233,125
Viscosity (μPa.s)	890,400	32,110
Ionization coefficient ($logK_w$)	-13,99	-17,61
Dielectric constant	78,460	3,530
Heat capacity (kJ/kg.K)	4,137	136,406

In 1982, organic sewage treatment using super critical water oxidation was first reported by Prof. Modell. However, using of SCWO is not common due to some problems like severe corrosion, salt deposition and high operating costs since then. Some researchers have proposed several methods for controlling corrosion

such as changing of reactor type and materials in SCWO systems (Modell 1985). Oxidation in supercritical water has been used for treatment of industrial wastewater (Vadillo et al. 2009), leachate (Chi et al. 2018, Civan et al. 2015, Gong and Duan 2010), coking wastewater (Du et al. 2010) by some researchers.

The aims of this study are; (a) investigation of treatability of domestic wastewater with supercritical water oxidation (b) the determination of the effect of both different oxidation dose (H_2O_2) and reaction time on removal efficiencies.

MATERIAL AND METHODS

Samples were taken from effluent of physical treatment units of Konya Wastewater Treatment Plant. Physical units consist of screens, grit chamber and primary clarifier. Capacity of Konya WWTP is approximately 200.000 m^3/day. Wastewater characterization and effluent quality of treatment plants were given in Table 2.

Table 2. Wastewater characterization and effluent quality of treatment plants

	pH	COD (mg/L)	TP (mg/L)	Absorbance 436	525	620
Raw wastewater	8.4	424	17	0,183	0,125	0,1

Description and operation condition of SCWO process

The supercritical water oxidation was applied with 25 mL/min capacity reactor which could be operated as continuous flow or batch mode (Figure 1). Internal volume of the reactor was 300 ml. Maximum operating temperature and pressure of the reactor controlled by PID were 600 ◦C and 35 MPa, respectively. SCWO reactor was heated at a rate of 10 °C/min in electric furnace which had heating coil.

Firstly, the temperature was set on the desired value and then H_2O_2 and wastewater separately were fed into the reactor by booster pumps. The temperature of the reactor was measured by three temperature sensors located inside. The desired excess oxygen was determined according to initial COD of domestic wastewater.

The treated samples that completed the retention time in the reactor were transferred to the heat exchanger for cooling down. After the cooled fluid was passed through a metal filter which had 0.5 μm pore diameter, the pressure was decreased by back pressure regulator (BPR) and then liquid and gas were separated by phase separator.

Samples analyzes

In the scope of this study, chemical oxygen demand (COD), phosphate, UV-visible range absorbance, pH and conductivity parameters were analyzed. COD (closed reflux methods) and phosphate (colorimetric) were analyzed according to APA methods. pH and conductivity as used probe analyzed. UV-visible range absorbances were also determined by Hach-Lange Dr 5000 spectrophotometer.

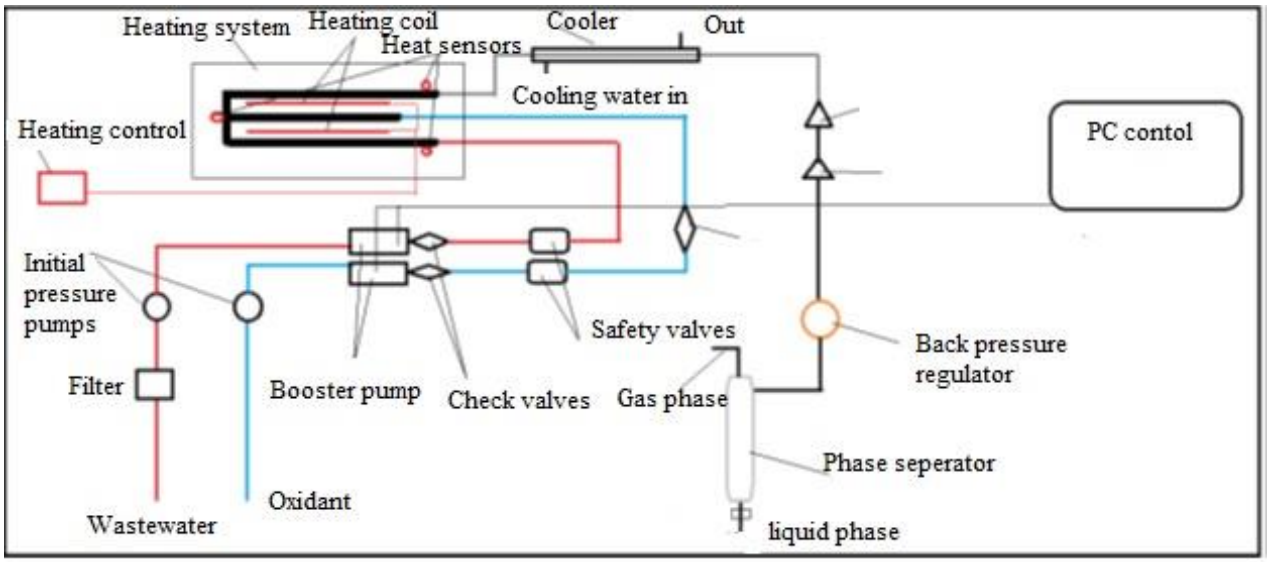

Figure 1. Scheme of the SCWO system

Working Condition

Dimensionless oxidant dose (DOD) and retention time were used as independent variables. Fixed reaction temperature (375°C) and pressure (23 MPa) were selected. Additionally, DOD and retention time were conducted between 0.19-2.31 and 3.0-15 min, respectively. Detail of working conditions were given Table 3. Hydrogen peroxide (H_2O_2) was used as oxygen source. Experimental set was generated via Design Expert Program (version 11).

Table 3. Experimental operating conditions for SCWO process

Experiment No	**Time (min.)**	**DOD***
1	17,1	1,25
2	10	1,25
3	15	2
4	10	1,25
5	15	0,5
6	10	1,25
7	10	1,25
8	2,9	1,25
9	5	0,5
10	10	2,31
11	10	0,19
12	10	1,25
13	5	2

*DOD: Dimensionless oxidant dose

RESULTS AND DISCUSSION

Measurement of color was conducted in both raw wastewater (RW) and treated samples by measuring of absorbance values at 436, 525 and 620 nm wavelengths. Nearly similar results were observed at three wavelengths for color removal. According to obtained results, color removal could directly associate with oxidant dose. Lowest color removal efficiency was obtained as 27% at 10 min and 0.19 DOD, while highest color removal was obtained as 92.5% at 10 min and 2.31 DOD (Figure 2). Additionally, color removal exceeded to 85% above 1.25 DOD ratio.

DOD was more important parameter than reaction time for the oxidation of organic compounds, as can be seen from Figure 3. COD removal efficiency raised from 31 to 81% as DOD increased from 0.5 to 2.0 except experiments having lowest and highest oxidant dose. Although reaction time increased throughout all experiments having DOD of 1.25, variations of organic compound degradation was negligible. However, increasing the reaction time increased the removal efficiency of COD while the oxidant dose was 2 DOD. Lowest removal was achieved as 31% at 0.5 DOD and 5 min. Degradation of COD tends to increase at high oxidant dose. This was seen obvious in the Figure 3 as well. Consequently, it is inappropriate to enhance the treatment by extending reaction time, oxidant dose being more effective to increase degradation.

Phosphate removal was determined between 90-99.5% with SCWO process in this study. Unlike COD, both the reaction time and the oxidant dose were affective parameters in phosphate degradation (Figure 4). It was determined that SCWO process more effective on phosphate removal than Konya municipal wastewater treatment plant (54%).

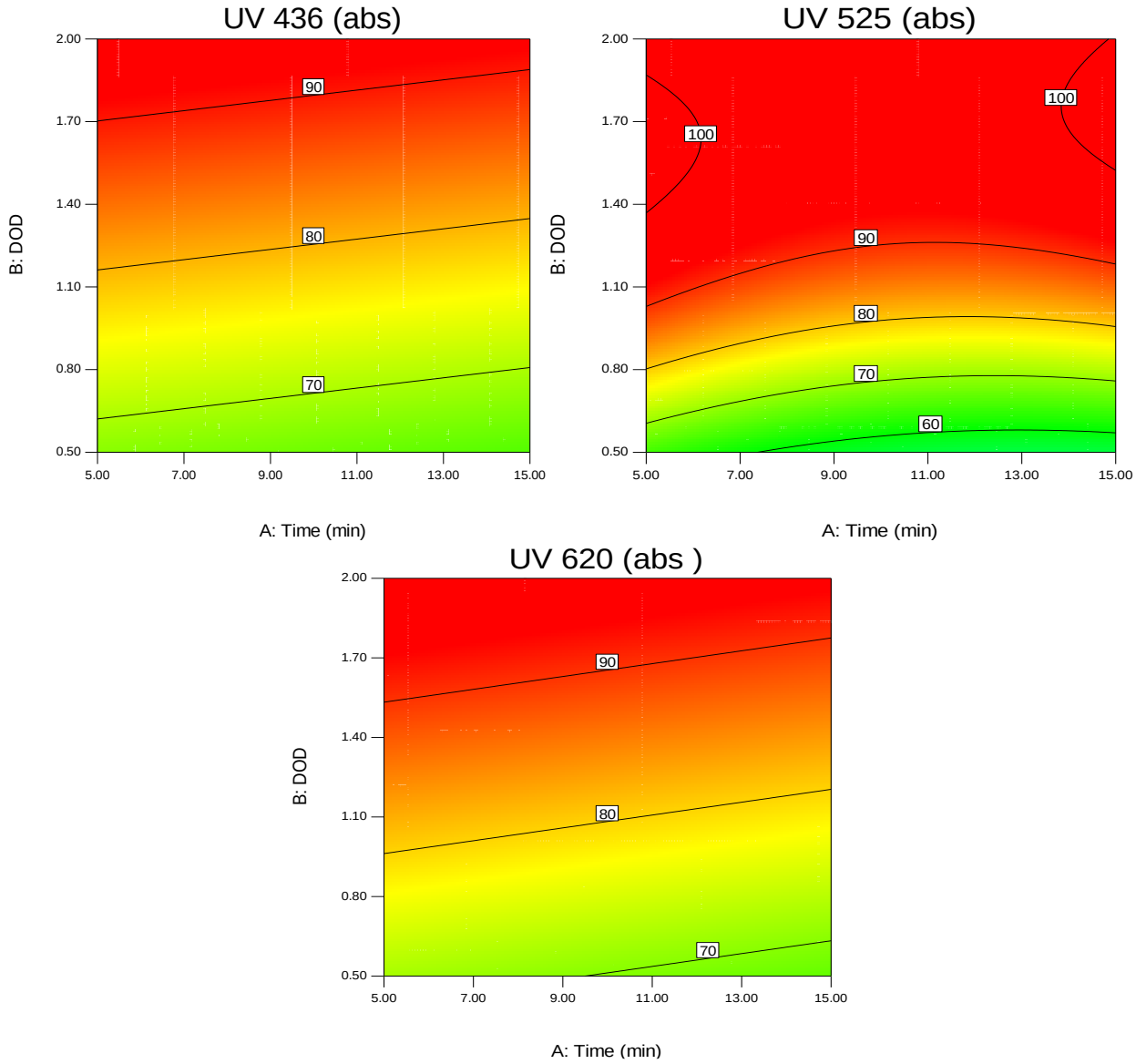

Figure 2. Color removal efficiencies for the absorbance values obtained in 436 nm, 525 nm and 620 nm wavelengths

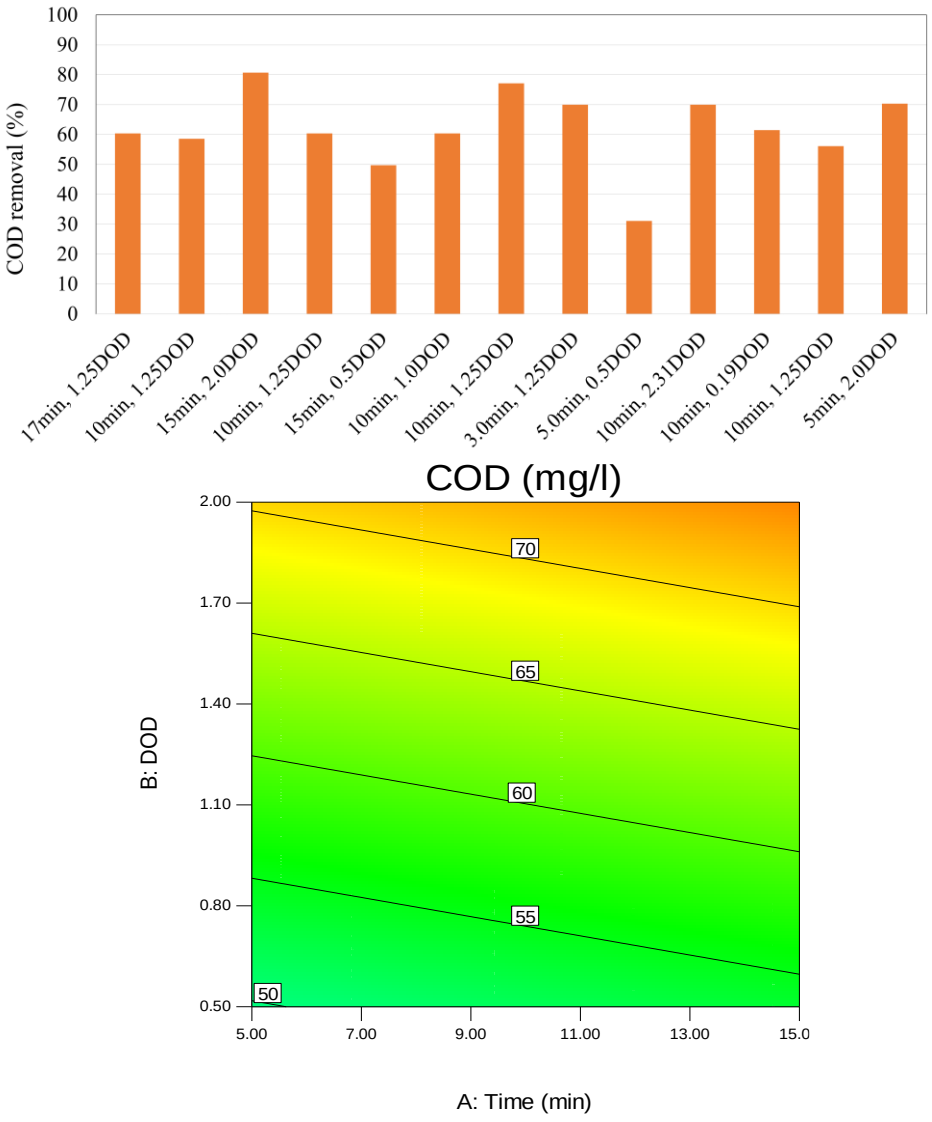

Figure 3. Variations of COD degradation in different operating conditions

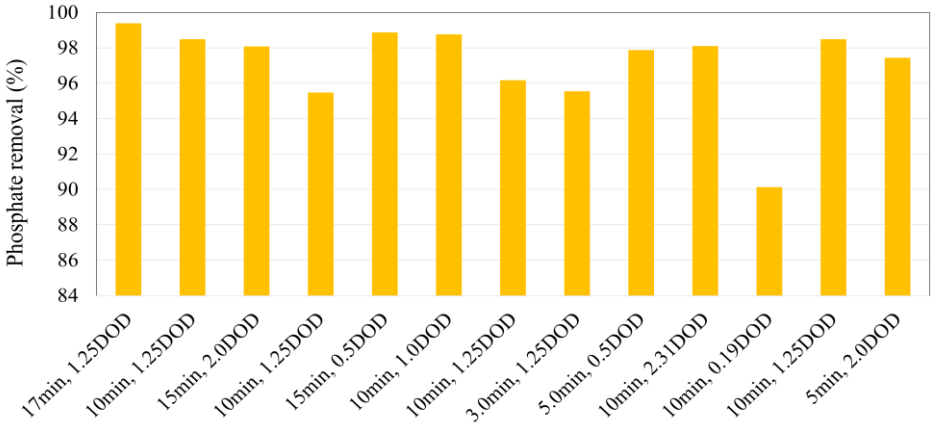

Figure 4. Variations of phosphate degradation in different operating conditions

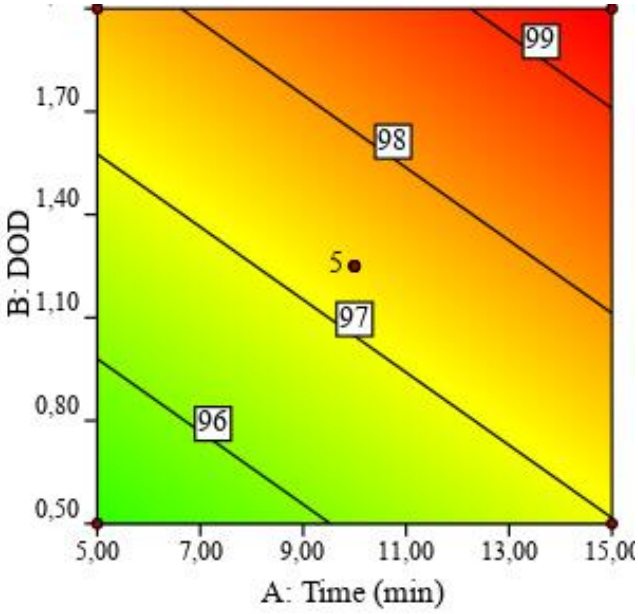

Figure 5. The effects of independent variables on the phosphate removal efficiency

ANAVO analyses obtained from Design Expert Program were given in Table 4. The relationship between COD and color removal especially for 436 and 525 nm with model were found significant. Moreover, it is understood from the p-values (<0,05) that oxidant dose was more effective for both removal of COD and color (436 and 525 nm) compared to time. The response variables were fitted to linear model as a result of the evaluation of experimental data.

Some treatment methods to removal of COD from domestic wastewater and comparison with SCWO were given in Table 5. SCWO process showed a competitive performance with the removal of 81% COD in very short reaction time.

Table 4. ANOVA results for the investigated parameters

Parameter	F value	P value	F value	P value	F value	P value	Model
	Time		DOD		Model		
COD (mg/l)	0.2866	0.6041	8.00	**0.0179**	4.14	**0.0489**	Linear
Absorbance (436 nm)	0.1245	0.7315	8.13	**0.0172**	4.13	**0.0493**	Linear
Absorbance (525 nm)	0.1670	0.6914	7.90	**0.0185**	4.03	**0.0520**	Linear
Absorbance (620nm)	0.1792	0.6810	6.94	0.0250	3.56	0.0680	Linear
Phosphate (mg/l)	1.27	0.2852	2.58	0.1392	1.93	0.1958	Linear

Table 5. Comparison of supercritical water oxidation and conventional treatment methods in terms of COD removal efficiency

Classical Treatment Methods	**HRT (hour)**	**Influent COD (mg/L)**	**Effluent COD (mg/L)**	**Removal efficiencies (%)**
Package treatment	8-16	1250	33.23	97
Classical activated sludge	4-8	490	107.8	78
4-Stage Bardenpho (Konya WWTP)	8-20	424	54	87
Membrane Bioreactor	6.1	883.3	50.2	94
This study (SCWO)	**0.16**	424	86	81

(Uysal and Üstünyıldız, 2016)(Bingül and Altıkat, 2017)(Tanyol and Uslu, 2013)(Azman, 2005) (Nas and Hatipoğlu, 2019)

CONCLUSION

The interactive effects of two independent variables such as oxidant dose and reaction time were experimented. Oxidant dose on the removal of COD and color was determined as an important variable than reaction time. Removal of COD and color were determined between 31-81% and 27% and 93%, respectively.

Dimensionless oxidant dose (DOD) and reaction time were effective parameters for phosphate removal. Phosphate removal efficiencies were determined between 90 and 99% in different operating conditions.

It was concluded from this study that the SCWO process could compete with other conventional treatment systems in terms of COD, color and phosphate removal efficiency. Therefore, the SCWO system could be preferred for wastewater having especially high organic contents due to the destruction capability in a short reaction time (0.16 h).

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DIVERSITY, MEDICINAL USES AND CONSERVATION STUDIES OF GRAVEYARDS FLORA OF PALOSI PESHAWAR, PAKISTAN

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ABSTRACT

The current study was conducted at four different graveyards of Palosi, Peshawar for assessing the role of graveyards in conservation, diversity and ethnomedicinal status of the area. The data was collected through questionnaire method which shows that inhabitants of the area practice several plants for treating numerous diseases. A total of 102 plant species were found belonging to 43 families, which were castoff as curative for 57 ailments. The result shows that fungi and pteridophytes are represented by single specie while monocots and dicots are represented by 10 and 90 species respectively. Number of families in major plant groups was recorded as 39 from dicots four from monocot and one each from Pteridophyte and Fungi. Total plants species were documented with 81 genera, the leading genera percentages were noted as 10 from Asteraceae while Zygophyllaceae was found with minimum number of three genera. The percentage of leading plant species in different families was noted from Asteraceae, Brassicaceae, Poaceae and Papilioniceae. Polygonaceae was the family noted with minimum numbers. Medicinally 12 species were used for curing bronchitis, 10 species each are used for diarrhoea and skin diseases and eight species each are used for treating diabetes and malaria. Rest of the species were used for curing different diseases like blood pressure, cough and swelling *etc*. Medicinal categorization of plant species shows that 16 species are diuretic, six species each are used as laxative and anti-inflammatory, four species are used as anti-parasitic and three species each are used as dysentery, purgative and respiratory. The plants parts which are most commonly used are leaves (34.6%), seeds (12.5%), stem (9.6%), root (8.6%), fruit and bark (6.7% each), flowers and oil (3.8% each), gum and pastes (2.8% each), rhizome (1.9%), buds and tubers (0.9% each) while incase of whole plant 24.0%. All the species were identified with the help of flora of Pakistan. Among them 68 plant species were found as indigenous while 34 species were exotic. Conservation status was checked according to the IUCN redlist categories 8.1 version (2010). In which 69 species were found not evaluated, 31 were least concern and two species were data deficient. Hence the indigenous flora was found to be reducing day by day due to the invasion of exotic species and unsustainable usages adopted by the local peoples. Similarly majority of species were not yet been listed and evaluated through IUCN redlist categories. Therefore it is proposed that some native species needs to be re-introduced in the local flora by using indicator species like *Dalbergia sissoo* and *Acacia modesta*.

Keywords: *Graveyard, Plant diversity, Medicinal Plants, Conservation status, Palosi.*

INTRODUCTION

Area and different research sites

Peshawar is the capital of Khyber Pakhtunkhwa province, which stands on the entrance of the world famous Khyber Pass. The district is located between 71°22′ to 71°42′ East longitudes and 33°44′ to 34°15′ North latitude on elevation of about 358 meter (1173 feet) from the sea level. Due to tropical climatic conditions and high moisture in monsoon (July-August), there is diversity in vegetation of the area. Mean extreme temperature of the area rises in summer up to 40 °C and falls in winter up to 10 °C. Peshawar is mostly fertile planes and the soil texture is fine sandy and clay mixture, which support a variety of flora (GoP, 1998). According to the local peoples of the area, Palosa (*Acacia modesta* Wall.) is the name of a plant which was found here at large scale, so for this reason peoples from the ancient times named this area as Palosi. The village of Palosi (*i.e.*, Atozai, Talarzai, Maghdarzai and Peeran) are surrounded by the green farming area and is situated four kilometres away from the University of Peshawar

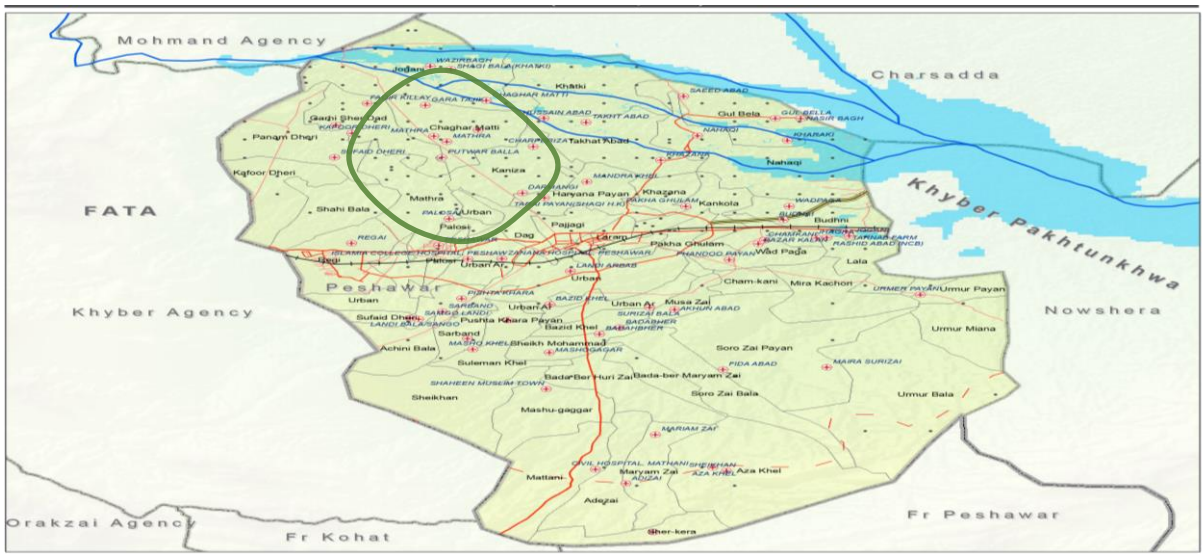

Fig-1: Map of the research area (Source: Peshawar Reference Map USAID June 14, 2012)
The old and historical graveyards of the area are named as

1. Kaankaro Adera (Talarzai)
2. Sheikh Umar Baba Regi Adera (Maghdarzai)
3. Nizamuddin Baba Adera (Peeran)
4. Akhun Baba Daag Adera (Atozai Warsak Road)

Flora of the Area

Well known fruit plants of Palosi include *Eriobotrya japonica, Phoenix dactylifera* and *Morus nigra etc.* Weeds are *Silybum marianum, Rumex dentatus, Poa annua* and *Parthenium hysterophorus* and ornamental *i.e., Pinus roxburghii, Aloe vera, Bauhinia purpurea,* and *Canna indica*. Several plants are used as medicinal remedies for treating different ailments which are *Carthamus oxycantha, Calotropis procera, Zizipus jujuba, Morus alba* and *Ficus carica.* For Timber and wood species *Dalbergia sissoo, Tamarix aphylla, Eucalyptus camaldulensis, Prosopis juliflora, Acacia nilotica* and *Populus nigra* are used. The common shrubs are (Spilmay) *Calotropis procera* W.T. (Aiton.) and (Drab) *Desmostachya bipinnata* L. Stapf. All kinds of roses and flowers like *Chrysanthemum indicum* L. (Guledawoodi), *Jasminum officinale* L. (Chamba), *Lonicera japonica* Thunb. (Rambel), *Narcissus tazetta* L. (Nargis) *Ocimum basilicum* L. (Kasmalo) *Nerium oleander* L. (Gander) *Tagetes erecta* L. (Mori Gul), are grown in the area (Jamshed *et al*., 2014).

Biodiversity and its current conservation status

It is assumed that about 4 billion plants are slash down every year in the world. The major reason is demographic burden; growth rate of Pakistan is 3.1% per year, which mark it among the utmost populated nation in the world, whereas on other hand the unsustainable utilization of plant natural resources may also affect biodiversity and status of conservation for the native indigenous flora. If the situation prevails, we lost our plant biodiversity and many species will reached to threatened levels. Therefore awareness regarding sustainable utilization of plant species for conserving plant biodiversity should be encouraged in the area to protect and conserve vegetation of local flora (Khan *et al*., 2013). Besides this, graveyards play a great part in conservation of plants resources *i.e.*, potential of old urban cemeteries are contributing biodiversity conservation to urban areas for specific cultural ecosystems (Razzaq *et al*., 2013).

Role of graveyards flora

Muslims graveyards are considered to be the most secured and ideal habitats for natural vegetation, because of special religious privileges and cultural roles (Ali *et al*., 2017). Different kinds of curative species grow naturally in graveyards which are used as therapeutic for various ailments (Rahman *et al*., 2008). Remedial species are the source of medication against several infections (Abbasi *et al*., 2009). Graveyards are well-known traditional habitats, which accomplish key roles in protection of the local flora (Molnar *et al*., 2017). The declining of the local flora is due to local exhaustion and unsustainably, that's why graveyards are the excellent conservatoires for medicinal and indigenous flora (Hadi *et al*., 2014). Graveyards conserve remnant vegetation of Tehsil Peshawar (Hussain *et al*., 2011). The local inhabitants had a great respect to graveyards and evade interfering with the natural vegetation in these places (Ilyas *et al*., 2018).

It is significant to file the prospective of ethno remedial information of plants growing in graveyards, which can be exploited by the local inhabitants. It is evident from the previous studies that a little scientific attention has been given towards these conserved areas of graveyards. That's why it is important to design study for screening the existing floristic diversity and to check the conservation status of the species growing therein (Shah *et al*., 2016).

Justification: Previously, no research work has been carried out on graveyard flora of this area, its uses, and importance in conservation status. Therefore, the present research is proposed to overcome this academic gape. The present study will focus on exploring the role of graveyards flora in conservation, diversity, medicinal and socio economic uses for the local community. The religious sanctity and role of graveyard flora will also be highlighted. Indigenous species growing in these graveyards sites can be used as indicator species for conservation and reforestation.

Socioeconomic benefits of the study

The Graveyards have a religious sanctity and are the most conserved places in the study area. Its flora is comparatively more conserved and some indicator species are growing inside the graveyards *i.e*., *Acacia modesta*, *Dalbegia sissoo* and herbs like *Fagonia cretica* and *Argemone maxicana*. The present study will provide a guideline for future research and conservation studies. Moreover, the role of graveyards will be highlighted in the conservation of indigenous plant biodiversity and documentation of ethno-medicinal knowledge regarding various plant species used by the local inhabitants of the area for curing various ailments.

Aim and Objectives

The objectives of the presents study are to;

1. prepare a checklist of plants of various graveyards of Palosi.
2. document medicinal uses of various plants in graveyards of Palosi.
3. highlight the role of graveyards in conservation.

Plants contains valuable basis for various bioactive composites which use for various human ailments directly and indirectly. Due to the huge price of allopathic medicines and worse reactions on human health, people from the rural area usually select herbal medications for different ailments. Approximately 80% World's population are reliant upon herbal traditional medicines for their

healthcare, specifically peoples in the tribal and rustic areas (WHO 2004). Hussain *et al*. (2008) explore a wild medicinal flora of Hattar, district Haripur, Pakistan. They concluded that the area contain a wide spectrum of medicinal flora which is use by the tribal people for plenty ailments. Nuzzi (2008) stated that plants derived drugs are growing slowly and gradually while demands for alternative and complementary medicine is being increasing with the passage of time. Khan and Khatoon (2008) identified folk medicine and uses of herbs in Bugrote and Haramosh valleys northern areas Gilgit. They concluded that peoples are using plants in prevention and curing of numerous diseases like diabetes, blood pressure, rheumatism, asthma, abdominal problems and stomach problems etc. Khan (2009) evaluated a research in Cholistan desert of Pakistan for the purpose to explore the usage of wild medicinal plants, in which 35 plant species were used as medicinal remedies such as *Calotropis procera* (Aiton), *Phyllanthus nirurii* L. and *Butea monosperma* (Lam.) were used as antiphlogistic, demulcent and emollient. *Phyllanthus nirurii* L. *Clerodendron phlomoides* L. *Capparis decidua* (Forssk.), *Amaranthus trilocular* L. and *Ricinus communis* L. were used as stomachic, carminative and appetizer. While *Aerva javanica* (Burm. f.) were used in dysentery and diarrhoea. Ali *et al*. (2009) recommended that tabibs and local practitioners of Chitral valley normally suggest useful plant part or its drugs for handling out different illnesses. These practitioners were inherited from descendants, through peers and never had educated formal in any medical institute. Furthermore it has concluded that soil destruction and concentrated deforestation are the main factors in reduction of the local flora. That's why it is suggested to take urgent actions for plant assets and conservation of the area.

Sabeen and Saeed (2009) explored the flora of Abbotabad city, Pakistan for the purpose of folk medicinal flora. They prepared a detail checklist and provided information regarding 108 plants belonging to 52 families. Tareen *et al*. (2010) conducted a study on folk medicine and indigenous knowledge of khuzdar and kalat regions Balochistan, Pakistan and concluded that the local healers do not provide prescription and related information to the native peoples which is affecting conservation status by the rough usages of plants materials. Also Shinwari (2010) documented that people are still using herbal medicines for treating various ailments on the other side deforestation and demographic pressure in Himalayas is generally attributed to increase in demand of fodder, timber and fuel wood and livestock population due to which conservation status is affecting. Pakistan is sanctified with numerous flora and climates, but a slight care has been given on certification of plants used as remedies for household remedies and treatment of different ailment. Likewise Ahmad *et al*. (2011) documented that most of the peoples from Kabal, district Swat, Pakistan are using plants for many purposes *i.e* timber wood, fodder for cattle's and fuel, food purposes. Murad *et al*. (2012) stated about ethnomedicinal properties of plant resources in district Malakand, hazar nao forest, where 132 medicinal plants were recorded from 65 families. In which 7 were monocot 64 were dicot, 3 pteridophytes, 1 gymnosperm and 61 were angiosperm. Ghani *et al*. (2012) conducted a study on ethno botanical survey and folk recipes of district, Mianwali Pakistan. They found that *Acacia nilotica* and *Dalbergia sisso* are the most common originated trees throughout the district. Furthermore it has stated that medicinal plants contain dynamic constituents of chemicals in any of their part, which produce definite curing responses in the action against numerous ailments in both the human and animals.

Ishtiaq *et al*. (2012) found that peoples from the hilly areas are entirely reliant on indigenous vegetation to meet their necessities of life. Shedayi and Gulshan (2012) stated that majority population of the world are quiet depend on the herbal medications; some plant contains antimicrobial agents which are the source of treatment for different skin problems. Raut and Shrestha (2012) carried out a study in Morang district, Nepal to find the status of knowledge from the local healers of the area about the use of herbal medication for cattle diseases. For this purpose seven villages were taken on concerns with traditional uses. They recorded that 37 plant species belong to 24 families are used for the treatment of 21 common diseases of cattle's. Shah and Farrukh (2012) conducted a research on significance of plants and conservation status from several areas of chakesar valley, district Shangla. They suggested that conservation status should be evaluated through IUCN standards. In this study 127 plant species were evaluated for conservation status. Amongst those (9%) 12 species were (IF) infrequent, (25%) 32 species (VU) vulnerable, (37%) 47 species were endangered (E), and (28%) 36 species was found (R) rare. The study had concluded measures for awareness of indigenous community for in-situ conservation and formation of nurseries and gardens for sustainability of plant resource in the area as ex-situ conservation. They revealed that therapeutic species should be planted on big scale and should

be used to protect nature; role of some medicinal plants are in deprived condition that's why these plants should be assumed as precedence for conservation.

Sharma (2012) carried a study on documentation of ethnomedicinal uses of plants for local community and various livestock ailments in himalaya sikkim, India. They concluded that 37 medicinal plants were treating diseases like wound, dysentery, disorders, weakness, and bleeding. Vidyarthi *et al*. (2013) documented the native uses of some important curative plants used by the local inhabitants of north western Himalaya Himachal, Pradesh, India. They suggested conservation strategies because residents of the area are mostly contingent on plants for the treatment of various diseases. Moreki (2013) documented the use of originated flora used to treat parasites diseases of poultry, for this purpose 15 villages of the area were investigated from 1000 family in which most of the plants were frequently used from Liliaceae and Asteraceae. Overall 19 plants were recorded as representative of 15 families which were used by household poultry bearers to resist poultry parasites and diseases. Bokhari *et al*. (2013) explored Azad Jammu, Kashmir, Pakistan for medicinal Importance of plant categories. They noted *Achilleamille folium* with more medicinal values as the rest of presented species. Mahmood *et al*. (2013) explored the ancient knowledge about plant species from district Gujranwala, Pakistan. The study was determined for the purpose to examine a primary data for broad studies on bio-dynamic composites of local medicinal flora. According to the survey some plants must be partitioned for complete pharmacological studies to discover new biological compounds and several plants to provide a major part in elementary health care requirements.

Goraya *et al*. (2013) investigated that certain areas from urban peri Punjab, Pakistan was still using plants to cure equine disease. A total of 60 taxa belongs to 40 families were documented which symbolized for the use to cure different conditions of equines diseases. Fabaceae was the major signified family with five plants. 31 species were used for the usage of numerous infections. *Citrullus colocynthis* (L.) plant parts were the most repeated medicines used for various syndromes disorders of equines. Shah and Rozina (2013) conducted a research on Peer Taab, Dheri baba, graveyards, Swabi, Pakistan to explore phytodiversity and Phytosociological characteristics of vegetation. They selected various sites on the base of leaf form spectra, physiognomy, topography, floristic composition and species diversity. They concluded that soil was somewhat sandy and alkaline in texture, and most of the therophytes were healthier adjusted to dry climate. Species like *Calotropis procera*, *Boerrhavia procumbens*, *Cynodon dactylon*, *Digera muricata*, *Cyperus rotundus*, *Tribulis terristris*, *Zizypus mauritiana* and *Tribulis terristris* were found subjugated in selected plant communities. Bhardwaj *et al*. (2013) conduct a survey on plant species for ethno botanical importance and its uses in district Bandipora Jammu Kashmir. Total 33 species were testified from the study area, which were belonged to 32 genera and 25 different species. The most dominated plant families were Lamiaceae, Liliaceae and Asteraceae, each containing three species. Mostly plant were used against different ailments such as anorexia, diarrhea, gaseous bloat, indigestion, milk deficiency, yoke gall, constipation etc.

Azam *et al*. (2013) performed a survey on ethnomedicinal properties of plant species between two tribes of the Gors and the oraons. Overall 74 medicinal species were obtained from the ancestral therapists in whom 9 were acquired from the Gor traditional healers and 65 species from the Oraon and circulated amongst 43 families. The ailments treated with the plants were diabetes, nerve stimulant, fever, respiratory tract disorders, and blood purification etc. Prasad *et al*. (2013) explored the area for ethno botanical survey in Wayanad from paniya and adiya tribes of district, Kerala. Plant preparations were castoff for peripheral application were 84%, while 16% for interior treatment of common infections. Following were the treated ailments such that tumour, foot and mouth disease, stomach disorders etc. Rahman (2013) recorded angiosperm diversity with emphasis on medicinal plants in graveyards of Rajshahi, Bangladesh. A total of 106 plants were recorded from the major class angiosperm, under 44 families and 91 genera in which 49 plants species have been documented to cure of more than 45 diseases. Prakash (2014) carried out a study on traditional uses of curative plants in Himalayan Region Uttarakhand. He provided a detailed description about 111 plant species which is used for numerous ethnomedicinal purposes. Raina *et al*. (2014) stated that plants are essential components of an ecosystem and are used as timber, food and medicines etc. They are very important for health care as about 80% peoples from the world are reliant upon traditional medicines**.**

Hosseinzadeh *et al*. (2015) highlighted the importance of traditional management practices for various human infections and diseases. They concluded that *Thymus vulgar* contains bioactive compounds with antifungal and antibacterial properties. Dogra *et al*. (2015) stated that treatments for

various diseases are based on plant parts are common practice for ethno medication among the ethnic societies throughout the world. Razzaq *et al*. (2015) explored the vegetation of higher altitude of district Shangla for conservation status and medicinal importance of plant species. They found different species belonging to 21 families in which one was tree, 2 species were climbers, 3 were shrubs, and 19 were herbs. *Ajuga bracteosa*, *Berberis vulgaris*, *Geranium wallichianum*, *Paeonia emodi* and *Valeriana jatamansii* were considered the most significant species of the area. Whereas they suggested the dire need for protection of plant biodiversity and conservation status of the area. Khan and Musharaf (2015) conducted a survey on conservation status and ethnomedicinal importance of plant species in Takht Bhai, district Mardan, Pakistan. They revealed that most of the species are endangered and not a single plant was originated dominant because the natural flora is in glitches of agricultural practices and constructional developments. Saleh *et al*. (2015) proved that plants are the assets for old traditional remedies while most of the modern medications are dependent on the plants indirectly. Ethnobotany is a natural science and diverse form of numerous traits dealing with botany, medicine, ecology, economics, cultural, religious and some additional disciplines. Therefore awareness is suggested for sustainable utilization of the native vegetation for the conservation purposes which help in maintenance of those species to encounter the necessity for curing ailments, but also traded as a source of income-generation. Ahmad *et al*. (2016) recorded diverse flora from district Dir Lower. They collected 65 species distributed into 60 genera and 42 families. Among these 2 species (3.07%) were noted from higher class gymnosperm, 17 species (26.98%) were monocots and 46 species (73.02 %) were recorded from dicots which is used by the local community for different ailment purposes.

Carag and Buot (2017) enlisted a detail checklist for Philippine medicinal plants, its order and families. The accepted names, families, and orders in this checklist followed by the current classification and inclusive references. The writers equally included an alphabetical listing of older and conserved family names, a total of 48 orders out and 182 families were recorded for convenience and practical uses. Moreover, the checklist not only provides the information about the rich medicinal flora of the Philippines but as well as the extensive knowledge about plant diversity for the local population. Khan *et al*. (2018) stated that due to high dependency on traditional remedies and its increasing demand for health issues, fundamental strategies must be taken for improving the sustainable uses of biodiversity and ultimately conserve flora. Suitable measures should be taken for ethnomedicinal flora conservation and biodiversity by encouraging networks between the local, regional and national coordination's for taking actions regarding sustainable utilization and improving conservation status. Regulatory platforms should be implemented for aggressive species growing in the area. Muhammad *et al*. (2018) carried out study about plant resources and conservation status of Hazar-Nao hills; district Malakand Pakistan. They collected 77 plants species from the area belonging to 42 families. In which 15 (19.48%) species were found rare, 19 species (24.67%) were infrequent, 20 species (25.97%) were endangered and 23 species (29.87%) were vulnerable. Due to anthropogenic activities, burning, excessive collection and overgrazing, the plant resources in the area are under the stress. That's why satisfactory in-situ conservation policy is needed to be adopted for the restoration of the local flora and to bring awareness about plant resources and its viable consumption.

MATERIALS AND METHODS

Research area

The research data was collected from four different graveyards of village Palosi (*i.e.,* Atozai, Talarzai, Maghdarzai and Peeran) and is situated about four kilometres away from the University of Peshawar. The old and historical graveyards of the area are named (i) Akhun Baba Daag Adera (Atozai Warsak) (ii) Sheikh Umar Baba Regi Adera (Maghdarzai) (iii) Kaankaro Adera Rahatabad (Talarzai) and (iv) Nizamuddin Baba Adera (Peeran) graveyards.

Field visits and Plants Collection

The present study was carried out to assess medicinal usages and diversity of graveyards flora of Palosi District Peshawar. For this purpose the area was extensively surveyed during field trips in 2017-18. Plants were collected from different sites of the area in order to collect information from the local residents about their local names, traditional and medicinal uses (Annex-1). During collection the local community was interviewed through questionnaire method adopted by Ali and Qaiser (2009). Collected plants were pressed and put in the old newspapers to remove the moisture and the dried plants were

mounted on herbarium sheets. The vouchers specimens were deposited at the Centre of Plant Biodiversity University of Peshawar Herbarium (UPBG).

Identification of species

The plants were identified with the help of Flora of Pakistan, and relevant literature including Nasir and Ali (1970-1989); Ali and Nasir (1989-1991); Ali and Qaiser (1993-2019).

Check List and Medicinal uses

The checklist of plants was arranged alphabetically along with their family names, local names, english names, part used and medicinal importance will be listed in the Check List.

IUCN Conservation studies

The conservation status of plant species was obtained by applying the IUCN redlist Categories (2010) Version 8.1 (Annex-1).

RESULTS AND DISCUSSION

The present study was conducted at village Palosi district Peshawar Pakistan. For this purpose the area was surveyed to gather plants species from different sites in order to collect information from the local residents about their local names, traditional and medicinal uses (Annex-1). The data presented in Table-1 are showing the information of plants species regarding botanical name, family, common name, diseases treated and part used for indigenous ethnomedicinal purposes of the area *i.e.*, i) Palosi Atozai (Akhun Baba, Pir Bala), ii) Palosi Talarzai (Kaankaro Adera), iii) Palosi Maghdarzai (Sheikhumar Baba), iv) Palosi Peeran (Sheikh Imamuddin Baba) Graveyards (Fig-1). At the present study total of 102 plant species were recorded for their medicinal usage, belonging from different plant groups of 43 families, which are used as curative for 57 diseases *i.e.*, (Asthma, blood clotting, diabetes, cold fever, oedema, swelling, indigestion, diarrheic, malarial, foot and mouth disease, headache, insomnia, constipation, dysentery, fever, weakness and skin ailments etc. All these medicinal plants are collected from the surroundings of research area, which were used as remedial against different ailments (Table-1).

Documentation of medicinal uses for various Graveyards Plants

The term "medicinal plant" encompasses different types of plants used in herbal medication. Nowadays, herb is called to any portion of the plant species like stem, root, flower, fruit, bark, leaf, stigma or seed and non-timbered plants. It is evident that various plant parts used included leaf, whole plant, seed, stem, root, fruit, bark, flower, oil, gum pastes, rhizome, buds and tubers. Most commonly plant parts use were leaves 36 (34.6%), charted by whole plant 25 (24.0%), seed 13 (12.5%), stem 10 (9.6%), root nine (8.6%), fruit and bark seven (6.7%), flowers and oil four (3.8%), gum pastes three (2.8%), rhizome two (1.9%), buds and tubers one (0.9%) respectively (Fig-2).

From the recent study it has observed that 12 species were casted off for curing bronchitis, 10 species each were used for diarrhoea and skin diseases nine species were used for treating asthma eight species each were used for diabetes and malaria, six species each were used for curing blood pressure, cough and, swelling, three species each were used for treating mouth diseases, oedema, and blood clotting, while two species each are used for treating liver, kidney and one specie is used for curing leucorrhoea (Fig-3). Collected plants treat the numbers of ecto and endo parasitic diseases which were better in results in comparison with the previous related literature. Lulekal *et al*. (2014) enlisted various plants from Ethiopia, for the treatment of 23 diseases. Such that Gastro-intestinal, ecto and endo parasitic, foot and mouth disease, poisoning and hepatitis *etc*. Simillarly Yineger, (2007) conducted an ethnomedicinal survey and observed the use of 74 curative species which were disseminated among 37 families and 64 genera for the treatment of 25 diseases. The herbs were in the most obsessive and progressive forms of utilization. *i.e.*, (47.3%, 35 species) was tracked by shrubs (37.84%, 28 species). According to Sharma and Kumar (2013) Plants have been used by tribal and local peoples for curing many diseases.

So here we medicinal categories of plant species were recorded *i.e.*, 16 species are used as diuretic, six species each were used as astringents, anti-inflammatory, and laxative, four species were used as anti-parasitic, three species each were used as dysentery, purgative, and respiratory, one specie each were used as, inhibitory, stimulant, antioxidant agents, anthelminthic, and anti-rheumatic (Fig-4). Plants located in deserts and graveyard sites are merely similar in some factors like water availability and plants competition, that's why it might be found similar on some physiological and phytochemical characteristics like *Calotropis procera* (Aiton) and *Ricinus communis* L. (Khan, 2009) Desert

Cholistan, Pakistan was explored for the usage of wild medicinal plants, in which 35 plant species were used as medicinal remedies such as *Calotropis procera* (Aiton), were used as demulcent and emollient and *Ricinus communis* L. were used as stomachic, carminative and appetizer. Because of similar stress drought conditions in deserts and graveyards, it can be stated that some of the xerophytic plants available in deserts can be easily accessed from the graveyards for the purpose of their medicinal trend and usages. While Tipu *et al.* (2006) suggested a complete description of medicinal properties of many plants which performs as antioxidant, anticarcinogenic, antibacterial, antifungal, analgesic, anticoccidial and insecticidal. *i.e.,* Strong antibacterial plants are *Zizyphus valgaris*, *Atlanta monophylla*, and *Azadirachta indica* whereas the plant *ocimum* has strong agents for analgesic, antioxidant, antifungal, antipyretic and anti-carcinogenic properties.

Table-1: Checklist and Important medicinal plants in various graveyards of Palosi.

Sr. #	Family/Botanical Name	Local/ English Name	Part used	Voucher No	Ethnomedicinal uses
		A. FUNGI			
	1. Agaricaceae				
01	*Agaricus campestris* L.	Kharerri	Whole plant	Izhar CPB-1	Use for diabetes, decrease insulin resistance
		B. PTERIDOPHYTE			
	2. Marsileaceae				
02	*Marsilea quadrifolia* L.	Shin tirwaky	Leaves	Izhar CPB-2	Used as functional in swellings to and reliieve snake bites, leaves extract is diuretic
		C. MONOCOTS			
	3. Arecaceae				
03	*Phoenix dactylifera* L.	Kajoora	Fruit	Izhar CPB-3	**Use** in cold, fever, oedema, low sperm count
04	*Nannorrhops ritchiana* (Griff.) Aitchison	Mezar boty	Leaves	Izhar CPB-4	It is a basket with a lid as a covering and used in homes for storing bread
	4. Asparagaceae				
05	*Agave americana* L.	Gamla boty	Gum and Paste	Izhar CPB-5	**Use to heal burns, wounds and other skin ailments.**
	5. Cyperaceae				
06	*Cyperus rotundis* L.	Dhela	Tuber	Izhar CPB-6	Stimulant, astringent, diuretic and stomachic
	6. Poaceae				
07	*Cynodon dactylon* L.	Kabal	Whole Plant	Izhar CPB-7	Used as purgative, caustic, and diuretic
08	*Desmostachya bipinnata* L.	Drahb	Roots, flowers	Izhar CPB-8	Cure leucorrhoea abnormality in the reproductive organs in women
09	*Heteropogon contortus* (L.) Beauv.	Torr kabal	Whole plant	Izhar CPB-9	**Plant has been use for** erosion control in sandy soil
10	*Phragmites karka* L.	Wakha	Rhizome	Izhar CPB-10	The rhizome is Aphrodisiac and Diuretic
11	*Saccharrum munja* Roxb	Gaya	Stem	Izhar CPB-11	Its fibre is **used** for making ropes
12	*Saccharum spontaneum* L.	Shalghashay	Rhizome	Izhar CPB-12	Used in blood infections burning and sensation

	D. DICOTS				
	7. Amaranthaceae				
13	*Achyranthus asper* L.	Enhatay	Whole plant	Izhar CPB-13	Used as emetic, laxative, diuretic, and caustic
14	*Aerva javanica* Burm.f.	Kapok bush	Stem	Izhar CPB-14	Used against skin dryness
15	*Amaranthus viridis* L.	Batwa Saag	Leaves, seed	Izhar CPB-15	Used in diarrhoea, mouth ulcer
16	*Kochia indica* Wight.	Bambaly	Stem	Izhar CPB-16	Use for fever and de-warming
17	*Suaeda fruticosa* Forrsk.	Sumandari	Leaves, stem	Izhar CPB-17	Used against retention of urine
	8. Apiaceae				
18	*Pimpinella diversifolia* de Candolle.	Watani kaga	Seeds	Izhar CPB-18	Use in gastritis, leucorrhoea, abdominal swelling and stomach disorders
19	*Anethum graveolens* L.	Watani sperky	Seeds	Izhar CPB-19	Used for Ear disease, tympani syndrome
	9. Asclepiadaceae				
20	*Calotropis procera* Aiton.	Milk weed	Leaves, stem	Izhar CPB-20	Demulcent and emollient
	10. Asteraceae				
21	*Artemisia annua* L.	Khog largy	Seeds	Izhar CPB-21	Used **treatment of malaria, infections, inflammation, fever, bleeding, and headaches**
22	*Cichorium intybus* L.	Kaasni	Whole plant	Izhar CPB-22	Treat various ailments ranging from wounds to diabetes, tonic, used in fevers, and vomiting
23	*Carthamus oxycantha* M.Bieb.	Gul kaboda	Seeds	Izhar CPB-23	Oil of seed is used against ulcer and itching
24	*Conyza canadensis* L.	Kamasal botay	Whole plant	Izhar CPB-24	Stimulate sneezing and cure diarrhoea
25	*Cirsium arvense* L.	Kaboda	Roots, Seeds	Izhar CPB-25	Parts of the roots have been used to treat worms in kids. It has been crushed as a cure for toothache.
26	*Eclipta prostrata* L.	Bhangra	Leaves, Stem	Izhar CPB-26	Used in fever, liver problems, cough and headache
27	*Launaea procumbens* Roxb.	Zyar boty	Whole plant	Izhar CPB-27	Plant is animated in water and soak is taken for skin impatience
28	*Matricaria aurea* (Loefl.)Schultz-Bip.	Zyar chamba	Whole plant	Izhar CPB-28	Used for numerous medical complaints including asthma, colic, fevers, nervous complaints

29	*Matricaria chamomilla* L.	Spinguly	Whole plant	Izhar CPB-29	The plant was found accidental / cultivated in the area which have Palliative, anti-provocative, carminative and antispasmodic properties
30	*Silybum marianum* (L.) Gaertn.	Azghaki	Whole plant	Izhar CPB-30	Leaves and seeds are used for hepatitis and liver difficulties
31	*Sonchus asper* L.	Zyar gul	Leaves, Flowers	Izhar CPB-31	Applied to wound or boils, leaves are applied as inflammatory to swellings
32	*Taraxacum officinale* Weber.	Dandelion	Leaves, root	Izhar CPB-32	Used as a remedy for kidney and liver disorder. Aperient, stimulant
33	*Xanthium strumarium* L.	Cocklebur	Whole plant	Izhar CPB-33	Categorize as diuretic and astringent. The root is used in small-pox the fruits are in earache.
	11. Brassicaceae				
34	*Brassica campestris* L.	Sharsham	Oil	Izhar CPB-34	Used as diuretic for foot and mouth off feeding and dietary
35	*Capsella bursapastoris* (L.) Medic.	Chambraka	Seeds	Izhar CPB-35	Stimulant, astringent in diarrhoea
36	*Coronopus didymus* L.	Alam	Leaves	Izhar CPB-36	The crude extract assessed for antioxidant potential
37	*Eruca sativa* Mill.	Zyar Gualy	Leaves	Izhar CPB-37	Used as an alternative to cure ulcers.
38	*Malcolmia cabulica* L.	Shna panra	Leaves	Izhar CPB-38	Fodder for cattle
39	*Lepidium sativum* Wild.	Masor panry	Roots	Izhar CPB-39	Used for treatment of hyperactive airways disorders, such as asthma, bronchitis and cough.
40	***Lepidium virginicum* L.**	Pepper Grass	Seeds	Izhar CPB-40	It is **used** in the cure of asthma and coughs. Cardio tonic and diuretic.
41	*Sisymbrium irio* L.	Khhobikalam	Seeds	Izhar CPB-41	Weakness, blood **clotting** deficiencies and **immunodeficiency disorders**
	12. Cactaceae				
42	*Opuntia littoralis* L.	Prickly pear	Seeds	Izhar CPB-42	**Used** in fever, colic pain, heart pain and as wormifuge.
	13. Cannabaceae				
43	*Cannabis sativa* L.	Bhang	Whole plant	Izhar CPB-43	Used as narcotic, an toxicant, stomachic, sedative and tonic

	14. Caryophyllaceae				
44	*Stelaria media* L.	Chickweed	Leaves	Izhar CPB-44	The leaves are purgative and laxative. whole plant paste is used for swollen joints.
	15. Caesalpiniaceae				
45	*Prosopis juliflora* Swartz.	Sreekh	Leaves	Izhar CPB-45	Leaves used to treat eyes
	16. Chenopodiaceae				
46	*Chenopodium album* L.	Bathuva	Stem and leaves	Izhar CPB-46	Used in hepatic syndrome, anthelmintic and laxative
47	*Chenopodium ambrosioides* L.	Levany batwa	Stem and leaves	Izhar CPB-47	Oil is used to treat disease of hookworm, Anthelmintic
48	*Chenopodiastrum murale* L.	Ghata Batwa	Leaves	Izhar CPB-48	Anti-rheumatic, contraceptive, laxative
49	*Convolvulus arvensis* L.	Prewaty	Roots	Izhar CPB-49	Purgative and diarrheic and as a stimulant and antispasmodic
	17. Cucurbitaceae				
50	*Cucumis melo* var. agrestis	Kalkondara	Whole plant	Izhar CPB-50	Fodder
	18. Euphorbiaceae				
51	*Euphorbia helioscopia* L.	Ganda Buty	Stem and seeds	Izhar CPB-51	Seeds are use in cholera Liquid is applied to outbreak.
52	*Ricinus communis* L.	Castor bean	Leaves	Izhar CPB-52	Crushed leaves are used as carminative, stomachic, appetizer and purgative.
	19. Fumariaceae				
53	*Fumaria indica* (Haussk.) Pugsley	Tarkha	Flower, leaves	Izhar CPB-53	Use as diuretic, laxative and stomachic activities
	20. Geraniaceae				
54	*Geranium lucidum* L.	Sre jhodai	Whole plant	Izhar CPB-54	Used for treating insomnia and healing contain essential **oils** around the greenery and flowers
	21. Laminaceae				
55	*Ajuga bracteosa* Wall. ex Benth	Kneelbark	Leaves, flowers, barks	Izhar CPB-55	The treatment of cancer including diabetes, malaria, and inflammation.
56	*Salvia moorcroftiana* Wall.	Ghat chalkhi	Seeds, leaves	Izhar CPB-56	Used for cold and cough and applied to injuries as bandage.

57	*Mentha longifolia* L.	Wenaly	Leaves	Izhar CPB-57	Used in various trivial diseases like headaches, digestive disorders and fevers
	22. Linaceae				
58	*Linum usitatissimum* L.	Canada weed	Seed	Izhar CPB-58	Seed oil is used as analgesic, affected as laxative, expectorant and relieves pain.
	23. Malvaceae				
59	*Grewia asiatica* L.	Waroki bera	Fruit	Izhar CPB-59	Administered the biased cholesterol and blood pressure level
60	*Hibiscus rosa-sinensis* L.	Gull Toot	Leaves	Izhar CPB-60	Had prospective in improving skin caution and functions.
61	*Malva neglecta* Wall.	Buttonweed	Stem	Izhar CPB-61	Absorbs ultraviolet radiation and acts as an anti-solar agent.
62	*Malva rotundifolia* L.	Tikalai	Leaves	Izhar CPB-62	Laxative and relieve constipation
	24. Meliaceae				
63	*Melia azedarach* L.	Bokyanra	Leaves	Izhar CPB-63	Leaves mixture with acacia gum used to treat fever
	25. Mimosaceae				
64	*Acacia modesta* Wall.	Palosa	Gum	Izhar CPB-64	It has Antifungal activity and is utilized to treat Skin Disorders, Infections, Allergies and Pigmentatio
65	*Acacia nilotica* L. Delice.	Keekar	Bark, Gums	Izhar CPB-65	Bark used in diarrhoea, gum used in cough
66	*Albizia lebbeck* (L.) *Benth.*	Kikar wana	Bark, Gums	Izhar CPB-66	Gum is used in cough, bark in diarrhoea, acts as astringent
67	*Leucaena leucocephala* L.	Sarrani srekh	Leaves, Stem	Izhar CPB-67	Wood is used as fuel and leaves as a fodder
	26. Moraceae				
68	*Broussonetia papyrifera* L.	Zangli Toot	Fruit, Bark	Izhar CPB-68	Used as febrifuge and purgative
69	*Ficus carica* L.	Inzar	Fruit	Izhar CPB-69	Use to treat various ailments such as gastric problems, inflammation, and cancer.
70	*Ficus palmata* L.	Zangali inzar	Fruit	Izhar CPB-70	Used for the treatment of constipation and infections of bladder and lungs.

					demulcent, emollient, laxative and poultice.
71	*Morus alba* L.	Toot	Leaves	Izhar CPB-71	Used to treat painful throat. Bark is refrigerant and purgative
72	*Morus nigra* L.	Toor toot	Fruit	Izhar CPB-72	Used to treat some internal infections oedema, asthma, coughs, diabetes, bronchitis, and hypertension
	27. Myrtaceae				
73	***Eucalyptus camaldulensis*** Dehnh.	Laachi	Leaves	Izhar CPB-73	Used for sore throats relieving colds coughs and other infections
74	*Eucalyptus todtiana* F.Muell.	Ghat laachi	Leaves	Izhar CPB-74	Antiseptic and is used for relieving coughs
	28. Oxalidaceae				
75	*Oxalis corniculata* L.	Tirwakay	Leaves, Roots	Izhar CPB-75	Cure fever and dysentery, Roots chewed to prevent vomiting
	29. Papaveraceae				
76	*Argemone mexicana* L.	Azghi	Leaves	Izhar CPB-76	Used by traditional healers to treat malaria
	30. Papilionaceae				
77	*Alhagi maurorum* Medic.	Camelthorn	Whole plant	Izhar CPB-77	Used as aperient, blood purifier, diuretic, purgative and treat **asthma.**
78	*Vicia monantha* Retz.	Climbing herb	Leaves	Izhar CPB-78	Used as a fodder for animals
79	*Dalbergia sissoo* Roxb.	Shava	Leave, Bark	Izhar CPB-79	Stimulant, astringent, alterative
80	*Melilotus indica* L.	Levani saag	Whole plant	Izhar CPB-80	**Used** as vegetable and have antioxidant properties. It also has alpha-amylase inhibitory activities, because of which it may be useful for type 2 diabetes.
	31. Plantaginaceae				
81	*Plantago lanceolata* L.	Lamb's tongue	Leaves	Izhar CPB-81	Used against blood flow and bleeding. It repair of damaged tissues quickly
82	*Plantago major* L.	Ghwa jaby	Leaves	Izhar CPB-82	Leaves can be used for wounds to stop infection, stings, and sores in order to ease healing
	32. Platanaceae				

83	*Platanus orientalis* L.	Chenarwana	Bark	Izhar CPB-83	Use in acute sinus, cough common cold, infections, bronchitis, and respiratory infections
	33. Polygonaceae				
84	*Polygonum aviculare* L.	Dhelay	Leaves	Izhar CPB-84	Used mainly in the treatment of complaints such as dysentery and haemorrhoids
85	*Polygonum plebeium* L.	Knotweed	Seed	Izhar CPB-85	Useful in the treatment of parasitic infection, water retention and skin conditions
86	*Rumex dentatus* (Meisn.) Rech	Chalkhi	Leaves	Izhar CPB-86	Use for constipation and gas problems
	34. Primulaceae				
87	*Anagallis arvensis* L.	Dabhar boty	Leaves	Izhar CPB-87	Use against fever, has expectorant and diuretic
	35. Ranunculaceae				
88	*Ranunculus muricatus* L.	Zeyar guly	Leaves	Izhar CPB-88	Used for asthma and cough
	36. Rhamnaceae				
89	*Ziziphus nummularia* Burm.	Jarr bera	Fruits and leaves	Izhar CPB-89	Leaves are used for external treatments, acted as astringent in scabies
90	*Ziziphus jujuba* Mill.	Bera	Leaves	Izhar CPB-90	Purifies blood relieve stress and encourage sleep
	37. Rosaceae				
91	*Rosa indica* **L.**	Gul	Stem, flower oil	Izhar CPB-91	Cosmetic and medicinal value. It is medicinally used for blood purification, treatment of the intestinal ulcer, diarrhoea and anti-inflammatory action.
	38. Salicaceae				
92	*Populus nigra* L.	Sofida	Buds	Izhar CPB-92	Buds of this plant are analgesic, blood thinners, and able to reduce inflammation
	39. Scrophulariaceae				
93	*Veronica biloba* L.	Ghutialy	Whole plant	Izhar CPB-93	Due to high concentration of astringent tannins the plant, it is useful for minor bleeding and diarrhoea
	40. Simaroubaceae				

94	*Ailanthus altissima* (Mill.) swingle	Zangali Boty	Roots	Izhar CPB-94	Crushed roots are motled with vegetable ghee or milk and castoff for curing diarrhoea and dysentery
	41. Solanaceae				
95	*Datura alba* L.	Gul boty	Leaves	Izhar CPB-95	Served the purpose of healing respiratory problems
96	*Solanum nigrum* L.	Spin guly	Whole plant	Izhar CPB-96	Contain analgesic and anti-inflammatory properties.
97	*Solanum surrattense* Bumr.f.	Kantakary	Roots	Izhar CPB-97	Used in sore throat, asthma. Stomachic and diuretic
98	*Withania somnifera* Dunal.	Kotilal	Tubers and fruits	Izhar CPB-98	Tubers are used in ulcer and fruits are diuretic.
	42. Tamaricaceae				
99	*Tamarix aphylla* L.	Ghaz	Stem, bark	Izhar CPB-99	Kidney stone and injuries treatment
	43. Zygophyllaceae				
100	*Fagonia cretica* Auct.	Fagonbushes	Stem roots	Izhar CPB-100	Observed anti-inflammatory, analgesic, antipyretic and thrombolytic activities
101	*Peganum harmala* L.	Wild rue	Whole plant	Izhar CPB-101	Use as relaxant, analgesic, or cytotoxic agent
102	*Tribulus terristris* L.	Azghakay	Whole plant	Izhar CPB-102	Used in urinary, kidney, heart diseases

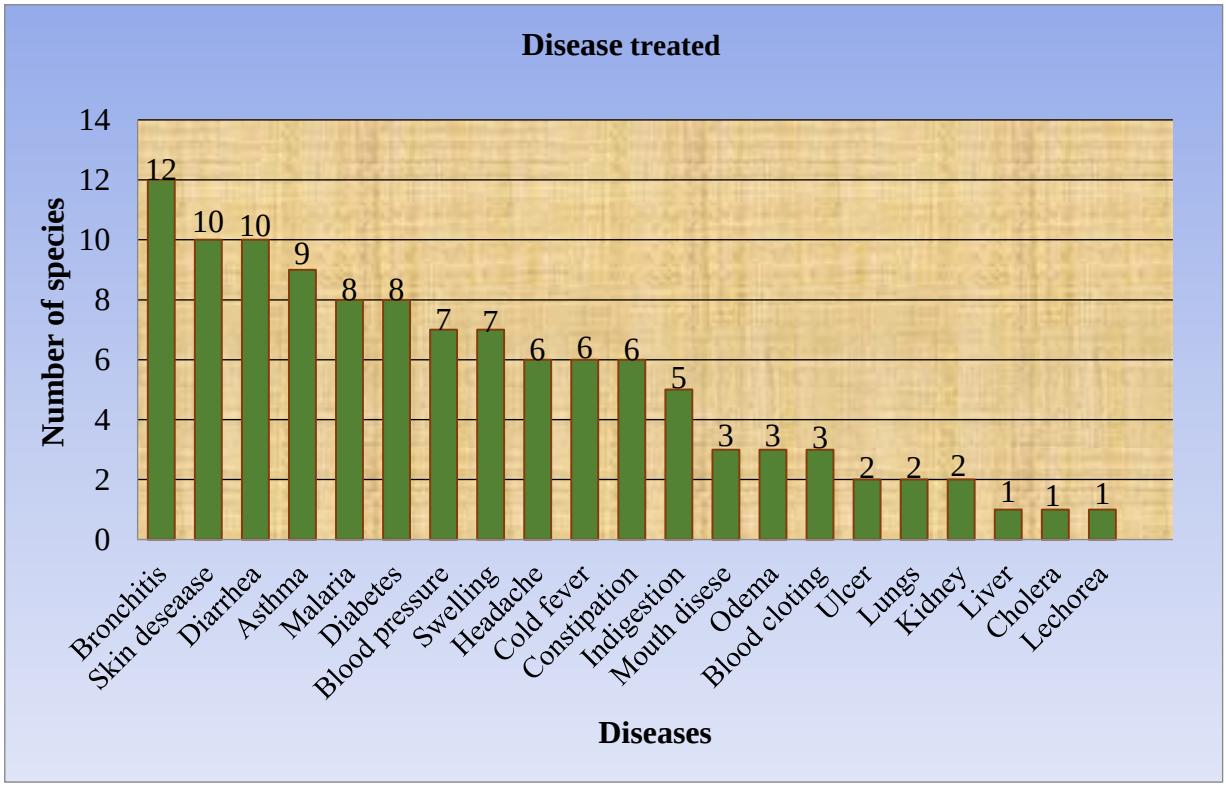

Figure-2: Medicinal uses and number of species used for various ailments

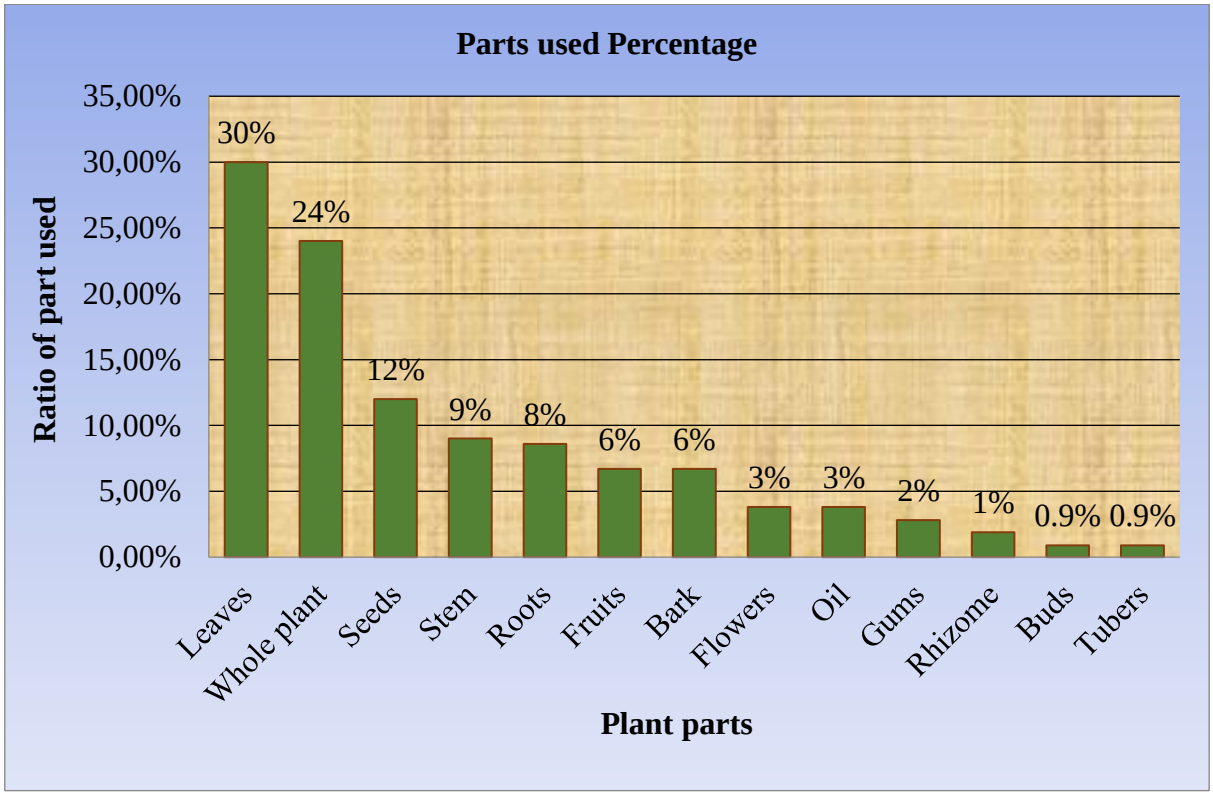

Figure-3: Medicinal uses of plant parts used for various ailments

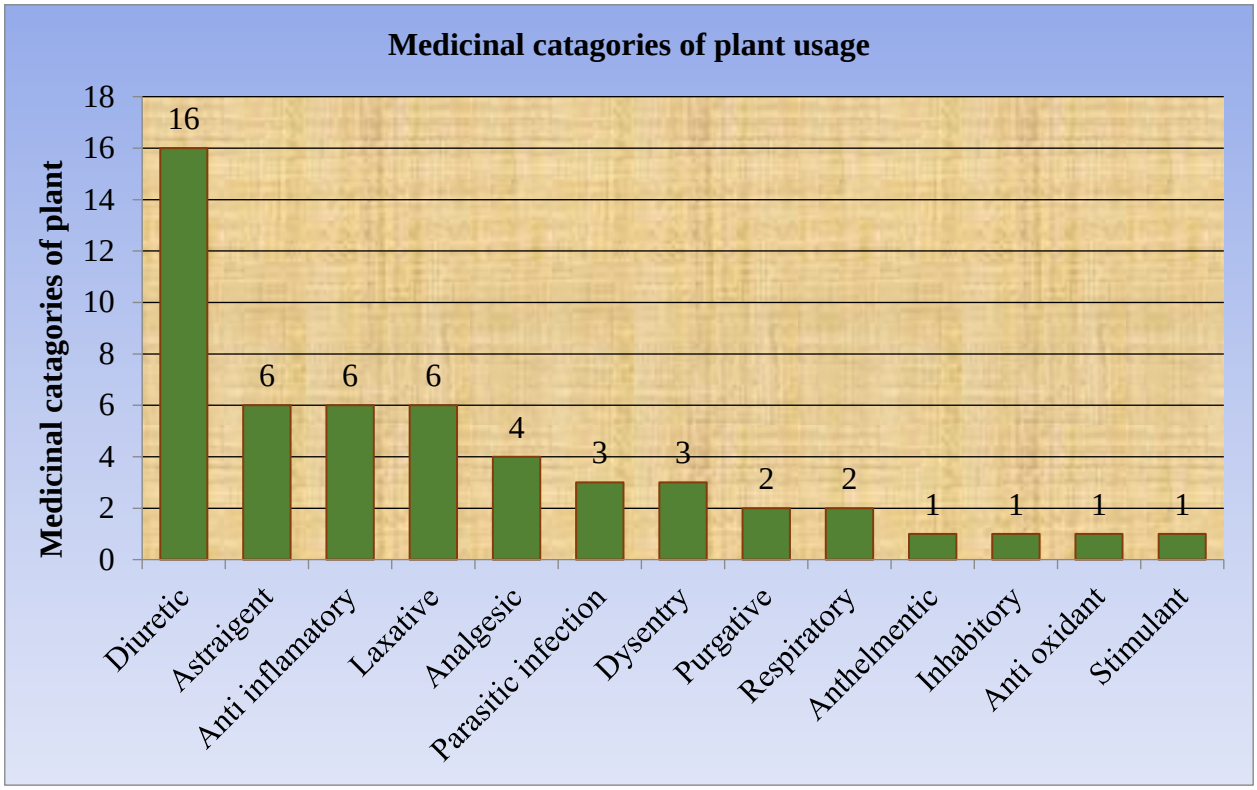

Figure-4: Medicinal categories of plant species use for various ailments

Checklist details and plant identification

The present study was carried out to assess medicinal usages, diversity and checklist evaluation of graveyards flora for the mentioned sites in research area. The area was extensively surveyed and plants were collected from four different graveyards in order to collect information from the local residents about their local names, traditional and medicinal uses (Annex-1). During collection the local community was interviewed through questionnaire method adopted by Ali and Qaiser (2009). Collected plants were pressed and put in the old newspapers to remove the moisture and the dried plants were mounted on herbarium sheets. The vouchers specimens were deposited at the Centre of Plant Biodiversity University of Peshawar Herbarium (UPBG). Result in a checklist shows that fungi and pteridophytes are represented by single specie while monocots and dicots are represented 10 and 90 species respectively in (Table-1&2). Number of families in major plant groups was recorded as 39 from dicots, four from monocot, one Pteridophyte and one from Fungi (Fig-5). A total of 102 plants species were documented with 81 genera, the leading genera percentages were noted as 10 from Asteraceae, six from Brassicaceae, four from Amaranthaceae, Poaceae, and Solaneceae. Wheras Moraceae, Mimosacceae, Malvaceae and Zygophylaceae were found with lower genera percentage (Fig-6). Leading plant species percentage was noted down from Asteraceae 14, Brassicaceae eight, and Poaceaea six. Moraceae, Mimosaceae, Papilionaceae and Solanaceae were found with five percent each respectively (Fig-7).

Mujtaba and Ajab (2006) conducted a survey in siran valley, and explore the area through straight observations and semi-structured interviews by adopting questionnaire method to obtain the knowledge of indigenous species and its documentation, which were used for the handling of diverse diseases. Fraz Khan (2009) observed severe pressure on plant diversity due provision of desert into villages which consequently damage habitats for the native flora. While Qureshi (2012) considered the simillar reasonable plant diversity, which was found in the small area of Hingol national park Baluchistan, they represents that Capparaceae and Chenopodiaceae contain two species each while Fabaceae was recorded with significant number of seven species observed by Asteraceae, Asclepiadaceae and Zygophyllaceae with three species respectively

Table-2: Showing total number of species in major classes growing in area.

S. No.	Fungi	Pteridophyte	Monocots	Dicots
1.	1	1	10	90

Table-3: Showing total number of genera, %age of genera, number and %age of species in different families in research area.

S. No	Name of Family	Genera Numbers (81)	Genera %age	Species Numbers (102)	Species %age
A. Fungi					
1	Agaricaceae	1	1.23	1	0.96
B. Pteridophyte					
2	Marsileaceae	1	1.23	1	0.96
C. Monocots					
3	Arecaceae	2	2.46	2	1.92
4	Asparagaceae	1	1.23	1	0.96
5	Cyperaceae	1	1.23	1	0.96
6	Poaceae	4	4.93	6	3.84
D. Dicots					
7	Amaranthaceae	4	4.93	5	4.80
8	Apiaceae	2	2.46	2	1.92
9	Asteraceae	10	12.3	14	13.4
10	Brassicaceae	6	7.40	8	5.76
11	Cactaceae	1	1.23	1	0.96
12	Cannabaceae	1	1.23	1	0.96
13	Caryophyllaceae	1	1.23	1	0.96
14	Caesalpiniaceae	1	1.23	1	0.96
15	Chenopodiaceae	1	1.23	3	2.88
16	Convolvulaceae	1	1.23	1	0.96
17	Cucurbitaceae	1	1.23	1	0.96
18	Euphorbiaceae	2	2.46	2	1.92
19	Fumariaceae	1	1.23	1	0.96
20	Geraniaceae	1	1.23	1	0.96
21	Laminaceae	2	2.46	3	2.88
22	Linaceae	1	1.23	1	0.96
23	Malvaceae	3	3.70	4	3.84
24	Meliaceae	1	1.23	1	0.96
25	Mimosaceae	3	3.70	5	3.84
26	Moraceae	3	3.70	5	4.80
27	Myrtaceae	1	1.23	2	1.92
28	Oxalidaceae	1	1.23	1	0.96
29	Papaveraceae	1	1.23	1	0.96
30	Papilionaceae	3	3.70	4	3.84
31	Plantaginaceae	1	1.23	3	2.88
32	Poaceae	4	2.46	6	5.76
33	Polygonaceae	2	2.46	3	2.88
34	Primulaceae	1	1.23	1	0.96
35	Ranunculaceae	1	1.23	1	0.96
36	Rhamnaceae	1	1.23	2	1.92
37	Rosaceae	1	1.23	1	0.96
38	Salicaceae	1	1.23	1	0.96

39	Scrophulariaceae	1	1.23	1	0.96
40	Simaroubaceae	1	1.23	1	0.96
41	Solanaceae	4	4.93	5	4.80
42	Tamaricaceae	1	1.23	1	0.96
43	Zygophyllaceae	3	3.70	3	2.88

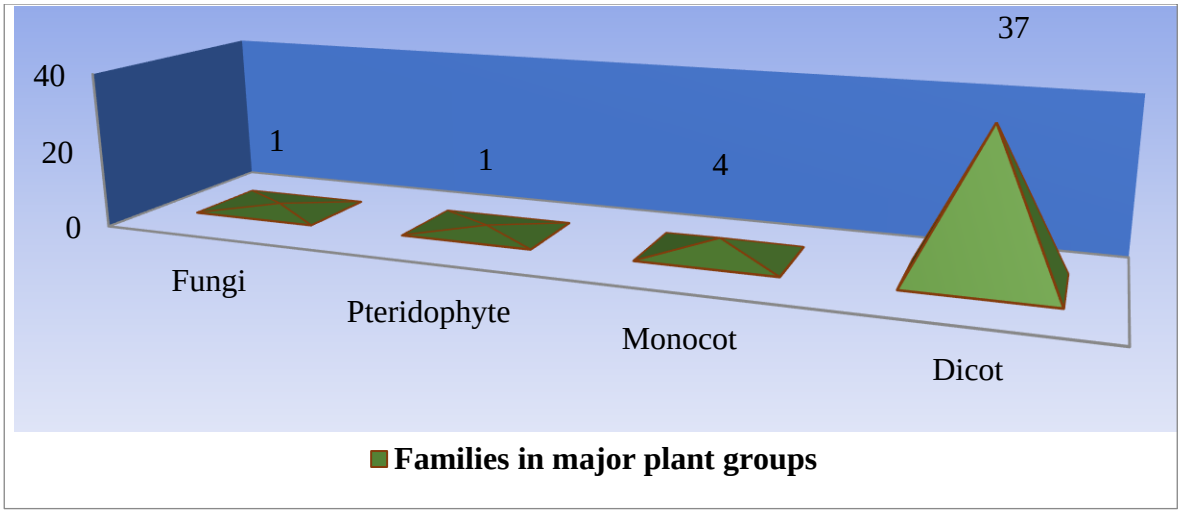

Figure-5: Number of families in major plant groups from the study area

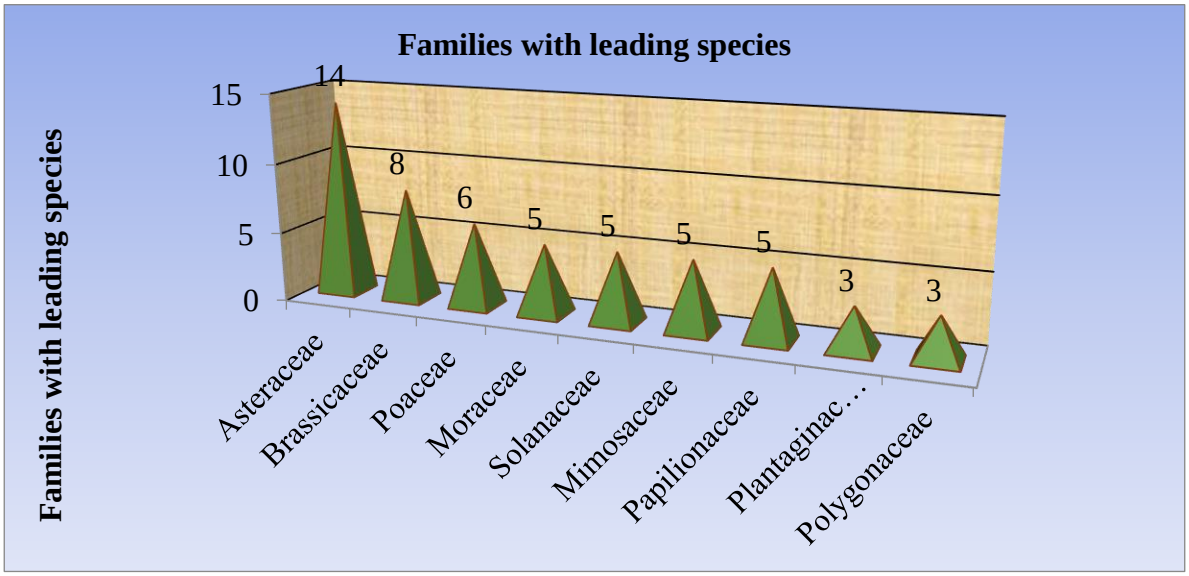

Figure-6: Families with leading species growing in the study area

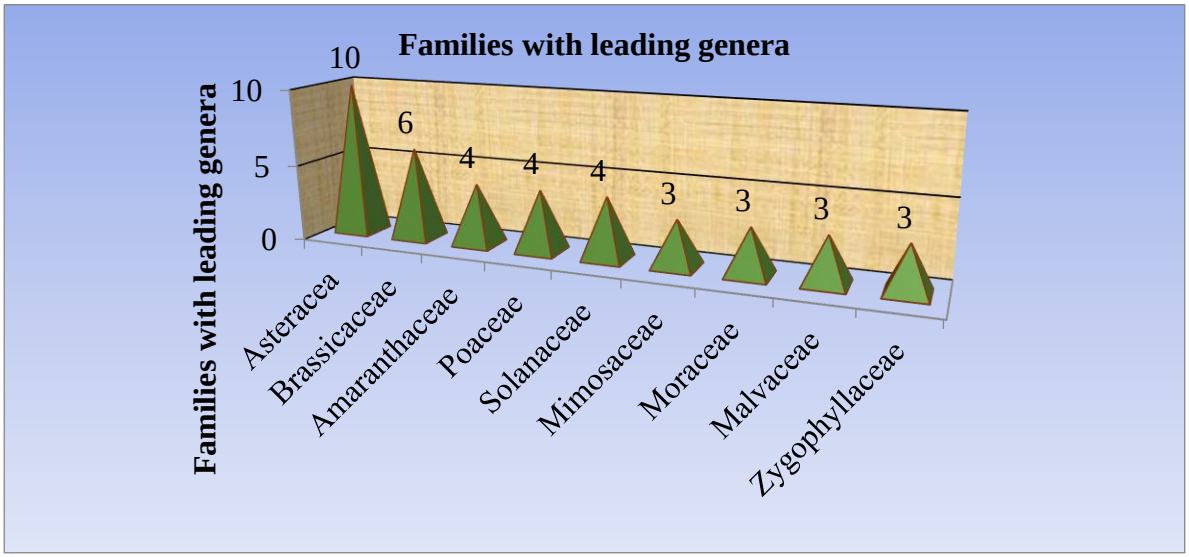

Figure-7: Families with leading genera growing in the study area

Conservation status of plant species

Collected plants were pressed and put in the old newspapers to remove the moisture and the dried plants were mounted on herbarium sheets. The vouchers specimens were deposited at the Centre of Plant Biodiversity University of Peshawar Herbarium (UPBG). The plants were identified with the help of Flora of Pakistan, and relevant literature. For this purpose a total of 102 plant species were evaluated from research area mong them 68 plant species were found indigenous on flora of Pakistan while the rest of 34 species were recorded as exotic to the area. Hence percentage of indigenous flora was 66.6% and exotic were recorded as 33.3%, which means that exotic species are in competition with the native vegetation. If invasion of exotic species were continue with such pace then the native indigenous flora will be affected by the competition of exotic species. Therefore it is proposed to halt the invasion of exotic species and re-introduce the native indigenous flora for restoration and reforestation. Some of the indicator species like *Dalbergia sissoo* and *Acacia modesta* are infrequently exist in the area which can be used for conservation and restoration of the native indigenous flora of the area. Sharifullah *et al*. (2016) mentioned that native information is vibrant and fluctuations happen with the passage of time, culture, generation, and properties, therefore precise documents of this information is required. Strategies proposed by the IUCN redlist categories should be considered as a basis for providing management related to the native indigenous flora and its conservation status.

The second treat to plant biodiversity is unsustainable utilization of plants for wood and fuel through slashing and burning, which disturbs the local vegetation. Mainly children of the area are collecting the plant, who doesn't know the appropriate methods and time of plant assortment, as a result maximum collection become unfeasible. On the other side they are unconscious about the preservation and withering techniques which eventually lead to depletion of plant resources, whereas as brutal uses of these flora will effect in loss of treasured plant resources. Due to which indigenous flora is in the pressure which ultimately affects the conservation status and plant biodiversity of the area up to susceptible levels. Qurreshi *et al*. (2009) suggested that sustainable uses of plant resources are required in the area, If the interventions could by some means be restricted, the native flora will be certainly move a progress towards the betterment. Khan *et al.* (2018) proposed that due to high dependency on traditional remedies and its increasing demand for health issues, fundamental strategies must be taken for improving the sustainable uses of biodiversity and ultimately conserve flora. Suitable measures should be taken for ethnomedicinal flora conservation and biodiversity by encouraging networks between the local, regional and national coordination's for taking actions regarding sustainable utilization and improving conservation status.

Table-4: Showing the information of flora regarding scientific name, families, local name and conservation status of various species in graveyards of Palosi.

S#	Scientific name/ Families	Local/English name	Indigenous	Exotic	Conservation status
A.	**FUNGI**				
	1. Agaricaceae				
01	*Agaricus campestris* L.	Kharerri	-	+	NE
B.	**PTERIDOPHYTE**				
	2. Marsileaceae				
02	*Marsilea quadrifolia* L.	Shin tirwaky	-	+	LC
C.	**MONOCOTS**				
	3. Arecaceae				
03	*Phoenix dactylifera* L.	Kajoora	+	-	LC
04	*Nannorrhops ritchiana* (Griff.) Aitchison	Mezar boty	+	-	NE
	4. Asparagaceae				
05	*Agave americana* L.	Gamla boty	+	-	LC
	5. Cyperaceae				
06	*Cyperus rotundis* L.	Dheela	+	-	LC
	6. Poaceae				
07	*Cynodon dactylon* L.	Kabal	+	-	NE
08	*Desmostachya bipinnata* L.	Drahb	+	-	LC
09	*Heteropogon contortus* (L.) Beauv.	Tor kabal	+	-	LC
10	*Phragmites karka* Retz.	Wakha	+	-	LC
11	*Saccharrum munja* Roxb	Gaya	-	+	LC
12	*Saccharum spontaneum* L.	Shalghashay	+	-	LC
D.	**DICOTS**				
	7. Amaranthaceae				
13	*Achyranthus asper* L.	Enkhaty	+	-	NE
14	*Aerva javanica* Burm.f.	Kapok bush	-	+	NE
15	*Amaranthus viridis* L.	Batwa Saag	+	-	LC
16	*Kochia indica* Wight	Bambaly	+	-	NE
17	*Suaeda fruticosa* Forrsk.	Sumandari	+	-	NE
	8. Apiaceae				
18	*Pimpinella diversifolia* de Candolle.	Watani kaga	+	-	NE
19	*Anethum graveolens* L.	Watani sperky	-	+	NE
	9. Asclepiadaceae				
20	*Calotropis procera* Aiton.	Milk weed	+	-	NE
	10. Asteraceae				
21	*Artemisia annua* L.	Khog largi	+	-	NE
22	*Cichorium intybus* L.	Kaasni	-	+	NE
23	*Carthamus oxycantha* M.Bieb.	Gul kaboda			NE
24	*Conyza canadensis* L.	Kamasal botay	-	+	LC
25	*Cirsium arvense* L.	Kaboda	-	+	NE
26	*Eclipta prostrata* L.	Bhangra	-	+	LC
27	*Launaea procumbens* Roxb.	Zyar boty	+	-	LC
28	*Matricaria aurea* (Loefl.) Schultz-Bip.	Zyar chamba	+	-	NE
29	*Matricaria chamomilla* L.	Spinguly	-	+	NE

30	*Silybum marianum* (L.) Gaertn.	Azghaki	-	+	NE
31	*Sonchus asper* L.	Zyar gul	+	-	LC
32	*Taraxacum officinale* Weber.	Dandelion	-	+	NE
33	*Xanthium strumarium* L.	Cocklebur	-	+	NE
	11. Brassicaceae				
34	*Brassica campestris* L.	Sharsham	+	-	DD
35	*Capsella bursapastoris* (L.) Medic.	Chambraka	-	+	NE
36	*Coronopus didymus* L.	Alam	-	+	LC
37	*Eruca sativa* Mill.	Zyar Gualy	-	+	NE
38	*Malcolmia cabulica* L.	Shna panra	-	+	NE
39	*Lepidium sativum* Wild.	Masor panry	+	-	NE
40	***Lepidium virginicum* L.**	Pepper Grass	-	+	NE
41	*Sisymbrium irio* L.	Khhobikalam	+	-	NE
	12. Cactaceae				
42	*Opuntia littoralis* L.	Prickly pear	-	+	LC
	13. Cannabaceae				
43	*Cannabis sativa* L.	Bhang	+	-	NE

	14. Caryophyllaceae				
44	*Stelaria media* L.	Chickweed	+	-	NE
	15. Caesalpinaceae				
45	*Prosopis juliflora* Swartz.	Sreekh	+	-	NE
	16. Chenopodiaceae				
46	*Chenopodium album* L.	Bathuva	+	-	NE
47	*Chenopodium ambrosioides* L.	Levany batwa	-	+	NE
48	*Chenopodiastrum murale* L.	Ghata Batwa	+	-	NE
49	*Convolvulus arvensis* L.	Prewaty	+	-	NE
	17. Cucurbitaceae				
50	*Cucumis melo* var. agrestis	Kalkondara	+	-	NE
	18. Euphorbiaceae				
51	*Euphorbia helioscopia* L.	Ganda Buty	+	-	NE
52	*Ricinus communis* L.	Castor bean	+	-	NE
	19. Fumariaceae				
53	*Fumaria indica* (Haussk.) Pugsley	Tarkha	+	-	NE
	20. Geraniaceae				
54	*Geranium lucidum* L.	Sre jhodai	-	+	EN
	21. Laminaceae				
55	*Ajuga bracteosa* Wall.	Kneelbark	+	-	NE
56	*Salvia moorcroftiana* Wall.	Ghat chalkhi	+	-	LC
57	*Mentha longifolia* L.	Wenaly	-	+	LC

	22. Linaceae				
58	*Linum usitatissimum* L.	Canada weed	-	+	NE
	23. Malvaceae				
59	*Grewia asiatica* L.	Waroki bera	+	-	NE
60	*Hibiscus rosa-sinensis* L.	Gull Toot	+	-	NE
61	*Malva neglecta* Wall.	Buttonweed	+	-	NE
62	*Malva rotundifolia* L.	Tikalai	+	-	NE

	24. Meliaceae				
63	*Melia azedarach* L.	Bokyanra	+	-	LC
	25. Mimosaceae				
64	*Acacia modesta* Wall.	Palosa	+	-	NE
65	*Acacia nilotica* L. Delice.	Keekar	+	-	LC
66	*Albizia lebbeck* (L.) *Benth.*	Kikar wana	+	-	NE
67	*Leucaena leucocephala* L.	Sarrani srekh	+	-	LC
	26. Moraceae				
68	*Broussonetia papyrifera* L.	Zangli Toot	+	-	NE
69	*Ficus carica* L.	Inzar	+	-	LC
70	*Ficus palmata* L.	Zangali inzar	+	-	NE
71	*Morus alba* L.	Toot	+	-	NE
72	*Morus nigra* L.	Toor toot	+	-	NE
	27. Myrtaceae				
73	***Eucalyptus camaldulensis*** Dehnh.	Laachi	-	+	NE
74	*Eucalyptus todtiana* F.Muell.	Ghat lachi	-	+	NE

	28. Oxalidaceae				
75	*Oxalis corniculata* L.	Tirwakay	+	-	NE
	29. Papaveraceae				
76	*Argemone mexicana* L.	Azghi	-	+	NE
	30. Papilionaceae				
77	*Alhagi maurorum* Medic.	Camelthorn	+	-	NE
78	*Vicia monantha* Retz.	Climbing herb	+	-	LC
79	*Dalbergia sissoo* Roxb.	Shava	+	-	NE
80	*Melilotus indica* L.	Levani saag	+	-	LC
	31. Plantaginaceae				
81	*Plantago lanceolata* L.	Lamb's tongue	+	-	LC
82	*Plantago major* L.	Ghwa jaby	-	+	LC
	32. Platanaceae				
83	*Platanus orientalis* L.	Chenarwana	+	-	LC
	33. Polygonaceae				
84	*Polygonum aviculare* L.	Dhelay	-	+	LC
85	*Polygonum plebeium* L.	Knotweed	+	-	LC
86	*Rumex dentatus* Meisn.	Chalkhi	-	+	NE
	34. Primulaceae				
87	*Anagallis arvensis* L.	Dahber booti	+	-	NE
	35. Ranunculaceae				
88	*Ranunculus muricatus* L.	Zeyar guly	-	+	NE
	36. Rhamnaceae				
89	*Ziziphus nummularia* Burm.	Jhar beri	+	-	NE
90	*Ziziphus jujuba* Mill.	Bera	+	-	LC

	37. Rosaceae				
91	*Rosa indica* **L.**	Gul	+	-	LC
	38. Salicaceae				
92	*Populus nigra* L.	Sofida	+	-	NE
	39. Scrophulariaceae				
93	*Veronica biloba* L.	Ghutialy	+	-	NE
	40. Simaroubaceae				
94	*Ailanthus altissima* Mill.	Zangali Boty	+	-	NE

	41. Solanaceae				
95	*Datura alba* L.	Gul boty	-	+	NE
96	*Solanum nigrum* L.	Spin guly	-	+	NE
97	*Solanum surrattense* Bumr.f.	Kantakary	-	+	NE
98	*Withania somnifera* Dunal	Kotilal	+	-	DD
	42. Tamaricaceae				
99	*Tamarix aphylla* L.	Ghaz	+	-	NE
	43. Zygophyllaceae				
100	*Fagonia cretica* Auct.	Fagonbushes	+	-	NE
101	*Peganum harmala* L.	Wild rue	+	-	NE
102	*Tribulus terristris* L.	Azghakay	-	+	NE
		Total	**68**	**34**	

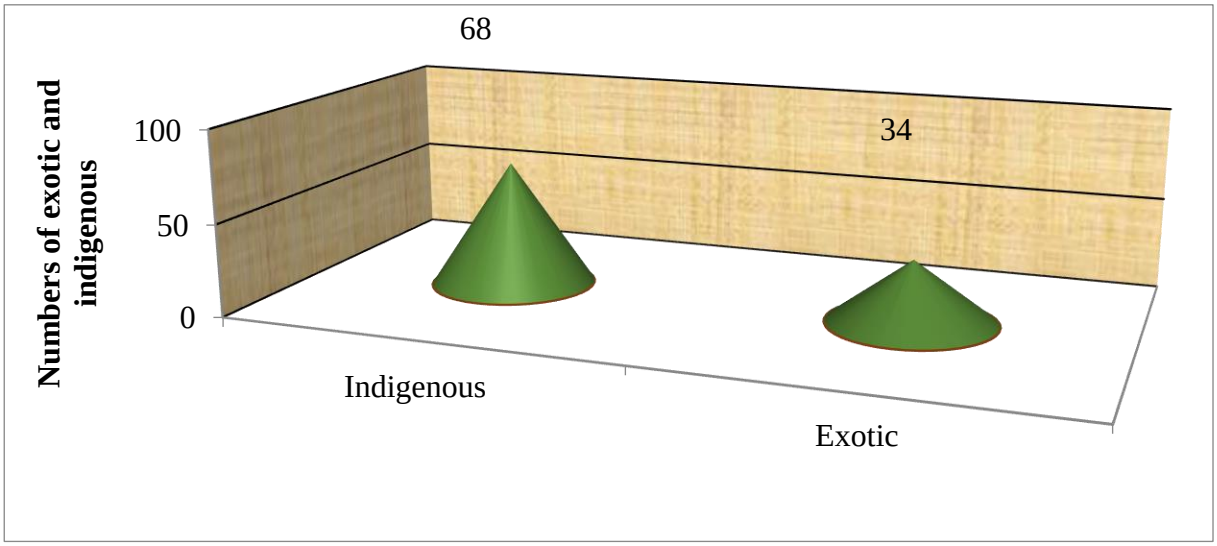

Figure-8: Numbers of exotic and indigenous species growing in the study area

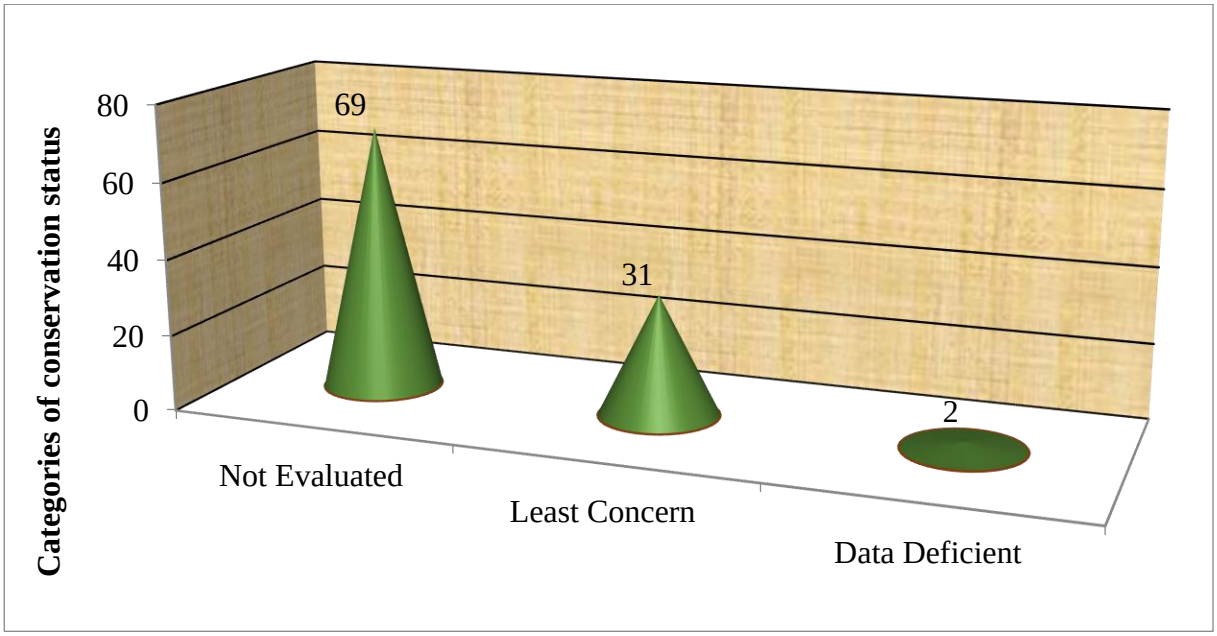

Figure-9: Various categories of conservation status of plants growing in the study area

Conservation status of all the plant species was obtained through IUCN redlist Categories (2010) Version 8.1. According to IUCN redlist categories 69 species were found not evaluated (67.6%), 31 species were least concern (30.3%) and two species were found data deficient (1.96%), (Fig-8 & 9). The results shown

that greater number of species were not evaluated and not yet been listed on IUCN redlist standard categories, therefore the future study will be encourage to regarding conservation status of plant species to enlist the native indigenous flora through the standard redlist categories evaluated by (IUCN). Declining of the local flora is due to local exhaustion and unsustainably, that's why graveyards are the excellent conservatoires for medicinal and indigenous flora (Hadi *et al*. 2014).

CONCLUSIONS

Based on the results obatained in present study, it has been concluded that:

1. As like other settled areas, In Palosi, most of the land is either under concrete *i.e.*, (Roads, buildings and houses) or under agriculture *i.e.*, (monoculturing) practices. Therefore the only land left for wild flora is graveyards, the plant biodiversity or indicator plants may be only found in graveyards.
2. Existing plant conservation status of Palosi was found pressurized by the unsustainable uses of plants resources, which affects and compels the local vegetation to vulnerable conditions.
3. It is also concluded that increase and rapid invasion of exotic species is one of the major threat to indigenous flora which are disturbing biodiversity and conservation status of wild flora.

RECOMMENDATIONS

1. Graveyards are the best conservatories for wild flora, that's why it is recommended to take measure for sustainable utilization of the local conserved flora.
2. Measures shoud be taken for the awairness of local residents about graveyards flora, its economic importance and its role in conservation of indigenous plant biodiversity.
3. Indicator species growing in the area *i.e.*, *Acacia modesta*, *Dalbergia sissoo, Withania somnifera*, *Calotropis procera* and herbs like *Fagonia cretica* and *Argemone mexicana* should be used for improving the local vegetation and reforestation.
4. Further research is recommended to explore and suggest conservation measure for the local inhabitants of the area.

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THE POLICY OF SUGARBEET PRODUCTION AND IT'S IMPACTS ON FARMERS IN TURKEY; CASE STUDY OF ÇUMRA-KONYA

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ABSTRACT

In this study, Turkey's sugar beet policy and its impacts on farmers have been studied. The aim of this study was to research the transfers between the producer and the consumer as a result of the agricultural support in Çumra district of Konya. Welfare analysis method was used to determine this. The data obtained were from 2001 and 2005. In the surveyed enterprises, the average land width was 137.77 decares, 66.12% of which were property, 29.94% were rented and 3.93% were land operated by partnership. In order to determine the actual state support to the sugar beet producer, instead of using reference (world) prices, method of detecting other supports done to the producer was used. By using this method, it was determined that the transfer of US $ 440 million done in Turkey in 2005. In the Çumra region, between 2004 and 2005, approximately 19 to 20 million dollars of support were provided to sugar beet producers.

Keywords: *Sugar, sugar beet, sugar policies, welfare analysis*

INTRODUCTION

Sugar has been an important foodstuff throughout history. Although the production of sugar dates back to ancient times, it became widespread in European countries since the 1900s. Today, sugar production is carried out in 100 countries around the world.

In Turkey, sugar beet is an important plant which is planted on 5 million decares by 450-500 thousand farmers per year (Yücel, 2000). Turkey ranks 12th in the 2004-2005 world sugar production with a production value of 2,059,000 tons while it ranks 16th in the 2003-2004 world sugar production with a production value of 1,997,000 tons. Sugar consumption in Turkey is above the world average with value of 28,1 kg/raw per individual while it is 22.5 kg/raw per individual in the World (Anonymous, 2005)

Specialized Commission Report of The State Planning Organization (SPO) states that the share of sugar sector in the gross national product (GNP) is 0.2% and the share in the manufacturing industry is 0.8% (Anonymous 2001). In employment, it constitutes 0.15% of the country in general and 1% in the manufacturing industry. In our country, since sugar production is obtained only from sugar beet, it has kept its importance in support policies until today.

MATERIAL AND METHODS

The material of the study consisted of primary and secondary sources. The primary datas were; the data obtained from sugar beet producers in Çumra via survey and interviews with officials of Konya and Çumra Sugar Factories. Statistics, term reports and resources were also utilized as a secondary source. The research conducted by various individuals and institutions is also included.

Neyman Method was used to determine the number of agricultural holdings to be surveyed. In the Neyman method, a single sample volume is determined by considering the mean and variance weights of each layer. The number of surveys according to Neyman method was found by the following formula (Çiçek and Erkan 1996).

$$n = \frac{[\_Nh.Sh]2}{N2.D2 + \_Nh.(Sh)2}$$

n = sample volume,
Nh = total unit number belonging to the sampling frame in layer "h",
Sh = standard deviation of the layer "h",
N = total unit number belonging to the sampling frame,
D2 = (d / t) 2, value,
d = error margin allowed from the population average (5% of the average land width),
t = It represents the t table value (1.96) corresponding to the 90% confidence limit predicted in the study.

The sample size was calculated as 54 for a confidence interval of 90%. The interviewed farmers were randomly selected on a voluntary basis as a sample. In the first group (1-50 da) 6, in the second group (51-100 da) 13, in the third group (101-200 da) 20, in the fourth group (201 da >) 15 sample surveys were conducted. The reason for conducting a survey of producers is to identify the institutions that the producers are partners, to learn their opinions about sugar beet price and purchase policies, to determine the level of agricultural techniques and input usage and to identify the problems of producers.

A general database was prepared in SPSS package program for 54 questionnaires applied to sugar beet producers and a general coding plan was prepared according to the questions asked. The surveys were entered into the computer according to this coding plan.

ANALYZES FOR MEASURING PRODUCER WELFARE

In this section, the definitions and calculations of PSE (Producer Support Equivalent) and CSE (Consumer Support Equivalent) developed by OECD are used to measure the producer and consumer transfers resulting from agricultural support. The concepts of PSE and CSE aim at revealing transfers through intervention. PSE means that the producer is taxed instead of subsidy when it is found negative, and that the consumer pays net tax instead of net subsidy to the consumer if CSE is negative. By taking advantage of PSE and CSE, in Turkey, Konya and Çumra region, the welfare levels of the producers obtained by cultivating sugar beet were determined by referring to sugar, which is the processed state of sugar beet. The reason for this is that the calculations in OECD countries are made as Sugar (Ören, 1994). In this study, PSE and CSE economic indicators between 2001 and 2005 were calculated. The following formula is used in the calculation of PSE_P.

$$PSE_P == (Pp - Pr) \cdot Q$$

PSE_P : Producer Support Equivalent (market transfers to producer),
Pp : Sugar beet price received by the producer,
Pr : Reference (world) price for sugar,
Q : Sugar production quantity.

Using the formula above, we can also see the protection for sugar in foreign trade. PSE is an indicator of the monetary transfers to the producers as a result of agricultural policies in a year. In order to determine the actual support given to the sugar beet producer by the state, the following PSE calculation, which identifies other supports to the producer instead of using reference (world) prices, gives different results. Direct payments; cash advances paid to the producer in sugar beet. General support; input subsidies provided by the state or subsidies to farmers. General services; education – extension services (OECD, 1994).

$$PSE_O = DP + GS1 + GS2$$

PSE_O : Producer Support Equal (other transfers to the producer),
DP : Direct Payments,
GS1 : General Support,
GS2 : General Services.

This is not a resource fully transferred to the producer, but it is a resource that guarantees sugar beet production in return. No further payment is made to the producer who receives the early dismantling incentive premium. The support provided to sugar beet producers in Turkey by both foreign trade and other means are given below.

$$PSE_t = PSEp + PSE_{Om}$$

PSE_t : Total Producer Support Equivalent,
PSEp : Producer support equivalent with protection in foreign trade,
PSE_{Om} : Producer support equivalent provided by other means,

In the concept of PSE, percentage of PSE is used when comparing countries. Accordingly, percentage of PSE is formulated as follows.

$$PSE\% = PSE_t / (Pp \cdot Q \cdot 100)$$

Another aspect of agricultural subsidies is the concept of CSE, which measures the transfers made to consumers. CSE calculation;

CSE = - (Pc – Pr) . C

CSE: Consumer Support Equivalent (consumer Market Transfers),

Pc: Consumer prices (sugar),

Pr: Reference for Sugar (world) price,

C: Amount of sugar consumption.

The most important resource in supporting agriculture is the state budget in Turkey. A significant portion of the state budget consists of direct taxes by taxpayers and indirect taxes paid by all citizens. Sometimes, consumers meet all of the support provided to the producer. Because a significant portion of the taxes collected in Turkey is consists of indirect taxes, the source of agricultural support is the all citizens.

RESEARCH AND FINDINGS

Turkey's General Welfare Analysis of the Sugar Beet Producers

Land use status in the enterprises examined in the research; the amount and width of the property land, partner or rented land were examined. As it can be seen from Table 6.1, the average land width for the surveyed enterprises is 137.77 decare, of which 66.12% is property, 29.94% is rented and 3.93% is land operated by partnership. According to the size of the farms, the share of property within the farmland varies between 57.38% and 80.81%.

The concepts of PSE and CSE aim at revealing transfers through intervention. When the PSE is negative, it means that the producer is taxed instead of subsidy. When CSE is negative, it means that the consumer pays net tax instead of net subsidy. PSE is an indicator of the monetary transfers made to producers as a result of agricultural policies in a year.

Table 1. PSEp calculation in terms of foreign trade

Years	Pp ($/ton)	Pr ($/ton)	Q (ton)	PSEp ($)
2001	542.85	238.1	1,652,300	503,538,425
2002	623.47	203.3	2,157,200	906,390,724
2003	658.31	203.7	1,762,400	801,204,664
2004	621.63	226.7	1,939,800	766,085,214
2005	536.73	278.9	1,965,000	506,635,950

In order to determine the actual support given to the sugar beet producer by the state, the following PSE calculation (Table 1), which identifies other supports to the producer instead of using reference (world) prices, gives different results. According to this; the more realistic PSE calculation in the sugar beet, which includes general advances, including cash advances paid to the producer, input subsidies provided by the state, and education and extension services, can be formulated as follows (OECD, 1994).

Table 2. Calculation of the PSE_o in terms of other supports

Years	DP (million $)	GS1 (million $)	GS2 (million $)	PSE_O (million $)
2001	167	25	0.22	195.22
2002	270	30	0.23	300.23
2003	297	33	0.25	330.25
2004	369	35	0.24	404.24
2005	402	38	0.25	440.25

When the supports given in Table 2 are examined, a transfer of US $ 195-440 million was made to the sugar beet producer between 2001 and 2005. 167-402 million US $ of this transfer is a direct payment under the name of early dismantling incentive premium. Although it varies by years, this payment is up to 50% of the total sugar beet production. The remaining 50% is also paid to sugar beet producers so that the total support reaches a resource of approximately 400-800 million US $. This is not a source fully transferred to the producer, but in return it is a source that guarantees sugar beet production. No further payment is made to the producer who receives the early dismantling incentive premium.

According to this, if a valuation is made between 2001-2005 it can be seen that Turkey provides protection and support for sugar beet production with approximately 1.1 to 1.2 billion US $ per year (Table 3).

Table 3. Calculation of the PSE_t in terms of foreign trade protection

Years	PSEp (million $)	PSE_{Om} (million $)	PSE_t (million $)
2001	503.53	195.22	698.75
2002	906.39	300.23	1,206.62
2003	801.20	330.25	1,131.45
2004	766.08	404.24	1,17.32
2005	506.63	440.25	946.88

In the concept of PSE, percentage of PSE is used when comparing countries. Accordingly, percentage of PSE is formulated as follows.

PSE% = PSE_t / (Pp . Q. 100)
The calculation of % PSE for 2005;
PSE% = 946,880,000 / (536,73*1,965,000)100
PSE% = 89

Another dimension of agricultural subsidies is the concept of CSE, which is used to measure transfers to consumers. The most important resource in supporting agriculture is the state budget in Turkey. A significant portion of the state budget consists of direct taxes by taxpayers and indirect taxes paid by all citizens. Sometimes, consumers meet all of the support provided to the producer. Because a significant portion of the taxes collected in Turkey is consists of indirect taxes, the source
Calculation of CSE for Turkey;

CSE = - (Pc – Pr) . C
CSE : Consumer Support Equivalent (consumer market transfers),
Pc : Consumer prices (sugar),
Pr : Reference for Sugar (world) price,
C : Amount of sugar consumption.
In this study, CSEs were calculated between 2001 and 2005. According to this

Table 4. Calculation of CSE between 2001 and 2005

Years	Pc ($/ton)	Pr ($/ton)	C (ton)	CSE ($)
2001	467.25	238.1	1,920,000	-439,968,000
2002	652.69	203.3	1,942,000	-820,281,380
2003	931.12	203.7	1,930,000	-1,403,920,600
2004	1,130.08	226.7	1,937,000	-1,749,847,060
2005	1,170.28	278.9	1,966,400	-1,752,809,632

When the Table 4 is examined, between 2001 and 2005, approximately US $ 400 million to US $ 1,7 billion was allocated to producers to support sugar beet production. So sugar beet producers were paid between approximately US $ 400 million and US $ 1,7 billion by all of the citizens who pay taxes and indirect tax payers in Turkey.

Welfare Analysis of Sugar Beet Producers in Konya Region

The indirect income of the producers from sugar beet production in Konya Region is calculated below with the terms PSE and CSE. In the study, PSE and CSE for 2001 and 2005 were calculated for Çumra Region. According to this;

$PSE_{P.==}$ (Pp– Pr) . Q
PSE_P : Producer Support Equivalent (market transfers to producer),
Pp : Sugar beet price received by the producer,
Pr : Reference (World) price for sugar,
Q : Sugar production quantity (Konya region).

Table 5. Konya Region Manufacturers PSE_P by World Prices

Years	Pp ($/ton)	Pr ($/ton)	Q (ton)	PSE_P ($)
2001	542.85	238.1	203,214	70,157,716
2002	623.47	203.3	271,185	113,943,801
2003	658.31	203.7	273,600	124,381,296
2004	621.63	226.7	268,069	105,868,490
2005	536.73	278.9	388,500	100,166,955

The sugar beet producer of Konya Region has been preserved between 70 and 124 million dollars in comparison with world prices (Table 5). The sugar beet producer of Konya Region has been preserved between 70 and 124 million dollars in comparison with world prices. The following PSE calculation, which identifies other subsidies to the manufacturer (cash advance advances, government subsidies and training and extension services) rather than using world prices, is calculated for the Konya Region.

Table 6. Calculating PSE_O in terms of other supports

Years	DP (million $)	GS1 ((million $)	GS2 (million $)	PSE_O (million $)
2001	167	25	0.22	195.22
2002	270	30	0.23	300.23
2003	297	33	0.25	330.25
2004	369	35	0.24	404.24
2005	402	38	0.25	440.25

PSE_O = DP + GS1 + GS2
PSE_O : Producer Support Equal (other transfers to the producer),
DP : Direct Payments (Konya region),
GS1 : General Support (Konya region),
GS2 : General Services (Konya region),
Between 2001 and 2005, the producers in the region received support of 195 to 440 million dollars in sugar beet agriculture (Table 6).

Welfare Analysis of Sugar Beet Producers in Çumra Region

The indirect income of the producers from sugar beet production in Çumra Region is calculated below with the terms PSE and CSE. According to this;

PSE_P == (Pp– Pr) . Q
PSE_P : Producer Support Equivalent (market transfers to producer),
Pp : Sugar beet price received by the producer,
Pr : Reference (World) price for sugar,
Q : Sugar production quantity (Çumra region).

Table 7. Calculation of PSE_P for Producers in Çumra Region according to World Prices

Years	Pp ($/ton)	Pr ($/ton)	Q (ton)	PSE_P ($)
2004	621.63	226.7	41,369	16,337,859
2005	536.73	278.9	44,532	11,481,685

The sugar beet producer in the Çumra region was preserved between 11 and 16 million dollars in comparison with world prices (Table 7). The following PSE calculation, which identifies other support to the manufacturer (cash advance advances, government subsidies and training and extension services) instead of using world prices is given for Çumra region;

Table 8. Calculation of the PSE_O in terms of other supports

Years	DP ($)	GS1 ($)	GS2 ($)	PSE_O ($)
2004	19,351,226	747,862	4,000	20,103,088
2005	18,570,862	1,049,460	4,000	19,624,322

PSE_O = DP + GS1 + GS2

PSE_O : Producer Support Equal (other transfers to the producer),
DP : Direct Payments (Çumra region),
GS1 : General Support (Çumra region),
GS2 : General Services (Çumra region).

Between 2004 and 2005, approximately 19 to 20 million dollars of support were provided to the producers of sugar beet in the region (Table 8).

CONCLUSION AND RECOMMENDATIONS

As a result of the calculations, PSE value of 2005 was calculated as 506 million dollars. The PSE value ranged from 503 million dollars to US $ 906 million between 2001 and 2005. As a result of this calculation; conclusion can be made that sugar beet producers in Turkey is supported in very high levels. This can be clearly seen when comparing world prices with domestic prices. However, this is not entirely correct, since the PSE calculated here is a price that does not reach the producer. Low world prices are not available in Turkey, because of 100% customs duty application. In other words, Turkey provides 503 to 906 million dollars of support to sugar beet producers with 100% customs duty on sugar. However, since this support does not go directly into the producers' pocket, it is perceived by the producers as not a support. This is seen as an application to protect agriculture and industry.

However, in order to determine the main support given to the sugar beet producer by the state, instead of using the reference (World) prices, it was found that between 2001 and 2005, between 195 and 440 million dollars $ were transferred to the producer by using the method that determines the other supports to the producer. 167 to 402 million US $ of this transfer is a direct payment under the name of early dismantling incentive premium. Although it varies by years, this payment is 50% of the total sugar beet production. The remaining 50% is also paid to sugar beet producers so that the total support reaches 400 to 800 million dollars This is not a source fully transferred to the producer, but in return it is a source that guarantees sugar beet production. If a valuation is made between 2001-2005 it can be seen that Turkey provides protection and support for sugar beet production with approximately 1,1 to 1,2 billion dolars per year. In terms of sugar beet producers in the Konya region, it can be seen that they are preserved between 70 and 124 million dollars when the comparison is done with world prices. With the other transfers made to the producer for Konya region, it was determined that between 2001 and 2005, local producers received support of 27 to 123 million dollars for sugar beet production. The sugar beet producers in Çumra region have been protected between 11 and 16 million US $ according to the calculations. For Çumra region; As a result of the PSE calculation, which identifies other subsidies to the producer (cash advance advances, government subsidies, training and extension services) instead of using world prices, it was found that 20 million dollars for 2004 and 19 million dollars for 2005. The new “Sugar Law” which is numbered as 4634, was published in the Official Gazette on 19.04.2001 and it has brought quota to the domestic market share of sugar factories, which has led to the shrinkage of the sugar beet plantation area of the beet producer. The greatest impact of the sugar beet production quota on the farmer is 42.59% of those who cannot evaluate the extra labor force resulting from the contraction in the production area. This can be interpreted as the inefficiency of the potential labor force. After the quota, 70.37% of the farmers are reduced the input and labor force used per unit area of sugar beet and 74.08% of the farmers is declined yield per unit area. So it can be said that the unit area is not used effectively and this leads to loss of productivity. With the commissioning of Çumra Sugar Factory, 61% of sugar beet processing quota was added in the region and the shrinkage in sugar beet area decreased further.

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ACARICIDAL AND SYNERGISTIC EFFECT OF ZEOLITE ON *Tetranychus urticae*

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ABSTRACT

In this study, acaricidal effect of zeolite was investigated in Tetranychus urticae Koch. adults. In addition, the synergistic effect of zeolite with fenbutatin oxide was investigated. Residual effect tests were applied in the study. The study was carried out in an illuminated climate cabin for 16 hours under 28 ± 2˚C temperature and 60 ± 5% humidity.

In the study, 2.5, 5 and 10 % w / v concentrations of zeolite were tested on Tetranychus urticae adults. The effects of exposure times at 24, 48, 72 and 96 hours were investigated. The highest mortality (93.75%) was determined at 72 hour exposure time and 10 % concentration.

The synergistic effect of mixing zeolite with fenbutatin oxide was investigated on Tetranychus urticae adults. First, fenbutatin oxide was applied alone. Then, fenbutatin oxide mixing with zeolite (0.4 % concentration) was applied. LC_{50} and LC_{90} values of fenbutatin oxide were determined. When fenbutatin oxide is used alone; The LC_{50} and LC_{90} values at 72 hour exposure time were 0.196% and 10.299% w / v, respectively. LC_{50} and LC_{90} values of fenbutatin oxide mixing with zeolite in 72 hour exposure time were 0.094% and 5.890%. The results showed that zeolite had acaricidal and synergistic effect.

Keywords: *Fenbutatin oxide, Zeolite, Synergistic effect, Tetranychus urticae*

INSECTICIDAL AND SYNERGISTIC EFFECT OF ZEOLITE ON *Callosobruchus maculatus*

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ABSTRACT

In this study, insecticidal effect of zeolite was investigated in Callosobruchus maculatus F. adults. In addition, the synergistic effect of zeolite with deltamethrin was investigated. Residual effect tests were applied in the study. The study was carried out at 28 ± 2˚C temperature and 60 ± 5% humidity conditions in a climate cabin.

In the study, 0.2, 0.4 and 0.8 % w/v concentrations of zeolite were tested on Callosobruchus maculatus adults. The effects of exposure times at 24, 48, 72 and 96 hours were investigated. The highest mortality (27.50%) was determined at 96 hour exposure time and 0.8% concentration.

The synergistic effect of mixing zeolite with deltamethrin was investigated on Callosobruchus maculatus adults. First, deltamethrin was applied alone. Then, deltamethrin mixing with zeolite (0.4 % concentration) was applied. LC_{50} and LC_{90} values of deltamethrin were determined. When deltamethrin is used alone; The LC_{50} and LC_{90} values at 72 hour exposure time were 0.012% and 0.035% w / v, respectively. LC_{50} and LC_{90} values of deltamethrin mixing with zeolite in 72 hour exposure time were 0.010% and 0.023%. The results showed that zeolite had insecticidal and synergistic effect.

Keywords: *Deltamethrin, Zeolite, Synergistic effect, Callosobruchus maculatus*

EFFECT OF EINKORN WHEAT FLOUR (*TRITICUM MONOCOCCUM* L.) ON THE QUALITY CHARACTERISTICS OF CAKE

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ABSTRACT

*In this study, wheat flour used in cake formulation was replaced with einkorn wheat flour (EWF) at 0, 10, 20 and 30% levels. Some physical and sensory properties of cakes containing EWF were determined. Crust and crumb L * values of cake samples decreased and a * values increased with the use of EWF. In general, the volume of cake samples was not statistically different from each other. Weight loss and specific volume of cake samples ranged between 10.80-13.66% and 2.63-2.76 ml/g, respectively. Volume index values of cake samples enriched with EWF were similar to control samples and the highest symmetry index value was found in cakes containing 20% EWF. Sensory evaluation results showed that the taste, texture and chewiness scores of all cake samples were similar to the control samples, but the taste and chewiness of the cakes were improved with EWF. Cake samples containing 30% EWF gained higher overall acceptability scores than control and 10% EWF samples. From this study, it can be concluded that einkorn wheat flour can be used in the cake formulation without causing any deterioration in quality properties but for future studies, the use of more than 30% einkorn in cakes can be investigated.*

Key words: *Einkorn, cake, sensory, quality*

INTRODUCTION

Primitive wheat types are resistant to frost, drought and diseases and they are generally used as animal feed or in making meal like bulgur (Zengin, 2015). The type *Triticum monococcum L. ssp. monococcum* (einkorn-siyez) soft wheats are diploid hulled wheats (2n=2x =14) and it is also highly resistant to disease and harm due to its tight hull structure and its single head even in arid conditions and poor soil (Hendek Ertop, 2018). The wheat was domesticated about 10 000 years ago in the Fertile Crescent, especially in the Karacadag mountains of Turkey, and spread to other regions (Europe) during its agricultural revolution (Hidalgo and Brandolini, 2014).

There is growing interest in the development of new or special foods such as bakery products and baby food products with high dietary fiber and caratenoid content. In this context, the attention on the nutritional properties of primitive wheats increased in the recent years (Corbellini et al. 1999). The researches on the einkorn quality showed that this diploid wheat type has some advantages over polyploid wheats. Einkorn wholemeal is a good source for proteins, lipids (principally unsaturated fatty acids), fructans and trace elements (commonly zinc and iron). Some antioxidant compounds such as carotenoids, tocols, conjugated polyphenols, alkylresorcinols and phytosterols and some enzymes especially β-amylase and lipoxygenase which limit antioxidant degradation during food processing provide extra nutritional properties of its flour compared to other wheats (Hidalgo and Brandolini, 2014).

Cakes are a popular bakery product consumed by all people, especially children, because of their flavor, readiness to eat and a wide variety. Cake is the most produced bakery product after bread and biscuit (Levent and Bilgiçli, 2013). The cakes formulations contain primarily basic nutrients and this product can be easily enriched with various ingredients (Tuncel and Demirci, 2006). In recent years, special attention has been given to the development of healthy foods and many food manufacturer are searching ways to add functional ingredients to their products (Holguin-Acuna et al. 2008).

In the literature, EWF was used in different cereal products such as breadmaking (Borghi et al. 1996), cookies (Corbellini et al., 1999; Nakov et al. 2016) and pasta (Brandolini et al., 2018).

The main objective of this study is to determine of some physical and sensorial properties of cakes enriched with EWF as a primitive wheat type whose consumption is limited.

MATERIAL AND METHODS

Materials

Cake ingredients (wheat flour, milk, sugar, eggs, oil, salt and baking powder) were obtained from local markets in Karaman. The einkorn flour (*Triticum monococcum L.*) was purchased from Agriculture and Credit Cooperatives, Ankara, Turkey.

Preparation of Cakes

Cakes samples were produced according to the modified method described by Ambigaipal and Shahidi (2015). The control cake formulation was given in Table 1 and EWF incorporated to formulation as flour substitutes at four different addition levels (0, 10, 20 and 30%).

Table 1. Cake formulation

Wheat flour	65 g
Sugar	37.5 g
Baking powder	3 g
Salt	0.6 g
Milk	60 ml
Whole egg (whipped)	50 ml
Oil	20 ml

Colour

For color analysis of crust and crumb of cake samples, *L** (light /dark), *a** (red/green) and *b** (yellow/blue) values were determined by using the chroma meter CR-400 (Konica Minolta, Inc., Osaka, Japan).

Cake quality

Moisture content was estimated by the methods of AACC (2000). Before and after baking, samples were weighed and weight loss was calculated as percentage. However, the volume of cooled samples after baking were determined with method (10-05) of AACC (2000). Diving the volume values to their weight (cc/g) determined the specific volume of cakes. Volume index, symmetry index and uniformity index of the cakes were measured by using AACC template method 10-91 (AACC, 2000).

Sensory properties

The assessments of taste, odour, texture, chewiness and overall acceptability for all cake samples were performed by the panelists using five-point hedonic scale (1.Dislike very much, 2.Dislike, 3.Neither like or dislike, 4.Like, 5.Like very much).

Statistical analyses

The statistical software JMP 10.0 (SAS Institute, Cary, NC, USA) was used for analysing ($p< 0.05$) of the data according to the appropriate experimental designs and provided as means and standard deviations.

RESULTS AND DISCUSSION

Colour values of cake samples are given in Table 2. *L** (brigtness), *a** (redness) and *b** (yellowness) values of cake crust ranged from 50.64 to71.87, 2.94 to14.47 and 35.13 to 41.58, respectively. The use of EWF in cake samples decreased *L** values and increased crust and crumb *a** values of cakes. Crumb color depends largely on cake ingredients because the temperature is not high enough for Maillard and caramelization reactions (Gómez et al. 2010).

Some quality parameters of cake samples are given in Table 3. The use of EWF in cake formulation increased the moisture contents of cake samples compared to control samples. Weight loss values ranged between 10.80% and 13.66%. In general, the volume and specific volume of cake samples was not found statistically different from each other.

The volume index values of cake samples enriched with EWF were not statisticaly different from each other (Table 4). The volume index is an indicator of cake volume and symmetry indicates the differences in

height between the central zone and the lateral zone. Therefore, high symmetry indicates that the cakes rise substantially in the central portions, while a negative symmetry indicates that the cake volume decreases at the end of the baking process (Gómez et al. 2008). The lowest uniformity index were found in samples containing 10% EWF.

Table 2. Colour values of cake samples

	Crust color			Crumb color		
	L^*	a^*	b^*	L^*	a^*	b^*
Control	71.87±0.18^{a}	2.94±0.23^{c}	38.44±0.33^{b}	70.47±0.33^{a}	-2.36±0.07^{c}	24.32±0.28^{ab}
10% EWF	60.24±0.30^{b}	12.46±0.16^{b}	41.58±0.54^{a}	67.37±0.24^{b}	-1.77±0.13^{b}	24.05±0.30^{ab}
20% EWF	54.45±0.16^{c}	12.22±0.25^{b}	35.13±0.17^{c}	65.69±0.52^{c}	-0.99±0.20^{a}	23.66±0.23^{b}
30% EWF	50.64±0.57^{d}	14.47±0.13^{a}	37.33±0.30^{b}	66.20±0.25^{bc}	-0.63±0.06^{a}	25.19±0.41^{a}

EWF: Einkorn wheat flour, The means with the different letter in column are significantly different ($p<0.05$).

Table 3. Some quality parameters of cake samples

	Moisture (%)	Weight loss (%)	Weight (g)	Volume (ml)	Specific volume (ml/g)
Control	36.98±1.10^{b}	10.80±0.40^{c}	116.91±0.30^{a}	320±5.83^{a}	2.74±0.12^{a}
10% EWF	40.68±0.54^{a}	13.66±0.23^{a}	112.24±0.11^{d}	295±3.39^{b}	2.63±0.07^{a}
20% EWF	41.77±0.83^{a}	11.20±0.31^{bc}	115.44±0.24^{b}	305±2.35^{ab}	2.64±0.20^{a}
30% EWF	41.46±0.72^{a}	12.22±0.25^{b}	114.11±0.35^{c}	315±3.58^{a}	2.76±0.11^{a}

EWF: Einkorn wheat flour, The means with the different letter in column are significantly different ($p<0.05$).

Table 4. Volume index, symmetry index and uniformity index values of cake samples

	Volume index (mm)	Symmetry index (mm)	Uniformity index (mm)
Control	166±5.66^{a}	26±1.24^{b}	6±1.12^{a}
10% EWF	161±4.07^{a}	28±0.92^{b}	-10±0.42^{c}
20% EWF	154±3.11^{a}	41±1.40^{a}	-1±0.28^{b}
30% EWF	169±2.66^{a}	26±0.45^{b}	-2±0.92^{b}

EWF: Einkorn wheat flour, The means with the different letter in column are significantly different ($p<0.05$).

Table 5. Sensory properties of cake samples

	Taste	Odour	Texture	Chewiness	Overall acceptibility
Control	4.27±0.21^{a}	3.93±0.16^{b}	4.50±0.16^{a}	4.17±0.21^{a}	4.33±0.11^{b}
10% EWF	4.33±0.17^{a}	4.50±0.08^{ab}	5.00±0.14^{a}	4.33±0.17^{a}	4.40±0.06^{b}
20% EWF	4.70±0.24^{a}	4.50±0.11^{ab}	5.00±0.11^{a}	4.73±0.20^{a}	4.77±0.17^{ab}
30% EWF	4.93±0.25^{a}	5.00±0.25^{a}	4.67±0.17^{a}	4.83±0.07^{a}	4.90±0.10^{a}

EWF: Einkorn wheat flour, The means with the different letter in column are significantly different ($p<0.05$).

Sensory properties of cake samples are presented in Table 5. When compared to control samples, taste, texture and chewiness scores of cake samples enriched with EWF were not statistically different from control. Odour and overall acceptability scores of cake samples increased with EWF usage. Cake samples containing 30% EWF had higher overall acceptability scores than control and samples containing 10% EWF.

CONCLUSION

The use of EWF in formulation decreased *L** (brightness) and increased *a** (redness) values of crust and crumb of cakes. The volume and specific volume of the cake samples were not adversely affected by the use of EWF. The volume index and symmetry index (except for cake samples containing 20% EWF) were not statistically different from each other. Odour and overall acceptability scores of cake samples increased with EWF usage. As a result of this study, EWF can be used without causing any adversity in the cake formulation and in future studies, more than 30% usage of EWF can be investigated.

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EVALUATION OF LAND CONSOLIDATION IN ERZURUM-AZIZIYE KUMLUYAZI NEIGHBORHOOD FROM DIFFERENT PERSPECTIVES

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INTRODUCTION

Agricultural land, which is the main factor in agricultural production, is a fixed area that cannot be increased. In Turkey almost all of the agricultural land is useable. Since the amount of agricultural land remains constant despite the population increase day by day, in order to meet the needs of the increasing population, it is necessary to produce foodstuffs by using the agricultural land in the most efficient way. At this point, land consolidation comes into prominence in every aspect.

The existence and ownership of land, the structure and shape of the enterprise and the existence of agricultural infrastructure services are the main elements of the agricultural structure and the way to best coordinate these elements is the consolidation of the land.

In this study, land consolidation project of Erzurum-Aziziye-Kumluyazı neighborhood will be examined. It is aimed to evaluate the aggregation project implemented in the region with some indicators in order to show the reason why it is successful.

MATERIAL AND METHOD

In this study, land consolidation study in Erzurum-Aziziye Kumluyazı neighborhood was evaluated from different perspectives. The workspace has coordinate information with the Latitude: 40,04266 and Longitude: 41,09680. The climate information; summers are mild and rainy; winters are very cold and snowy. 2801276.48 m^2 land consolidation project has been started and the project has been completed on 2787556 m^2 area. While the number of parcels before consolidation was 338, the number of parcels after consolidation decreased to 154. While the transportation network before the consolidation was 11.191.00 km, it was 14.300.00km after the consolidation.

Pre-aggregation and post-aggregation data were analyzed comparatively. According to the data obtained, road condition and adequacy were evaluated and agricultural parcels were evaluated in terms of number, shape, ownership and area size. In addition, some enterprises were analyzed in terms of land size and number of parcels.

RESULTS

THE PROJECT SUMMARY	
Location of the Project (Province-District-Village)	ERZURUM AZİZİYE KUMLUYAZI NEIGHBORHOOD
Public Investment Share Deduction Rate (%)	0,011191

PROJECT VALUES OF CASTASTRO PARCELS IN OLD CASE (m^2)					
Area entering the project	Not distributed	Distributed area	1st degree area	1st degree area Investment Share deduction kesintisi	1st Degree Project Area (Progress)
2801276	13720,69	2787555,78	2096368	41941,98	2138310

PROJECT VALUES OF CADASTA PARCELS IN NEW CASE (%)	1st degree area	
New block areas 2759711,23	218309,23	
Number of parcels	Old condition	338
	New condition	154
Average Parcel Area	Old condition	8247,20m²
	New condition	17804,47m²
SOCIETY RATE	0,54	
NUMBER OF PEOPLE	247	

NUMBER OF BUSSINESES	247
AVERAGE BUSINESS SIZE (m^2)	11285,65

LENGTH OF TRANSPORTATION SYSTEM (KM) (km)	Old condition	11.191,00	
	New condition	14.300,00	
UNIT ROAD TO THE FIELD MT/HEKTAR	Old condition	40,25	
	New condition	51,44	
Shareholding rates	Shareholding	Whole	
	109	229	59,38%
	46	108	42,59%
NUMBER OF PARCELS AND NISPETES BENEFIT FROM THE TRANSPORTATION SYSTEM DIRECTLY			
Old condition	111		32,84%
New condition	154		100,00%

CONCLUSION

Based on the data, it has been determined that the number of parcels, which is one of the main elements of the consolidation, is reduced by approximately 60% and this decrease in the number of parcels has saved fuel, labor and time. At the same time, there was an increase in the road network in the transportation system, which increased the access to the parcels and contributed to the national economy by saving time and fuel. Land consolidation projects are not only bringing together the lands, but also the projects where all aspects of the land are examined and solved. The combination of the land provides transportation, irrigation, drainage and all the land needs, providing maximum productivity and quality products with minimum cost, which increases the farmer's earnings. The increase in production is based on the basic principle of supporting development and making our country a producing and winning country working in agricultural land.

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BASOSQUAMOUS CARCINOMA IN A MALTESE TERRIER DOG

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ABSTRACT

In this presentation, a basosquamous carcinoma in the left femoral region of a 7-year-old female Maltese Terrier dog was described by pathological findings. A solid hard mass overflowing from the skin surface of the left femoral region was surgically extirpated and brought to the Pathology laboratory. The mass was approximately 2.5x2x1 cm in size and hard consistency, and lobular, bloody and gray-white colored on cut surface. The samples taken from this mass were fixed in 10% formalin solution, and were than embedded into paraffin blocks after the routine pathological process. Then 5-micron thick sections were stained with HxE and examined under light microscope. Microscopically, numerous islets of malignant tumors were noticed that spread to the dermis. These islets were composed of concentric arrangement of squamoid keratinocytes with polygonal shaped and eosinophilic cytoplasm, that showed moderate pleomorphism, and there were keratin pearls at the center of these islets. Atypical basaloid cells with hyperchromatic nuclei and low cytoplasm were observed to align as fence-like at the periphery of these tumor foci. Melanin pigment and moderate mitoses were detected in basaloid cells. Neutrophil granulocytes and mononuclear cell infiltrations were also found among tumor islets. This case, which was diagnosed as basosquamous carcinoma by the pathological findings in a Maltese terrier dog, was found appropriate to publish in order to contribute to veterinary oncology.

***Keywords**: Basosquamous carcinoma, Maltese Terrier, Veterinary oncology*

INTRODUCTION

Basasquamous carcinoma (BSSC) is a rare skin tumor both in dogs and cats. The highest incidence is 6-12 age olds. There is no gender predisposition. Saint Bernard, Bloodhound, Samoyed, and old English sheepdog breeds have been reported to be at risk. In dogs, it occurs most commonly in the head, neck and forearm, accounting for 0.35% of all skin tumors (Shin ve ark 2011, Goldschmidt ve Goldschmidt 2016). The tumor, which may be intradermal or subcutaneous, is usually associated with epidermal ulceration and hair loss. The cut section of BSSC is gray-white and usually lobular (Goldschmidt ve Goldschmidt 2016). BSSC has the characteristics of both basal cell tumor and squamous cell carcinoma and has transition regions between these two types of cells (Oldbury ve ark 2018). Although it is suggested that these two tumors develop independently of each other (Bowman ve ark 2003), squamous differentiated basal cells due to their histological features are reported to form BSSC (Burston ve Clay 1959). This is supported by the definition made by the World Health Organization (WHO 2018).

Although the incidence and histological features are well defined in humans, the information in the veterinary literature is very limited (Shin ve ark 2011). Therefore, it was aimed to contribute to the field of veterinary oncology by histopathological identification of basosquamous carcinoma in a Maltase Terrier dog.

CASE HISTORY

In this presentation, a basosquamous carcinoma in the left femoral region of a 7-year-old female Maltese Terrier dog was described by pathological findings. A solid hard mass overflowing from the skin surface of the left femoral region was surgically extirpated and brought to the Selcuk University, Faculty of Veterinary Medicine, Department of Pathology laboratory.

MATERIAL AND METHODS

Tissue samples taken from the tumour mass were fixed in 10 % formaldehyde solution one day and routine tissue processing procedures were performed. Then the tissue sections embedded in paraffin blocks were cut on 5 micrometer thick and stained with hematoxylin-eosin (H&E) and examined under a light microscope (Olympus BX51, Tokyo, Japan).

RESULTS AND DISCUSSION

In the macroscopic examination, the mass was approximately 2.5x2x1 cm in size and hard consistency, and lobular, bloody and gray-white colored on cut surface (Figure 1). Microscopically, numerous islets of malignant tumors were noticed that spread to the dermis (Figure 2A). These islets were composed of concentric arrangement of squamoid keratinocytes with polygonal shaped and eosinophilic cytoplasm, that showed moderate pleomorphism, and there were keratin pearls at the center of these islets (Figure 2B-C). Atypical basaloid cells with hyperchromatic nuclei and low cytoplasm were observed to align as fence-like at the periphery of these tumor foci (Figure 2D). Melanin pigment and moderate mitoses were detected in basaloid cells. Neutrophil granulocytes and mononuclear cell infiltrations were also found among tumor islets. The macroscopic and microscopic findings described in this case consistent with previously reported BSSC data in the literature (Shin ve ark 2011, Goldschmidt ve Goldschmidt 2016, WHO 2018).

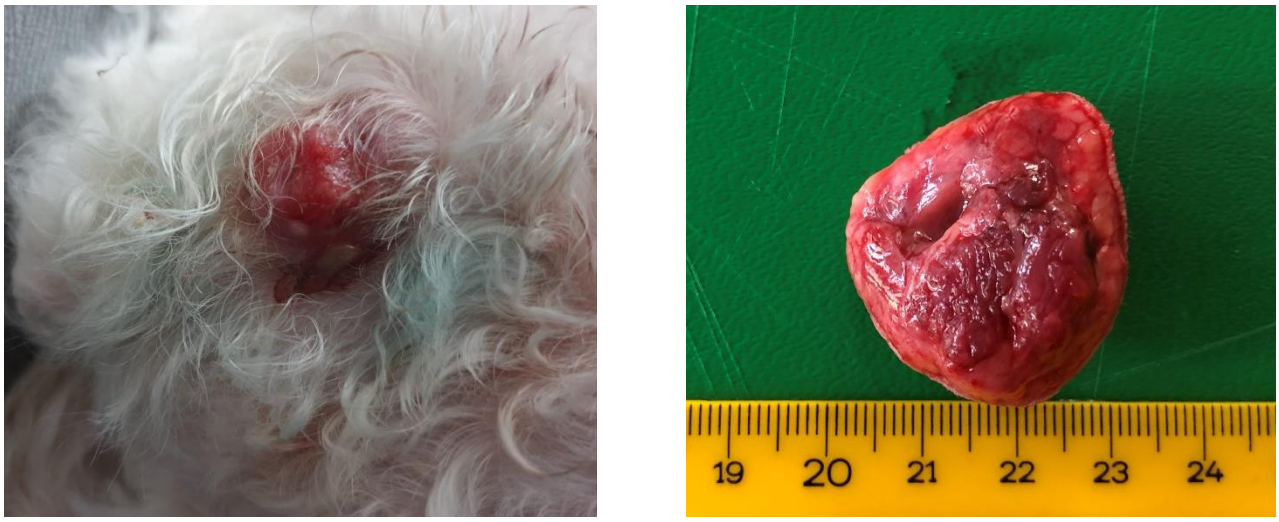

Figure 1. The extirpated mass.

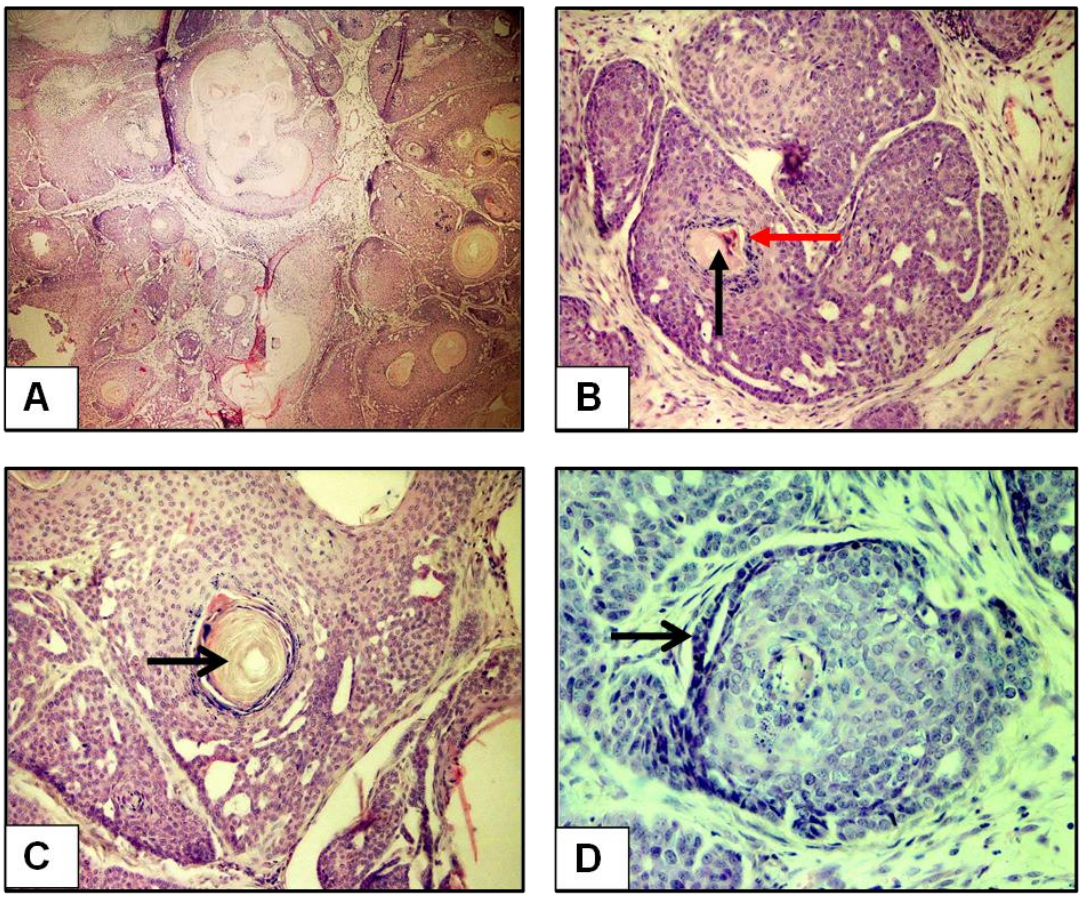

Figure 2. A.Numerous islets of malignant tumors in dermis, H&E,4x. **B**. Keratin pearls in the center of tumor islets (black arrow), fence-like align formed by basal cells (red arrow), H&E,20x. **C** Keratin pearls in the center of tumor islets (arrow), H&E,20x. **D.** Fence-like align formed by atypical basal cells (arrow), H&E,40x.

CONCLUSION

According to the information obtained, the dog was in good health and no recurrence was reported. This case of basosquamous carcinoma was described histopathologically and it was aimed to contribute to the field of Veterinary oncology which has very limited data on this subject and also, it was emphasized that surgical removal of this tumor may be a good treatment option.

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A CASE OF HEMANGIOPERICYTOMA IN A CROSSBRED DOG

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ABSTRACT

In this case report, we describe a case of hemangiopericytoma in a 4-year-old crossbred female dog. A mass of 10x10x5 cm on the left anterior extremity just above the antebrachium was extirpated by surgical operation. Then, the mass was sent to the Selcuk University, Faculty of Veterinary Medicine, Department of Pathology laboratory. In the macroscopic examination, numerous red colored foci in the gray-white cross-sectional face of the hard mass were noted. Microscopically, whirlpool structures formed by spindle cells were observed. There were prominent vascular structures in the middle of these areas and it was noted that the neoplastic cells showed fingerprint-like arrangement around them. Pale pinkish collagenous or mucinous formations were observed in the parenchyma of the tumor. A small number of erythrocytes were seen in the vascular structures and some areas of bleeding around of them were noted. Apart from these, the areas where the vessel structures were not fully formed, were also observed. Nuclear atypia and few mitosis were detected in these round or oval shaped neoplastic cells. This tumor, which can easily be confused with lipomas because of its macroscopic appearance, has been diagnosed as hemangiopericytoma with the presence of vessels in the center of fingerprint-like arrangements of the neoplastic cells. Considering hemangiopericytoma in skin and soft tissue tumors may help in a conscious treatment.

Keywords: *Hemangiopericytoma, myopericytoma, crossbred dog, histopathology.*

MELEZ BIR KÖPEKTE HEMANGIOPERISITOMA

ÖZET

Bu vakada 4 yaşlı melez dişi bir köpekte hemangioperisitoma olgusu tanımlandı. Sol ön ektremitede antebrahiumun hemen üzerinde 10x10x5 cm ebatlarındaki kitle cerrahi operasyonla ekstirpe edildi. Kitle oldukça sert kıvamlı olup kesit yüzü genelde gri-beyaz renkteydi, ancak fazla sayıda kırmızımsı renkte kanama alanları içeriyordu. Mikroskobik incelemelerde çoğunluğu mekik şekilli hücrelerin girdap benzeri yapılar oluşturduğu, bazı alanlarda ise bu görünümün ortalarında belirgin şekilde damar yapıları ve etrafında parmak izi benzeri dizilim gösterdiği dikkati çekti. Bu yapılar arasında yer yer solgun pembemsi renkte kollajenöz veya müsinöz oluşumlara rastlandı. Damar yapıları içerisinde az sayıda eritrosite rastlanırken çevrelerinde yer yer kanama alanları dikkati çekti. Damar yapılarının tam olarak şekillenmediği alanlarda, yuvarlak ve oval şekilli hücrelerin bulunduğu ve bu hücrelerde az sayıda mitozla birlikte nükleer atipi de olduğu gözlendi. Makroskobik görünümüyle lipomlar ve mikroskobik görünümüyle bağ doku ve sinir kılıfı tümörleriyle kolayca karıştırılabilen bu tümör, yerleşim yeri ve parmak izi benzeri dizilim gösteren hücrelerin merkezinde damarların görülmesiyle hemangioperisitoma olarak teşhiş edilmiştir.

INTRODUCTION

Hemangiopericytoma is seen commonly in dogs and rarely in cats. Although this tumor is mostly seen in large breed dogs, there is no gender predisposition. It is usually seen in dogs aged 8-14 years. It occurs mostly in the extremities, especially in the lateral sections. Less commonly, it can also be seen in the head and tail area. The tumor may be well-limited or infiltrative. It is usually 2-10 cm in diameter and sometimes can reach up to 25 cm. The macroscopic appearance varies, the cross-sectional face can be gray or white to red, soft to hard, or fatty. Sometimes the skin on it can become ulcerated (Erer ve Kiran 2005, Hendrick 2016). Histopathologically, the characteristic findings of hemangiopericytoma are the formation of helical growths around the vessels and the fingerprint structure formed by tumor cells (Erer ve Kiran 2005). Although this feature can be seen in other sarcomas, it is usually quite dominant in hemangiopericytomas (Hendrick 2016).

This hemangiopericytoma case, which can be mixed macroscopically with lipomas, is discussed in detail and aimed to contribute to the field of veterinary oncology.

CASE HISTORY

In this case report, we describe a case of hemangiopericytoma in a 4-year-old crossbred female dog. A mass of 10x10x5 cm on the left anterior extremity just above the antebrachium was extirpated by surgical

operation (Figure 1A). Then, the mass was sent to the Selcuk University, Faculty of Veterinary Medicine, Department of Pathology laboratory.

MATERIAL AND METHODS

Tissue samples taken from the tumour mass were fixed in 10 % formaldehyde solution one day and routine tissue processing procedures were performed. Then the tissue sections embedded in paraffin blocks were cut on 5 micrometer thick and stained with hematoxylin-eosin (H&E) and examined under a light microscope (Olympus BX51, Tokyo, Japan).

RESULTS AND DISCUSSION

In the macroscopic examination, numerous red colored foci in the gray-white cross-sectional face of the hard mass were noted. Microscopically, whirlpool structures formed by spindle cells were observed (Figure 1B). There were prominent vascular structures in the middle of these areas (Figure 1C) and it was noted that the neoplastic cells showed fingerprint-like arrangement around them (Figure 1D). Pale pinkish collagenous or mucinous formations were observed in the parenchyma of the tumor. A small number of erythrocytes were seen in the vascular structures and some areas of bleeding around of them were noted. Apart from these, the areas where the vessel structures were not fully formed, were also observed. Nuclear atypia and few mitoses were detected in these round or oval shaped neoplastic cells. These macroscopic and histopathological findings were consistent with the previously reported literature (Erer ve Kiran 2005, Coskan ve ark 2013, Namazi ve ark 2014, Hendrick 2016). Also, it has been reported that the formation of helical growths around the vessels and the fingerprint structure formed by tumor cells which are microscopic findings of hemangiopericytoma may be diagnostic (Williamson ve Middleton 1998, Erer ve Kiran 2005, Santos ve ark 2009, Namazi ve ark 2014). Canine hemangiopericytoma cases have been reported to occur mostly in middle-aged and older dogs (Erer ve Kiran 2005, Kim ve ark 2007, Hendrick 2016). In this case, hemangiopericytoma was diagnosed in a 4-year-old dog with macroscopic and microscopic findings.

CONCLUSION

Hemangiopericytoma should be taken into consideration especially in the diagnosis of masses on skin and soft tissue of the extremities. With this case, it was pointed out that hemangiopericytoma, which is mostly reported in older dogs, can also be seen in younger dogs.

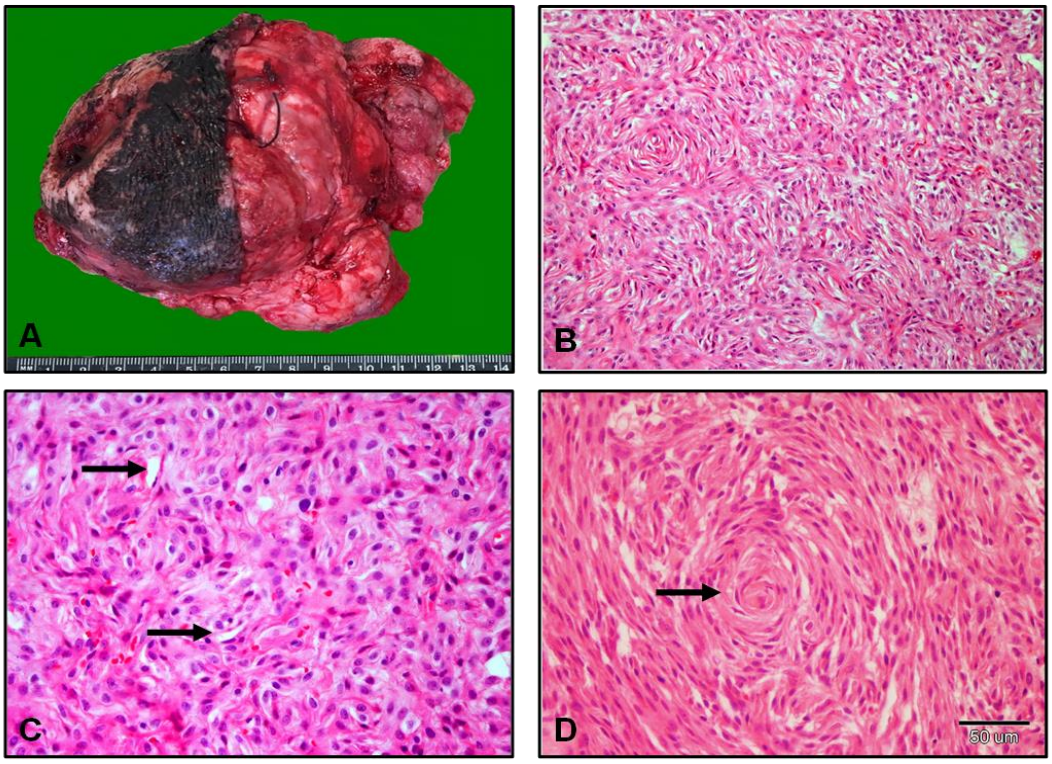

Figure 1. A. Extirpated tumoral mass. **B.** Whirlpool structures formed by spindle cells and pinkish collagenous formations, H&E, 20x. **C.** Vascular structures (arrows), H&E, 40x. **D.** Characteristic "fingerprint pattern" appearance formed by neoplastic cells (arrow), H&E, 40x.

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PREDATOR MITES AND THEIR BIOPREPARATES IN CONTROL OF TETRANYCHUS URTICAE

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ABSTRACT

Tetranychus urticae Koch (Acari: Tetranychidae) is a mite that is harmful a lot of plant species. Two spotted spiders mites suck out plantsap and reproduce without overwintering in greenhouse and temperate climate places. It can complete one generation in the fields and gardens in 10-20 days depending on the climatic characteristics of the region. The damage caused by T. urticae starts in the from of yellow dots and eventually becomes red dots. The damage caused bylocal drying and defoliationon the plant can reach 100%. Chemical control used extensively against two spotted spider mites has raised resistance to pesticides.To solution this problem, farmers were increase the amount of active substance and the number of spraying.But this solution has brought more problems for the environment and human health.For this reason, the best control methot of two spotted spider mites was be biological control.In biological control is used predator mites such as Phytoseiulus persimilis, Neoseiulus californicus, Neoseiulus fallacis, Amblyseius degeneras, Galendromus occidentalis and Mesoseiulus longipens.Predatör mites can be used for one-time for active control throughout the season.Biopreparates of predator mites are mostly produced abroad.Predator mites can be produced on artificial and natural foods .Enough predatör mites are grown, collected and sold in small paper bags or plastic bottles of various sizes.This predator mites are mixed homogenously with vermiculite, wheat bran, sawdust or similar meterials in the biopreparates for easy distribution to the plant.Application time and usage methods of predator mites used in biological control have an important place in control ofTetranychus urticae.

Keywords:*Tetranychus urticae, Biological Control,Predaceous Mites,Biopreparates.*

1.*Tetranychus urticae*(Koch) (Acari: Tetranychidae)

Figure 2. Tetranychus urticae adult

Morphology

Its main color is greenish and may be yellowish dark green or brownish green. The female's body length is 0.3–0.5 mm and the width is 0.2–0.3 mm. There are thorny hairs on the back. Males are smaller than females. There is a pair of black spots on both sides close to the center of the body. The larvae are four double-legged, whereas the larvae are three double-legged(Anonymous,2008).

Figure 3.*Tetranychus urticae* egg,nimf, adult.

Egg is spherical and has a diameter of 0.1 mm. The color of the egg is initially transparent and white, and it is slightly red and yellow.The color of the newly hatched larva is light yellow and pale red. The new larvae, which are in the form of ovals, become darker and look like adults after feeding. Protonimf period is similar to the body adult. greenish yellow and slightly red in color. Feeding and movement are more common in this period, and it is difficult to separate males and females. Two black spots on the cephalothorax and hairs on the body are prominent.

Male and female can be distinguished from each other during the deutonimf period. Males are more delicate and smaller than females, and the abdominal tips are sharp. Speckles on cephalothorax are more pronounced than females. At the end of this period mature red-spiders occur(Anonymous,2008)..

Biology:

Adults spend the winter in red or orange winter form, under the fallen leaves and in the form of diopause between the pieces of soil. There is no mandatory diapose. They live throughout the year in warm regions and greenhouses and continue to generation.

In winter, females give their first offspring in weeds. They pass from the edge of the field and the weeds in it, from the seedlings to the vegetables. On the underside of the leaves, they lay their eggs one by one among the nets they weave along the leaf veins. Leaves more dense eggs around the main vein near the petiole and towards the edges of the leaf. Two spotted spiders mate as soon as they mature and begin to lay eggs after feeding about one day in summer. A female can lay 100–200 eggs during her lifetime. Eggs are opened in 3-5 days depending on the temperature. The larvae become mature in 8-15 days. The number of offspring varies according to the climate of the region and the host. It completes one generation 10-20 days according to climatic conditions and regions. They give 10-12 generations per year(Anonymous,2008).

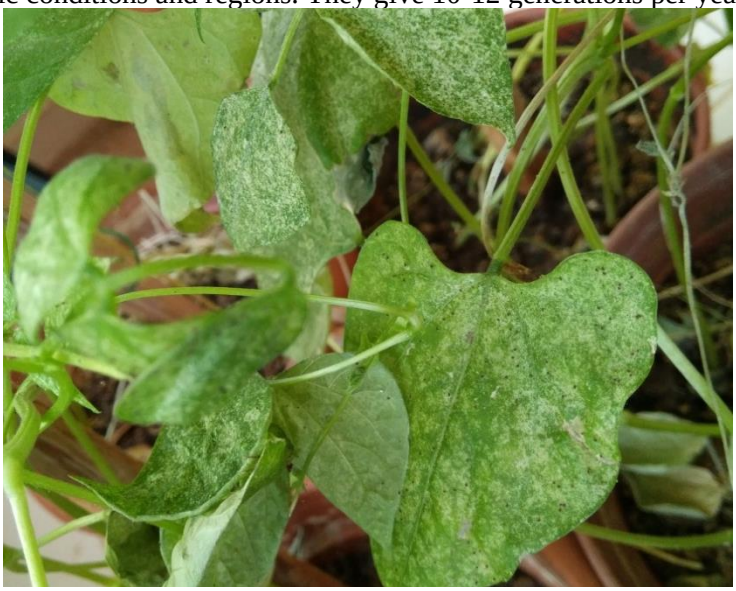

Figure 4. Bean leafinfested with *Tetranychus urticae*.

Damage type:

They feed on the leaf sap of the plants they live in. Damaged leaf turns yellow. The chlorophyll of the plant is reduced and the leaves are curled and shed. The quality and quantity taken from the damaged plants decrease. As the density increases, the plants cover with a network layer and dry the plant.

Tetranychus species are the vector of Potato Y virus (PVY) and Tobacco ring spot virus (Tobacco ring spot).

Predator mites and biopreparates used in biological control of *Tetranychusurticae*

***Phytoseiulus persimilis*(Acari: Phytoseiidae)**

Figure 5.*Phytoseiulus persimilis* adult(Anonymous,2019b)

Target pest:

Tetranychus urticae

Morphology:

Adults are 0.5 mm long, long legs and pear shaped. color is bright reddish-orange. Pre-adult periods of this species pale color is a salmon color. The eggs are oval and approximately 0.3 mm long(Anonymous,2019c).

Biology:

Females live 35 days on average and lay an average of 60 eggs. Eggs are opened in 2-3 days. larvae do not eat, but nymphal periods and adults feed on all stages of mites. Each predator consumes 5-30 prey per day.

There is no mandatory diapose. Therefore they can remain active throughout the year in greenhouses. *P. persimilis* requires more than 60% relative humidity to survive. Optimum conditions are 20-27 °C and relative humidity 60-90%(Anonymous,2019c).

Phytoseiulus persimilis biopreparate

Product Informatıon:

Phytoseiulus persimilis is sold either in a granular carrier (vermiculite or corn grit) or on bean leaves. When the package is cold, the package should be kept horizontally at room temperature for a period of time and should not be exposed to direct sunlight. Cold mites tend to accumulate, so their warming provides some separation (Anonymous,2019d).

Usage

1. The product should be slowly poured onto a paper and the predator mites inside should be checked.10-15x magnifier can be used.
2. If the product is used for prevention purposes it is evenly distributed over the plants.
3. If used for infested areas, it is poured directly into the infestation zone.
4. Overall usage rate is 5 predators per 10 m^2 (Anonymous,2019d).

Phytoseiulus persimilisin Bean Leaves

The advantage of this product is that*P. Persimilis* includes all life stages. Also contains a small amount *T.urticae* along with predators on the leaves. It is an ideal source of moisture and food for the predator(Anonymous,2019d).

Usage

The leaf parts contained in the package are placed on the leaves of plants infested by *T. urticae*.

Neoseiulus fallacis(Acari: Phytoseiidae)

Figure 6.*Neoseiulus fallacis*adult (Anonymous,2017a)

Target Pests

Tetranychus urticae, Panonychus ulmi, Oligonychus ununguis, Oligonychus ilicis, Schizotusy ceusus and polen.

Morfology

Adults pear-shaped, long legs and 0.5 mm long. colors are light orange and bright. Pre-adult periods are cream colored and semi-transparent. Eggs are 0.3mm long and oval(Anonymous,2019e).

Biology

Females lay a total of 26-60 eggs during their lifetime. Eggs are opened in 2-3 days. The development from egg to adulthood lasts for 7-9 days at 21 °C. Newly hatched larvae do not eat, nymphal periods and adults feed at every stage of the prey. A female can eat 2-16 *T.urticae* per day.

*Neoseiulus fallacis*feeds and multiplies at 50% humidity and 9-30°C temperatures. Under optimum conditions it can increase from 10 to 200-500 in 2 weeks. They do not enter diapose where the temperature is higher than 18 °C. For example; in greenhouses or indoor plants(Anonymous,2019e).

***Neoseiulus fallacis* biopreparate**

*Neoseiulus fallacis*is available commercially either on bean leavesor in a granular carrier (e.g.vermiculite, sawdust, or corngrits).

***Neoseiulus fallacis*in Bean Leaves**

The advantage of this product is that *N. fallacis* includes all life stages.Alsocontains a small amount *T. urticae* along with predators on the leaves. It is an ideal source of moisture and food for the predator(Anonymous,2019f).

Usage

The leaf parts contained in the package are placed on the leaves of plants infested by *Tetranychus urticae*.

***Neoseiulus fallacis*on Vermiculite or Corn Grit**

When the package is cold, the package should be kept horizontally at room temperature for a period of time and should not be exposed to direct sunlight. Mites tend to accumulate in cold, so their warming provides some separation(Anonymous,2019f).

Usage

1. The product should be slowly poured onto a paper and the predator mites inside should be checked.
2. Gently rotate the bottle to mix the mites with the carrier and distribute.
3. If the product is used for prevention purposes it is evenly distributed over the plants.
4. If used for infested areas, it is poured directly into the infestation zone(Anonymous,2019f).

***Neoseiulus californicus*(Acari: Phytoseiidae)**

Figure 7.*Neoseiulus californicus*adult (Anonymous,2017b).

Target Pests

Tetranychus urticae, Polyphagotarsonemus latus, Phytonemus pallidus, Aculops cannibicola.

Morfology

They are 0.5 mm long, pear shaped and skin colored predator mites. Eggs are oval and pearl white. Male are much smaller and darker than female (Anonymous,2019g).

Biology

Females lay about 60 eggs during their lifetime. They place their eggs under the leaves. Eggs are opened in 1-2 days. After the larval period, they become mature by passing two nymph periods. The average time from an egg to an adult is 4-10 days, and adults live an average of 20 days.

General predator small insects, mite and pollen can also be feed. They tolerate higher temperatures and lower humidity than *P. persimilis*(Anonymous,2019g).

Neoseiulus californicus biopreparate

Neoseiulus*californicus* biopreparate package and the way of use is as in *P. persimilis* and *N. fallacis*

2.4.Galendromus occidentalis(Acari: Phytoseiidae)

Figure 8.*Galendromus occidentalis*adult (Anonymous,2017c).

Target Pest

Tetranychus urticae, Panonychus citri, Panonychus ulmi

Morfology

Galendromus occidentalis is very similar to *N. fallacis* in appearance and life cycle. Adults are pear-shaped and shorter than 0.5 mm. The colors are beige, amber and red. The egg is pear-shaped and almost transparent. Only larvae have 3 pairs of legs. In other periods, it has 4 pairs of legs(Anonymous,2019h).

Biology

The total development period from eggs to adults is 6-12 days. Females have a lifespan of approximately 30 days.They lay an average of 21 eggs. They prefers to feed on nymphal stages of *T.urticae*. It is also fed during adult periods, but not with eggs. It is also fed with pollen when mite populations are low. *G. occidentalis* multiplies very quickly and can given 8-10 generations per year(Anonymous,2019h).

Galendromus occidentalis biopreparate

Galendromus occidentalis biopreparate package and the way of use is as in *P. persimilis* and *N. fallacis*.

***Mesoseiulus longipes*(Acari:Phytoseiidae)**

Figure 9.*Mesoseiulus longipes*adult (Anonymous,2017d)

Morfology

Pear-shaped mites shorter than 0.5 mm. They have beige, amber and red shades (Anonymous,2019ı).

Biology

Females, in high populations, lay eggs between their prey under the leaves. The eggs are opened in 1-4 days. Pre-adult periods last for 8 days. The average adult life is 34 days and a female can lay 54 eggs.

M. longipes is a predator similar to *P. persimilis* and can survive at low humidity. Optimum conditions for *M. longipes* are 18-32 °C with a relative humidity of 40-60%. It can be effective at higher temperatures as the humidity increases(Anonymous,2019ı).

Mesoseiulus longipes biopreparate

Mesoseiulus longipes biopreparate package and the way of use is as in *P. persimilis* and *N. fallacis*.

Some Trials With the Use of Predator Mite

The efficacy of *Phytoseiulus persimilis* (Acari: Phytoseiidae) in different release rates (1:10, 1:20 and 1:40 predator: prey) and on different plants (tomatoes, peppers, eggplants, cucumbers) has been investigated in the control of *T. urticae*.They observed that *P. persimilis* also controlled to*T. urticae* in all release rates, but 1:10 and 1:20 predator: prey ratios were more successful. It was reported that *P. persimilis*can be used successfully against *T. urticae* in 4 plants(Tiftikci and Kasap,2019).

Neoseiulus californicus (McGregor, 1954) investigated the consumption capacity and biology of *T. urticae* (Koch).*N. californicus* daily catch consumption capacity; They observed that there were 6.97 adults, 11.49 larvae, 9.15 nymphs and 16.33 eggs.They also reported that the average life of *N. californicus* female was 35.85 days and they laid 52.7 eggs on average (Armağan and Çobanoğlu, 2011).

Between 1995-1997 in Izmir in the biological control of*T.urticae* predator mite *P. persimilis* the possibilities of use were investigated. The ratio of predator mite to red spiders, 1:20, 1:30 and 1:40, was compared with medicated and non-medicated control applications. The best results were reported as 1:20 and 1:30.

In the second production period, the plastic tunnel was divided into two parts. In the first part, acaricide was applied 4 times, in the second part, *P.persimilis* release was done at a rate of 1:20. At the end of the study, *P. persimilis* applied part was reported to be more successful(Kısmalı et all,1999).

P. persimilis(adult female) reported that daily consumption of*T. urticae* was 27.54 eggs, 18.12 nymphs and 11.32 adults. (Naher, N., Islam, W. & Haque, M. M. (2005)

Suggestions

The control of *Tetranychus urticae* with predator mite was found to be successful.The effectiveness of predator mites in different temperature and humidity conditions varies. For this reason, biological control of the area to be used should be done with correct predator selection based on climatic conditions.

The combined use of predator mites will create wider temperature and humidity conditions. in this way, a more sustainable and effective control can be made.

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AN APPROACH FOR PRODUCING THE MAP OF SOIL QUALITY BY USING RASTER CALCULATOR TECHNIQUE

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ABSTRACT

Determination of soil quality which is an important for sustainable agriculture. In many studies have been used raster data generated from point-based creation in GIS environment for spatial distribution of soil quality. The famous approaches used for assessing soil quality and classifying agricultural land is a CASH and SMAF. These methods are suitable for converting point-based data into raster layers of pixels of a certain magnitude and producing thematic maps according to the literatures. Raster calculator technique (RCT) is very important for precision agriculture by indicating soil quality distribution of the research area. This study was carried out in the intensive agriculture areas of Çumra plain in Konya approximately 8500 ha. With the study were selected 12 soil quality indicators: AS, AWC, PR0–20, PR20–40, OM, AC, PMN, RHV, pH, AP, K, Mg, Fe, Mn, and Zn were measured and scored according to the CASH from 54 randomly selected soil samples. The scores obtained from the point-based data on CASH values were produced and spatial distribution maps using RCT. The map of soil quality was produced and classifying as high, moderate, and low quality with 2200, 4600 and 1700 ha respectively in terms of agricultural cultivation according to RCT, CASH and SMAF methods. Consequently, it was recommended that the produced soil quality map can be used as a base cartographic material that will help to thoroughly grasp the soil quality and select suitable agricultural practices

Keywords: *GIS, Raster Calculate, Soil Quality, Sustainable Agriculture*

INTRODUCTION

The agricultural development of our country depends largely on the soil ecosystem. As a result of increasing agricultural activities, the deterioration that occurs with increasing pressure on soils threatening soils. In order to ensure the sustainability of soils, it is necessary to select the soil quality functions and monitor the changes of the selected parameters over the years (Tahoun et al., 1999; Tahoun and El-Naka, 2002). Soil quality is defined in the simplest terms as the capacity of workability of soils. Soil quality assessments are based on soil characteristics affected by management (Karlen et al., 1997). These indicators indicate management and health status in the short and long term (Andrews et al., 2004). But, determining the soil quality of all soils requires intensive effort and long time. In this context, comprehensive assessment of soil health (CASH), produced by Karlen and Stott (1994) to accelerate indicator selection and processing, is used by many researchers (Bastida et al., 2008; da Luz et al., 2019; Frost et al., 2019; Marzaioli et al., 2010). The selected physical, chemical and biological soil properties show the sustainability capacity of soils in the best way. Nevertheless, applying all these soil properties for each land requires high costs. For this reason, the integration of the indicators in the CASH selection into the spatial model of GIS will provide saves time and cost in the assessment of soil quality. Dynamic soil quality is affected by activities such as irrigation, mechanization and fertilization. Statistical techniques have been extensively used to measure these affected dynamic soil (AbdelRahman and Tahoun, 2019; El-Zeiny and El-Kafrawy, 2017). In addition, other studies have proved that soil properties and Kriging techniques are powerful enough to estimate values at non-sampling locations. For this purpose, in this study, soil quality measurements have been made in approximately 8500 hectares of land area in Konya Çumra region and land quality classes have been determined by using RCT.

MATERIALS and METHODS

Field descriptions

Study area, which are covers plant cultivated land in Çumra basin, located in 4178032-4165540 N, 477158-490589 E latitude mercator (Fig.1). The total area of the area is 8500 ha and the of the basin is 1010 m.

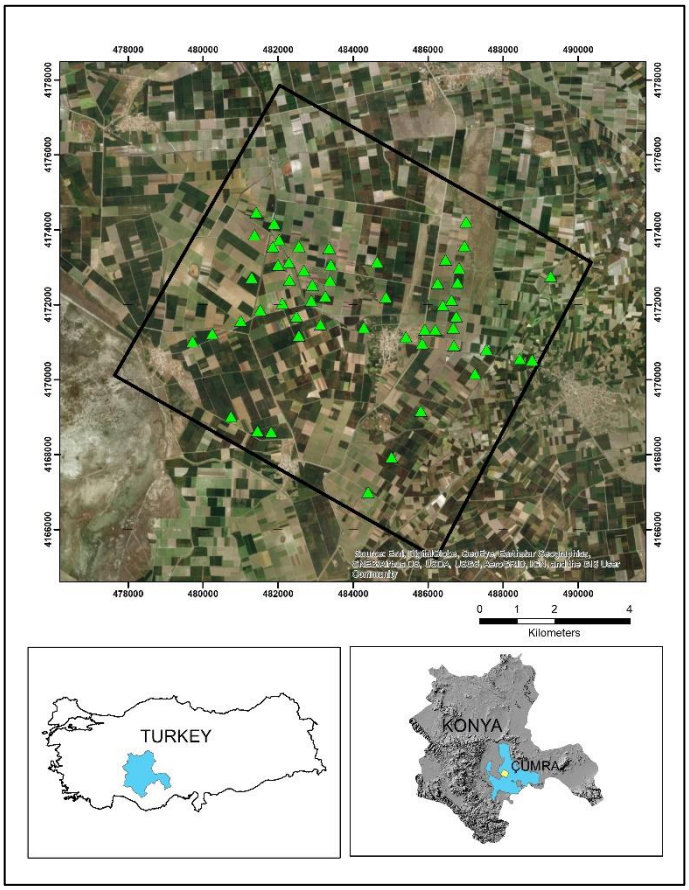

Fig 1. Location map of the study area

The study area is widely heterogeneous with respect to geomorphology, pedological features, soil use and crop cover. Climate ranges from sub-arid to arid, with yearly mean rains and temperature of 296.80 mm and 11.40 °C, respectively.

Soil sampling and analysis

Soil samples from topsoil (0–20 cm) was collected from 54 sites unevenly distributed in plain area of the Basin. Samples were processed based on the CASH manual (Gugino et al., 2009). Briefly, a subsample of approximately 1 kg was sent to an accredited laboratory for analyses of soil texture of percent clay, silt, sand (Bouyoucos, 1962), hydrometer method), pH (1:1 v/v method), available P (mg kg-1) (Olsen bicarbonate extraction,(Olsen, 1954)), K (mg kg-1), Mg (mg kg-1), Fe (mg kg-1), Zn (mg kg-1), Mn (mg kg-1) via atomic absorption via ammonium acetate and DTPA extraction (Kacar, 2009), organic matter (%) by Leco, active C (mg kg-1) by permanganate oxidation, and potentially mineralizable N (PMN) (mg kg-1) with a 7 days anaerobic incubation. Root health represented the mean of four bean bioassays. Briefly, bean seeds were planted in field soil, grown in greenhouse for 5 weeks before root samples were collected, washed, and ranked for rot severity based on a scale of 1–9. Approximately 40 g of soil dried at 40 °C was used to estimate percent water stable aggregate using a rainfall simulation method.

Production of grid layers

The raster data can be stored in the matrix of two-dimensional, uniform grid cells (pixels) on regular frames. These layers also can be consist of adjacent and single pixels with different values. All spatial objects have individual location information in grids. Each cell indicates a value for the property reflects such as depth, slope, texture etc. Pixel size assigns the detail of the grid structure. When the image's resolution level also increases, distinguishable detail will rise (Malczewski, 2004). In this study, a grid structure was set up for the study area. Vector data designed 10x10 pixel size, and thus high detailed grid layers were generated. ArcGIS 9.3 software was used in the production of GIS processing.

Application of raster calculate technique

The Raster Calculator Technique allows you to create and execute Map Algebra expressions in a tool. This technique provides the experts a powerful tool for performing multiple tasks with raster layers. RCT allows the creation of sensitivity maps by using overlay function with the raster layers of different spatial features according to the pixel area sizes that were determined by the user. The uniting of the different layers in common values and calculating the effect of each on land quality can be evaluated in all aspects. All the features of the land can be proportional to each other. In this study, 12 different grid layers were produced via RCT to create the soil quality map according to CASH.

RESULTS and DISCUSSIONS

The scoring results of the soil samples analyzed according to CASH are given in Table 1. When Table 1 is examined, it is seen that the lowest average score value of the soils is obtained by aggregate stability and the highest score is obtained by potassium score value. In general, it is seen that physical and biological soil parameters have lower score values. The main reasons for low scoring of physical and biological parameters are caused by heavy field traffic conditions. In general, the chemical quality scores of the soils obtained medium and high score values. When the biological quality scores were examined, it was observed that organic matter and root health values were higher than the other two values (active carbon and potentially mineralizable nitrogen).

Table 1. CASH on select soil parameters and score in 0–20 cm (n=54).*

Variable	Mean	SE Mean	CV	Min.	Max.
AS	18.00	2.21	90.15	2.00	81.00
AWC	37.74	2.28	44.36	14.00	88.00
PR_{0-20}	39.30	3.40	63.63	2.00	84.00
PR_{20-40}	31.22	4.54	106.85	0.00	96.00
OM	87.06	1.89	15.94	42.00	100.00
AC	22.63	2.79	90.53	2.00	77.00
PMN	32.80	4.94	110.59	0.00	100.00
RHR	69.72	3.14	33.08	29.00	100.00
pH	77.17	0.541	5.15	66.00	84.00
P	77.30	4.93	46.84	0.00	100.00
K	100.00	0.00	0.00	100.00	100.00
ME	58.94	3.35	41.79	0.00	100.00
Average score	46.93	1.33	20.89	28.00	65.00

*Min: minimum; max: maximum; CV: AS: aggregate stability; AWC: available water capacity; $PR_{0-20,20-40}$: penetration resistance (0-20 and 20-40 cm); OM; organic matter; AC: Active carbon; PMN: potential mineralizable nitrogen; RHR: root health value; P: phosphorus; K: potassium; ME: micro elements (Mg, Fe, Mn and Zn).

The soil quality map of the study area was shown in Figure 2. As a result of the study, the plots showing distribution in all quality classes of study area were According to the generalized CASH map, 2200 ha area (25.88%) is classified as high quality in the study area. The criteria taken into consideration for plant cultivation in these areas have no restrictive effect. In the regional land, 6300 ha (74.12%) area is defined as moderate and low quality. These areas have a soil depth of 50-100 cm and are close to flat-level slopes. However, the heavy construction factor (Heavy Clay), low organic matter content and low aggregate stability, which stand out as the limiting factors of agricultural production and reduce the value of CASH.

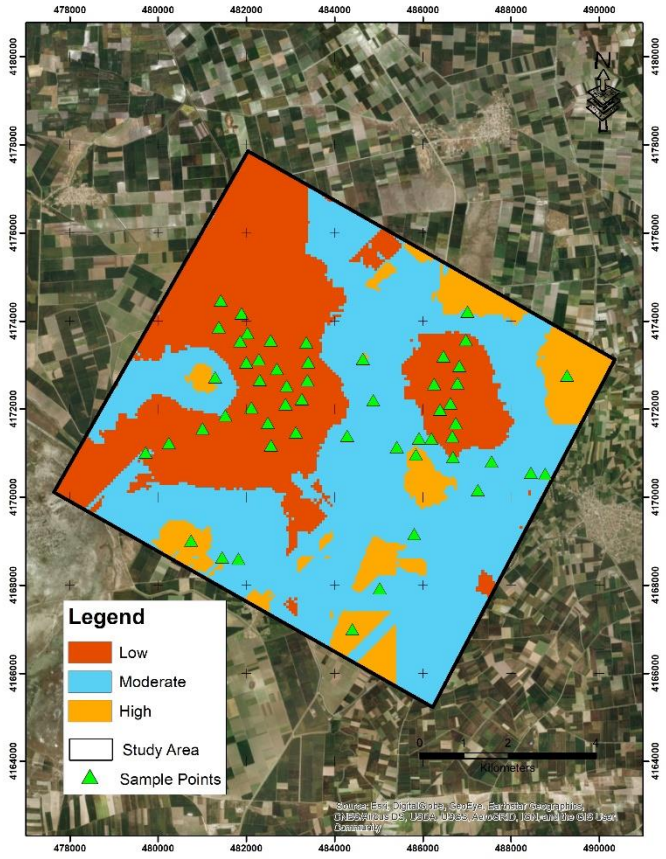

Fig 2. Distribution of CASH quality classes

CONCLUSION

With this study, a model was created by using RCT to determine the Soil Quality classes according to CASH individual soil factors which were combined, stored, transformed and analyzed in GIS. It has been determined that physical and biological soil parameters have lower score values and have more striking effects on the score values of SQ classes and this situation has been caused by factors, such as aggregate stability and active carbon parameter. The main reasons for low scoring of physical and biological parameters are caused by heavy field traffic and low organic matter content

ACKNOWLEDGMENTS

This study is a part of a TOVAG 112O314 project and was supported by TUBITAK (Scientific and Technological Research Council of Turkey).

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A QUANTITATIVE SOIL QUALITY EVALUATION BY USING THE SOIL MANAGEMENT ASSESSMENT FRAMEWORK IN CENTRAL ANATOLIA

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ABSTRACT

Modern mathematical approaches to soil quality assessment for agricultural purposes provide a framework for identifying and improving the impact of soil management practices. The soil management assessment framework (SMAF), which is one of the most widely used soil quality determination approaches was developed for this purpose, nowadays. SMAF was developed in accordance with the soil quality measurement paradigm and designed with maximum benefit from minimum data. The aim of this study was to determine soil quality by using SMAF model and GIS capabilities for agricultural activity in Konya province located at Central Anatolia. The study area was Konya- Beşgözler with the area of 5134 ha. A total of 151 soil samples were collected from surface depth (0-20 cm) during the study. Soil quality parameters that bulk density, available water capacity, pH, EC, extractable K, potentially mineralizable nitrogen, extractable soil phosphorus and total organic carbon were included in SMAF model. According to soil quality distribution map, 36.68% of the study area was classified as high quality level, whereas 13.44% of the total study area was found in low land quality level. On the other hand, 49.88% of the study area had moderately land quality level. This study showed that the use of indicators and their different levels were successful in representing soil quality using SMAF and could be used with a small number of data for managing soil resource.

Keywords: *GIS, Konya, SMAF, Soil quality,*

INTRODUCTION

Sustainable agricultural production is the most important target of agricultural policies of developed or developing countries (Kumar, 2015). In the line with this target, it aims at balancing the soil with the requests of crop production and to ensure the long-term efficiency by optimizing the resource utilization (Joshua et al. 2013). To achieve these aim and objectives, the determination of land quality in the planning of sustainable agricultural practices has been one of the important ecological approaches in the world (Xue et al, 2019). Land quality is defined as the capacity of the functions resulting from the nature of the soil within a certain ecosystem and depending on its use under a certain management (Karlen et al, 2013). Moreover, the quantification of soil quality is very important to establish an early warning tool of adverse impacts from change in land use type. Thus, the objective of this study was to determine the soil quality by using SMAF (soil management assessment framework) model for K.O.P. agriculture area of Konya – Beşgözler.

MATERIAL AND METHODS

Field descriptions

The study area was Konya Beşgözler with the area of 5140 ha (Figure 1). It is located between 38° 31'- 38° 16' North latitude and 32° 16'- 32° 19' East longitude. The study area ranges from 1010 m to 1040 m above sea level. In the study, the soil map belonging to the region was used as basic cartographic.

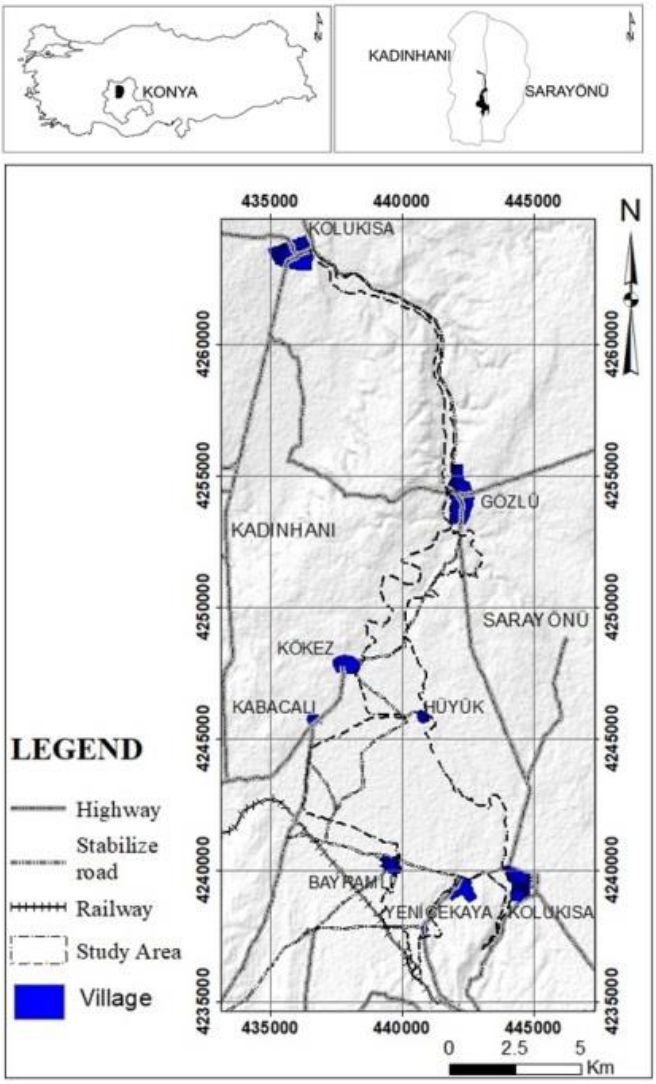


Figure 1. The location map of study area

This area has a terrestrial climate characteristic with annual rainfall of 322.5 mm and average annual temperature of 11.5 °C. According to the multi-year average annual temperature, the highest temperature of 23.9 °C is experienced in July (Anonymous 2015). According to the climate characteristics, it was determined that the soil is in Aridic moisture regimes and Mesic temperature regime (USDA 2014).

Soil properties

According to the report of soil map of the study area done by Dedeoğlu (2017), 6 different soil series were determined and classified as Aridisol and Entisol orders (USDA, 2014) with the diagnostic horizons of soils and their pedogenetic properties. The series were divided into 79 different mapping units according to soil depth, top soil texture, slope, stony and drainage condition. Field study was conducted in 2015 and a total of 152 soil samples from Entisol, and Aridisol soils orders were collected randomly from the site. The samples were taken in the fall after harvest and before the next cropping season in order to avoid the effect of direct fertilization during the crop growing season. Each soil sample was collected from soil surface (0–20 cm). The location of each soil sampling point was recorded using a handheld GPS (global positioning system) tool. Samples were air-dried and passed through a 2 mm sieve. A total of eight soil quality parameters which are bulk density, available water capacity, pH, EC, extractable K, potentially mineralizable nitrogen, extractable soil phosphorus and total organic carbon were included in SMAF model. Laboratory analyses revealed that most of the study area had heavy textured soil and included low organic matter content, alkaline pH, high lime, high exchangeable cations and sufficient P values. Descriptive statistics of laboratory analyses have been presented Table 1.

Table 1. Descriptive statistics of soil samples

Variable	N	Mean	Max.	Min.	StDev	CoefVar
OC, %	151	1.51	2.87	0.28	0.48	31.85
Ext. P, mg/kg	151	14.37	114.46	1.28	12.31	85.63
pH, 1:1	151	7.82	8.84	7.52	0.16	2.03
EC, (ds/m)	151	0.408	0.920	0.134	0.137	33.49
Ext. K, mg kg^{-1}	151	35.65	168.88	9.93	24.18	67.83
AWC,%	151	0.13	0.15	0.12	0.01	6.41
BD, gr cm^{-3}	151	1.27	1.32	1.21	0.01	1.20
PMN, mg kg^{-1}	151	7.67	18.02	0.50	2.39	31.19

SMAF application

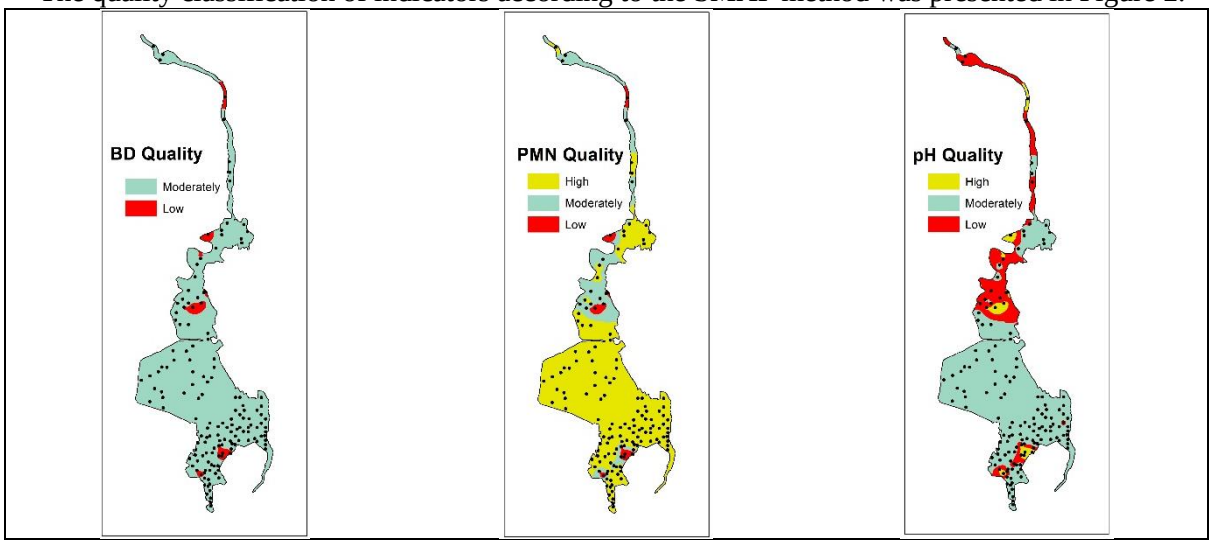
The SMAF uses a series of decision rules in a database format, to generate a list of suggested indicators from more than 80 integrative measurements related to ecosystem processes and function currently residing in the database. The decision rules use the management goals for the site, associated soil functions, as well as other site-specific factors, like region or crop sensitivity, as selection criteria. These rules serve as an expert system to select appropriate SQ indicators (Andrews et al. 2004). In our study, 8 indicators of soils under wheat cultivation were used. Quality scores and maps of each indicator were generated in GIS environment and MS Excel.

Interpolation analyses

In this study, Simple Kriging (SK) method was applied as an interpolation approach, because we obtained the lowest Root Mean Square Error (RMSE=0.08456**)** which indicated the most accurate prediction.

RESULTS AND DISCUSSIONS

The quality classification of indicators according to the SMAF method was presented in Figure 2.



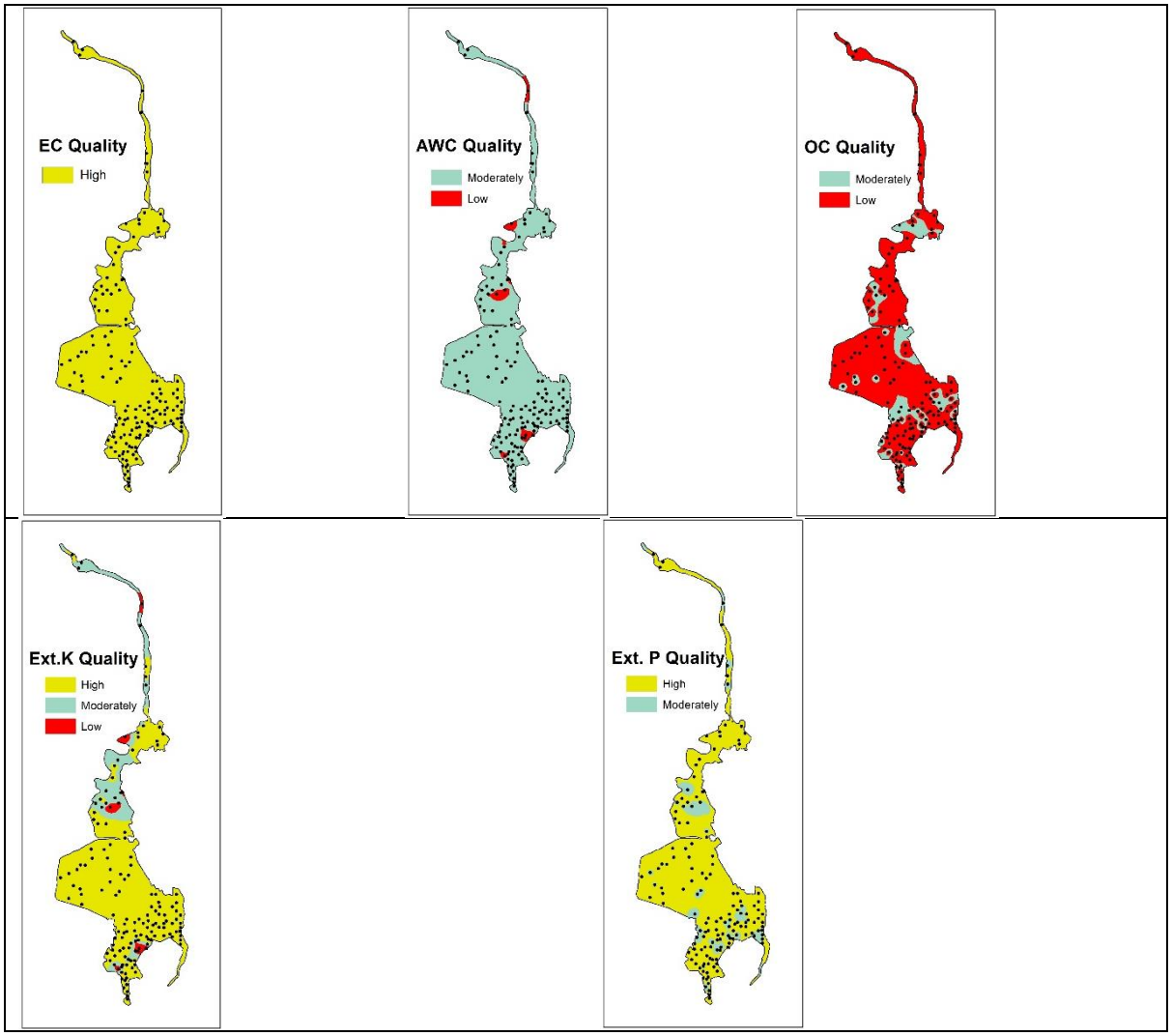


Figure 2. Distribution maps of all factors according to SMAF score values

The findings showed that all the land in the region was found in moderately and low-quality classes for wheat cultivation in terms of BD and AWC. Similarly, the pH distribution was low and moderately quality, especially in areas where the groundwater level was high. High quality scores have been obtained for nutrients because of intensive agricultural activities in the regional soils. At the same time, the absence of salinity problems in the region has a positive effect on EC scores. However, the distribution of OC, which is the most important indicator of soil quality, was classified as low and moderately quality and this decreased final quality score values. In the last stage, the soil quality map was obtained for study by calculating raster layers for each indicator (Figure 3).

According to soil quality distribution map, 36.68% of the study area was classified as high quality level, whereas 13.44% of the total study area had soil land quality level. On the other hand, 49.88% of the study area had moderately soil quality level. In addition, this study also was in line with (Dedeoğlu, 2017). He investigated different land evaluation approaches such as FAO-Soil Productivity Index (SPI), Complex Square Land Quality Index (CI), Productivity Index (PI) and Irrigation Ability Index (SII) in the same area.

CONCLUSION

According to the soil quality map of the study area, BD and AWC factors of soil physical properties indicated low suitability for wheat cultivation. Similarly, soil organic carbon content was insufficient for agricultural areas. This situation has been reflected in the quality final score values, therefore organic material enhancing precautions have been proposed by us for positively improving physical factors and microbial activities. In addition, this study showed that the indicators and their degrees of impact by using SMAF were successful in representing soil quality. Also, it could be used with a small number of data to manage soil resource.

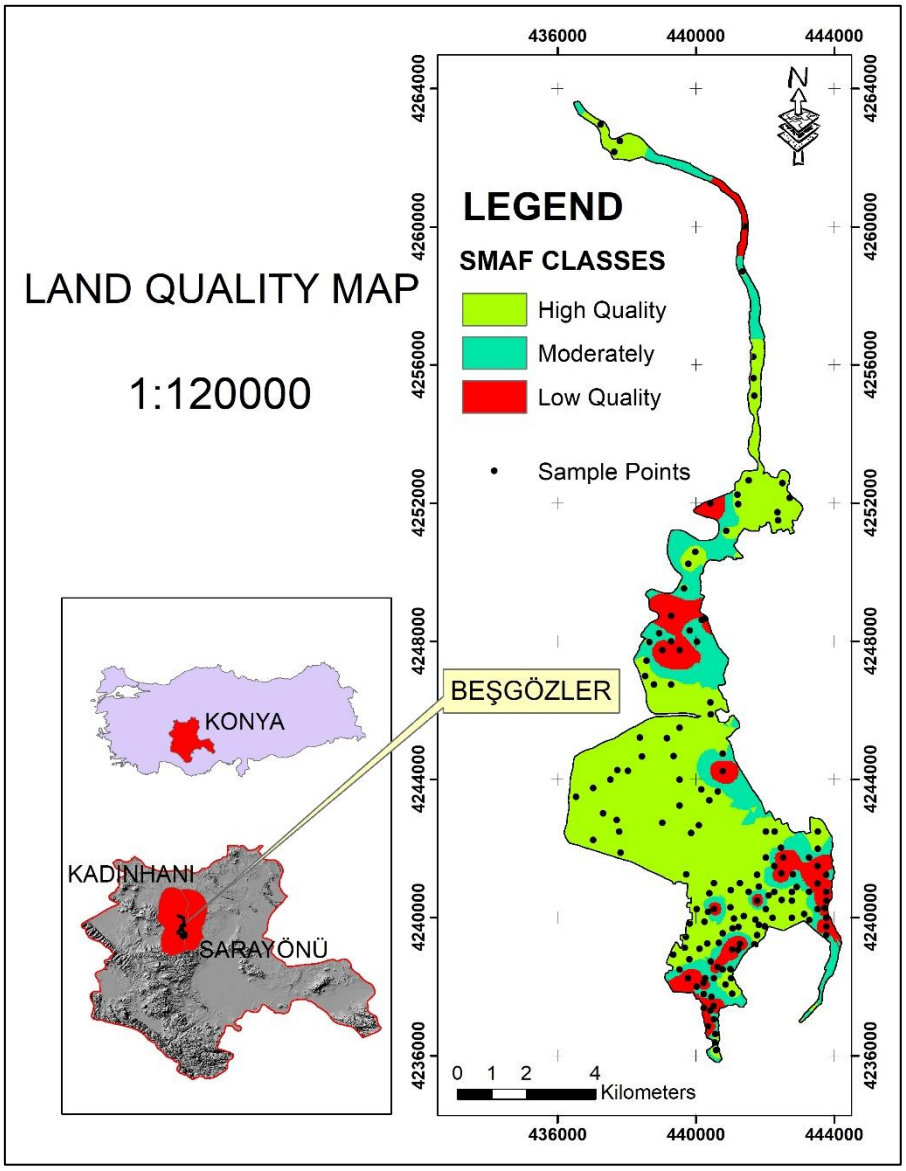


Figure 3. Distribution of SMAF land quality classes

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AGRICULTURAL SUPPORTS ON SUSTAINABILITY OF AGRICULTURE IN TURKEY

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ABSTRACT

The agricultural sector is important for both developed and developing countries. Almost every country in the world generally supports the agricultural sector with the aim of keeping the people living in rural areas in place, providing food safety and security and trading agricultural products. Turkey support the agriculture for providing both quantitative and qualitative increase in agricultural production and supporting the rural area as a rural development tool. The purpose of agricultural support in Turkey, "contribute to solving the priority problems of the agricultural sector, to improve the effectiveness of policies, to facilitate the sector's compliance with this policy" was expressed in 5488 Agricultural Law issued in 2006. Over time, this objective has been reorganized to be based on productivity, quality and rural development. Despite such intense efforts on agricultural subsidies, there is still a debate about the effectiveness of the subsidies and there is a consensus on the reorganization of agricultural subsidies for the development of the sector and the solution of structural problems in agriculture. In this study, the development of agricultural subsidies and their impact on the sustainability of agriculture in Turkey were examined. For this purpose, the relationship between real agricultural support value (RASV) and real agricultural production value (RAPV) between 2000-2018, which is considered as reformist period, has been examined by time series analysis. As a result, a structural break was detected in the aftermath of the global economic crisis in 2009, and after 2009, the RASV effect on the formation of RTPV has increased. This shows that although the share of RASV in GDP tends to decrease proportionally, its effect is increasing. It has been concluded that the increase in the devotion of RAPV to supports may be due to the proportional increase in market distorting supports such as deficiency payment support within the support payments. Structural reforms are needed for a sustainable agricultural support policy, and it would be more appropriate to increase agricultural subsidies (rural infrastructure, agricultural education and extension, young farmers, agricultural schools, R & D, etc.), especially for the development of human and social capital.

Keywords: *Agricultural supports, Reformist Period, Sustainability, Turkey*

INTRODUCTION

The agricultural sector is important for both developed and developing countries. This importance stems from the peculiar characteristics of agriculture. Almost every country in the world generally supports the agricultural sector with the aim of keeping the people living in rural areas in place, providing food safety and security and trading agricultural products. Turkey support the agriculture for providing both quantitative and qualitative increase in agricultural production and supporting the rural area as a rural development tool. In addition, although the share of the agricultural sector in the country's economy decreases proportionally, it maintains its importance in areas such as employment, foreign trade and nutrition.

In general, agricultural supports given to direct the agricultural sector in the desired direction; These are government interventions that are implemented in order to solve the problems that arise in the sector, to ensure the adoption of new technologies and to eliminate the shortage of production (Yavuz, 2017). In almost every country in the world, governments intervene in the markets in different ways. One of the intervened markets is the agricultural markets. In this regard the first application in the sense of supporting the agricultural sector in Turkey in the form of input support in accordance with the law enacted in 1926, has been entered in the form of tax refunds received from the spent fuel in agricultural activities. This was followed by the first support application in terms of product in 1932 as wheat purchase support. Today, agricultural supports have been transformed into a different structure with changes in purpose and scope, and especially agricultural support and sustainability issues have become more debatable.

Some of the important issues that affect their present agricultural policy since the establishment of the Republic of Turkey are January 24, 1980 decisions and the September 12 military coup occurred in the same year. The state, which is based on the liberalization of markets, has started to regulate agricultural policies in

this direction. Input and product supports have been significantly reduced or completely abolished, privatization of public institutions regulating markets has been brought up and markets have been opened to foreign capital (Kazgan, 1999, Oral et al., 2013). Turkey, depending on the liberalization of markets, has evolved into agricultural products importer position from the exporter position (Kazgan, 1999). The effects of the change in the approach of the state in agricultural policies have been manifested especially when the internal terms of trade turn against agriculture. The ratio of internal terms of trade in 1979 reached the same level after almost 20 years (Şahinöz, 2011). Another policy implementation affecting the agricultural sector before the 2000s was the economic measures plan taken on 5 April 1994. In this context, it was envisaged that support purchases would be limited to cereals, tobacco and sugar beet, agricultural Government Business Enterprises (GBEs) and cooperatives should not be allowed to be financed by the Central Bank and thus the abolition of credit privileges, limitation of input subsidies and completion of privatization of various GBEs and closure of some enterprises (Narin, 2008, Oral et al., 2013). In the late 1990s, the duty losses of GBEs increased to a very high level due to the high borrowing interest rates, and only half of the agricultural subsidies reached the agricultural sector (Şahinöz, 2010).

Agricultural subsidies in Turkey can be divided into four periods (Figure 1). The period between the proclamation of the Republic and the transition to the planned period (1923-1960), the period between the beginning of the planned period and the transition period to the free market economy (1960-1980), the period from the free market economy to the beginning of the reform projects in agriculture (1980-2000) and the present period-the period under the influence of reforms (2001-present). Although populist policies in the agricultural support period is effective, in recent years, the international agreements (World Trade Organization) and the European Union cohesion policies (Common Agricultural Policy) in Turkey's agriculture support policy instruments are effective. Agricultural supports increased approximately 2.5 times in real terms between 2000 and 2018 (BUMKO, 2019; Yavuz, 2019). Among these supports, animal husbandry supports increased from 83 million TL to approximately 3.8 billion TL (Yavuz, 2019).

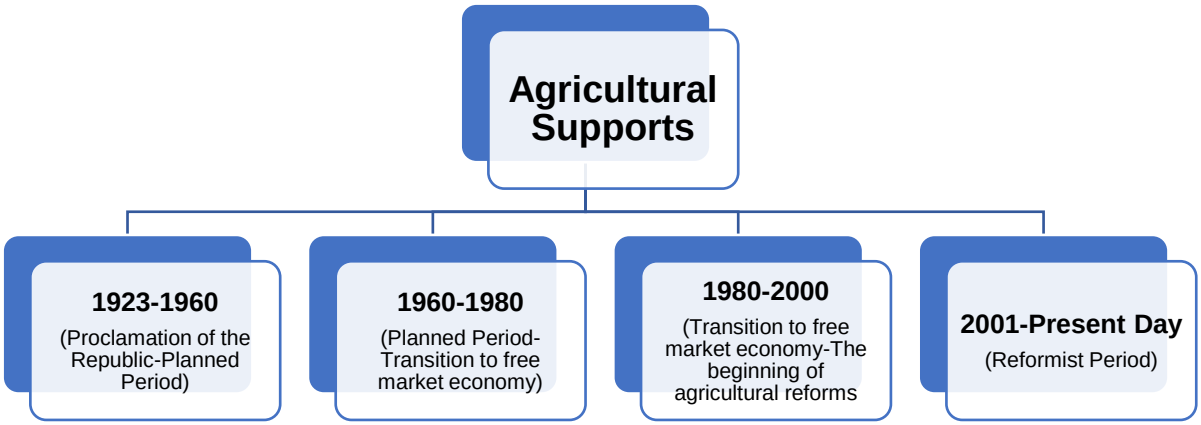

Figure 1. Agricultural Support Periods of Turkey

At this point, agricultural supports have taken an important position in terms of sustainability of production. In Turkey, aim of agricultural support has been expressed in the Agricultural Law which was issued in 2006 year and 5488 numbered as "contribute to the solution of the agricultural sector priority problems, to improve the effectiveness of policies, to facilitate compliance of the sector to this policy". Over time, this objective has been reorganized to be based on productivity, quality and rural development. Despite such intense efforts on agricultural subsidies, there is still debate about the effectiveness of subsidies and there is a consensus on the regulation of agricultural subsidies to ensure the development of the sector with productivity and technological aspects and to provide solutions to structural problems of agriculture in particular (Demirdöğen and Olhan, 2017; Yıldız, 2017; Semerci, 2019; Sasmaz and Özel, 2019). In addition, in 2006, within the Agricultural Law, there is an expression that "Agricultural support programs are financed from budgetary sources and external sources. The budget allocation cannot be less than one percent of the gross domestic product (GDP)". Although this ratio varies over the years, the relationship between the support and the produced value and the extent of this relationship is important for the sustainability of the agricultural sector. In this study, the development of agricultural support in Turkey, the relationship between agricultural

subsidies and agricultural GDP, effectiveness of the supports and the subject that how can increase the contribution of agricultural sustainability were investigated. The answer the question of how agricultural subsidy policy supports sustainable agricultural model in Turkey was examined.

MATERIAL AND METHODS

The main material of the research was formed by agricultural production (plant and animal) value (APV) produced by the Turkey Statistical Institute for reformist period which covers between 2000-2018 years and agricultural support payments (ASV) issued by the Ministry of Finance, Financial Control Headquarters. In the study, the data were converted to real values by using Producer Price Index in order to eliminate prices and inflation.

In the econometric analysis part of the study, the hypothesis "Agricultural supports have an impact on agricultural production value" was examined by econometric tests that allow structural breakage. In this context, cointegration and causality tests were used to analyze the hypothesis. Firstly, whether the series used in the analyzes contained unit root was analyzed by stationary tests that allowed normal and structural breaks. After the unit root tests, Gregory-Hansen Cointegration Test and Hacker-Khatami causality tests, which are one of the cointegration tests allowing single structural break, were applied. In addition, FMOLS test was used to interpret the coefficients in the model due to the long-term cointegration relationship between the variables.

Data Set and Model Description

In this study, the relationship between agricultural supports and agricultural production value was analyzed with annual data covering 2000-2018 periods. The model established for testing the hypothesis of the study within the scope of the analysis can be expressed as follows;

$$RAPV_t: \beta_0 + \beta_1 RASV_t + e_t$$

RAPV (Real Agricultural Production Value), which is used as a dependent variable in the model, represents agricultural production value. RASV specified as an argument (Reel Support Agricultural Value) represents the agricultural support payments allocated to agriculture from Turkey Central Government Budget.

Unit Root Test

Before statistical analysis of a time series, it is necessary to examine whether the series is stationary or not. When econometric analyzes are performed between non-stationary series in time series analysis, a misleading result may occur and it is called a false regression. In other words, conventional t, F tests and R2 values may yield deviant results. Therefore, the stationary test should be performed first (Tatoğlu, 2012).

Expanded Dickey-Fuller (1981) and Philips-Perron (1988) and Zivot-Andrews (1992) unit root tests were used in the study. The extended Dickey-Fuller (ADF) test is constructed by adding delayed values of the variable to the Dickey-Fuller test. The ADF test aims to eliminate the autocorrelation problem in the error term of the model (Wojciech and Derek, 1999). The ADF and PP unit root test results used in the study are shown in Table 1 below.

Table 1. ADF and PP Unit Root Tests

	ADF		**PP**	
	At Level			
	RASV			
With Constant	t-Statistic	-3.3672	t-Statistic	-4.4416
	Prob.	***0.0267***	***Prob.***	***0.0031***
		**		***
With Constant & Trend	t-Statistic	-2.5133	t-Statistic	-3.9425
	Prob.	***0.3182***	***Prob.***	***0.0319***
		n0		**
Without Constant & Trend	t-Statistic	0.7858	t-Statistic	0.6981
	Prob.	***0.8740***	***Prob.***	***0.8571***
		n0		n0
	RAPV			
With Constant	t-Statistic	-0.0018	t-Statistic	-0.6830
	Prob.	***0.9441***	***Prob.***	***0.8270***
		n0		n0
With Constant & Trend	t-Statistic	-3.5374	t-Statistic	-3.7837
	Prob.	***0.0672***	***Prob.***	***0.0424***
		*		**
Without Constant & Trend	t-Statistic	1.8914	t-Statistic	0.6471
	Prob.	***0.9804***	***Prob.***	***0.8466***
		n0		n0

Not: *%10 **%5, ***%1 error level statistically significant.

When Table 1 is analyzed in which unit root test results are analyzed, it is concluded that the ADF and PP test statistical values are greater than the absolute values of the table critical values in both fixed and trend model. In other words, it can be said that the variables are stationary in the level values. When the significance level is analyzed, it is seen that RASV and RAPV values are stationary at 5% level in the fixed and trend model according to PP test.

The ADF and PP tests used in the study analyze the stationary of the series without taking into account the breaks that may occur due to crises and economic shocks in the global economy. However, in the next generation of econometric analyzes, structural propositions in the markets should be included in the analysis and policy propositions should be realized (Arouri et al., 2007). In addition, the unit rooted probability of the series is quite high in stationary analyzes without taking structural breaks into consideration. However, it is seen that non-stationary series become stationary when unit root tests are performed considering structural breaks.

Many unit root tests have been developed that take into account structural breaks in time series analysis. In this study, Zivot-Andrews fracture test was used to determine the structural breakage internally and allow single structural break. Zivot-Andrews (1992) examines the situation in which structural breakage is not known exactly and is determined internally. In this context, they developed three different unit root tests for the detection of structural breakage.

Model A at level, Model B on the slope, Model C shows the structural breaks occurring at both slope and level. In the implementation of the models, each year in the observation period is taken as a possible break year and the d statistics of the α coefficient are obtained by creating dummy variables. After this process is applied for the whole of the observation period, the year in which the t statistic of the α coefficient is obtained at minimum is determined as the possible breaking year. The obtained t statistic is compared with the critical values created by Zivot and Andrews. If the obtained absolute value of t statistic is less than the critical value, the null hypothesis that the series contains the unit root is accepted. If the absolute values t statistics obtained are greater than by the critical value, the null hypothesis is rejected and the alternative hypothesis stating that the series is stationary with structural break is accepted (Korkmaz et al., 2008).

When the series used in the study were examined by Zivot-Andrews test which allowed single structural breakage, the results were as follows;

Table 2. Zivot-Andrews Unit Root Test

Models	**Level**		**1%**	**5%**	**10%**
	RASV				
	Breakage Year	**T stat.**			
Model A	2005	3,36	-5.34	-4.93	-4,58
Model B	2007	3,80*	-4.80	-4.42	-4,11
Model C	2009	-5,14***	-5,57	-5,08	-4,82
	RAPV				
Model A	2010	-5,81***	-5.34	-4.93	-4,58
Model B			-4.80	-4.42	-4,11
Model C	2010	-6,59***	-5,57	-5,08	-4,82

Note: Statistically significant at *%10 **%5, ***%1 levels

When the results of the Zivot-Andrews unit root tests for the RASV series are examined, the null hypothesis (H0) that unit root with the structural breakage within the B and C models is rejected according to t-statistics. Therefore, Z-A unit root test results are similar to ADF unit root test results.

When the results of Zivot-Andrews unit root tests for RAPV series are examined, it is seen that it is stationary in the determined structural breakage periods according to t-statistics at 99% significance level in all models.

When the breakage periods of the RASV and RAPV series are analyzed, it is concluded that the RASV series became stationary in 2007 and 2009 and the RAPV series became stationary in 2010 with the structural breakage. When the aforementioned dates are examined in terms of agricultural supports, it is seen that the supports are in an increasing trend until 2007 and then they have decreased significantly between 2007-2009.

When both structural breakage analysis and Figure 2 are examined, agricultural support value has undergone a structural break in both the level and the slope in 2009. Therefore, we can examine the period under two headings as 2000-2008 and 2009-2018 years.

The period between 2000 and 2008 was the period when the input, price and credit supports were abolished. In this period, in line with the agreement made with the World Bank, Direct Income Support (DIS) was introduced through the Agricultural Reform Implementation Project. The transition to this period, which was called the period when reformist movements started, was influenced by the provisions of the WTO Agreement on Agriculture, harmonization with the EU Common Agricultural Policy, IMF and World Bank policy proposals. In Turkey, within the framework of agrarian reform that was implemented in 2000. it left quickly traditional support tools, DIS determined by per processed agricultural area was passed into the system in 2001. However, the resumption of credit subsidies with DIS in 2006 and diesel and fertilizer subsidies in 2007 were an important factor in the increase of agricultural support payments both nominally and in real terms. The results of reeling the World Economic Crisis to all of the world, economic shrinkage has also affected Turkey in 2009. Between 2000 and 2008, the momentum of real increase in agricultural subsidies was reversed. The fact that the “Alternative Product Support" given within the scope of the ARIP project in the same period was completed in 2009 can be shown as the reasons for the decrease in agricultural support values. Agriculture is the most disadvantaged group in terms of paying the bill of crisis compared to non-agricultural sectors as a whole with its unorganized and weak structure as a sector. In particular, there has been a significant reduction in agricultural supports with the IMF's suggestions (Şengül, 2009).

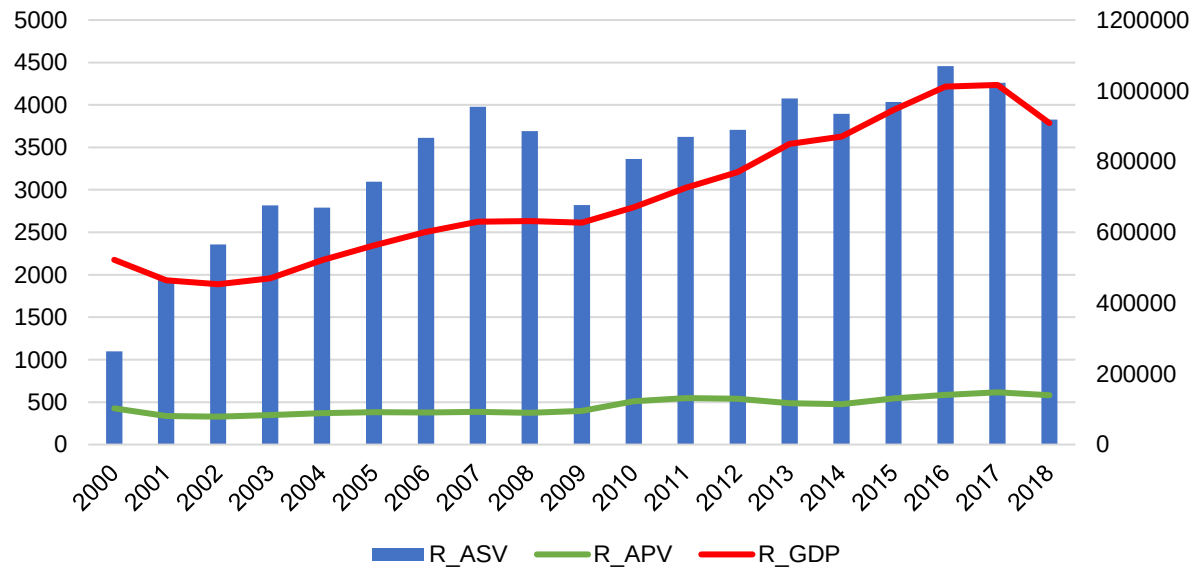

Figure 2. The Change on GDP, Agricultural Production Value (R_APV) and Agricultural Support Value (R_ASV) Between 200-2018 Years

The global crisis that started in 2008 shook the whole world deeply, and especially in developed economies, it revealed deteriorating effects on social and economic structure as well as financial balances. In most developed countries and developing countries, economic growth stagnated, the payments balance deteriorated and unemployment rates rose to high levels. The crisis has risen to threaten the existence of states, not just at the micro level on businesses or specific firms. Countries have put in place successive packages for stability and stimulation and have made intensive efforts to revive the economy and increase employment. In terms of the agricultural sector, DIS was abolished in the post-2009 period. Instead of DIS, the use of certified seeds and seedlings for the environmental protection of agricultural areas, field-based diesel, fertilizer, hazelnut, tobacco and tea subsidies have been expanded. In the post-DIS period, there were significant changes in the types of support compared to the DIS period. While some support items continued degressively and some support items were completely removed from the application. Indemnities and difference payments have been continuous support tools, although their amounts change during the DIS period and after the DIS period. During the DIS period, price subsidies placed a decreasing rate among the other support methods and became a completely abandoned support method after the DIS. Similarly, incentive premiums, export subsidies, input subsidies, and RUSF are supportive methods that have been gradually abolished or otherwise implemented. A

large part of the support in the post-DIS period was made in the form of area-based payments. In addition to this, the forage crop support has been continuously applied in order to eliminate the problems experienced in animal husbandry. Current agricultural supports implemented in Turkey can be classified under plant production supports, animal production supports, structural improvement supports, rural development, and environmental supports. Various biological control supports, fuel, fertilizer and soil analyses supports, agricultural consultancy, and farm accounting data network registration supports are the supports provided to improve agricultural infrastructure. The support program for rural development investments (KKYDP) and environment-oriented agricultural land preservation (CATAK) project are also among the policies implemented by the ministry within the scope of rural development and environment. In addition, 50% state supported agricultural insurance (TARSIM) implementations are provided as a policy tool for risk management and stable producer income (Tan, 2016).

Gregory-Hansen Co-Integration Test Results

Classical tests used in cointegration tests assume that the variables used in the model do not change over time, and that the cointegrated vector is not affected by structural breaks. But the Gregory-Hansen cointegration test, which is shown in the next generation of tests, suggests that there may be an internally determined break in the cointegrated vector. Gregory-Hansen (1996) developed a hypothesis that fracture may be in cointegration. In the analysis, three alternative models have been developed: constant (C), trend-constant (C/T) and regime-breaking (C/S).

Table 3. Gregory-Hansen Cointegration Test Results

Models	**Breakpoint Year**	**t-Stat**	**1%**	**5%**	**10%**
C	2011	-4,23	-5,13	-4,61	-4,34
C/T***	2009	-6,28	-5,45	-4,99	-4,72
C/S	2011	-4,05	-5,47	-4,95	-4,68

Note: Statistically significant at *%10 **%5, ***%1 level

Table 3 shows the minimum ADF results obtained from the Gregory-Hansen test to determine the long-term relationship between the variables included in the model under structural breakage, the critical values obtained from the Gregory-Hansen (1996) article and breakage periods. When the statistical values in the table are compared with the critical values, it is concluded that the statistical absolute value in the model that permits the breaking in the fixed-trend model is greater than the table critic value and therefore there is a long-term relationship between the variables in the specified models with the breakage in 2009 at the 99% significance level. The break in 2009 can be seen as an effect of the result of the economic crisis on agriculture.

The long-term co-operation of the models established in the analysis shows that the cointegration analyzes to be performed with the level values of these series will not encounter the problem of false regression. Therefore, long-term cointegration coefficients between the series should be estimated. Structural breakage dates obtained from cointegration analysis were included in the long-term analysis with dummy variables.

Table 4. FMOLS Regressor Results (Indebendent Variable RAPV)

Variables	**Coefficients**	**T Statistics**	**P Values**	**JB Chi Square Normality Test**
RASV	27.94	15.40	0.00	1.81
D1	19362.33	2.26	0.04	
Note: Statistically significant at *%90 **%95, ***%99 levels. autocorrelation and heteroscedasticity problems were solved by using Newey-West method. JB; Jarque-Bera test value was found bigger than 0.05 probability value. It means that the error value has normal distribution. Dummy variable was selected as D1:2009.				

After determining the cointegration relationship between the variables, the long-term coefficient estimator, FMOLS was used to determine the direction and how much the independent variable RASV affects the dependent variable. In the FMOLS method, when the model is established, the date of break is taken into consideration with the dummy variable. 2009 year, which is considered as the common breaking year only in

all models as the date of fracture, is included as a dummy variable. According to the results obtained from the analysis, the dummy variable is statistically significant at 95% level, while the RASV variable which expresses agricultural supports is significant at 99% level. When the results obtained are interpreted, it is concluded that the increase in agricultural supports positively affects the agricultural production value.

CONCLUSIONS

Compared with developed countries, the relative share of support payments, a share of agriculture sector in GDP and employment in Turkey are high. This is due to the structural problems of the agricultural sector. The high rate of employment in the agricultural sector hinders the rapid transition of those employed in the sector to other sectors. In addition, the necessity of maintaining the income levels of the employees at certain levels prevents the reduction of agricultural support payments. Steady implementation of agricultural subsidies to ensure efficiency and technological development in the sector will contribute to economic growth by supporting agricultural production growth.

As a result of the empirical findings of the study conducted to investigate the relationship between agricultural support expenditures and agricultural production value from the central government budget; a long-term relationship was found between agricultural support expenditures and agricultural production value. This shows that the state's support expenditures for the agricultural sector positively affect the level of agricultural production in the country. As a result, direct and indirect subsidies that promote production in the agricultural sector will contribute to the increase in agricultural production. Agricultural supports that increase the production in the agricultural sector should be implemented in a way that will increase productivity in the long term rather than increase the income of producers in the short term. In addition, it is necessary to develop long-term programs that increase productivity in the agricultural sector. Especially the distorted factors in agricultural markets should be eliminated with new programs that will increase productivity. The effectiveness of these practices will reduce the structural problems in the agricultural sector and turn the sector into a sector that makes significant contributions to the national economy.

The structural breakage in agricultural support policies in 2009 has been identified because of economic crisis between 2000-2018 years-reformist period. The positive relationship between agricultural supports and agricultural production value shows the importance of supports in terms of sustainability of agriculture. The share of agricultural subsidies in GDP has been on an upward trend until 2009 and this trend has turned to decline together with 2009. Showing fluctuations in real value of agricultural support payments, but passing is relatively declining trend in Turkey is thought to be a result of the policy on short-term support in the agricultural sector.

The variety of supports is as important as the amount of subsidies in providing sustainable agricultural production. In the early 2000s, the share of premium support / difference payment supports within the support tools increased from around 10% to 30% today, which both reduces the effectiveness of supports and can cause prospective problems since such supports are seen as market distortion support. Therefore, agricultural policy should be reoriented from supporting production towards improving agricultural productivity and adding more value with sustainable use of natural resources. Currently, producer support is granted mainly through the most market distorting measures. Because of that the share of the most distorting types of support should be reduced. The agriculture supports should be long term and the farmers should know the situation what will be in short-medium and long term period. It will help to plan of national production and give the opportunity to the farmers and the other stakeholder to see their ways.

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PERITONEAL MESOTHELIOMA IN A TEKIR CAT

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ABSTRACT

In this report, we describe a case of mesothelioma which is widely distributed over visceral pleura (lung) and parietal peritoneum (diaphragm) in castrated Tekir breed female cat. During the laporatomy performed for diagnostic purposes to the cat who was brought to the clinic with the complaint of urinary difficulty, numerous walnut sized nodular structures were observed in the diaphragm. As the clinical condition of the animal deteriorated, the operation was terminated, but the animal died after the operation. In necropsy, nodular masses were determined abdominal side of the diaphragm, with diameters ranging from pin head to walnut size, commonly on the pleura of the lung, on the chest and peritoneal side. It was observed in the liver in two foci, one in the lymph node. The cross-sectional face of the nodules looked like suet. Caseification and calcification were not observed. Histopathological examination revealed that mesothelial polygonal large neoplastic cells were lined up on serosal surfaces similar to epithelial cells to form tubular or papillary structures. It was also observed that neoplastic cells formed solid structures. Atypia and mitotic figures were high in these cells. In addition, tumor emboli in the lung and diaphragm lymph vessels and tumor foci in the liver lymph node were determined. Based on these findings, it was concluded that the case was a malignant epitheloid type mesothelioma developing on the pleural and peritoneal surfaces. Mesotheliomas are tumors originating from mesothelial tissue covering the peritoneum, pleura and pericardial surfaces. The metastasis of the tumor is low and it is mostly spread by implantation. However, mesotheliomas are considered among malignant tumors. Although it is an important problem associated with asbestos dust in humans, it is less common in animals. Mesotheliomas are usually recorded in cattle and dogs, but have also been reported in horses, cats and pigs. It is noteworthy that cases in cattle are mostly congenital.

***Keywords**: Peritoneal mesothelioma, Cat, Pathology, Oncology.*

INTRODUCTION

Tumors originating from serosa are called mesothelioma. Mesotheliomas are often considered malignant. Nearly all mesotheliomas can spread with implantation as less through metastasis. Mesotheliomas are rare in animals. It has been most commonly reported in cattle and dogs, sometimes in horses, cats, pigs and other species (Uzal et al 2016) . In humans, mesothelioma has been discovered to be associated with asbestos (McCaughey et al 1985). However, this relationship has not been confirmed in animals. In domestic animals, mesothelioma occurs most commonly as fetal or as a congenital neoplasm in young cattle (Uzal et al 2016, Munday et al 2017) . Mesotheliomas originate from mesothelial cells on the serous surfaces of the pericardial, pleural and peritoneal cavities, and can sometimes affect all three locations simultaneously (Uzal et al 2016). Three main histological types have been identified in animals: epithelioid, fibrous, and biphasic (or mixed) types (Munday et al 2017).

CASE HISTORY

In this report, we describe a case of mesothelioma which is widely distributed over visceral pleura (lung) and parietal peritoneum (diaphragm) in castrated Tekir breed female cat. During the laparotomy performed for diagnostic purposes to the cat who was brought to the clinic with the complaint of urinary difficulty, numerous walnut sized nodular structures were observed in the diaphragm. As the clinical condition of the animal deteriorated, the operation was terminated, but the animal died after the operation. Then, the cat was sent to Selcuk University, Faculty of Veterinary Medicine, Department of Pathology laboratory for necropsy.

MATERIAL AND METHODS

Tissue samples taken from all visceral organs and nodular structures in the seroza for histopathological examinations were fixed in 10 % formaldehyde solution 48 hours and routine tissue processing procedures were performed. Then the tissue sections embedded in paraffin blocks were cut on 5 micrometer thick and stained with hematoxylin-eosin (HxE) and ziehl-neelsen (ZN) and examined under a light microscope (Olympus BX51, Tokyo, Japan).

RESULTS AND DISCUSSION

In necropsy, nodular masses were determined abdominal side of the diaphragm (Figure 1), with diameters ranging from pin head to walnut size, commonly on the pleura of the lung, on the chest and peritoneal side (Figure 2-A). It was observed in the liver in two foci (Figure 2-B), one in the lymph node. The cross-sectional face of the nodules looked like suet. Caseification and calcification were not observed. Histopathological examination revealed that mesothelial polygonal large neoplastic cells were lined up on serosal surfaces similar to epithelial cells to form tubular or papillary structures (Figure 3A). It was also observed that neoplastic cells formed solid structures (Figure 3B). Atypia and mitotic figures were high in these cells (Figure 3B). In addition, tumor emboli in the lung and diaphragm lymph and blood vessels and tumor foci in the liver lymph node were determined(Figüre 3C-F). Based on these findings, it was concluded that the case was a malignant epithelioid type mesothelioma developing on the pleural and peritoneal surfaces. In addition, ZN staining was negative. The macroscopic and microscopic findings observed in this case consistent with the data of mesothelioma cases previously reported in cats (Raflo ve Nuernberger 1978, Bacci et al 2006, Al-Dissi ve Philibert 2011). Although it has been reported that humans may be associated with mesothelioma asbestosis (McCaughey et al 1985), no information is available on whether the cat has been exposed to asbestosis. Some authors' opinion that metastasis in mesothelioma is rare (Uzal et al 2016, Munday et al 2017). However, multiple metastatic foci were detected in the lung and liver in this case.

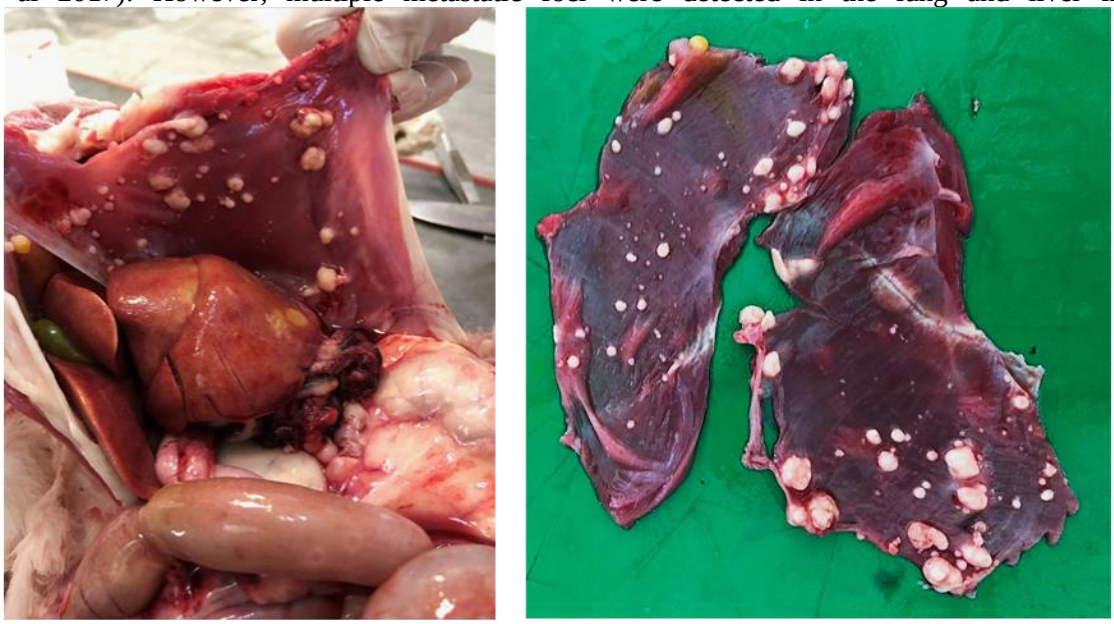

Figure 1. Nodular masses on the diaphragm.

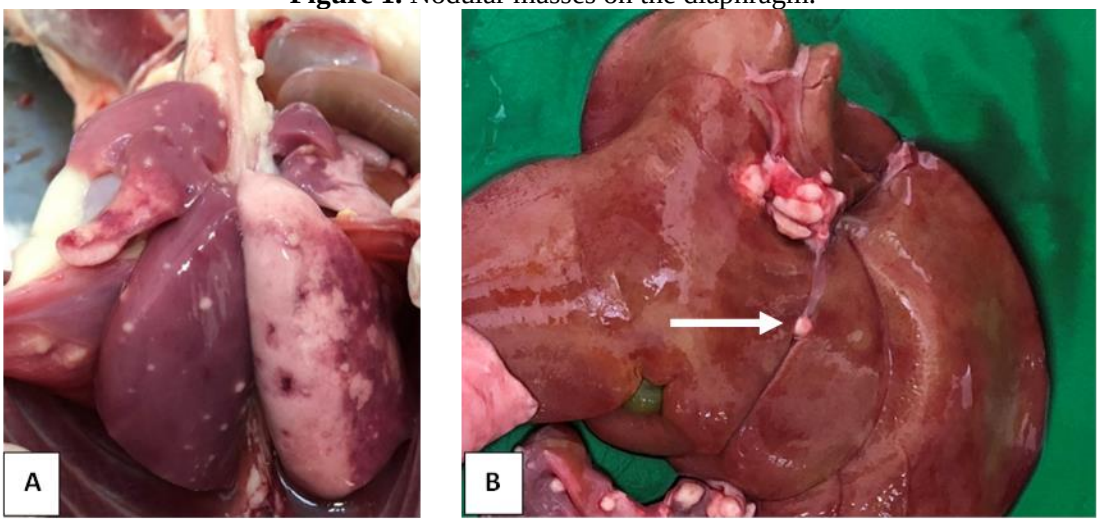

Figure 2. A: Nodular masses on the lung, **B:** White metastatic foci on the liver (arrow).

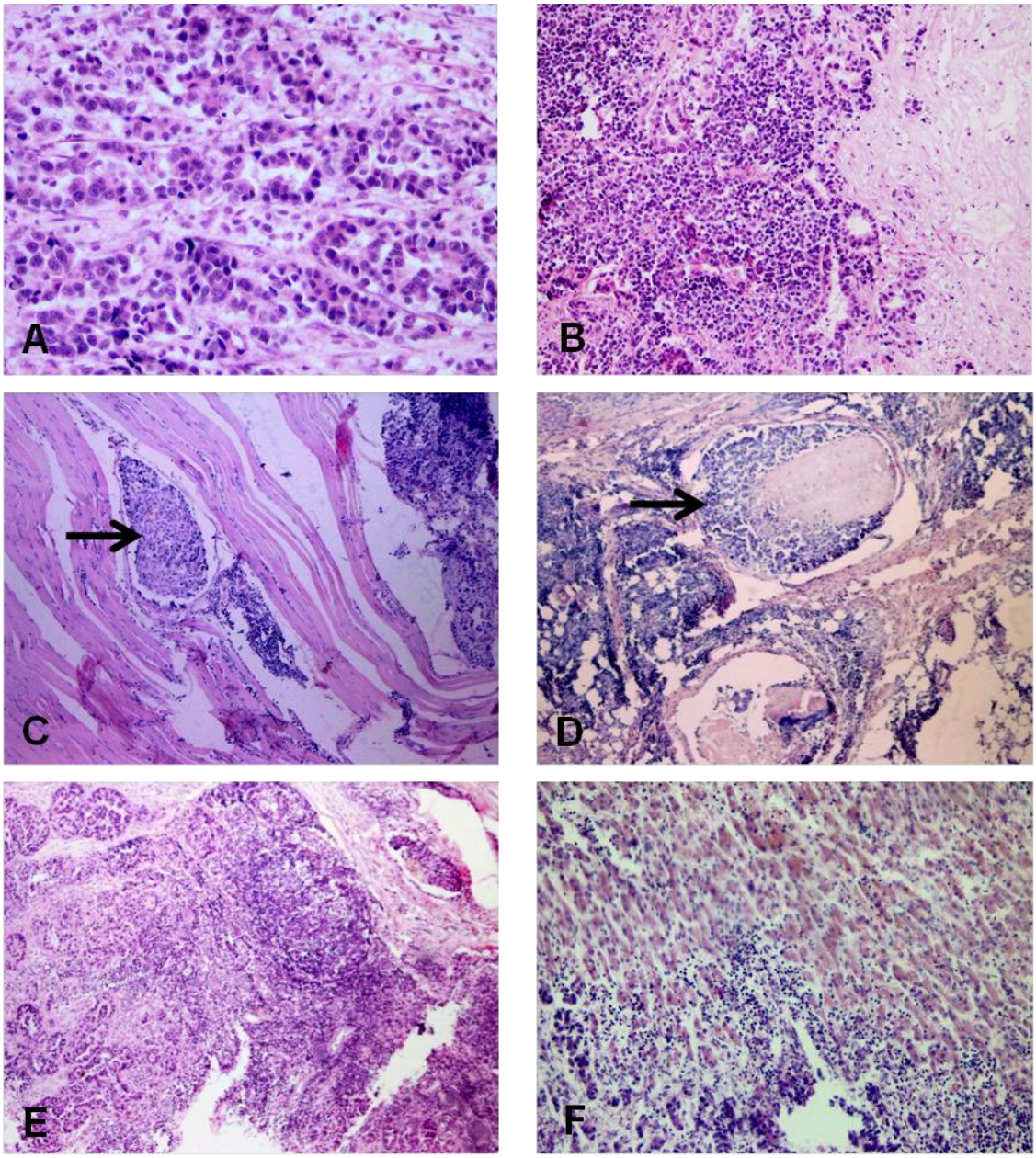

Figure 3.A. Tubular or papillary structures formed by neoplastic cells, HxE, 40x. **B.** Solid structure formed by neoplastic cells, HxE, 20X. **C.** Tumor emboli in the lymph vessels (arrow), HxE, 10x. **D.** Tumor emboli in the blood vessels (arrow), HxE, 10x. **E.** Tumor metastases to lymph node, HxE, 10x. **F.** Neoplastic cells in the liver, HxE, 20x.

CONCLUSION

A rare case of mesothelioma in cats that can easily be mistaken for abscesses or tuberculosis granulomas have been discussed in macroscopic and microscopic terms. To our knowledge, this is the first report of a case of peritoneal mesothelioma in a cat in Turkey.

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GENERALIZED TUBERCULOSIS CASE IN A 5-MONTH-OLD HOLSTEIN CALF

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ABSTRACT

In this presentation, generalized tuberculosis was described in 5-month-old male Holstein calf. In the anamnesis, the calf was brought to the Department of Pathology at Selcuk University Veterinary Faculty for necropsy due to respiratory problems, anorexia and weakening complaints that started after birth and did not heal despite drug treatment. Macroscopically, multiple chickpea-sized, pus-filled foci in the cranial lobes of the lung and caseous hard nodules in the dorsal part of the caudal lobes were seen. It was noted that the bronchial and mediastinal lymph nodes were caseous and hard. In the brain, especially in the left frontal lobe multiple pinhead-sized nodules were seen. When the brain sections were examined, it was determined that these lesions had spread to the cerebral cortex, cerebral cortex-corpus callosum border and pons. In the microscopic examination, typical tuberculosis granulomas were observed to have caseification necrosis with calcification and surrounding mononuclear cells, epithelioid histiocytes, Langhans type giant cells and fibrous capsule consisting of fibroblasts, fibrocytes and collagen fibers in the lung parenchyma, bronchial and mediastinal lymph nodes. Similar lesions were seen in the cerebral cortex as well as in the meninges. In Ziehl-Neelsen staining performed on these sections, many bright red colored asido-resistant bacilli were found in the lesioned areas. In this case, it was aimed to draw attention that tuberculosis should be considered as one of the important diseases affecting the brain in calves.

***Keywords**: Tuberculosis, Calf, Pathology, Respiratory.*

INTRODUCTION

Tuberculosis is a chronic, infectious and zoonotic disease caused by Mycobacterium genus that affects animal and human health negatively and usually causes respiratory problems (Carter et al 1995, Arda et a 1997). Tuberculosis, one of the most important diseases of cattle, is generally caused by Mycobacterium bovis (M. bovis), a gram positive, non-spore forming, acid-resistant bacterium that contains complex lipids on its wall (Caminiti et al 2016). The disease is transmitted by the alimentary, aerogenic, skin, genital and congenital tracts. Although genital and congenital transmission is not common, the congenital pathway is still important in areas with a high prevalence of tuberculosis (Phillips et al 2003). Although bovine tuberculosis is generally considered to be a chronic infection of middle-aged and older animals, it may also occur in young animals. Clinical, postmortem, histopathological, immunological, bacteriological and molecular investigations are used to confirm the disease. Clinically, anorexia, weakening, biphasic fever, difficulty breathing, and hairs confusion with chronic cough are noted (Cantwell et al 1994, Caswell ve Williams 2016). It is macroscopically characterized by the formation of nodular granulomas known as tubercles (Caswell ve Williams 2016, Ciftci et al 2018).

CASE HISTORY

In this case report, generalized tuberculosis was described in 5-month-old male Holstein calf. In the anamnesis, the calf was brought to the Department of Pathology at Selcuk University Veterinary Faculty for necropsy due to respiratory problems, anorexia and weakening complaints that started after birth and did not heal despite drug treatment.

MATERIAL AND METHODS

Tissue samples taken from all visceral organs, especially the lung and brain for histopathological examinations were fixed in 10 % formaldehyde solution 48 hours and routine tissue processing procedures were performed. Then the tissue sections embedded in paraffin blocks were cut on 5 micrometer thick and stained with hematoxylin-eosin (H&E) and ziehl-neelsen (ZN) and examined under a light microscope (Olympus BX51, Tokyo, Japan).

RESULTS AND DISCUSSION

Macroscopically, multiple chickpea-sized pus-filled foci in the cranial lobes of the lung and caseous hard nodules in the dorsal part of the caudal lobes were seen (Figure 1A). It was noted that the bronchial and

mediastinal lymph nodes were caseous and hard. In the brain, especially in the left frontal lobe multiple pinhead-sized nodules were seen (Figure 2A). When the brain sections were examined, it was determined that these lesions had spread to the cerebral cortex, cerebral cortex-corpus callosum border and pons (Figure 2B). In the microscopic examination, typical tuberculosis granulomas were observed to have caseification necrosis with calcification and surrounding mononuclear cells, epithelioid histiocytes, Langhans type giant cells and fibrous capsule consisting of fibroblasts, fibrocytes and collagen fibers in the lung parenchyma, bronchial and mediastinal lymph nodes (Figure 1B-C). Similar lesions were seen in the cerebral cortex as well as in the meninges (Figure 3A-C). In Ziehl-Neelsen staining performed on these sections, many bright red colored asido-resistant bacilli were found in the lesioned areas (Figure 3D). The macroscopic and microscopic findings in this case were consistent with the previously reported literature (Caswell ve Williams 2016, Ciftci et al 2018).

In congenital infections of calves, lesions are seen primarily in liver, portal lymph nodes and spleen, and in alimentary infections it is seen in intestine and mesenterial lymph nodes (Caswell ve Williams 2016, Özdemir ve Erer 2018). In the presented case, primarily lesions were seen in the lung, and no lesions were detected in the spleen and intestine and mesenterial lymph nodes. this respect, it was thought that the infection was not congenital or alimenteric and was caused by aspiration of infected amniotic fluid during birth or aerogenic pathways. In addition, there has been an increase in the number of tuberculosis reports in early calves in recent years (Ozyigit et al 2007, Demelash et al 2009, Ortatatlı et al 2012, Del Moral et al 2018, Ates et al 2019).

CONCLUSION

Bovine tuberculosis, which is highly prevalent in the cattle population and can be transmitted by many routes, poses a significant threat to calves that have not yet developed the immune system. It was also noted that it may affect the brain without any neural findings. Therefore, it was aimed to draw attention that tuberculosis should be considered as one of the important diseases affecting the brain in calves.

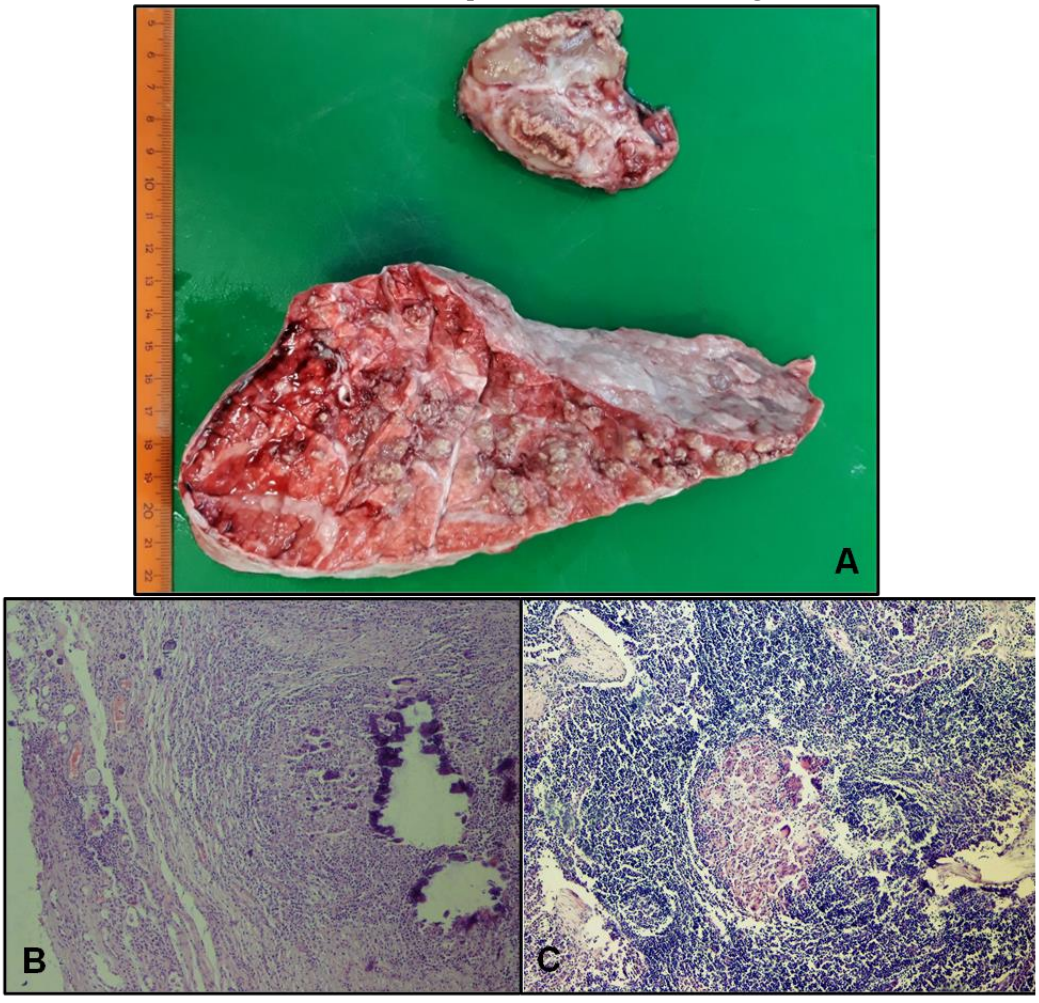

Figure 1. A. Multiple chickpea-sized nodules in the cranial lobe of the lung and in the mediastinal lymph node. Typical tuberculosis granulomas, H&E,10x. **B:** Lung, **C:** Lymph node.

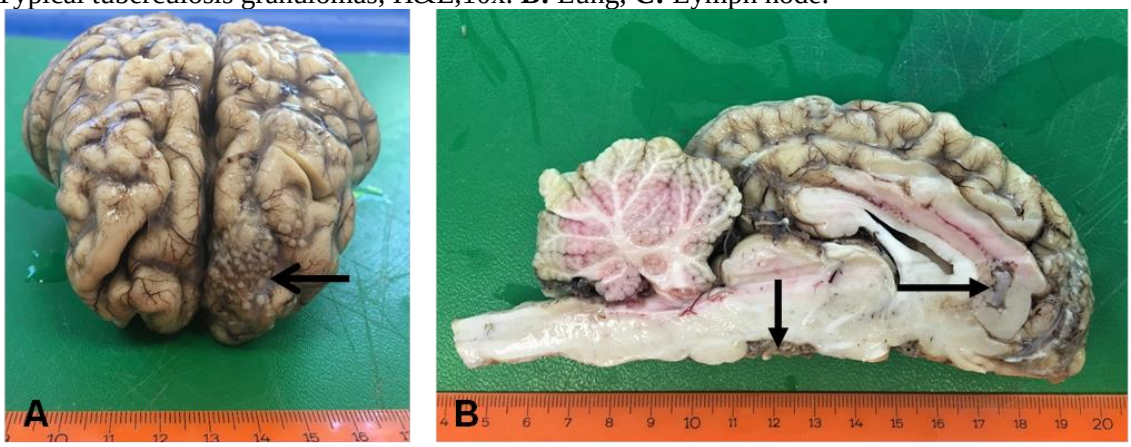

Figure 2. A. Brain. Especially in the left frontal lobe multiple pinhead-sized nodules (arrow). **B.** Brain. Multiple pinhead-sized nodules and macroscopic lesions in and around the corpus callosum (arrows)**.**

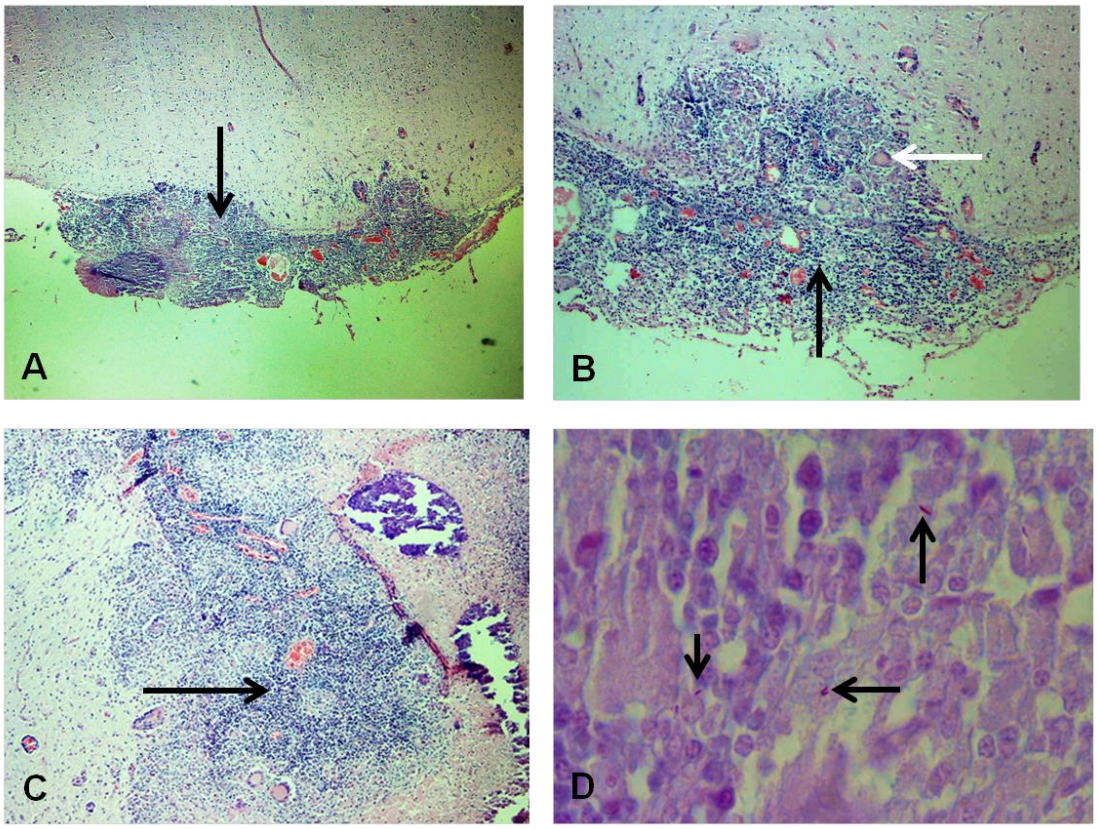

Figure 3. A. Meningoencephalitis tuberculoza (arrow), brain H&E, 4x. **B.** Meningoencephalitis tuberculoza (black arrow), Langhans giant cell (white arrow) brain, H&E, 10x. **C.** Typical tuberculosis granuloma (arrow), brain H&E, 10x. **D.** Red colored asido-resistant bacill (arrows)i, lung, ZN, 100x.

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SOCIO-ECONOMIC IMPACTS OF RURAL TO URBAN MIGRATION; CASE STUDY IN KARATAY DISTRICT OF KONYA PROVINCE

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ABSTRACT

Rural migration is defined as the rural people leaving their places individually or in groups and choosing new living spaces for themselves. In this study, it is aimed to determine the reasons of migration and socio-economic effects of households migrating from rural to urban areas in Karatay district of Konya. The data required for the study were obtained through a questionnaire. In order to determine the causes and effects of migration in the region, the results of the survey conducted with 30 household heads by proportional simple random sampling method were used. The main factor driving the households to migrate is the lack of livelihood and education. Rural migration affects socio-economic structures of households in different ways. In this study, the socio-economic dimension of migration and its effect level were investigated.

Keywords: *Rural to Urban Migration, Education, Karatay*

INTRODUCTION

Migration can be defined as an act of leaving individuals and communities to another place or another country for political, social or economic reasons. Urbanization movements have accelerated with industrialization throughout the world, especially in developed countries. In 1960, 66.4% of the world's population lived in rural areas, while this rate decreased to 60.8% in 1980, 53.5% in 2000, 48.7% in 2010 and 2018. 45.1% and is expected to decrease to 35.1% in 2050.

The proportion of rural population in Turkey, as in other developing countries, together with the relatively high, this rate is decreasing. 24.2% of Turkey's total urban population in 1927, while 75.8% lived in rural areas. However, over the years, the change in the population has shown a trend in favor of urban areas. Thus, the ratio of rural population to total population has decreased from 68.1% in 1960, 56.1% in 1980, 35.1% in 2000, 23.7% in 2010 to 7.5% in 2018 (Table 1).

Table 1. World and Turkey Rural Population

Year	World Rural Population%	Turkey Rural Population%
1960	66.4	68.1
1980	60.8	56.1
2000	53.5	35.1
2010	48.7	23.7
2018	45.1	7.7

Source: TÜİK 2019, www.worldometers.info

MATERIALS AND METHODS

The main material of the study consists of original data collected through questionnaires from households in Karatay which is selected as the research region. Sample size is calculated as 30 within 99% confidence interval and with 5% error margin and the enterprises in sample size are randomly selected on the basis of voluntariness. At the same time, reports, surveys and statistics at national and regional level were used as secondary data.

$$n = \frac{\mathrm{N} \times \mathrm{p} \times \mathrm{q}}{(\mathrm{N}-1) \times D^2 + p \times q}$$

RESEARCH FINDINGS

Demographic Characteristics of Households

According to the findings; 108 people live in 30 households surveyed in Karatay district. The survey was conducted with 30 people (29 male and 1 female). Based on the data obtained from the study conducted in the Karatay district in the research area, it was determined that 54% of the people were male and 46% were female (Table 2).

Table 2. Distribution of Households Examined by Gender

Gender	**%**
Male	53.70
Female	46.30
Total	100.00

In the survey samples examined, 2.06% of the respondents were not literate, 20.41% were primary school, 14.29% were secondary school, 30.61% were high school, and 32.65% were university level (Table 3).

Table 3. Distribution of Households Examined by Educational Status

Education	**%**
Not literate	2.06
Primary school	20.41
Middle School	14.29
High school	30.61
University	32.65
Total	100.00

When the income status of the households was examined, it was found that 24% of them have minimum wage level, 53% of them have 2000 - 3000 TL, 18% of them have 3000-500 TL and 5% of them have 5000 TL or more (Table 4).

Table 4. Distribution of Households Examined by Income

Income (TL)	**%**
1000-2000	23.68
2001-3000	52.63
3001-5000	18.42
Over 5000	5.26
Total	100.00

Reasons for Migration from Rural to Urban

According to the information obtained from the 30 households surveyed, the majority of the families live in the villages before they come to the city and earn their living from farming. Unemployment, children's education and livelihood are the main reasons for their arrival in the city. The households in the survey had to leave their villages for many reasons while settling in the city center. In this study, it was found that 47% of the families settling from the village to the city to find employment in the city, 30% of their children leave the village due to their education, 13% because of their livelihood problems and 7% of them leave the village due to the marriage reasons. The remaining 3% was determined to be the center of the city in order to live a comfortable life (Table 5).

Table 5. Reasons for Migration of the Households Surveyed from their villages

Migration Reasons	**%**
Employment	46.67
Education	30.00
Marriage	6.67
The charm of the city	3.33
Living difficulties	13.33
Total	100.00

The families involved in the research make their living in different ways before settling in the city. According to the survey results, 80% of the families have made their living from farming in the village and 7% from living in the fields of others (Table 6).

Table 6. Livelihoods of Surveyed Households Before Arriving in the City

Livelihoods	**%**
Farmer	80.00
Officer	3.33
Worker	6.67
Retired	3.33
Others	6.67
Total	100.00

The Results of Rural To Urban Migration

When the results of rural migration are grouped under the main headings; it is a fact that there are some economic and social consequences. However, it will be useful to examine the situation of these results in both urban and rural areas, since the physical and humanitarian consequences of such migrations may develop depending on the reasons of the migration. Therefore, the results of rural migration should be evaluated by direct or indirectly affected parties. Güreşçi (2014) classifies the parties to rural migration as follows:

Village side
a) Immigrants
b) The immigrant in the village;
-First-degree relatives
-Other relatives
- The neighbors,
-Grocery, grocery, barber, etc.

Relatives of immigrants in nearby villages
a. First-degree relatives
b. Other relatives
c. Neighbors
d. Grocery, barber, etc.

Large environment in which the immigrant emigrated
a. Small industrialist, entrepreneur, small hand artist etc. in the province, district or town.
b. Local authorities in the province, county or town
c. Public institutions and employees in provinces, districts and towns

City side
1. Migrants or immigrants
2. Relatives of first-degree immigrants from the village
3. Relatives who migrated from other villages to the city
4. Neighbors

5. Neighboring villagers and other fellow countrymen
6. Citizen's associations
7. In the city,
a. Neighbors (new in the city)
b. Other people living in the city
c. Tradesmen and other entrepreneurs
d. Industrialists and investors
e. Local administrators
f. Public institutions, administrators and authorities in the city

Government side
1. Government or other executive bodies concerned,
2. Other public institutions (Ministry of Agriculture, TURKSTAT etc.)
3. Academicians interested in the subject

When the parties to rural migration are evaluated according to the above information, it is understood that there is a wide range of them. Therefore, the consequences of rural migration can affect not only immigrants but also almost all segments of society directly or indirectly. However, the extent and severity of this interaction may be different.

CONCLUSIONS AND RECOMMENDATIONS

Migration is a socio-economic event and affects the lives of migrant individuals and causes social, cultural and economic changes in the communities in which individuals are separated and involved (Bahar and Bingöl, 2010). The increase in the number and population of large cities as a result of rural migration, especially in developing countries, causes socio-economic and political concerns in these countries (Beauchemin and Schoumaker 2005).

Konya has many types of migration at different impact levels. Together with the migrations from outside the region, it constitutes an important problem area for migrations to urban centers in the rural areas. The experienced social mobility leaves many deep effects in cultural, economic and social aspects of migration and it is composed of very complex and intertwined factors.

According to the information obtained from the households participating in the study, 47% find employment in the city, 30% leave their village due to education of their children, 13% subsistence problems, and 7% leave the village for marriage reasons. The remaining 3% was determined to be the center of the city in order to attract a comfortable life.

In order to minimize the effects of rural migration, policies that can keep the producer in his village should be followed. In addition, the importance of cooperatives and being organized should be explained to the producers in order to revive the production activities in the villages and to enable the producers to act together on issues such as supply of inputs, price formation and marketing. Agricultural consultants should benefit from this issue.

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WHEN AN ORPHAN GENE SAYS MORE THAN ITS IN *TRICHODERMA* BIOCONTROL SCREENING

W. MOKHTARI, N CHTAINA, M. ACHOURI, E. HALMSCHLAGER, H. VOLGMAYR, C. STAUFFER, W. JAKLITSCH

ABSTRACT

Molecular identification of Trichoderma spp. has brought to complete the genetic blueprint database of the genus and revolutionized the functional analysis of different genes of this organism. ITS was considered the essential marker to be used for phylogenetic relationships between Trichoderma species especially through biocontrol agents screening. However, tef1 a protein-encoding genes containing large intron could distinguish between closely related species and cover the complex speciation of the genus especially between two close orthologs' positions.

Context

- *Molecular markers in biocontrol*
- *ITS international bar-code for identification of Trichoderma*
- *tef1 best-resolving marker for Trichoderma identification*

INTRODUCTION

Fungal identification has been revolutionized in the mid-1900 by the application of molecular techniques for detection, characterization, monitoring and demonstrated relevance of molecular tools in cryptic identification of fungal species like *Trichoderma* spp. (Jaklitsch, 2009). Molecular markers are powerful tools for the routine identification of *Trichoderma* spp. during screening process besides monitoring and following *Trichoderma* spp in the micro and macro-ecosystem (Savazzini *et al*., 2008; Feng *et al*., 2011). Thereafter, molecular markers have been developed to explore *Trichoderma* diversity and identify the specific species patterns of each isolates. In fact, state of the art molecular tools like *Trichoderma* specific markers were generated to identify uncultivable isolates or low detectable *Trichoderma* and when *Trichoderma* spp. are epitypified (Jaklitsch, 2011).

Fries *et al*. (1825) first represent *Hypocrea* as the generic type of Hypocreaceae family (Hypocreales, Ascomycetes) based on characterizing cultivated hyaline ascospores of *Sphaeria rufa* actually designated the type species of the genus and named now *Hypocrea rufa*. Characterizing and identifying *Trichoderma* for BCA beyond simple morphological / biochemical / physiological. BCAs practitioner and researchers have focused on identifying cryptic fungal species like those of *Trichoderma* spp. for safe and reliable use of fungi all through biocontrol application.

One of the great concerns of traditional identification during biological agent (BCAs) screening process is the introduction of new and non-specific species of BCAs to a cropping system (Gosselin *et al*., 1999). The presence or absence of the related marker sequences confirm the presence or absence of antagonistic *Trichoderma* species and assure specific monitoring during antagonists selection phase and downstream when using it as BCAs in crop biocontrol treatment. Molecular markers are the best tool to identify, characterize and monitor *Trichoderma* in the environment where they already exist or just introduced in. In fact, molecular markers have different potential in their application during selection process of *Trichoderma* BCAs.

Molecular Markers and biocontrol agents blue print and diversity

Trichoderma recognized as the anamorph of the genus studied first in 1794 by Persoon. Tulasne (1865), cited by Bisby (1939), demonstrated the combination of *Trichoderma viride* with its teleomorpic *Hypocrea rufa* based on stroma structures similarity (Bisby, 1939). In 2003, Chaverri and Samuels studied the commonly green ascospores of *Hypocrea* based on phylogenetic analysis of two molecular markers; translation elongation factor alpha gene (*tef1)* and RNA polymerase II subunit (*rpb2).* They defined 40 species as *Hypocrea/Trichoderma* combination. Since then, wide repertoire of *Trichoderma* species have been identified at species level, evaluated for their antagonistic activity, selected for biocontrol performance and experimented as efficient BCAs products. Molecular markers have been used to identify and detect already existing *Trichoderma* species in BCAs database; therefore, this will avoid ambiguity during antagonistic evaluation of strains with similar biological function. Moreover, consistent molecular markers are indicative to eliminate duplicate strains during BCAs screening (Chaverri *et al*., 2015; Van Lenteren *et al*., 2017). The most prevalent molecular marker for fungal identification is the ribosomal internal transcribed spacer (ITS) region (ITS1–5.8S rDNA–ITS2) distinguished to be the universal barcode for fungal phylogenetic study. ITS markers were

considered the essential marker to be used for phylogenetic relationships between *Trichoderma* species. However, recently, protein-encoding genes containing large intron are key interest for *Trichoderma* phylogeny studies. Protein encoding genes could distinguish between closely related species and cover the complex speciation of the genus especially between two close orthologs' positions. Though, some of pioneer of *Trichoderma* systemic taxonomy have stressed out on the use of ***tef1*** to reveal **genetic variation** in the genus, they recommended the integrated genetic analysis of different sequences like endochitinase (*ech42*), RNA polymerase II subunit (*rpb2*) and calmodulin (*cal1*) beside ITS (Jaklitsch *et al*., 2006; Jaklitsch, 2009; Samuels et al., 2012; Jaklitsch and Voglmayr, 2015). Saying this, ***tef1,*** stay more available for **routine species-specific** identification and characterization of *Hypocrea/Trichoderma* (Druzhinina *et al*., 2008; Jaklitsch and Voglmayr, 2015). Cited *Trichoderma* as potential antagonists against plant pathogens are *Hypocreal lixii/T. harzianum, T. gamsii, T. spirale, T. velutinum, T. hamatum, Hypocreal koningii/T. koningii, Hypocreal virens/T. virens, T. tomentosum, Hypocreal semiorbis, Hypocreal viridescens/T. viridescens, Hypocreal atroviridis/T. atroviride, T.asperellum* and *Hypocreal koningiopsis/T. Koningiopsis* (Gupta *et al*., 2014).

tef 1 **and other Molecular markers phylogenetic resolution spots in screening *Trichoderma* for biocontrol**

In 1996, Restriction Fragment Length Polymorphism (RFLP) has been applied by Bowen *et al*. to **screen and monitor antagonistic** *Trichoderma* during field treatment and distinguish between antagonists *Trichoderma* and other closely related species or strains. The author stressed out on the fact that southern analysis is a difficult and time-consuming technique. Here again, ITS sequences play key role in discrimination among *Trichoderma* BCAs and non-BCAs. In fact, it was demonstrated by Chaverri et al. 2015 work that ITS1 – 5.8S – ITS2 come to define and delimit the complex lineages of *T. harzianum* complex.

The choice and design of specific DNA barcodes like ITS correlating with metabolic profiles related to *Trichoderma spp* has been initiated by Nagy *et al*. (2007). The study implies **to direct screening** of interesting *Trichoderma* spp. metabolic profiles like mycoparasitic and superior chitinases strains. **Highly chitinases producers strains** of *Trichoderma harzianum* have been verified using only two markers which are **ITS and** *tef1* sequences.

Phylogenetic analysis with ITS and *tef1* alleles revealed the **co-existence** of both *Trichoderma harzianum* sensu-stricto strains with other *Trichoderma harzianum* species. The called *harzianum* sensu-stricto strains were the superior chitinases producers. Since these *harzianum* chitinases type were identified for the first time, ITS1 and ITS2 were highly recommended for the determination of the species. Yet, ITS analysis gave **non-congruent** support in sample phylogeny. Therefore, *tef1* suggested to be used for molecular screening of *T. harzianum* superior chitinases strains. *tef1* and ITS alleles were recognized as effective markers for identifying specific *harzianum* sensu-stricto strains which are superior chitinases producers. Therefore, *tef1* with its 4 and 5 introns were recommended as DNA barcode screening tools since ITS sequences represent high similarity between *harzianum* population. In addition, highly producing chitinases characteristic is proved to be a fixed trait distributed in Harzianum population studied (Nagy *et al*., 2007).

For screening and identification of superior chitinases producer strains and other potential antagonistic isolates of *Hypocrea lixii/Trichoderma harzianum,* Nagy *et al*. (2007) have developed an online barcoding database called *Tricho*CHIT software program (http://www.isth.info/tools/trichochit/) (Kullnig-Gradinger *et al*., 2002; Druzhinina *et al*., 2008).

ITS phylogenetic resolution in *Trichoderma*

Five ITS1 and 2 constant oligonucleotide sequences are very known in different *Trichoderma* genus. These sequences are specific, conserved and hypervariable that able the identification of *Trichoderma* genus specific hallmarks. However, these ITS sequences alone could not resolve the phylogenetic relationship *Trichoderma* species since many different species share same ITS allele that support poorly *Trichoderma* cladistic and contradict bootstrapping other gene phylogenetic placement (i.e. *tef1, rpb2, cal1, ech42*). Indeed, they are universal and genus specific but not species specific! For more schematic details of ITS barcode sequences see figure 1 (Samuels *et al.*, 2006; Jaklitsch *et al.*, 2006; Druzhinina et al. 2008, Atanasova et al, 2010).

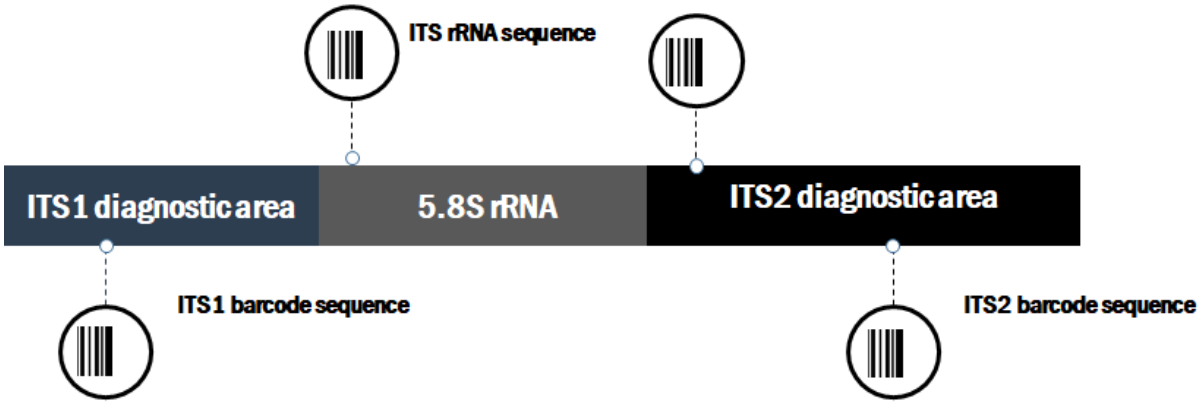

Figure 1: ITS barcodes sequence in *Trichoderma* genome; ITS 1 and ITS2 in five constant oligonucleotide sequences annotated specific, conserved and hypervariable (Druzhinina et al.,

Discrimination of cryptic species in *Trichoderma* is tightly related to quest of orthologous sequences which in its turn concatenate tremendous relationship of the functional conservation of orthologous and the species lifestyle like that mycoparasitic of *T. harzianum/virens* or saprophytic of *T. reesei* (Zachow *et al*., 2009; Jaklitsch, 2009).

***tef1* best-resolving marker for *Trichoderma* identification**

tef1 is considered a highly conserved constitutive promoter that regulates translational machinery functions in different fungi. *tef1* is present as an orphan gene in ascomycete like *Trichoderma* spp and it is used as phylogenetic informative indicator that reveal ecophysiological, mating, colonization adaptation and delimitation of *Hypocrea*/*Trichoderma* species as well as geographical distribution of this hyper-diverse genus (figure 2) (Rossman and Seifert, 2011).

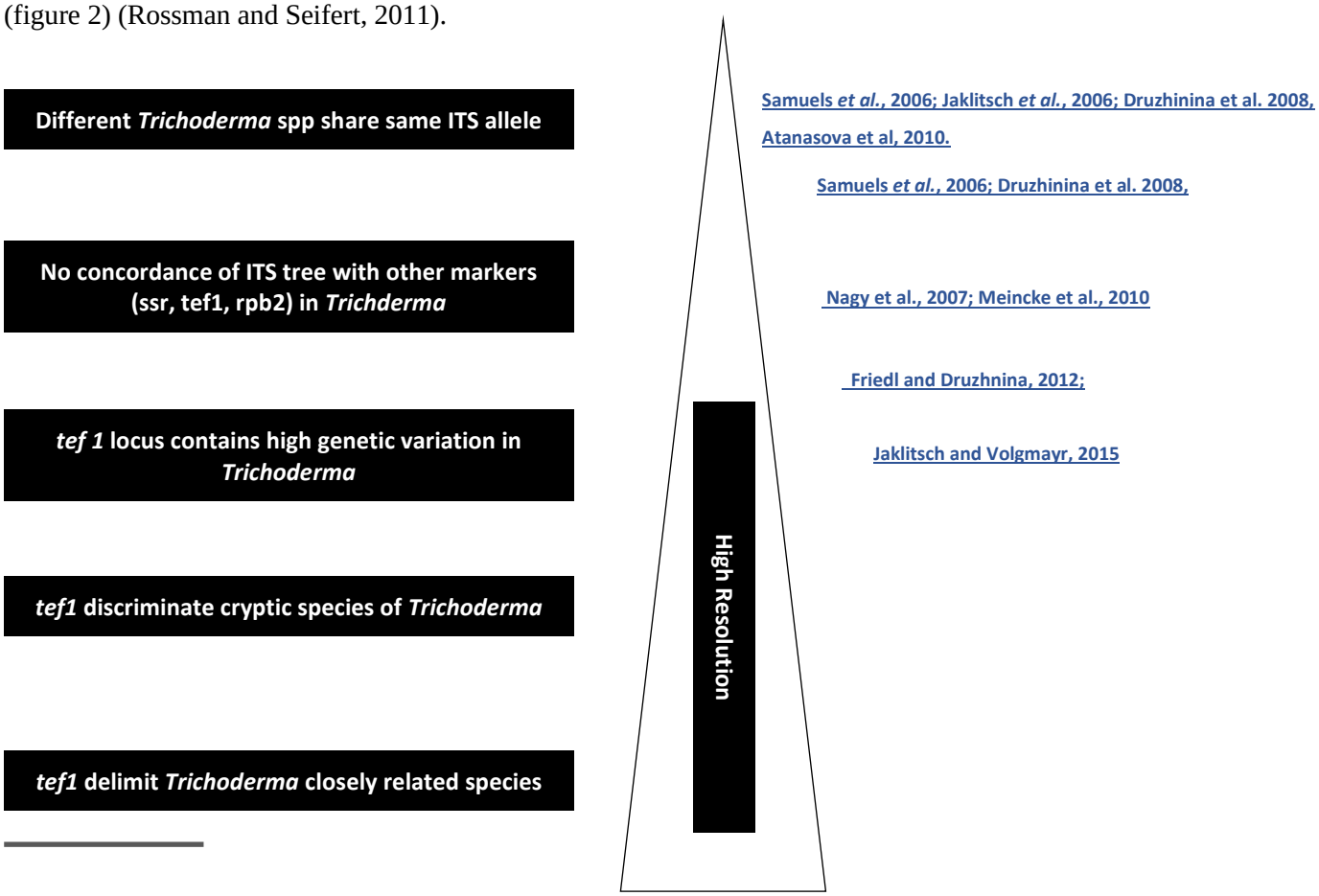

Figure 2: Relevance and time evolution of phylogenetic resolution of *tef1*

In 2003, Chaverri and Samuels studied the commonly green ascospores of *Hypocrea* based on phylogenetic analysis of two molecular markers; translation elongation factor alpha gene (*tef1)* and RNA

polymerase II subunit (*rpb2).* They defined 40 species as *Hypocrea/Trichoderma* combination. In 2009, Jaklitsch has recognized 75 European *Hypocrea/Trichoderma* green spore species and 56 hyaline spore species based on multigenes phylogeny approach including *tef1* gene as species specific with more than 636 orthologues, 90 species are putative in last research work (Chaverri and Samuels, 2003; Jaklitsch, 2009; Jalitsch and Volgmayr, 2015).

Molecular Markers in Quality control of Biocontrol Agents (BCAs)

BCAs can be successfully introduced to a cropping system yet being not specific they may lead to undesirable effects especially if they are pathogenic (Figure 3) (Gosselin *et al*., 1999). Different molecular analysis have been performed to monitor this fungus and quality control and toxicity tests have been established using markers like RAPD and ITS for the safety use of *Trichoderma* as a BCA in the crop system. In fact, identifying false or nonspecific *Trichoderma* species may reveal a safety risk when applied as "BCA" in the environment. Of these, *Trichoderma isaria* diagnosed as safety risk to human health as it produces toxic secondary metabolites and *Trichoderma aggressivum* f. *europaeum* in Europe and *T. aggressivum* f. *aggressivum* in North America as pathogenic responsible of green mold disease in mushroom since they revealed aggressive colonization in mushroom farms. ITS 1 and ITS 2 have revealed distinction between the causal agents that showed aggressiveness and other *Trichoderma* spp isolated from the bulk of infected mushroom (i.e. *T. harzianum, T. atroviride, T. longibrachiatum, T. asperellum and T. ghanense) (*Samuels *et al*., 2002). Another similar example is that of *Chondrostereum purpureum* which is used as an effective BCA to control forest weed species yet diagnosed as pathogenic to other non targeted forest trees (Gosselin *et al*., 1999). In addition, these markers were also used to label and track *Trichoderma* isolates in their origin. The originated habitat or site of collecting antagonistic isolates is crucial to establish safe and reliable BCAs in cropping system. Migheli and co-workers (2009) could reveal the origin of *Trichoderma* species isolated from soil samples based on ITS barcodes. They have identified *Trichoderma* species with already existing genotypes in other part of the world. In fact, pan-European and pan global *Trichoderma* spp were the species detected in the pool of Sardinia Island. Yet molecular marker ITS1 and ITS2 have revealed one endemic haplotype *T. hamatum* in the Island phylogenetic pool. Therefore, it could be inferred from ITS phylogenetic analysis that all *Trichoderma* species (i.e. *T. harzianum*) habitat in Sardinia were typically competitive colonizers invading the Island from Africa, Asia and Europe. Similar results have been reported in the research work of Zachow *et al*. (2009) characterizing *Trichoderma* species of Tenerife Island.

The advantage of using *tef1* marker for BCAs tracking is that *tef1* sequence reveal and discriminate ambiguous sequence variation of closely related species in *Trichoderma*. Many commercial BCAs product containing *Trichoderma* spp were misleading in identification. Recently, different commercial products containing *Trichoderma harzianum* species BCAs have been re-identified at the species level using *tef1* marker. Identification of this product has revealed misleading in identification and produced phylogenetic artifacts of species contained in these BCAs products. Chaverri and co-workers have re-identified five commercial BCAs with an active ingredient containing *Trichoderma harzianum*: strain T22 (G. Harman 129522 = G.J.S. 09-1563), Canna AkTRIvator® (G.J.S. 08-137), WP Promot® (G.J.S. 08-135), WP Trichosan® (G.J.S. 08-134) and Vitalin® (G.J.S. 08-136). Strikingly, none of the bio-fungicides were identified as *T. harzianum*. Identification using *tef1* markers permitted to re-classify Canna AkTRIvator® and T22 as *T. afro-harzianum*, WP Promot® as *T. guizouhense* and WP Trichosan® and Vitalin® as *T. simmonsii* (Chaverri *et al*., 2015).

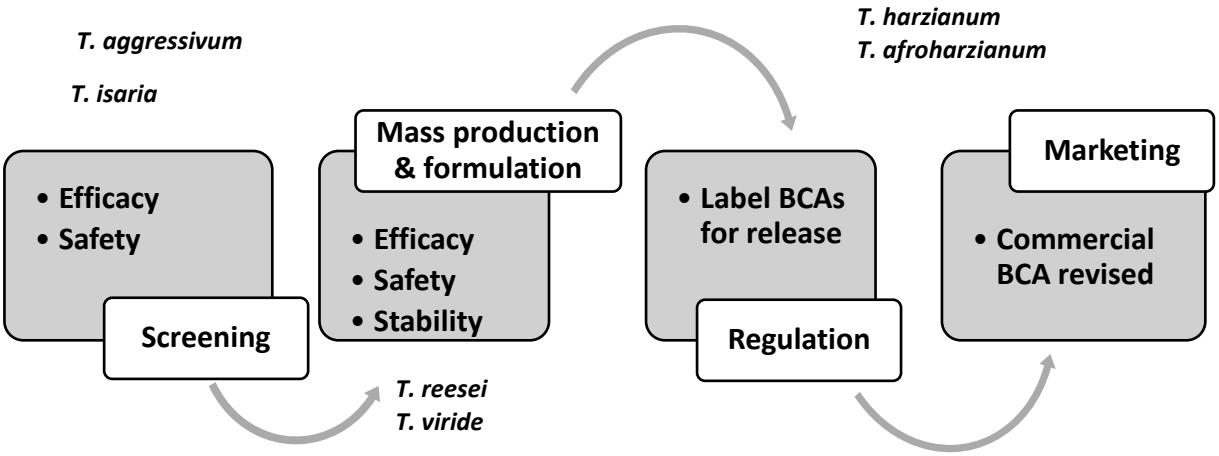

Figure 3: Process of *Trichoderma* screening and advantages of markers monitoring, some example of economic important *Trichoderma* (human aggressive or industrial) are mentioned in related process.

All conclusions derived from identifying and selection of BCAs requires sensitive molecular tools for better BCAs screening process. Screening methods is a whole process including not only potential antagonistic candidates' determination for biocontrol application but also the quality control issue during registration of BCAs. Therefore, choice of molecular marker during antagonistic candidate's selection may resolve screening tests and registration procedures of antagonists during screening protocols. Thus, *Trichoderma* spp can be identified at the species level, fingerprinted and selected as antagonistic candidates and labeled by molecular markers for further screening procedures and monitoring.

Molecular Marker in Monitoring *Trichoderma* BCAs

Molecular markers are powerful tools for the routine identification of *Trichoderma* spp. during screening process besides monitoring and following *Trichoderma* spp in the micro and macro-ecosystem (Savazzini *et al*., 2008; Feng *et al*., 2011). Potential antagonists have been monitored by molecular characterization using molecular markers. The presence or absence of the related marker sequences confirm the presence or absence of antagonistic *Trichoderma* species and assure specific monitoring during antagonist selection phase and downstream when using it as BCAs in crop treatment. Recently, monitoring BCAs stem from cultivation and cultivation-independent approaches based on highly consistent DNA markers to track antagonists during selection steps and way after their application in the environment. In fact, different research works in situ and in –root detection of *Trichoderma* DNA have been investigated (Gosselin *et al*., 1999; Friedl and Druzhinina, 2012; Geistlinger et al., 2015).

Molecular markers are the best tool to monitor and track *Trichoderma* strains in the environment. In fact, molecular markers have different potential in their application during selection process of antagonists. They have been used to evaluate and detect already existing species in BCAs database; therefore, this will avoid ambiguity during antagonistic evaluation of strains with similar biological function. Moreover, consistent molecular markers are indicative to eliminate duplicate strains during BCAs screening (Chaverri *et al*., 2015; Van Lenteren *et al*., 2017).

CONCLUSION AND RECOMMENDATION

tef1 would be suggested as the marker to be used for *in situ* and in root monitoring of *Trichoderma*. For instance, *tef1* can be investigated as efficacious tool for detecting and tracing indigenous *Trichoderma* species (figure 4) collected from native locations (i.e. natural habitats, cultivated lands) especially through *in vitro* (antagonists screening) and *in vivo* (root dipping *Trichoderma)* evaluation of their biocontrol potential against fungal pathogens. Thus, *tef1* may be investigated as molecular diagnostic tool to monitor and quantify *Trichoderma* strains either for biodiversity or during pathogens scouting and BCA establishment in purpose of introducing it as BCA in the environment.

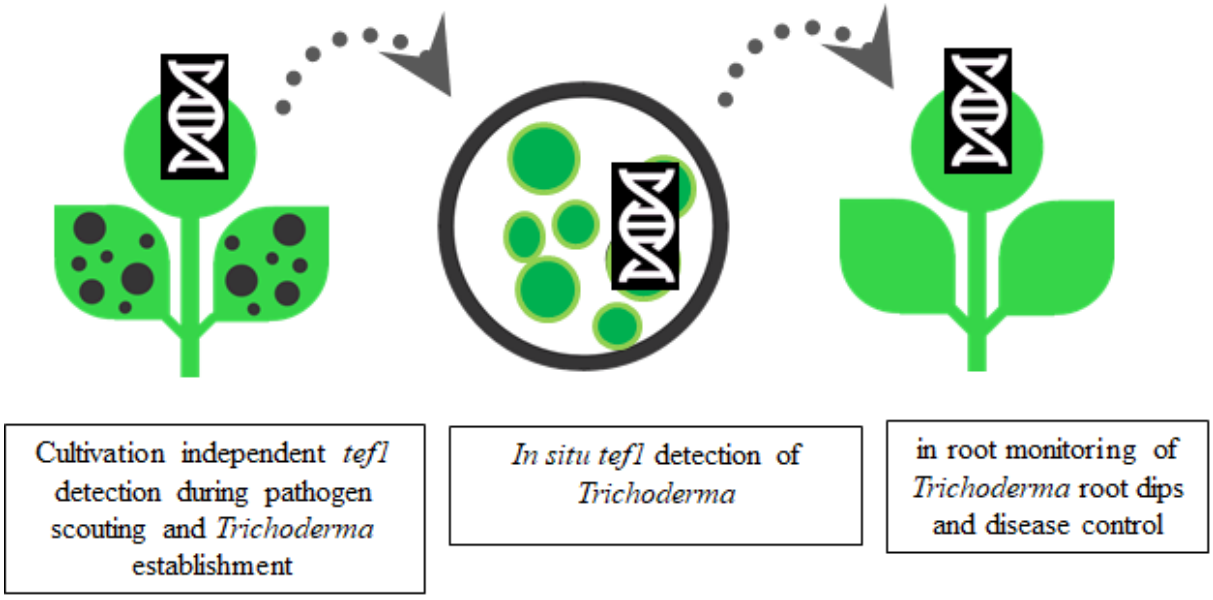

Figure 4: investigation of *tef1* marker as for diagnostic and quantification of *Trichoderma* strains for BCA establishment.

Molecular markers have played a key role in identifying false or non-specific species applied as BCAs at large scale and may represent safety risk mainly if they are pathogenic. For instance, two formae specialis of *Trichoderma* species, viz. *T. aggressivum* f. *europaeum* in Europe and *T. aggressivum* f. *aggressivum* in North America have been diagnosed as aggressive colonizers and causal agents of green mold disease in mushroom farms (Samuels *et al*., 2002). In fact, *tef1* might be the ultimate orthologous gene that carry most relevant speciation information that help delimit *Trichoderma* species and, therefore, discriminate in BCA establishment and pathogen control.

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FIRST REPORT OF CONGENITAL KAPOSI-LIKE TUMOR IN A CALF

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ABSTRACT

In this case presentation, a congenital Kaposi-like tumor in the cranium region of a 25-day-old calf was pathologically identified. When the calf was born, the mass observed on the dorsal site of the cranium grew to 6 cm in diameter. On macroscopic examination, the mass was 7x6,5x6 cm in size, subcutaneous, soft consistency, and cyst-like feeling on the palpation. The cut surface of the mass was transparent yellowish in color with brown areas and jelly consistency. In addition, there was a capsule structure of 0.5-1 cm thick, gray-white colored, and hard consistency under the skin on the cross-sectional surface of the mass.

In microscopical examination, the neoplastic areas with melting zone in the middle and spindle-shaped cells around them were seen. Spindle-shaped cells in these areas were found to form vascular slits extending vertically towards the melting area or in mixture. Some erythrocytes were found in these structures. Bleeding was also seen in some areas.

This tumor has been described almost only in dogs among animals except a one case. This presentation has been the first report, to our knowledge, to identify the tumor in a calf congenitally and it has been found appropriate to be presented in order to contribute to the oncology literature.

Keywords: *Kaposi-like tumor, congenital, calf, pathology*

BİR BUZAĞIDA İLK KEZ KONGENİTAL KAPOSİ-LİKE TÜMÖR OLGUSU SUNUMU

ÖZET

Bu sunumda 25 günlük Holstein ırkı bir buzağının kranium bölgesinde kongenital Kaposi-like tümör tanımlanmıştır. Buzağı doğduğunda kraniumun dorsalinde gözlenen kitle 6 cm çapına kadar büyümüş ve sonrasında meningosel şüphesiyle operasyonla alınarak Patoloji Laboratuvarına getirilmiştir. Makroskobik incelemede 7x6,5x6 cm ebadında deri altı yerleşimli, yumuşak kıvamlı, palpasyonda kist hissi veren kitlenin kesit yüzü yer yer kahverengi alanlarla birlikte şeffaf sarımsı renkte ve jöle kıvamındaydı. Ayrıca kesit yüzünde deri altında 0,5-1 cm kalınlığında gri-beyaz renkli sert kıvamlı kapsül görünümünde yapının ortasında yer yer ince beyaz bantlarla bölünmüş jöle görünümünde yumuşak bir alan vardı.

Mikroskobik incelemede orta kısımlarında erime alanları bulunan ve çevrelerinde iğ şekilli hücrelerin bulunduğu neoplastik alanlar belirlendi. Bu alanlarda iğ şekilli hücrelerin, karmaşık veya erime alanına doğru uzanan damar şeklinde yarıklar oluşturduğu görüldü. Bu yapıların içerisinde yer yer eritrositlere rastlandı. Bazı alanlarda kanamalar da görüldü.

Daha çok orta yaşlı ve yaşlı dişi köpeklerde görülen bu tümör bir vaka dışında yalnızca köpeklerde tanımlanmıştır. Bu sunumda ilk defa konjenital olarak buzağılarda tanımlanmış ve onkoloji literatürüne katkı sağlayacağı amacıyla sunulması uygun bulunmuştur.

INTRODUCTION

Kaposi-like tumor is an extremely rare vascular tumor in animals and has a controversial diagnosis still. Some researchers have suggested that Kaposi-like vascular tumor is not a separate entity, but a well-differentiated morphological pattern of hemangiosarcoma (Pazdzior-Czapula et al. 2015). This neoplasm has been recognized almost solely in the dogs among animal species. Of the few cases recorded, most of them have been in middle-aged to old female dogs (Goldschmidt and Hendrick 2002). In animals except dogs, to our knowledge, this tumor has been only reported in the urinary bladder of a cow by Pires et al (2009) in Portugal, by now.

There are 3 known titles about Kaposi tumors in literatures; these include Kaposi-like tumor, Kaposiform hemangioendothelioma and Kaposi sarcoma (Hendrick et al. 1998, Goldschmidt and Hendrick 2002). These entities have been used in complex with each other in various reports. Because Kaposi tumors are defined vascular endothelial tumors of humans, the similar tumor structures for animals are often referred to as Kaposi-like tumors. However, the term Kaposiform hemangioendothelioma has also been used in some veterinary sources (Vincek et al. 2004).

Kaposiform hemangioendothelioma has been defined as a rare, low-grade malignant vascular neoplasm. It was mostly reported as a soft-tissue mass or skin tumor in children younger than 10 years old. The tumor, which almost exclusively occurs in children, is locally aggressive but without proven metastatic potential (Vincek et al. 2004). Kaposiform hemangioendothelioma is endothelial-derived spindle cell neoplasm with features of capillary hemangioma and Kaposi sarcoma (Warren and Summers 2007). In veterinary medicine this tumor type was only described in the dog.

Kaposi sarcoma is a low-grade vascular tumor in humans associated with Kaposi sarcoma herpesvirus/human herpesvirus 8 infections. This type of cancer is seen in people who have suppressed immune systems. Kaposi sarcoma lesions predominantly present at mucocutaneous sites, but may involve all organs and anatomic locations. Recognized epidemiologic-clinical forms of Kaposi sarcoma include; classic, African (endemic), AIDS-associated (epidemic), and iatrogenic Kaposi sarcomas (Radu and Pantanowitz 2013). The first case of Kaposi sarcoma in a non-human species was described in an immunodeficient dog after phosphate poisoning (Sikora and Tomsikova, 1998).

The tumor is composed of abnormal vessels forming slit-like spaces surrounded by larger and ectatic vessels. In contrast to hemangiosarcoma, Kaposi sarcoma has not a significant number of mitoses, marked pleomorphism, or necrotic areas (Radu and Pantanowitz 2013). Human kaposiform hemangioendothelioma shows some of the histopathologic features of Kaposi's sarcoma, but is not associated with herpesvirus infections. Previous reports of canine Kaposi-like vascular tumors described the tumor as single or multiple dermal or submucosal masses. Central slits with peripheral cavernous spaces give the tumor an appearance dissimilar to any other vascular tumor (Pazdzior-Czapula et al. 2015).

The site and gross morphology of Kaposi-like tumor in veterinary literature have been described as single or multiple, usually involving tongue and/or skin. In one case, multiple dermal lesions were recorded on the limbs, and submucosal masses were found in the tongue and rectum (Goldschmidt and Hendrick 2002). In another case, the tumor was noticed in the right atrium and abdominal cavity of a 8-years-old male dog (Pazdzior-Czapula et al. 2015). The tumor was also reported in the urinary bladder of an adult cow (Pires et al. 2009). Macroscopically tumors are generally nodular and usually less than a centimeter in diameter. They are raised, red-brown to black, soft, and covered by alopecic skin (Goldschmidt and Hendrick 2002).

Histologically, majority of the tumor are composed of a well-demarcated collection of bland nonvacuolated spindle cells that form small angular slit spaces, often containing extravasated erythrocytes. Within the spindle cell population, most cases have some open irregular vascular spaces resembling lymphatics. The nuclei are small and oval or spindle shaped, with rare atypia. Peripherally, cavernous vascular channels are seen, accompanied by hemosiderin deposits and infiltrates of lymphocytes and plasma cells (Goldschmidt and Hendrick 2002, Vincek et al. 2004, Pires et al. 2009, Pazdzior-Czapula et al. 2015).

CASE HISTORY

In this report, a congenital Kaposi-like tumor was pathologically described in the cranium region of a 25-day-old Holstein calf. When the calf was born, the mass observed on the dorsal site of the cranium grew to 6 cm in diameter (approximately apple-sized) and was then taken surgically and brought to our Pathology Laboratory with suspicion of meningocele because of its location and consistency. On macroscopic examination, the mass was 7x6,5x6 cm in size, subcutaneous, soft consistency, and cyst-like feeling on the palpation. The external surface of the mass was alopecic, bloody and ulcerated in some places (Fig. 1A). The cross-sectional surface of the neoplasm was transparent yellowish in color with brown areas and jelly consistency. These soft areas that looked like jelly, split with white bands. In addition, there was a 0.5-1 cm thick gray-white colored hard consistency capsule structure, which surrounded the jelly areas, under the skin on cross-sectional surface of the mass (Fig. 1B).

Figure 1. A. Alopecic, ulcreated and bloody tumor mass. **B.** Yellowish brown jelly-like area and subcutaneous thick capsule (arrow). Cut surface of tumoral mass.

After the routine histopathological preparation procedures, microscopic examination revealed neoplastic areas with melting zone in the middle and spindle-shaped cells around them (Fig. 2A-B) Spindle-shaped cells in these areas were found to form vascular slits extending vertically towards the melting area or some in mixture. Some vascular slits opened to circulation and few erythrocytes were found in these structures. Extravasated erythrocytes were also seen in some areas (Fig. 3A-B).

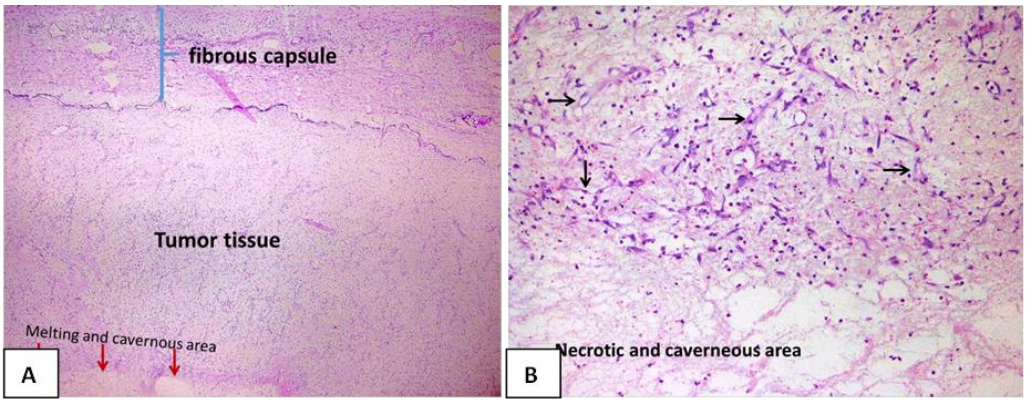

Figure 2. A. General view of tumor tissue H&E x40. **B.** New and open vascular slits in tumor tissue (arrows) and cavernous area. H&E x200.

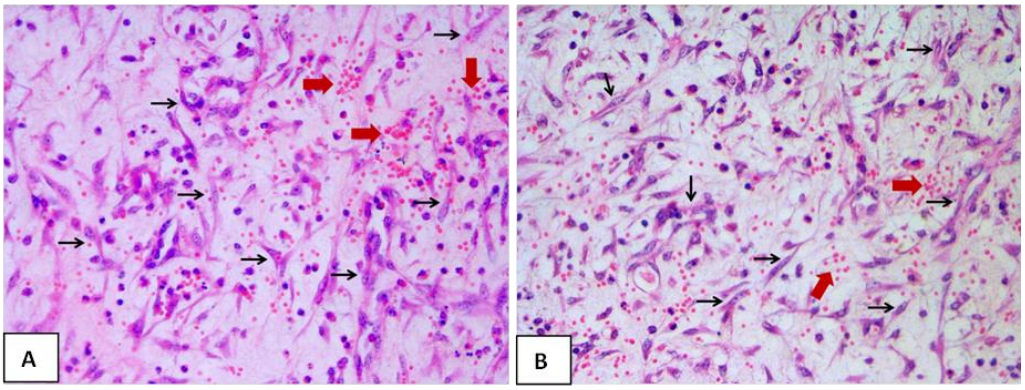

Figure 3. A-B. Spindle shaped cells, open vascular slits (thin black arrows) and extravasated erythrocytes (thick red arrows), H&E x400.

As a result, the tumor was defined pathologically as Kaposi-like tumor thanks to its typical microscopic structure and congenitally determined in a newborn calf. Immunohistochemical staining of the tumor could not be performed because of the lack of financial means. This tumor, mostly seen in middle-aged and old female dogs, has been described almost only in dogs among animal species except one case seen in urinary bladder of a cow. To the best of our knowledge, this presentation has been the first report to identify the tumor in a calf congenitally and it has been found appropriate to be presented in order to contribute to the oncology literature.

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A CASE OF TRICHOBLASTOMA WITH SEBACEOUS CARCINOMA IN A HUSKY BREED DOG

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ABSTRACT

In this case, two different tumors were detected together in a 13-year-old Husky male dog and pathologically identified as sebaceous carcinoma and trichoblastoma. Rigid consistency nodules, one at the right scapula level and the other under the left mandible, were removed by operation. The mass taken from the scapula was 6x5x3 cm in size, the other mass taken from the ventral aspect of the mandible was 6x4x3 cm in size.

Microscopic examination of the mass taken over the scapula revealed multilobular tumor islets divided by a thin stroma and they were adjacent to the adnexal structure. Tumor cells consisted of pale and low cytoplasmic basaloid reserve cells with oval-rounded, large nuclei, and among these a large number of sebocytes with atypical features and large and vacuolated cytoplasm. Atypical mitoses were also observed in the tumor areas. In addition, tumor invasion and tumor cells emboli in blood and lymph vessel lumens were noted. In the histopathology of the other mass taken from the mandible, long strands of basal cells with no significant atypia were observed and they showed usually ribbon-like linings, arranged in single or double rows, branching and anastomoses.

Although both tumors are usually seen in the head and neck region, sebaceous carcinoma can be seen in the thorax and perineum. In this case, it was detected at the level of scapula in the thoracic region. Trichoblastoma is common in dogs, but sebaceous carcinoma has been reported less frequently. It was evaluated that the coexistence of these two tumors could probably be due to the same etiology or that the Husky breed had a high tumor predisposition.

Keywords: *trichoblastoma, sebaceous carcinoma, Husky dog, oncology*

HUSKY IRKI BİR KÖPEKTE SEBASÖZ KARSİNOMLA BİRLİKTE TRİKOBLASTOMA OLGUSU

Özet

Bu sunumda 13 yaşında Husky ırkı erkek bir köpekte iki farklı tümör aynı anda tespit edilmiş ve patolojik olarak biri sebasöz karsinom diğer trikoblastom olarak tanımlanmıştır. Birisi sağ skapula hizasında, diğeri sol mandibula altında bulunan sert kıvamlı nodüller operasyonla alınmıştır. Skapuladan alınan kitle (sebasöz karsinom) 6x5x3 cm ebatlarında, mandibulanın ventralinden alınan kitle (trikoblastom) 6x4x3 cm ebatlarında ve her ikisi de sert kıvamlıydı.

Mikroskobik incelemelerde skapula üzerinden alınan kitlede, adneksal yapıya bitişik görünümde, belirgin ince bir stroma ile bölünmüş multilobuler görünümde tümör adacıkları belirlendi. Tümör hücreleri, oval-yuvarlak yapıda, iri belirgin çekirdekli, soluk ve az sitoplazmalı bazoloid rezerv hücreler ve bunların arasında çok sayıda, atipik özelliklere sahip, iri ve vakuollü sitoplazmaları bulunan sebositlerden oluşmaktaydı. Tümöral alanlarda atipik mitozlara da rastlandı. Ayrıca kan ve lenf damar lümenlerinde tümöral invazyon ve tümör hücre embolusları dikkati çekti. Mandibuladan alınan diğer kitlenin kesitinde ise genelde tek veya ikili sıralar şeklinde dizilmiş (ribbon-like), yer yer dallanma ve anastomozlar gösteren, belirgin atipi bulunmayan bazal hücrelerden oluşan uzun kordonlar görüldü.

Her iki tümör de genelde baş ve boyun bölgesinde görülmekle birlikte sebasöz karsinom toraks ve perineum bölgesinde de görülebilmektedir. Bu olguda da torakal bölgede skapula hizasında tespit edilmiştir. Trikoblastom köpeklerde yaygın görülmesine rağmen sebasöz karsinom daha az bildirilmiş olup bu iki tümörün birlikte görülmesinin muhtemelen aynı etiyolojiye bağlı olabileceği veya Husky ırkı bu köpeğin tümöral yatkınlığının yüksek olduğu değerlendirilmiştir.

INTRODUCTION

In this report, two different epithelial tumors, which were observed at the same time in a dog, were pathologically defined. They were trichoblastoma, its ribbon type, and sebaceous carcinoma.

Trichoblastoma is a benign neoplasm, which is either derived from or shows differentiation to the hair germ of the developing follicle. Mauldin and Kennedy (2016) have described this entity as a benign tumor derived from the primitive hair germ of embryonic follicular development. Several of these neoplasms were previously classified as basal cell tumors. Basal cell neoplasms are epithelial neoplasms which show no epidermal or adnexal differentiation. The neoplastic cells morphologically resemble the normal basal cells of the epidermis from which they may arise. The neoplasm previously classified as a basal cell tumor in the dog, horse, and sheep has been reclassified as a trichoblastoma, recently (Klopfleisch 2016, Goldschmidt and Goldschmidt 2017).

This tumour is relatively common in the dog and cat and usually affects middle-aged to older animals (between 4 and 10 years of age), uncommon in horses, and rare in other species (Goldschmidt and Goldschmidt 2017). It is reported to account for 4% of canine and 14% of feline skin tumours or for 11% of canine and 34% of feline epithelial tumours. Tumours are usually solitary, discrete, firm, well circumscribed masses, sited in the dermis and subcutis of the head and neck. The overlying skin may be ulcerated. Most tumours are small, 0.5–2.0 cm in diameter, although on occasion may reach up to 18 cm (Morris and Dobson 2001). Breeds at increased risk are Kerry blue terrier, puli, bichon frise, Shetland sheepdog, and Bedlington terrier. (Goldschmidt and Goldschmidt 2017).

The head and neck are the primary sites of occurrence of trichoblastomas in dogs and cats. The neoplasms are often exophytic masses. Most extend from the epidermal–dermal interface into the dermis and subcutis. They are well demarcated from the surrounding tissue by a pseudocapsule of compressed collagen. The overlying epidermis is devoid of hair and may be secondarily ulcerated. On cut section the mass is often subdivided into multiple lobules of varying size by connective tissue trabeculae. Some neoplasms are melanized, and others may show focal or multifocal cystic degeneration (Jasik et al. 2009, Beck et al. 2016, Goldschmidt and Goldschmidt 2017).

Histologically, there are several subtypes of trichoblastoma, including the ribbon, medusoid, granular cell, trabecular, and spindle subtypes. However, the considerable variability of these neoplasms on histological evaluation in no way affects their prognosis, since they are all benign (Mauldin and Kennedy 2016, Goldschmidt and Goldschmidt 2017). Ribbon type trichoblastoma, which was detected in our case also, consists of long cords of branching and anastomosing cells. These cords are two or sometimes three cells thick. The cells often have a palisaded appearance with little cytoplasm and prominent nuclei. The nuclei may appear hyperchromatic or normochromatic, and the nucleoli are inconspicuous. The small amount of cytoplasm is eosinophilic, and cell borders are indistinct. The number of mitotic figures may be quite variable, with some neoplasms showing marked mitotic activity. The adjacent stoma can vary from mucinous to collagenous, and the amount of stroma found between the cords of cells is also quite variable (Beck et al. 2016, Mauldin and Kennedy 2016, Goldschmidt and Goldschmidt 2017).

Sebaceous carcinoma is a malignant neoplasm with cells showing sebaceous differentiation. Sebaceous glands of the skin have two components: a glandular portion with undifferentiated cells at the periphery of the gland and mature sebocytes in the center of the gland, and a duct, which enters into the infundibulum of the hair follicle, and is lined by an undulating, flattened, keratinizing epithelium (Mauldin and Kennedy 2016). Neoplasms that arise from sebaceous glands are: sebaceous adenoma, sebaceous ductal adenoma, sebaceous epithelioma, and sebaceous gland carcinoma. In dogs, the sebaceous gland tumours represent the third most common type of skin tumours, accounting for 21-35% of all cutaneous epithelial tumours (Scott and Anderson, 1990).

Sebaceous carcinomas are uncommon in dogs and cats and rare in other species. In dogs the peak incidence is between 10 and 13 years of age. Breeds at increased risk are cavalier King Charles spaniel, cocker spaniel, Siberian husky, Samoyed, and West Highland white terrier. No sex predilection has been noted (Goldschmidt and Goldschmidt 2017).

Sebaceous carcinomas arise primarily on the head and neck in dogs and on the head, thorax, and perineum in cats. The neoplasms are usually solitary, firm nodules, up to 7 cm in diameter and macroscopically similar to sebaceous adenoma. A multilobulated intradermal mass is the most common finding. Ulceration and alopecia are common (Klopfleisch 2016, Mauldin and Kennedy 2016, Goldschmidt and Goldschmidt 2017).

The tumor is histopathologically subdivided by fibrovascular connective tissue trabeculae into lobules of varying size. The neoplasm consists of two cell types; they are basaloid reserve cells and vacuolated large sebocytes. The neoplastic cells have intracytoplasmic lipid vacuoles, but the degree of lipidization varies from cell to cell. The nuclei are large and chromatic, with prominent nucleoli, and display moderate pleomorphism (Goldschmidt and Goldschmidt 2017). The number of mitotic figures is variable, but atypical mitoses may be found. Mitotic figures will be found involving differentiated sebocytes as well as reserve cells, whereas in

sebaceous epitheliomas mitoses are found only in the reserve cells. The multilobulated appearance of the neoplasm allows it to be differentiated from a liposarcoma. Differentiation from a sebaceous adenoma is based on cells with greater cellular and nuclear pleomorphism, mitoses in sebocytes and on rare occasions infiltration of peripheral lymphatics. Other possible features include ulceration, necrosis, cystic degeneration, squamous differentiation, keratinization, or occasional glandular structures (Mauldin and Kennedy 2016, Gautam et al. 2017).

There may be multifocal connections to the epidermis. They are commonly ulcerated, and margins may be infiltrative and can extend into the subcutis. Distinction between epitheliomatous carcinoma and sebaceous epithelioma includes the following proposed criteria: Carcinomas have an increased nuclear size, a higher mitotic rate, atypical mitotic figures, and mitotic figures in the mature sebocytes. They may be locally aggressive but reports of distant metastasis are rare (Mauldin and Kennedy 2016).

CASE HISTORY

In this case report, we pathologically described two different tumors, which were detected together in a 13-year-old Husky male dog. The tumors were histopathologically identified as sebaceous carcinoma and trichoblastoma (Ribbon-like type). The dog had rigid consistency two nodules, one at the right scapula level and the other under the left mandible. The tumoral masses were removed by surgical operation at Clinics of Veterinary Faculty, University of Selcuk, and then brought to Pathology Department for histopathological examination. The mass taken from the scapula was 6x5x3 cm in size, the other mass taken from the ventral aspect of the mandible was 6x4x3 cm in size and both were hard in consistency (Fig.1 A-B).

Tissue samples were taken from both neoplasms and fixed in 10 % formaldehyde solution. Routine histopathological tissue processing was performed and then Hematoxylin & Eosin stained preparations were examined under light microscope. Immunohistochemical examination could not be done because of the lack of financial possibility.

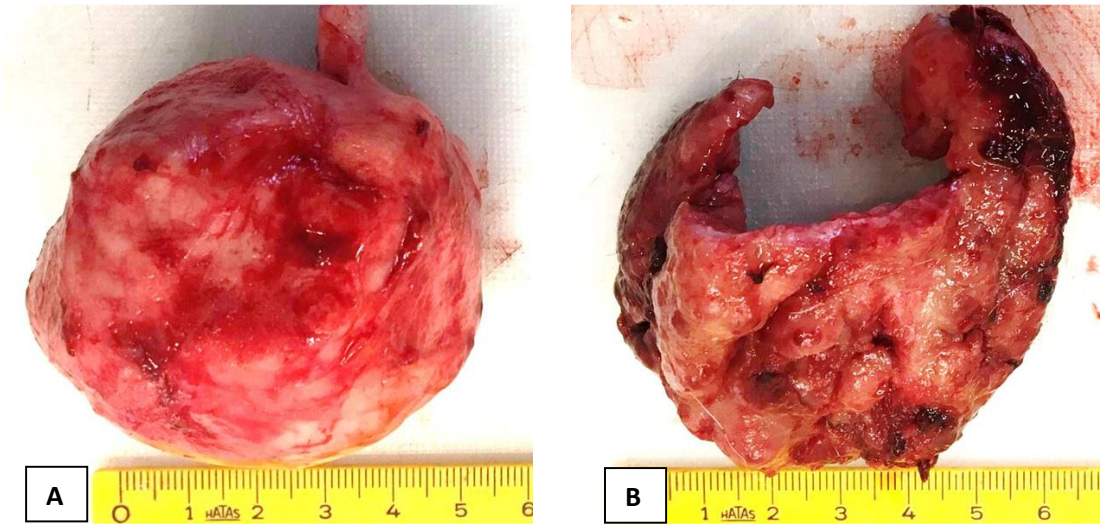

Figure 1. Macroscopic aspect and dimensions of tumoral masses. **A.** Sebaceous carcinoma, **B.** Trichoblastoma**.**

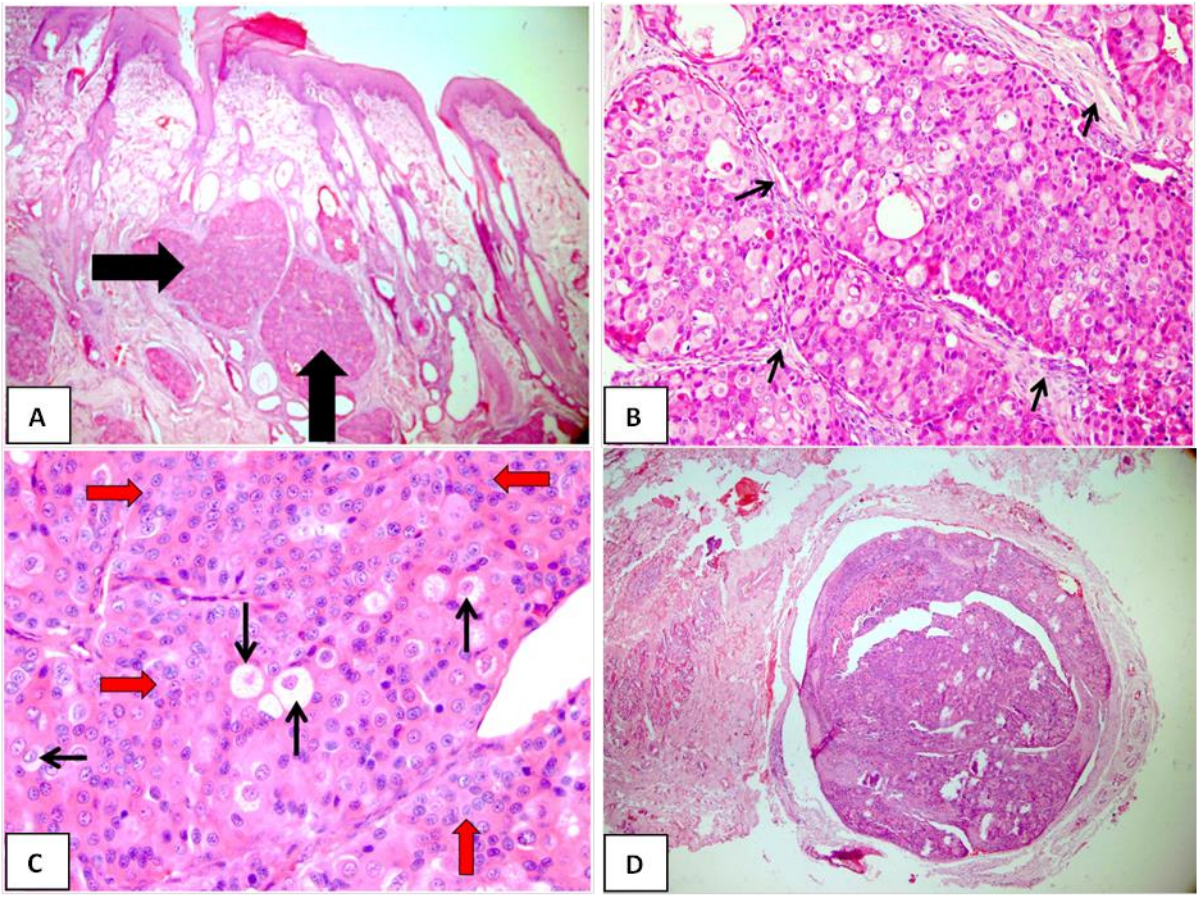

Figure 2. Sebaceous carcinoma. **A.** Tumor islets (arrows) adjacent to the adnexal structure. **B.** Tumor lobules consisted of basaloid reserve cells and sebocytes, and thin fibrovascular connective tissue trabeculae (arrows). **C.** Pale and low cytoplasmic basaloid reserve cells (thick red arrows) and sebocytes with atypical features and large and vacuolated cytoplasm (black arrows). **D.** Tumor invasion and tumor cells emboli in blood lumen.

Microscopic examination of the mass taken over the scapula revealed multilobular tumor islets divided distinctly by a thin fibrovascular stroma and they were adjacent to the adnexal structure (Fig. 2A). These tumor islets or lobules were consisted of two cells types; one was pale and low cytoplasmic basaloid reserve cells with oval-rounded and large nuclei, and the second was sebocytes with atypical features and large and vacuolated cytoplasm, among the reserve cells (Fig 2B-C). Atypical mitoses were also observed in the tumor areas. In addition, tumor invasion and tumor cells emboli in blood and lymph vessel lumens were noticed.

In the histopathology of the other mass taken from the mandible, long strands of basal cells with no significant atypia were observed and they showed usually ribbon-like linings, arranged in single or double rows, branching and anastomoses. The cells generally have a little cytoplasm and prominent hyperchromatic nuclei (Fig. 3A-B).

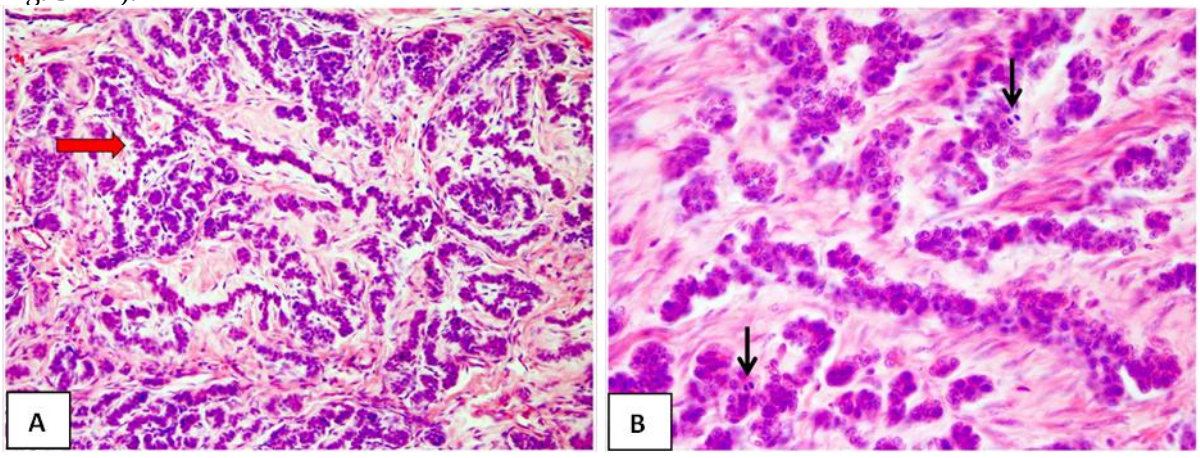

Figure 3. Trichoblastoma, ribbon type. **A.** Ribbon-like, long and somtimes anastomosing cords (arrow). **B.** Basal cells with little cytoplasm and prominent hyperchromatic nuclei, and mitoses (arrows).

Although both tumors are usually seen in the head and neck region in dogs, sebaceous carcinoma can be seen in the thorax and perineum. In this case, it was detected at the level of scapula in the thoracic region. Although trichoblastoma is common in dogs, sebaceous carcinoma has been reported less frequently. It was evaluated that the coexistence of these two tumors could probably be due to the same etiology or that the Husky breed had a high tumor predisposition.

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OPTIMIZATION OF FACTORS AFFECTING ON BIODIESEL PRODUCTION FROM WASTE OILS

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ABSTRACT

The production of biodiesel by recovering of waste frying oils is important for environmental protection and contributing to the national economy. In this study, the effect of four variables (alcohol and catalyst rate, temperature, reaction time) on the production of biodiesel from waste oil have been studied in order to improve product quality.

Mixture of waste olive oil and sunflower oil, KOH as catalyst and methanol as alcohol were used. The biodiesel produced was subjected to two different purification by aqueous and dry washing processes.

The pH, density and viscosity analyzes of biodiesel were carried out and their conformity with ASTM D-6751 and TS EN 14214 standards were examined. It was statistically determined that the most important variables affecting the quality of biodiesel were alcohol and catalyst ratio. The highest quality biodiesels that meet the standards were obtained with 30% alcohol (v/v) and 1% catalyst (w/w) in aqueous washing, 20-30% alcohol and 0.5-1% catalyst in dry washing.

Keywords: *Aqueous washing, Biodiesel, Dry washing, Waste oil*

INTRODUCTION

Energy is an indispensable element in terms of sustaining life and policies of countries. If fossil fuel consumption for energy continues to increase exponentially, fossil reserves may be depleted in the near future (Ahmad ve ark., 2019). The limited of energy, which is basic need, has led to search for alternative sources. Renewable resources have proven successful in preventing climate change, reducing greenhouse gas emissions and responding to increasing energy needs (Mahmodi ve ark., 2019).

Biofuel also reduces dependence to fossil fuels of countries and so country's economy affects positively (Şanli ve ark., 2019). Biodiesel is thought to be one of the best renewable sources that can meet this need and solve the problems. Eco-friendly, renewable and non-toxic biodiesel has potential to be used as alternative to oil (Fazal ve ark., 2019). Moreover, it is more advantageous than fossil fuels due to low emission in terms of environment and process of obtaining the product is easy.

The usage of waste oils instead of vegetable oils as primary energy source for biodiesel production has been known as more sustainable (Ortiz-Martínez ve ark., 2019). The most common method used to produce biodiesel is transesterification. Methanol and ethanol as alcohol, KOH and NaOH as catalyst are widely used.

MATERIALS AND METHODS

Materials

In this study, optimization of four variables affecting biodiesel production from waste oils was carried out. Experimental variables were determined as alcohol and catalyst ratios, reaction temperature and time. Experimental design (30 sets) was created from different values of four variables with statistical program. The experiments were named between EN1 (Experimental No 1) and EN30.

In this study, fried waste sunflower oil (¾) and olive oil (¼) mixture, methanol and KOH were used as raw material, alcohol and catalyst, respectively. Pure water and magnesol were used for aqueous and dry washing in the purification step.

Biodiesel Production Process

The waste oil was filtered with filter papers. The oils were heated in heater with magnetic stirrer until temperature determined in each experiment set. Methanol and catalyst were mixed in order to dissolve the catalyst in alcohol. Methanol-alcohol mixture was added to oil that reaching specified temperature. Stirring speed and temperature were kept constant during experiment. After completion of the reaction, glycerol was allowed to separate from mixture. The physical properties of glycerol which were changed according to experimental conditions were investigated after separation of accumulated glycerol from biodiesel.

At this stage, biodiesel produced is divided into two equal volumes. One was washed with pure water while the other with magnesol. Equal to volume of pure water and biodiesel were mixed for 1 hour. The mixture was waited for 1 day to carry out of stratification. The biodiesel separated from waste washing water was evaporated for half-hour at 120 °C to obtain final product.

In dry washing, 100 ml biodiesel was heated to 80-90 °C after 3 gr of magnesol addition and stirred for one hour at the same temperature. It was chilled off and filtered with filter paper to obtain final product. The processes are summarized in Figure 1.

Biodiesel Characterization

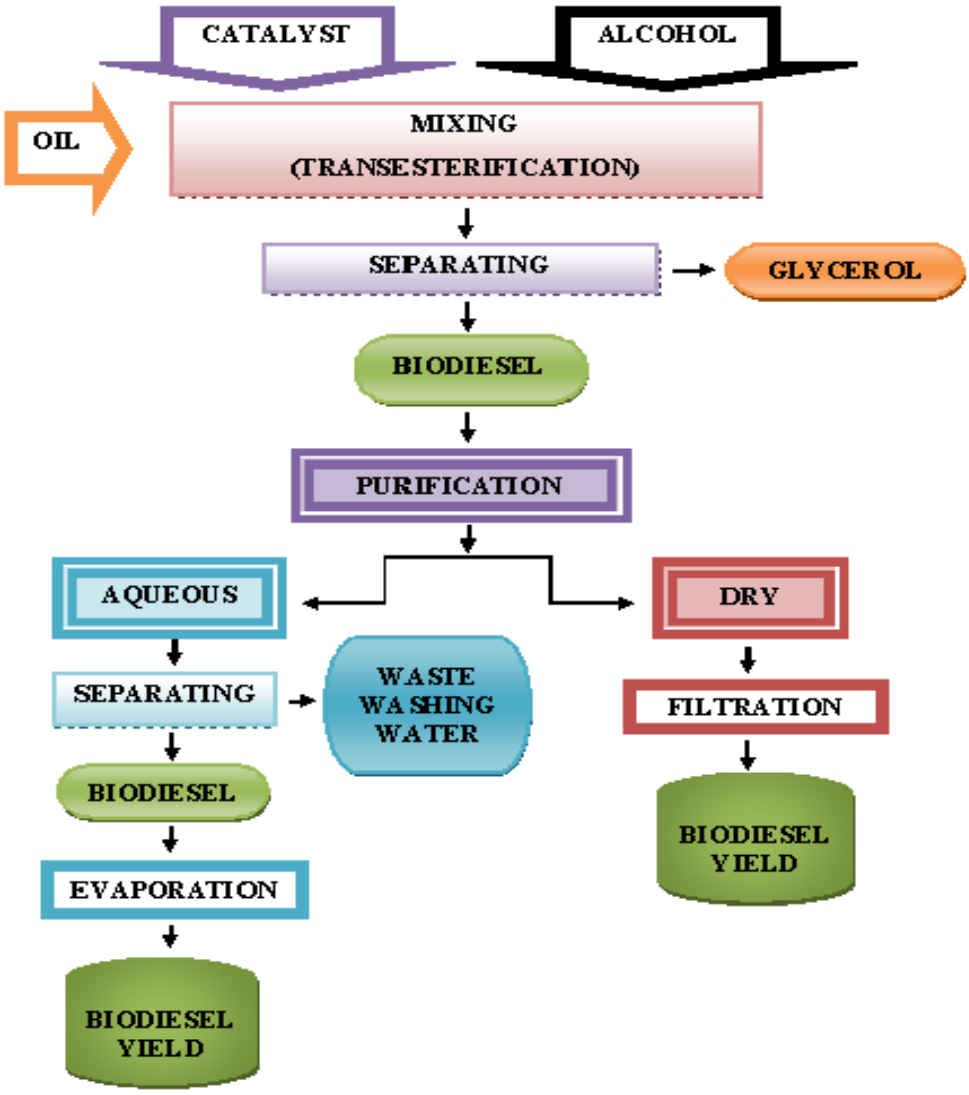


Figure 1. Production scheme of biodiesel purified by wet and dry washing

Kinematic viscosity (40 °C), density (15 °C) and pH parameters were examined for biodiesels produced.

- Kinematic viscosity was measured by Koehler K23377 instrument. The instrument can measure according to ASTM D 445, DIN 51550 and ISO 3104 standards.
- Density was measured by Kem Kyoto DA-130N instrument. The instrument can measure according to EN 61326 standards. Since density measurements are carried out at different ambient temperatures, temperature correction according to 15 °C has been made with formulation in Equation 3.1 (Acaroğlu ve ark., 2010).

$$d_{15}=d_t+0,0001(t-15)(15-10d_t) \quad \text{(Equation 1)}$$

t= Temperature of fuel at time of measurement,
d_t= Measured density,
d_{15}= Density reduced to 15 °C.

• pH measurements were performed with Merck pH papers.

Experimental design

30 experimental sets were created by using Design Expert 11 program with central composite design mode for 4 independent variables. The effect of four variables on significance and relationship between them were determined by ANOVA analysis according to the program. Table 1 shows min and max values that lower and upper in same range to midpoint value of the independent variables.

Table 1. Ranges of independent variables in experiment set

Independent Variables	Min value	-1	Midpoint	+1	Max value
A: Catalyst ratio (w/w %)	0,32	0,5	0,75	1	1,18
B: Alcohol ratio (v/v %)	2,8	10	20	30	37,2
C: Temperature (°C)	42,8	50	60	70	77,2
D: Reaction time (min)	34,2	45	60	75	85,8

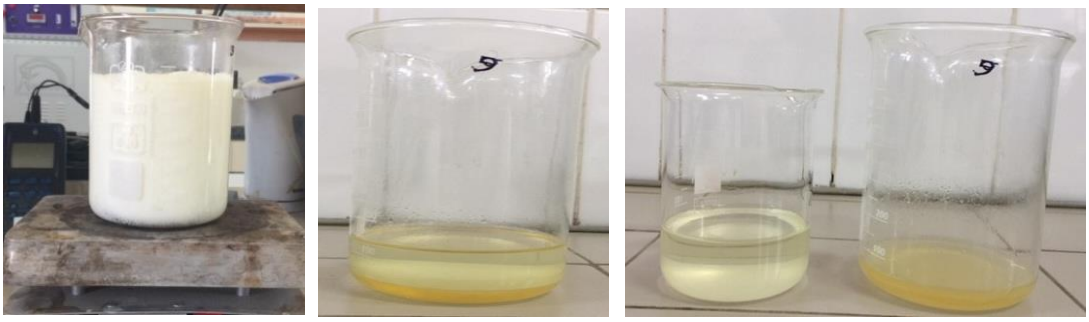
RESULTS AND DISCUSSIONS

Effects of experimental condition on the biodiesel quality and some unusual sitiation

Biodiesel could not produced for some conditions such as insufficient alcohol content due to the reaction didn't occur properly. Biodiesel and glycerol layers weren't separated in the first experiment with lowest alcohol ratio (EN1: 2,8% v/v). Unrealized stratification was carried out at this condition (Figure 2).

Figure 2. Appearance after first reaction stage for EN1

The saponification occurred in aqueous washing step for the experiment (EN9) that alcohol/oil ratio was 10% (v/v) and catalyst ratio was 1% (w/w). Although catalyst ratio is high, it is thought that saponification occurs due to low alcohol ratio. Nevertheless, evaporation was performed to possibility of returning to biodiesel structure and the stratification occurred relatively after a long time (Figure 3).



a) b) c)

Figure 3. The steps after aqueous washing of EN9; a) Evaporation process, b) Stratification formed, c) Separation of layers

Some photographs of aqueous washing step showing some different situations such as complete stratification, saponification and non-stratification were given in Figure 4. The operating conditions of these experiments were summarized in Table 2.

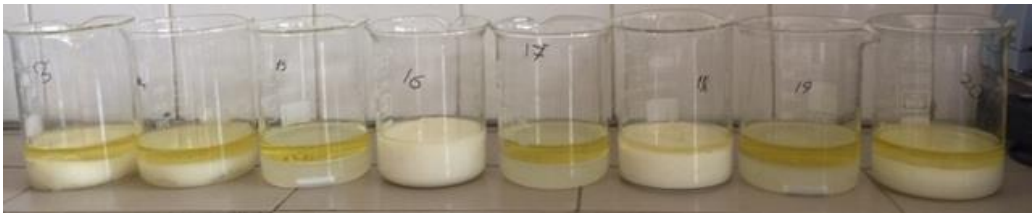


Figure 4. Appearance after aqueous washing stage for EN13-EN14-EN15-EN16-EN17-EN18-EN19-EN20

Table 2. Experimental conditions of some aqueous washing steps

Experiment Set	Catalyst ratio	Alcohol ratio	Temperature	Reaction time
	(w/w) %	(v/v) %	°C	min
13	0,5	10	50	45
14	0,32	20	60	60
15	1,18	20	60	60
16	1	10	70	45
17	0,5	30	50	45
18	1	10	50	45
19	0,75	20	77,2	60
20	0,5	30	70	45

Glycerin and biodiesel didn't stratified after first reaction stage in two experiments (EN9, EN16) that alcohol/oil and catalyst ratio was 10% (v/v) and 1% (w/w). Although stratification didn't take place, aqueous washing was carried out and stand for a while. However, stratification didn't take place at the end of this period due to low alcohol ratio. Stratification of biodiesel and glycerol occurred in two experiments (EN18, EN28) with alcohol/oil ratio of 10% (v/v) while phase separation between water and biodiesel didn't occur after aqueous washing (Figure 5).

Figure 5. Appearance after aqueous washing for EN16, EN18 and EN28

In some experiments (EN 21, 23, 25, 26 and 30) having alcohol/oil ratio of 20% (v/v), biodiesel-glycerol separation and biodiesel-wastewater separation after aqueous washing was clearly realized (Figure 6).

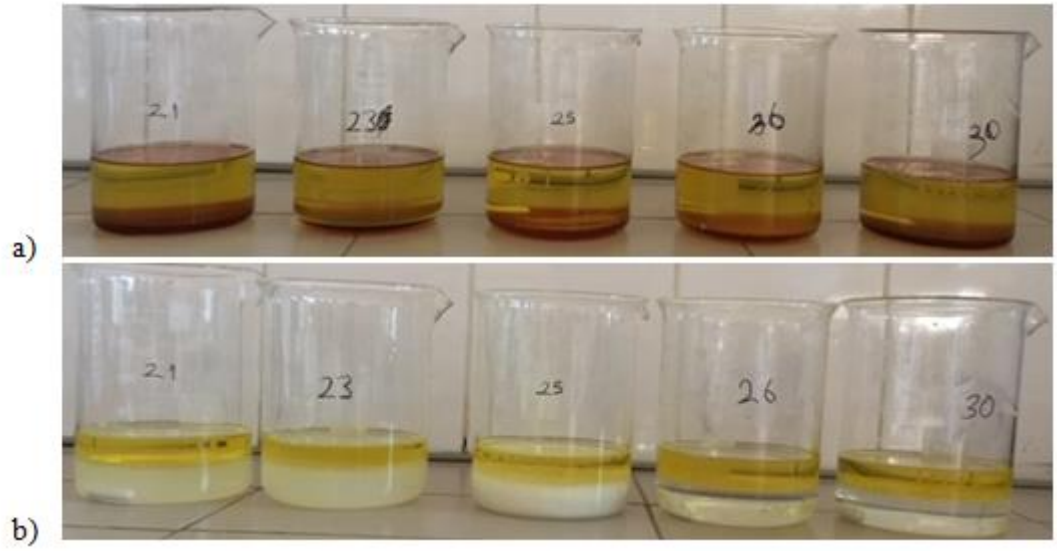


Figure 6. Biodiesel production processes for EN21-EN23-EN25-EN26-EN30; (a) stratification of biodiesel-glycerin (b) stratification after aqueous washing

Glycerin was not apparently formed or was formed poor quality, light colored, low viscosity for low alcohol ratio. Saponification occurred in washing stage of these experiments and then dense and highly turbid mixtures occurred. Stratification was clearly observed in experiments with high alcohol ratio and both layers were clear in themselves.

Figure 7 shows the final biodiesel product that applied dry washing for some experiments. Biodiesels showed of difference color depending on alcohol ratio after dry washing. When alcohol rate is hight, sample's color is dark. But when alcohol rate is low, sample's color is light.

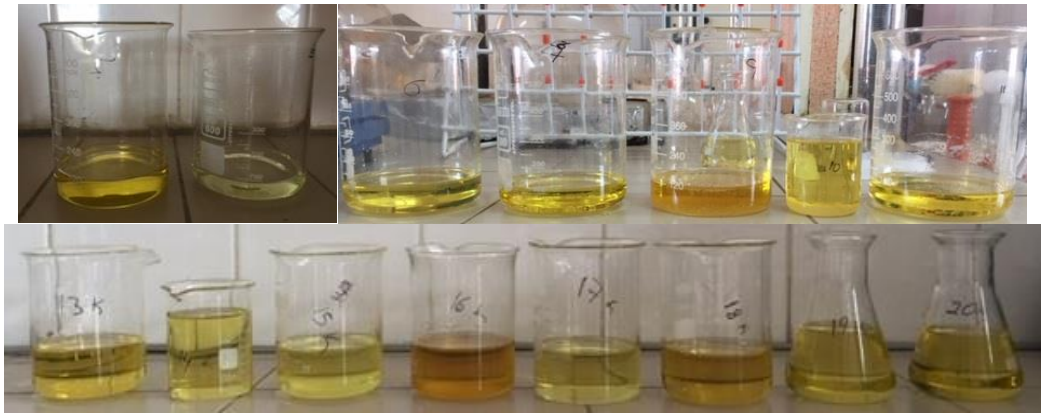


Figure 7. Appearance of experimentals no of 4-5-6-7-9-10-11-13-14-15-16-17-18-19-20 after dry washing.

Characterization of biodiesel

Each biodiesel produced was subjected to both dry and aqueous washing. The viscosity, density and pH analyzes of these biodiesels are given in Figures 8-10.

The kinematic viscosity values given in Figure 8 should be between 1.9-6 mm^2/s according to ASTM D-6751 standard. Biodiesels that meet this standard are experiments with alcohol ratio of 20% and 30% in aqueous washing (Experiment No: 3, 4, 5, 7, 8, 11, 12, 15, 17, 19, 27) and dry washing (Experiment No: 5, 6, 7, 8, 11, 12, 15, 17, 19, 20, 24, 26, 30).

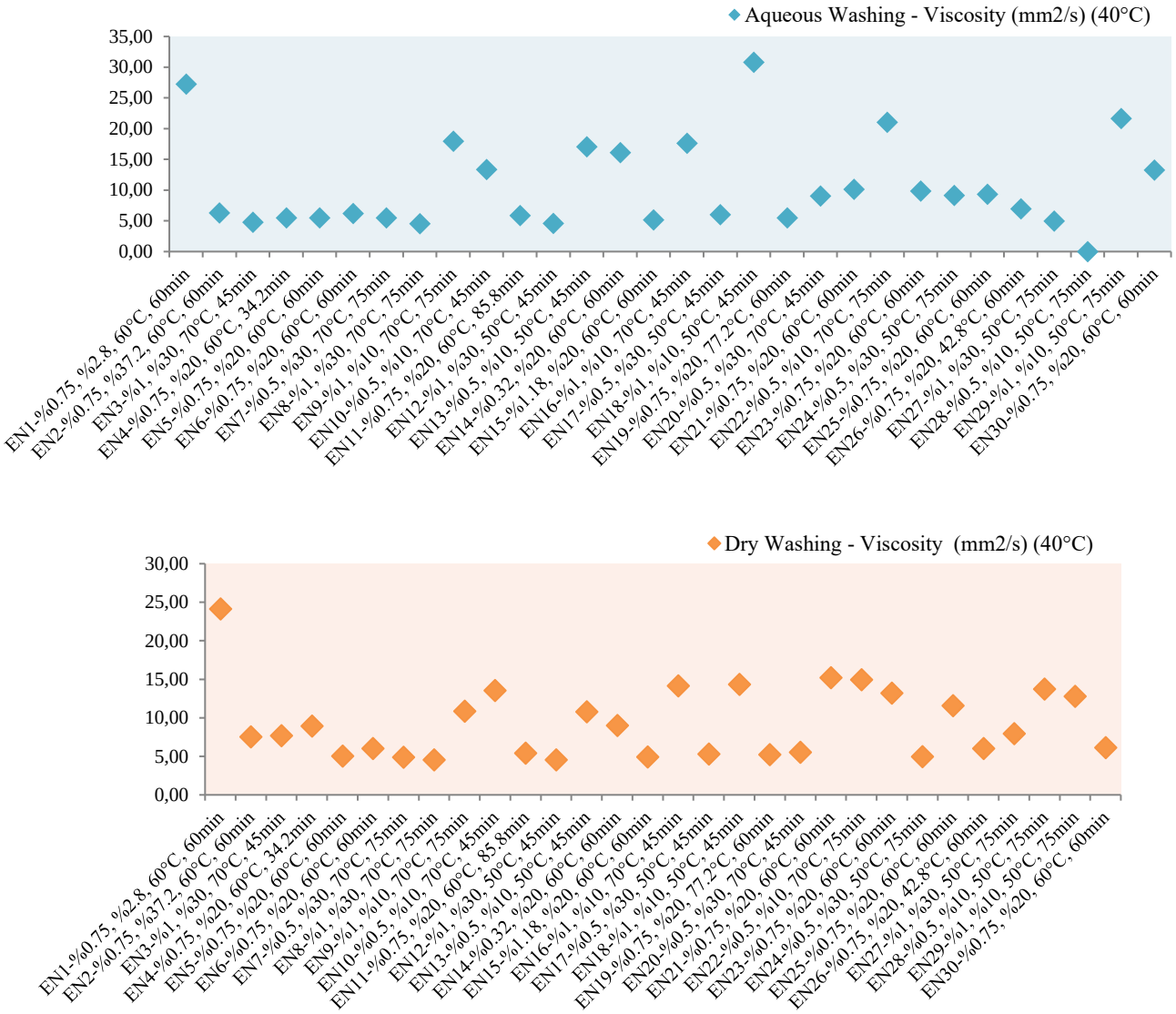


Figure 8. Viscosity analysis results for biodiesels purified by wet and dry washing

Density is required to be in the range of 0.86-0.90 g/cm^3 according to TS EN 14214 standard. Biodiesels that meet this standard are experiments with alcohol ratio of 20% and 30% for aqueous washing (Experiment No: 2, 3, 4, 5, 6, 7, 8, 11, 12, 15, 17, 19, 26, 27) and dry washing (Experiment No: 2, 5, 6, 7, 8, 11, 12, 13, 14, 15, 17, 19, 20, 24, 26, 30). The results of density analysis for biodiesel with aqueous and dry washing are given in Figure 9.

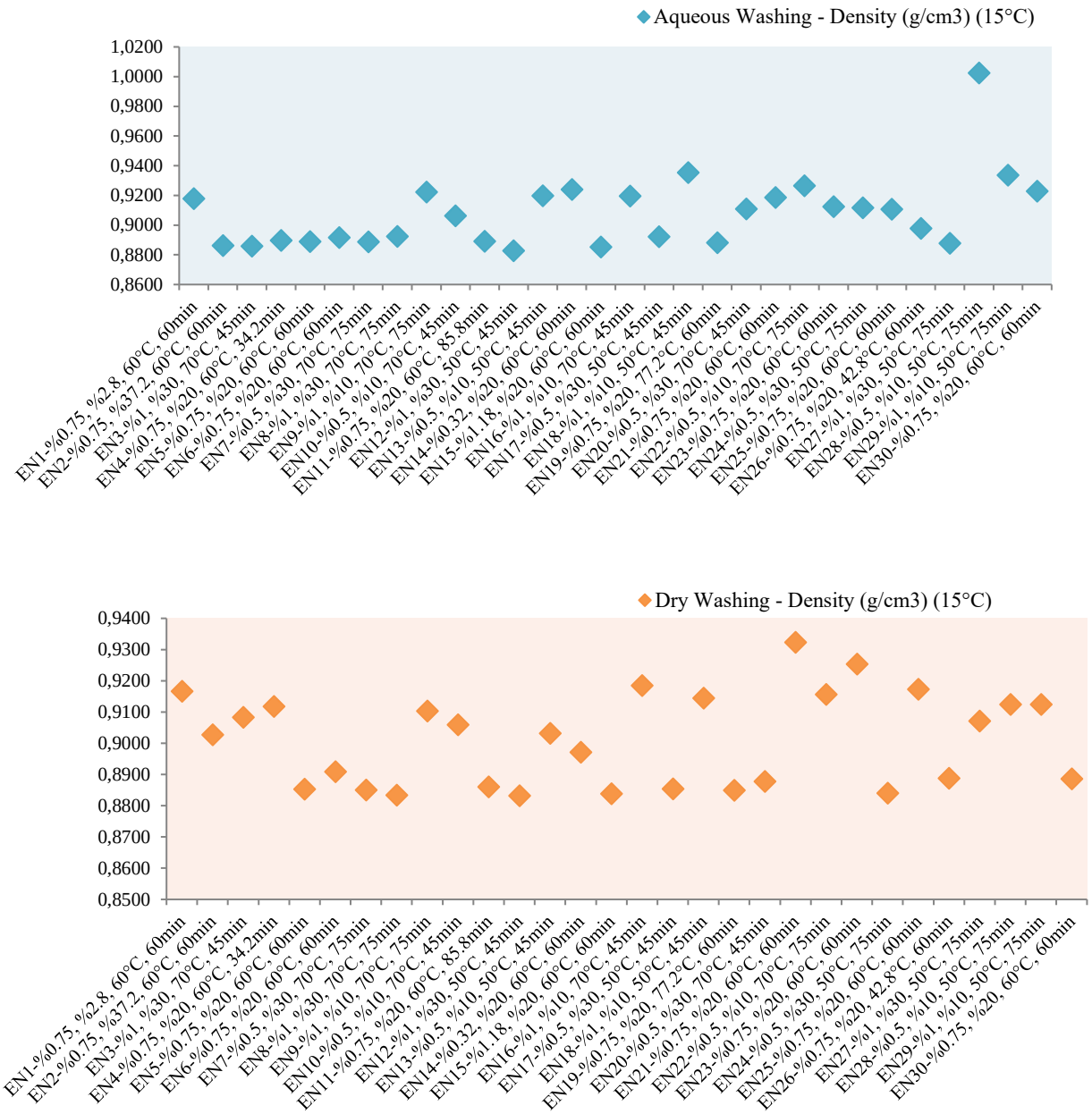


Figure 9. Density analysis results for biodiesels purified by wet and dry washing

Top quality biodiesels that meet both ASTM D-6751 and TS EN 14214 standards was experiments no of 3, 8, 12, 27 in aqueous washing and was experiments no of 5, 7, 8, 12, 15, 24 in dry washing. The common point of these experiments in aqueous washing was that alcohol ratio (v/v) was 30% and the catalyst ratio (w/w) was 1%, but temperature and time didn't remain constant. The alcohol ratio in dry washing was 30% in experiment no 7, 8, 12, 24 while 20% in experiment no 5, 15.

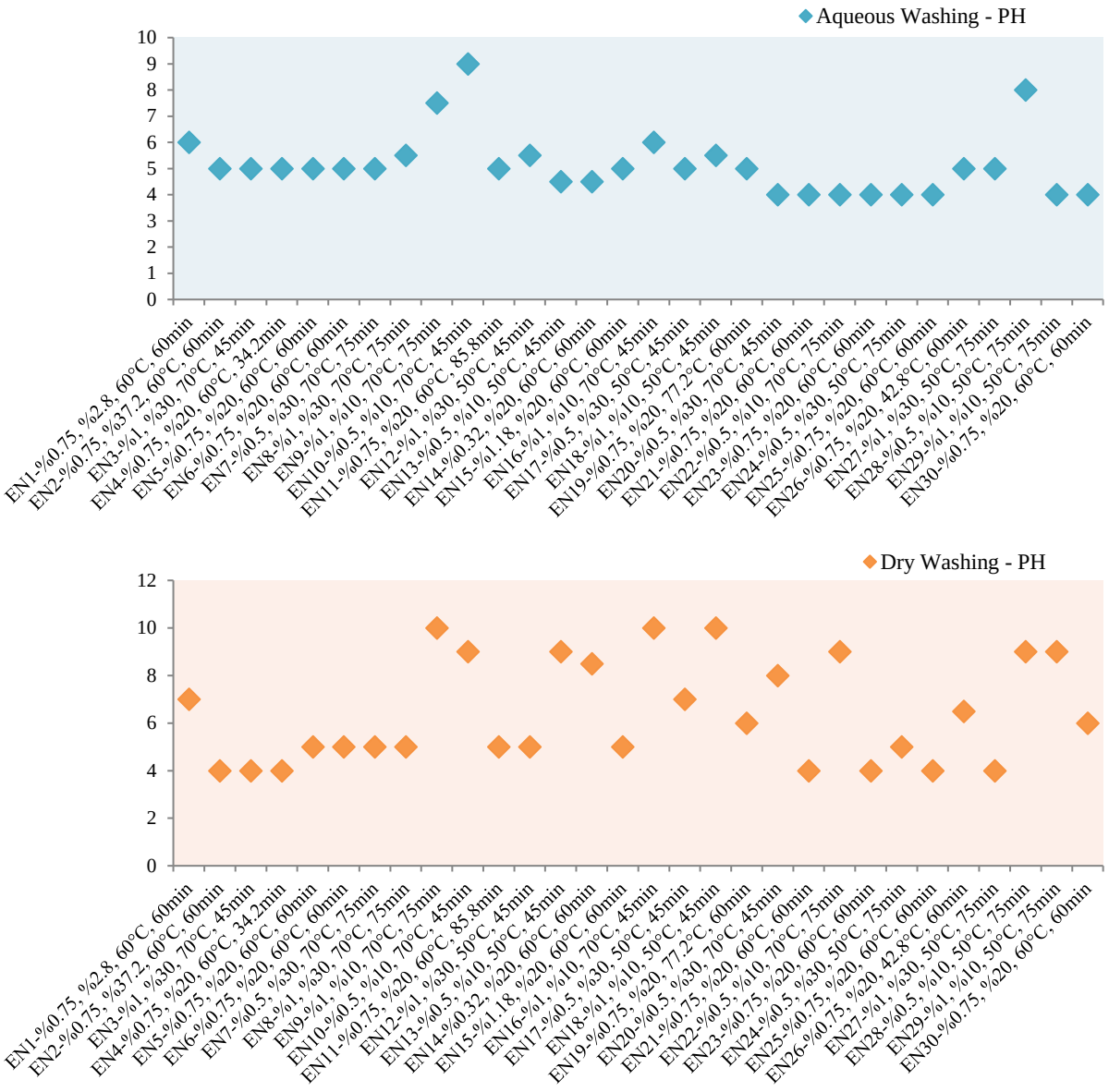


Figure 10. PH results for wet and dry wash-purified biodiesels

The pH values of biodiesel produced under optimum conditions are 5. The pH was high in experiments no of 10 and 28 in aqueous washing and 9, 10, 13, 14, 16, 18, 28 and 29 in dry washing. The common denominator of these experiments is that they all have viscosity values above the standards and therefore don't exhibit biodiesel properties. Figure 10 shows the pH results for dry and aqueous washing.

Statistical evaluation of the results

The statistical results of ANOVA response functions for biodiesel, which produced with two separate washes, and washing water were analyzed by F and p values. The significance of experimental sets for each result of variables was investigated. The ANOVA results for analysis of biodiesel purified by aqueous washing are given in Table 3.

The linear model where relationship between 4 variables and viscosity of biodiesel produced is significant according to Table 3 (p: 0.023). The parameter having the most effect on viscosity was determined as alcohol ratio with p<0.0001. Likewise, alcohol ratio has the highest effect on results with value of p: 0.0003 but catalyst ratio also has significant effect on density. There wasn't significant relationship between independent variables and pH changes (Table 3).

Table 3. Results of ANOVA response functions for biodiesel produced by aqueous washing

Parameter	Viscosity (A.W.)		Density (A.W.)		pH (A.W.)	
	F-value	P-value	F-value	P-value	F-value	P-value
Model	5,59	0,0023	6,45	0,0010	1,22	0,3272
A-Catalyst ratio	0,0657	0,7998	3,64	0,0678	0,0601	0,8084
B-Alcohol ratio	21,85	< 0,0001	17,94	0,0003	4,09	0,0539
C-Temperature	0,0121	0,9134	2,55	0,1225	0,6581	0,4249
D-Time	0,4308	0,5176	1,66	0,2098	0,0731	0,7891
Model relationship and distribution	Linear		Linear		Linear	
	Significant		Significant		Insignificant	

The results of ANOVA response function for analysis of biodiesel purified by dry washing are given in Table 4.

Quadratic model obtained between independent variables with viscosity (p: 0.0044) and pH (p: 0.0011) showed significant results for biodiesel with dry washing (Table 4). Alcohol (B), catalyst (A2) and temperature (C2) variables were given significant results for pH while alcohol (B and B2) was given significant result for viscosity. Alcohol/oil ratio is a determining factor.

Table 4. Results of ANOVA response functions for biodiesel produced by dry washing

Parameter	Viscosity (D.W.)		Density (D.W.)		pH (D.W.)	
	F-value	P-value	F-value	P-value	F-value	P-value
Model	4,23	0,0044	2,50	0,0681	5,50	0,0011
A- Catalyst ratio	0,0752	0,7877	0,3637	0,5519	3,08	0,0995
B- Alcohol ratio	41,79	<0,0001	9,17	0,0056	42,43	<0,0001
C- Temperature	0,0008	0,9773	0,0327	0,8580	0,0400	0,842
D- Time	0,2831	0,6025	0,4342	0,5160	0,5633	0,4645
AB	0,1756	0,6812			4,21	0,0581
AC	0,3092	0,5864			0,0000	1.0000
AD	0,4524	0,5114			0,6734	0,4247
BC	0,0277	0,8701			0,0000	1.0000
BD	0,0005	0,9829			0,6734	0,4247
CD	0,7562	0,3982			0,1683	0,6874
A^2	0,9680	0,3408			12,04	0,0034
B^2	10,92	0,0048			4,08	0,0617
C^2	2,65	0,1242			8,35	0,0112
D^2	0,7865	0,3891			0,7377	0,4039
Model relationship and distribution	Quadratic		Linear		Quadratic	
	Significant		Insignificant		Significant	

CONCLUSIONS

Experimental variables, especially alcohol rate, have a significant effect on biodiesel yield.

If alcohol rate (v/v) is equal to or more than 20% in biodiesel production, effect of other variables can be evaluated. In general, optimum alcohol and catalyst rate was found 30% and 1%, respectively. The optimum value for temperature is 70 °C, while time is 75 min.

The dry washing method used in purification stage of biodiesel production is better in terms of biodiesel yield than the aqueous washing method.

In both purification methods, a statistically significant relationship was found between viscosity and independent variables.

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DETERMINATION OF TROPICAL GREENHOUSE DESIGN AND COOLING SYSTEM BASED ON CLIMATE CONDITION IN WEST JAVA PROVINCE, INDONESIA

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ABSTRACT

Greenhouse in tropical area is widely used to protect plants from heavy rain, wind, sunlight, and, pests in order to support its growth. However, different location of greenhouse often results to various environmental condition and different ideal greenhouse requirements. This study aims to determine suitable greenhouse design and cooling system based on climate condition in four cities (Bogor, Bandung, Cisarua and Majalengka), West Java Province, Indonesia. The outside environmental condition were obtained from Meteorolgy, Climatology and Geophysical Agency (BMKG) in Indonesia. A greenhouse model is determined to grow tomato with ideal growth temperature of 25°C. The average calculated solar radiaton for Bogor, Bandung, Cisarua and Majalengka was 198.5 W/m², 185.4 W/m², 168.6 W/m², and 193.3 W/m² respectively. Greenhouse indoor temperature in Bandung and Cisarua for 20/h air exchange rate was 24.82°C and 22.53°C respectively, both with Av/Ag ratio of 15.46%. However, 25% Av/AG ratio for greenhouse model located in Bogor and Majalengka should be obtained with air exchange rate of 32/h, leads the greenhouse indoor temperature to 26.98°C and 28.38°C respectively. All the greenhouse design should be permanently open at side walls and ridge ventilators throughout the year, in order to provide better air exchange rates under humid tropical condition.

Keywords: *greenhouse, climate condition, cooling system, tropical*

INTRODUCTION

Greenhouse in tropical area is widely used to protect plants from heavy rain, wind, sunlight, and, pests in order to support its growth. However, different location of greenhouse often results to various environmental condition and different ideal greenhouse requirements. A micro-climate condition occurs inside the greenhouse due to the closed building structure that covers and limit air circulation, as well as traps the sunlight radiation. This phenomenon leads to greenhouse effect where the temperature inside the greenhouse increases. Once the temperature exceed the optimum condition for plants, the growth rate, enzyme activity, respiration, and photosynthesis were all going down and would lead to a decreasing productivity (Ahmad and Prasad 2012).

Each variables influencing the micro-climate environment is dynamic. It is a combination of physical processes between the greenhouse and its outside environment which involve energy and mass transfer (water vapor fluxes and CO2 consentration). These processes depend on the outside climate conditions, the greenhouse structure, type and growing phase of the plant (Ikonomopoulos and Tsilingiridis 2016).

The climate conditions, general design criteria, locally available and also cost-effective materials are some significant factors to be considered to make a greenhouse structure design. A greenhouse integrated system includes greenhouse structure with light transmittance, ventilation, heating, cooling, protection from pest insect by screening, as well as all influences of management, irrigation, fertilization, water quality and physical and biological plant protection (Zabeltitz 2011).

Suhardiyanto *et al.* (2006) analyzed a natural ventilation system for modification of a steep-type (roof slope of 45°) in Bogor, Indonesia. Among five alternatives of modified and two alternatives of newly designed greenhouse, an alternative of modified greenhouse design was believed to have a highest natural ventilation rate at the lowest cost. A study also conducted by Impron *et al.* (2007) where a simple greenhouse climate model was developed for designing optimal tropical low land greenhouse according to greenhouse dimensions and covering material properties. This study itself aims to determine suitable greenhouse design and cooling system based on climate condition in four cities (Bogor, Bandung, Cisarua and Majalengka), West Java Province, Indonesia.

MATERIAL AND METHODS

The daily outside environmental condition (temperature, wind velocity and actual duration of sunshine) in 2016-2018 were obtained from Indonesia Meteorolgy, Climatology and Geophysical Agency (BMKG) in

four different cities (Bogor, Bandung, Cisarua and Majalengka), West Java Province, Indonesia. The exact location of the weather station can be seen as in Figure 1 and Table 1.

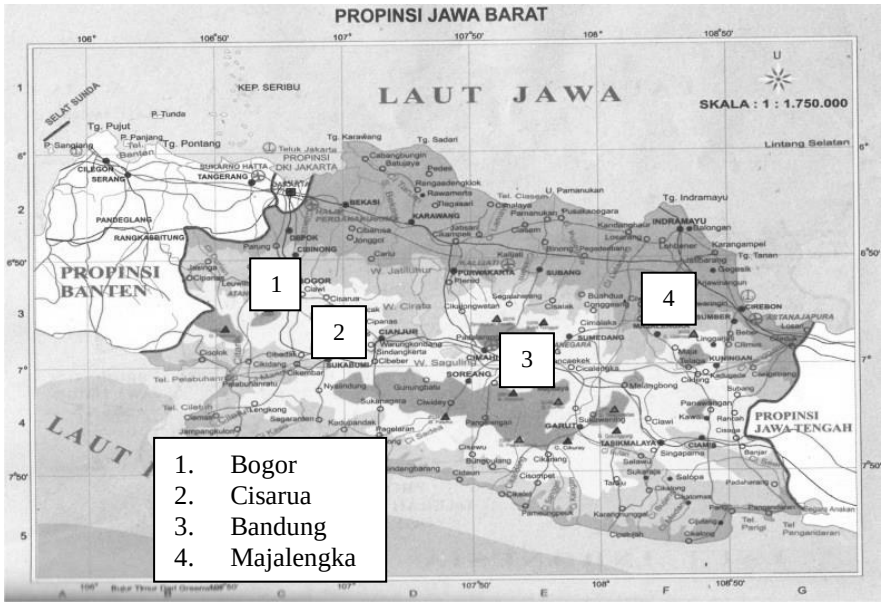

Figure 1. Weather station map in West Java Province, Indonesia

Table 1. Time and location detail

City	Weather Station	Longitude (N)	Latitude (E)	Altitude (m)	Years
Bogor	Bogor Climatology Station	-6° 33’	106° 44’	207	3
Bandung	Bandung Geophysics Station	-6° 52’	107° 35’	791	3
Cisarua	Citeko Meteorology Station	-6° 42’	106° 51’	920	3
Majalengka	Jatiwangi Meteorology Station	-6° 43’	108° 15’	85	3

Solar Radiation

Solar radiation for each city was calculated according to its location and the daily actual duration of the sunshine. Extraterrestrial radiation (Ra) is the solar radiation received at the top of the earth's atmosphere on a horizontal surface. Ra determined using equation from Allen *et al.* (1998):

$$Ra = \frac{24\ (60)}{\pi} G_{sc}\ d_r\ [\omega_s \sin(\varphi) \sin(\delta) + \cos(\varphi) \cos(\delta) \sin(\omega_s)]$$

where Ra : extraterrestrial radiation (MJ/m^{2}day),
G_{sc} : solar constant = 0.0820 MJ/m^2 min,
d_r : inverse relative distance Earth-Sun,
ω_s : sunset hour angle (rad),
φ : latitude (rad),
δ solar declination (rad)

Some of the radiation is scattered, reflected or absorbed by the atmospheric gases, clouds and dust as it penetrates the atmosphere. Solar radiation (Rs) is the amount of total radiation reaching a horizontal plane. As the sun emits its energy in the form of short wavelength electromagnetic waves, it also referred as shortwave radiation and could be calculated using angstrom formula:

$$Rs = \left(a_s + b_s \frac{n}{N}\right) R_a$$

where Rs : solar or shortwave radiation (MJ/m^2 day),
n : actual duration of sunshine (hour),
N : maximum possible duration of sunshine or daylight hours (hour),
n/N : relative sunshine duration (-),
Ra : extraterrestrial radiation (MJ/m^{2}day),
a_s : regression constant, expressing the fraction of extraterrestrial radiation reaching the earth on overcast days (n = 0),
as+bs: fraction of extraterrestrial radiation reaching the earth on clear days (n = N).

The values of a_s and b_s will vary depending on atmospheric condition (humidity, dust) and solar declination (latitude and month). If there is no actual solar radiaton data or calibration, the values a_s = 0.25 and b_s = 0.50 are recommended (Allen *et al.* 1998).

Greenhouse Model

The determined greenhouse model is one span greenhouse with the size of 15 m x 9.6 m x 5.72 m, as can be seen in Figure 2. It has total ground area 144 m^2 and total surface area 425.42 m^2. PE is chosen for the covering material as it is commonly used for greenhouse in Indonesia. The greenhouse is fully cropped and planted with tomato with ideal grow temperature of 25ºC.

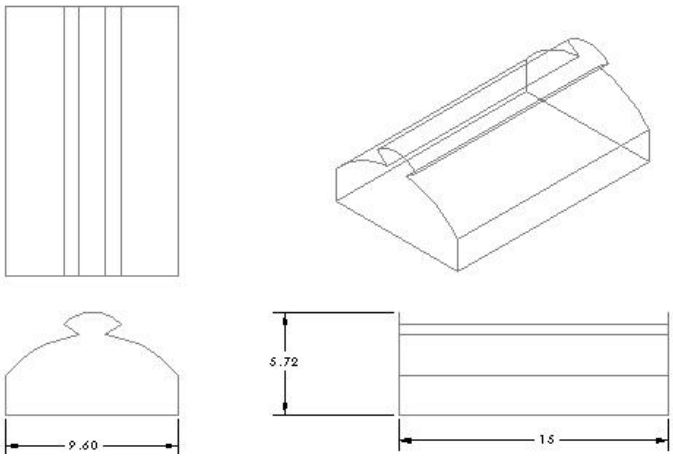

Figure 2. Greenhouse model

Greenhouse Indoor Temperature

The greenhouse is using ventilation in order to let the air exchanges between inside and outside atmosphere. Indoor temperature of the greenhouse depends on the enviroment outside the greenhouse, material, greenhouse size and the ventilation rate (V_E). Ventilation rate is the ventilation flow rate, exchanged in relation to the greenhouse floor area. Another term that is commonly used is air exhange number (N), it is the ventilation flow rate exchanged in relation to the greenhouse volume.

With determined greenhouse model and location, greenhouse indoor temperature mainly depends on the ventilation rate. The difference between inside and outside of the greenhouse is calculated by (Zabeltitz 2011):

$$\Delta T\ (℃) = \frac{\tau q_o (1 - Ef)}{V_E \rho c_p + u A_C / A_G}$$

Where τ : transmittance of greenhouse,

q_o : outside global radiation (W/m),
V_E: ventilation rate (m^3/m^2h),
cp : specific heat of air (Wh/kgK),
ρ : density of air (kg/m^3),
ΔT : temperature difference inside outside the greenhouse (^oC),
u : overall heat transfer coefficient (W/m^2K)
A_C : greenhouse surface area (m^2),
A_G : greenhouse ground area (m^2),
E : evaporation coefficient; ratio of energy used to evaporate water from the canopy to incoming solar energy,
f : area factor, area of greenhouse covered by crop.

The evaporation coefficient (E) has values between 0 and 1. When the outside humidity is not too low, the E value 0.8 is used as the greenhouse is fully cropped. The area factor (f) is set on 0.8 for vegetables on ground beds. Greenhouse covering material is PE with transmittance (τ) of 0.92 and 6.8 W/m^2K overall heat transfer coefficient (u). The greenhouse indoor temperature is evaluated by four different air exchange rate (N) 20/h, 40/h, 60/h and 80/h.

Greenhouse Suitable Design and Cooling System

Ventilation area is an important factor in order to reach the optimum air exchange rate. The greenhouse design and ventilation area (Av) ratio is determined based on the indoor temperature calculated above. Cooling system will also be included if necessary. The ratio of Av/A_G for the ventilation area Av (Zabeltitz 2011):

$$\frac{A_V}{A_G} = \frac{2}{c_p \rho v_w C_d \sqrt{C_W}} \left[\frac{\tau q_o (1 - Ef)}{\Delta T} - \frac{A_C}{A_G} u \right]$$

Where A_V : Ventilation area (m^2),
v_w : wind velocity ($m\ h^{-1}$),
C_d : discharge coefficient,
C_w : global wind pressure coefficient

RESULT AND DISCUSSIONS

Solar Radiation

The average calculated solar radiaton for Bogor, Bandung, Cisarua and Majalengka was 198.5 W/m^2, 185.4 W/m^2, 168.6 W/m^2, and 193.3 W/m^2 respectively, as can be seen in Figure 3.

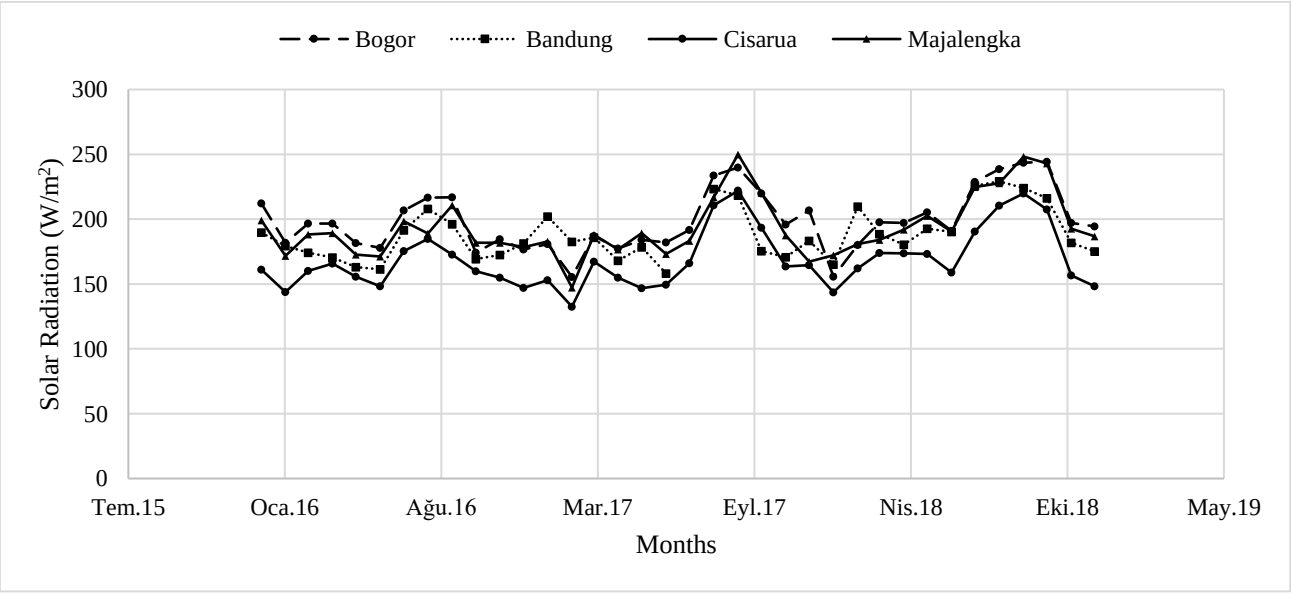

Figure 3. Calculated solar radiation

The solar radiation in four cities were similiar, with the highest amount in every August-September and lowest amount in January-February each year.

Greenhouse Indoor Temperature

The greenhouse indoor temperature was calculated using the formula and evaluated using four different air exchange rate 20/h, 40/h, 60/h and 80/h. The results can be seen on the Table 2 below.

Table 2. Indoor temperature based on different air exchange rate

Air exchange rate N (1/h)	Indoor Temperature (°C)			
	Bogor	Bandung	Cisarua	Majalengka
20	27.31	24.82	22.53	28.70
40	26.86	24.39	22.14	28.26
60	26.66	24.21	21.98	28.07
80	26.55	24.10	21.88	27.96

As seen on the table, within different air exchange rates, the lowest temperature inside the greenhouse was in Cisarua, followed by Bandung, Bogor and Majalengka. Majalengka location is relatively lower compared to the other cities, with altitude of 85 m. Eventhough the solar radiation of Majalengka was lower than Bogor, the altitude factor highly effects the environmental and micro-climate condition in the greenhouse. This factor caused the indoor temperature of Majalengka in every air exchange rates remain the highest among all.

When the air exchange rate increases, the indoor temperature is going low. This happened because the air flow acts to dissipate the surplus heat and being a temperature and humidity control. It is also change the carbon dioxide and oxygen inside the greenhouse. Ventilation provides air movement that influences the uniformity of greenhouse climate factors, which is very essential for crop growth and quality (Sase 2006).

The optimum temperature to grow tomato in the greenhouse model is 25 °C. Greenhouse indoor temperature in Bandung and Cisarua for 20/h air exchange rate were 24.82 °C and 22.53 °C respectively. It was already sufficient to support an ideal environment for the plant growth. As for Bogor and Majalengka, the air exchange rate of 80/h was still not enough to decrease the indoor temperature until 25 °C. The lowest temperature reached by greenhouse in Bogor and Majalengka with 80/h air exchange were 26.55 °C and 27.96 °C respectively.

Greenhouse Ventilation Area

One of the most important part of greenhouse structure is the ventilation area. The rate of air exchange highly depends on the ventilator design and area. The ventilation and ground area ratio (A_V/A_G) calculation for the greenhouse model are shown in Table 3 below:

Table 3. A_V/A_G ratio based on different air exchange rate

Air exchange rate N (1/h)	A_V/A_G ratio (%)			
	Bogor	Bandung	Cisarua	Majalengka
20	15.46	15.45	15.46	15.46
40	30.92	30.90	30.92	30.92
60	46.39	46.35	46.39	46.39
80	61.85	61.81	61.85	61.85

Greenhouse model located in Bogor and Cisarua needed both 15.46% ratio of A_V/A_G to get 20/h air exchange rate and fulfill ideal growth temperature requirement of 25 °C. To get the air exchange of 80/h in Bogor and Majalengka, 61.85% ratio of A_V/A_G was required. However, practical experience mentioned in Zabeltitz (2011) suggest a ventilator area of 18-25% related to greenhouse floor area, while ANSI/ASAE EP 406.4 standard recommend 15-25%. It is necessary to keep A_V/A_G ratio in the recommended range. Therefore, 25% A_V/A_G ratio for greenhouse model located in Bogor and Majalengka should be obtained with air exchange rate of 32/h, leads the greenhouse indoor temperature to 26.98 °C and 28.38 °C respectively.

Greenhouse Suitable Design

All the greenhouse design should be permanently open at side walls and ridge ventilators throughout the year, in order to provide better air exchange rates under humid tropical condition. Two-side roof ventilation were chosen to maximize the air change rate and natural ventilation process. The opening at side walls and roof ventilation's height differences causes the air to naturally flowing outside the greenhouse due to the thermal effect (Soegijanto 1999).

Ventilation efficiency is proportional to the pressure difference. Thus, higher ridge and greater distance between ventilators at the ridge and side wall is necessary to provide a higher pressure difference (Bot 1983). The air will flow into the center of the greenhouse and absorb the floor heat. The heated air will have lower mass, and it will flow upward without any mechanical tools. This flow caused by thermal effect called chimney effect (Romdhonah 2015). Functions of temperature difference, wind speed and direction, coefficient of discharge, ventilator opening area and the height between the ventilators can be used to predict the ventilation rate (Kamaruddin 1999).

Greenhouse Cooling System

Due to excessive heat occured in Majalengka and Bogor, additional cooling system was needed. Evaporative cooling is the most effective cooling method for controlling the temperature and humidity inside a greenhouse (Kumar et al. 2009). Evaporative cooling systems are based on the conversion of sensible heat into latent heat of evaporated water by providing water mechanically. The use of evaporative cooling system have been developerd to provide the desired relative humidity and temperature during hot season (Arbel et al. 1999). Fan-pad system and fog system are the common evaporative cooling system used in the greenhouse. In the fan-pad system, the outside air is forced by fan into the greenhouse through a wet pad, where the outside air is cooled and humidified by the water on the wet pad before entering the greenhouse. The fog system works by spraying small drops of water in order to increase the water surface in the contact with the air. However, these cooling systems are a bit costly in term of material, operational and maintenance compared to the natural ventilation. It is recommended to apply it under the production of high-value crops. Besides, instead of planting tomato, the greenhouse in Bogor and Majalengka can also be used to grow plants with suitable ideal temperature such as cucumber and eggplant.

CONCLUSION

The suitable greenhouse design and cooling system had been studied based on climate condition in four cities (Bogor, Bandung, Cisarua and Majalengka), West Java Province, Indonesia. A greenhouse model is determined to grow tomato with ideal growth temperature of 25 ^{o}C. The average calculated solar radiaton for Bogor, Bandung, Cisarua and Majalengka was 198.5 W/m^2, 185.4 W/m^2, 168.6 W/m^2, and 193.3 W/m^2 respectively. Greenhouse indoor temperature in Bandung and Cisarua for 20/h air exchange rate was 24.82 ^{o}C and 22.53 ^{o}C respectively, both with A_V/A_G ratio of 15.46%. The 25% A_V/A_G ratio for greenhouse model located in Bogor and Majalengka should be obtained with air exchange rate of 32/h, lead the greenhouse indoor temperature to 26.98 ^{o}C and 28.38 ^{o}C respectively. All the greenhouse design should be permanently open at side walls and ridge ventilators throughout the year, in order to provide better air exchange rates under humid tropical condition. For greenhouse in Bogor and Majalengka, it was recommended to plant another plantation that more suitable for their climate condition, such as cucumber and eggplant.

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EXAMINATION OF THE AIR POLLUTION AND TOURISM SECTOR RELATIONSHIP IN TURKEY

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ABSTRACT

Climate change is recognized as one of the major problems of the countries all around the world, considering the contribution of the climate changes on the economy, the environment and animal life. Tourism has a potential driver for growth of the developing countries and world economy. In 2018, tourism sector contribution to global GDP was almost $9 trillion with 319 million jobs which is 10% of total employment according to World Travel and Tourism Council. Therefore, it has been subjects by governments and researches. This study analyzes the potential impact of climate change and especially air pollution on the tourism sector of Turkey. For this purpose, carbon dioxide emission and international tourist arrivals are used as data set. $C0_2$ emission is used as an air pollution indicator which has been released by the World Development Indicators, and also international tourists are used as tourism indicators. All data set is analyzed using fully modified ordinary least squared method which is applied on SAS software. Our findings show that there is a positive and statistically significant coefficient for tourism which means that tourism deteriorates environment by augmenting carbon dioxide emission.

Keywords: *Climate change, Economic effects, Tourism sector.*

TÜRKİYE'DE HAVA KİRLİLİĞİ VE TURİZM SEKTÖRÜ ARASINDAKİ İLİŞKİNİN İNCELENMESİ

Özet

İklim değişikliği, iklim değişikliğinin ekonomiye, çevre ve hayvan yaşamına katkısını göz önünde bulundurarak, tüm dünya ülkelerinin en büyük sorunlarından biri olarak kabul edilmektedir. Turizm, gelişmekte olan ülkelerin ve dünya ekonomisinin büyümesinde potansiyel bir etkiye sahiptir. 2018 yılında Dünya Turizm Konseyi'ne göre turizm sektörünün küresel gayri safi yurtiçi hasıla (GSYH'ye) katkısı toplam istihdamın % 10'u olan 319 milyon iş ile yaklaşık 9 trilyon dolardır. Bu nedenle, hükümetlerin ve araştırmaların konusu olmuştur. Bu çalışma, iklim değişikliğinin ve özellikle hava kirliliğinin Türkiye'nin turizm sektörü üzerindeki potansiyel etkisini analiz etmektedir. Bu amaçla veri seti olarak karbondioksit emisyonu ve uluslararası turist varışları kullanılmaktadır. C02-emisyonu, Dünya Kalkınma Göstergeleri tarafından ülkeler bazında toplanan bir hava kirliliği göstergesi olarak ve uluslararası gelen turist sayıları da turizm göstergesi olarak kullanılmaktadır. Tüm veri seti, SAS yazılımında uygulanan, tamamen değiştirilmiş sıradan en küçük kareler yöntemi kullanılarak analiz edilir. Bulgularımız, turizm için pozitif ve istatistiksel olarak anlamlı bir katsayı olduğunu göstermektedir, bu da turizmin karbondioksit salınımını artırarak çevre kalitesinin azaldığını göstermektedir.

Anahtar Kelimeler: *İklim değişikliği, Ekonomik etkiler, Turizm Sektörü.*

INTRODUCTION

In the twenty-first century, greenhouse effect and its inevitable dispersal on nature has revealed a detrimental phenomenon defined as climate change (Hunt, and Watkiss, 2011). The forecast scenarios of environmental degradation led by climate change are still uncertain because anthropogenic and natural driving factors are ambiguous and climate varies in relation to geographical features of landscapes (Collins et al. 2013). There are several environmental impacts of climate change on ecosystem such as rise in atmospheric carbon dioxide (CO_2), air pollution, increased ocean temperature, sea level rising, urban heat islands, decreased sea-ice extent, decrease in freshwater input, deforestation, extinction of species, wind storms and floods caused by heavy precipitation events, instability in energy use for heating and cooling, and water and food borne diseases resulting with mortalities (Berkhout et al. 2006; Kirilenko,and Sedjo 2007; Hunt and Watkiss 2010; Doney et al. 2011).

Tourism is one of the sectors that contribute to a country's economic development and this sector has been impacted by the climate change due to increased demand for energy usage (Katircioglu 2014). According to Sajjad et al. (2014), tourism pioneers 5% of the world GDP and international tourism is the world's fourth largest global export leader with an industrial return of $1 trillion annually, representing 30% of world's commercial service products. For instance, in the Southeast Asia, tourism plays a vital role for the income of region's many countries in the aspects of travel, accommodation, business, and restaurants which therefore lead to havoc environmental consequences such as air pollution and natural resource contamination (Climate and Development Knowledge Network- CDKN, 2013).

There have been several studies focused on the relationship between tourism and climate. Lohmann and Kaim (1999) conducted surveys with tourists to investigate how important the destination characteristics such as landscape and weather were in the tourism sector. The researchers reported that further research examining the effects of weather on destination choice decisions was required to increase the tourism revenue in Germany. Another study by Hu and Ritchie (1993) reviewed researches focusing on tourism development and sustainable ecosystem relationship circa 1970s and concluded that determination of a touristic destination's attractiveness was highly correlated with significance given to sustainable nature and climate.

Cunliffee (2002) used the Delphi method to evaluate the qualitative techniques for forecasting economic development of tourism sector in relation to climate change in tropical coastal areas and found that forecasting environmental hazards can increase the economic return derived from coastal tourism aspects. Katircioglu et. al. (2014) examined the relationship between international tourism, energy consumption and CO_2 emission of Cyprus. The authors used unit root tests, bound tests and granger causality test. Their study results revealed that international tourism is catalyst for a rise of carbon dioxide emission of Cyprus. Therefore, understanding the relationship between environmental degradations caused by climate change and their impacts on tourism sector can be an important factor to explain tourism revenues. In Table-1, some climate change and tourism indicators are represented for a better understanding of changes. It shows that the CO_2 emission has been increased more than twice in past 24 years, and also energy usage has risen 3 times during the study period. Therefore, it is crucial to reveal the potential impact of climate change and tourism indicators.

Table 1. Climate Change and Tourism Indicators from 1990 to 2014

Years	International Tourist Arrivals (thousands)	CO_2 Emission in kt	Energy Use (kt of oil equivalent)
1990	5397.7	150,667.3	52,756.0
1995	7747.4	176,560.8	61,545,0
2000	10,428.2	215,970.8	76,348.0
2005	21,124.9	237,174.4	84,379.0
2010	31,396.1	298,002.3	105,133.1
2014	36,838.2	345,981.45	157,371.59

Source: İnternational Tourism Arrivals are obtained from TURKSTAT. CO_2 emission and energy usage data are retrieved from World Development Indicator data set.

All in all, this study analyzes the potential impact of climate change, specifically air pollution on the tourism sector of Turkey. For this purpose, this study uses CO_2 emission, international tourist arrivals and gross domestic products per capita as data sets from 1990 to 2014. The rest of the paper is designed as follows: Section 2 presents data and methodology, Section 3 shows analysis results, and Section 4 provides concluding comments.

Data and Method

For the present study, the data set are annual figures covering years from 1990 to 2014. The data set are restricted with 2014 which was the most recent available year for data in terms of CO_2 emission in Turkey. The variables of the study are: 1) international tourist arrival and staying in Turkey for Turkey's tourism establishment (Tourism), and 2) CO_2 emission of kt standing for air pollution. As explanatory variable of the study, the gross domestic product (GDP) per capita is applied. Tourism variables are retrieved from Turkish Statistics Institute (here after is TURKSTAT). CO_2 emission data set is obtained from the World Development Indicator which is released by the World Bank. The data set are available online at the World Bank and TURKSTAT.

Tourism and Functional relationship;

$$CO_{2t} = f(GDP_t, Tourism_t) \quad (1)$$

CO_2 is proxy for climate change in (kt). GDP is the gross domestic product of the year of t, and Tourism stands for the arrival international tourist of the year, and t is the time variable.

First, Zivot and Andrews test is used for unit root test to utilize stationary or non-stationary of the time series data set.

Then, to investigate potential relationship between the variables, the fully modified ordinary least square (FM/OLS) regression estimation is used. The model examines potential dynamic relationship between tourism and climate change along with the respect control variables.

$$lnCO_{2,t} = \beta_0 + \beta_1 lnTourism_t + \varepsilon_t \quad (2)$$

Where $lnCO_2$ stands for air pollution. β_0 and β_1 are calculated in the equation and standing for intercept, and the vector slope coefficients in sequence. ε_t is white noise error. FM/OLS model help to obtain unbiased estimators of co-integrating regression under the single equation based.

Regular ordinary least square equation may have endogeneity bias problem and FM/OLS is modified for elimination of it.

This study uses the following hypotheses for the analyses:

H0: There is not any relationship when CO_2 is dependent variable ($\alpha_1 = \alpha_2 = \alpha_3 = 0$)

H1: There is a relationship between independent variables ($\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq 0$)

Also, Zivot-Andrews (2002) test is applied for estimation of structural break during the study period. All data set are analyzed using SAS 9.4 program and analysis results are given in the next section.

Analysis Results

In this study, the stationary levels of variables are determined and the results are represented in the Table-2. The results show that if the variable can be used appropriately in the FM/OLS model. Since the air quality of the arrival country is so effective in the tourism potential, the CO_2 level is used and it is aforementioned in the first section of the study. In Table-2, Zivot and Andrews test results show that the variables are suitable to be used in FM/OLS model.

Then fully modified ordinary least square model is applied and results are given in the Table-3. It shows that Constant estimation of the FM/OLS is positively associated with CO_2; however, it is not statistically significant. The logarithm of GDP (LGDP) is positive and statistically significant whereas, $LGDP^2$ is negatively associated with the CO_2 emission in case of Turkey. Therefore, it can be concluded that Kuznets curve hypothesis which is an inverted-U-shaped relationship between different pollutants and per capita income is validated for Turkey during the study period. The other finding is also positive and statistically significant coefficient for tourism. It means that tourism deteriorates environment by augmenting carbon dioxide emission.

Table 2. Integration and Structural Break

Variables	**Zivot & Andrews test**			**Zivot & Andrews test for 1st difference**		
	T-stat	*Time Break*	*Lag Length*	*T-stat*	*Time Break*	*Lag Length*
$LnCO_2$	-3.273	1996	0	7.063	1999	0
LnGDP	-4.781	2001	2	-7.691	2005	0
LnTourism	-5,897	2007	3	-8.783	2009	0

Table 3. Fully Modified Ordinary Least Square (FM/OLS) Estimates

Variables	**Estimates**	**Standard Errors**	**P-value**
Constant	16.302	11.254	0.125
LGDP	12.577**	5.0254	0.077
$LGDP^2$	-2.387**	0.685	0.062
LTourism	0.099**	0.054	0.087
R^2	0.891		
Adjusted- R^2	0.873		

CONCLUDING COMMENTS

Tourism industry is evaluated as an initiator sector and plays a vital role in the development of countries' economy and labor markets. Considering climate change impacts on environment, augmentation of CO_2 emission causes significant forest loss and thereby natural resource contamination in Turkey. To increase the benefits derived from tourism revenue and provide a sustainable tourism, the level of CO_2 emission and air pollution requires to be controlled.

This study is proposed to empirically examine the effect of air pollution indicator of climate change on the tourism sector of Turkey. For this aim, the total number of international arrivals and staying in Turkey per year and CO_2 emission per year which stands for air pollution during the years from 1990 to 2014 are applied. For the examination of the data set, fully modifies ordinary Least Square Method is applied. Also, Zivot-Andrews test is used to test a structural break during the study period and a unit root test.

The study results show that LGDP is non-stationary at the level, but it is stationary after taking the first difference, and all the variables have break points. $LGDP^2$ is negatively associated with the CO_2 emission in case of Turkey. Therefore, it can be concluded that Kuznets curve hypothesis, which is an inverted-U-shaped relationship between different pollutants and per capita income, is validated for Turkey during the study period. The current study has some restrictions in terms of climate change variables. For future studies focusing on air pollution or climate change, the climate change variables and data set may be extended to estimate a future trend.

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THE ORIGIN OF GOAT AND SHEEP SPECIES USED IN MODERN PRODUCTION SYSTEMS IN THE WORLD AND THE ROLE IN DEVELOPMENT OF HUMAN HISTORY

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ABSTRACT

Human (homo saphiens) beings emerged about a million years ago, and about 990,000 years of this period has continued in a way of life based on hunting, fishing and food gathering. In the early time of human existence people were living by eating the products that they collected from nature instinctively. People in this period were fed by eating food products such as root, tuber, fruits and animal products (worms, crabs, snakes, etc.). When the food resources from nature were exhausted in a region, they settled in new regions in search of food and continued in this way their livelihood. After the gathering period, human being made various tools in order to catch and eat animals, then people started hunting. During this period, people necessarily followed the migration seasons of the animals and went to the areas where the animals lived. In other words, they lived as nomads. Thus, they began to know the animals more closely. When the hunted animals were kept together in a surrounded area with fences, the human noticed the reproduction and yield characteristics of animals. As a result of these observations, people started to agriculture and animals breeding by adopting a settled life in order to meet their nutritional needs. The current review examined the origin of modern sheep and goat species and their role in the development of human history.

Keywords: *Goat, Sheep, Nomadic Life, Hunting.*

INTRODUCTION

It is known that seven different species of people with different body structures and different abilities have lived on earth for 20 million years. Mentioned the human species are known as Homo heidelbergensis, Homo rudolfensis, Homo habilis, Homo floresiensis, Homo erectus, Homo neanderthalensis and Homo saphiens. Darwin stated that every human species that lived on earth evolved from the species that lived before it. Later two scientists, Thomas Huxley and Richard Owen, supported this idea. In light of this information, it can be said that as a result of evolution, each new species has different body structures and abilities. Therefore, Homo saphiens which evolved from other hominid families is considered as the ancestor of modern human today living in the world. It is considered the most advanced human species. From the appearance of the first human species in the world up to the evolution of modern humans, in the stone age (600,000-5000 BC) which called prehistory and in the mine age (5000-3500 BC) is known to lived (anonymous 2019a). The stone age is the oldest age in world history and in itself is divided into three as Paleolithic age, Mesolithic age and Neolithic age (anonymous 2019a). Human beings during the Paleolithic age (600.000-10.000 BC) known as the Ice age, which the longest period in human history, led a primitive and nomadic life, as seen in Picture 1, lived in caves and under rocks, used natural state of trees and stones found in nature and was fed by food gathering, hunting and fishing. During the Mesolithic age (10.000-8000 BC) were obtained many tools and equipment by chipping of stones.

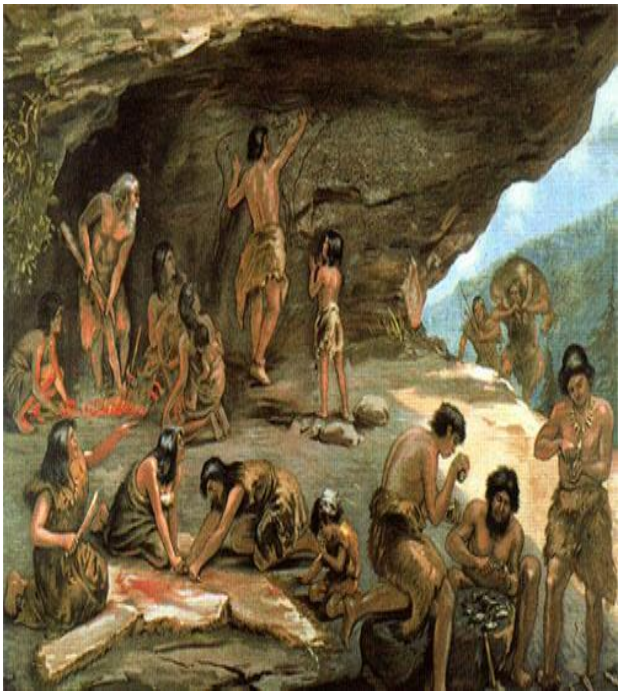

Figure 1. Caves and Rock-Bottom Shelters

By sharpening these stones, it is known that people are protected from enemies and predators and used for hunting. During this period, people dominated the fire and it was used to warm up, to protect against wild animals and to cook the animals they hunted. Also along with the melting of the glaciers in this period, appropriate environmental conditions for the breeding of some plant and animal species began to form. People in the Neolithic age (8000-5000 BC) moved from nomadic life to settled order. Along with the end of the last glacial period has been domesticated some plant and animal species living in a more mild environment. During this period, human societies acted cooperatively and moved from a consumer society to a productive society. The place of animals on the development of human history, it changed according to the age in which people lived, it increased its importance as time passed and it has had an effect on survival of people. All human species except Homo saphiens have survived on earth for a certain period of time. These species have disappeared due to various reasons such as especially climate change and not acting in cooperation. The Homo saphiens hunted together, lived together and developed to cope with climate change, as shown in Figure 2. In addition to hunting, Homo saphiens have discovered how to raise some species of animals and plants, thus quickly learned how to produce more nutrients. They also dominated the fire during this period and built better shelters due to their tendency to live in larger groups, as seen in Figure 3.

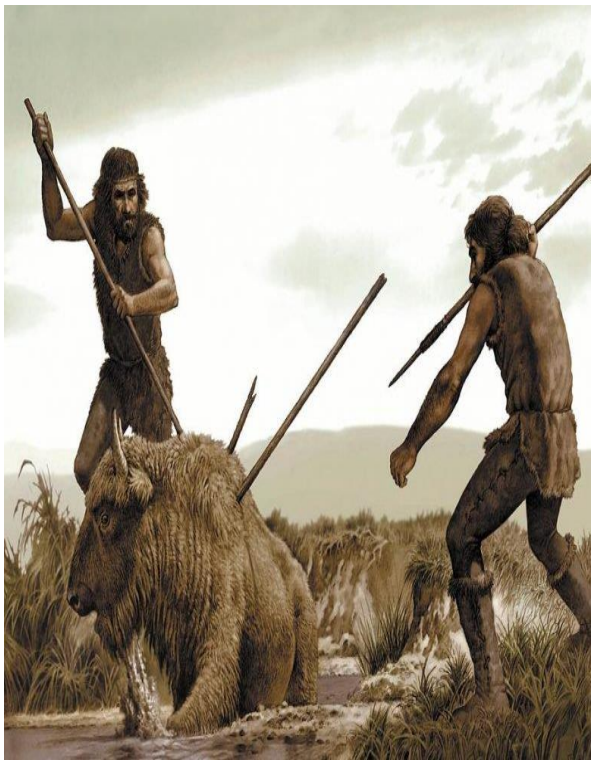

Figure 2. Hunting Together

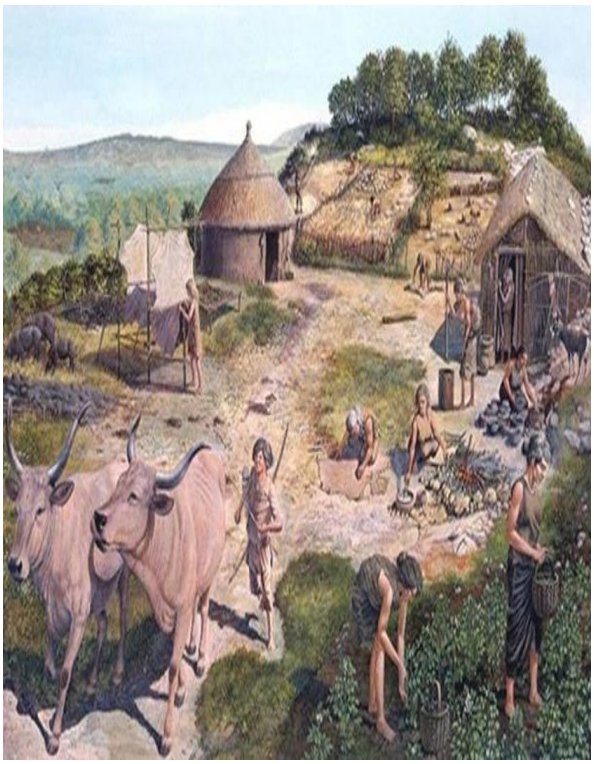

Figure 3. Transition to The Sedentary Order

After all these developments, the Homo saphiens made the transition to sedentary order based on agriculture and animal breeding instead of hunter-gatherer life as nomadic. The domestication of wild animals is of great importance during the transition of humans from a primitive and nomadic life to the sedentary order. Goat and sheep which the first domesticated species among these animals have an important role in the formation process of the modern world. In the current review examined the origin of modern sheep and goat species and their role in the development of human history.

Origin of Goat and Sheep Species

Researchers accept that sheep are domesticated in three different regions (Kaymakçı, 2006). These regions are South West Asia/Turkestan, Central Asia and Southern Europe. The most important and the oldest of this regions is South West Asia /Turkestan. During the Anou excavations in Turkistan, the discovery of sheep bones in 8,000 BC years confirms this view. The above-mentioned regions where plant and animal species were domesticated, is passed from nomadic life to sedentary order and people begin to produce their food were named the Fertile Crescent region. Fertile Crescent the word was first used by American historian

and archaeologist James Henry. As seen in Figue 4, Fertile Crescent region covers the South East of Turkey, Iraq's majority, all of Mesopotamia, South West of Iran, Egypt, Syria, Jordan and Palestine (Anonim, 2019b).

Figure 4. Fertile Crescent Region

Jeriko and Jarmo in Palestine, Mureybet in Syria, Caferhöyük (Malatya), Çayönü (Diyarbakir), Hallan CeMI (Batman), Nevali Çori (Urfa) and Göbekli Tepe (Urfa) in Anatolia are the most important Neolithic village settlements on the Fertile Crescent (Anonim, 2019b). There is a second Neolithic site in Central Anatolia. Among the most important settlements here are Çatalhöyük (Konya), Suberde (Konya), Canhasan (Karaman), Hacılar (Burdur), Kuruçay (Burdur) and Aşıklıhöyük (Aksaray) (Anonim, 2019b). Long-tailed domesticated sheep breeds are thought to occur in this region. The Central Asian region are known to be domestication area of the sheep with fat tails and European muflon and short-tailed breeds are known to be domesticated. Domestic sheep as seen in Figures 5, 6, 7 and 8 derived from muflon (*Ovis musimon or Ovis orientalis*), Arkal (*Ovis vignei*) and Argali (*Ovis ammon*) wild sheep (Kaymakçı, 2006). There are two important varieties of muflon sheep; Asian (*Ovis orientalis*) and European (*Ovis musimon*). These two types sheep which are considered as the ancestor of domesticated sheep resemble each other and are considered to be kin. Wild sheep called the Asian muflon is still present in Asia Minor and the Caucasus, while the European muflon has existed in many parts of Europe in the past, but it exists in Sardinia and the Costa Rica Islands in today (Kaymakçı, 2006). The short-tailed Marş and the sheep of Scotland are considered to be from Muflon. Muflon is the smallest form of wild sheep. Their colors range from red to brown. In rams, the color is slightly lighter than in females. Their hairs are short and coarse, but thin hairs under coarse hairs are seen (Kaymakçı, 2006).

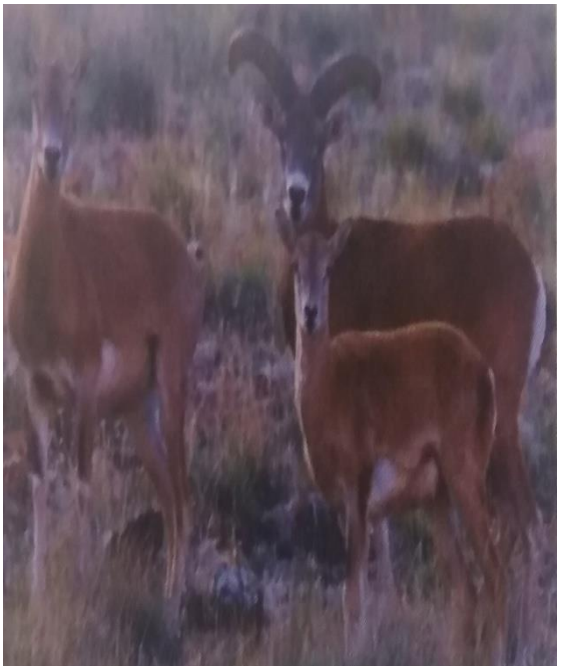

Figure 5. Asian (*ovis orientalis)* Muflonu

Figure 6. European (*ovis musimon*) Muflon

The Arkal sheep is a yellowish steppe animal that exists in the Kyrgyz and Turkmen steppes of Asia up to day, in the upper Yurt plateau between the Aral and the Caspian Sea (Kaymakçı, 2006). It has a slightly larger structure than muflon, its head structure and forehead area being wide, but it is narrowed forward. The horns are developed and thick and have a full spiral shape. Many of the sheep breeds that exist in today have their origin from Arkal. Merino, Kıvırcık and many greasy-tailed breeds are considered to come from Arkal. Nowadays, sheeps such as Hisar, Kazakh and Kalmuk are considered to have their origin from Argali.

Figure 7. Arkal Sheep (*Ovis vignei*)

Figure 8. Argali Sheep (*Ovis ammon*)

As seen in pictures 9, 10 and 11 domestic goat breeds derived from Capra prisca (sword horned) in the eastern region of Central Europe, Capra falconeri (auger horned) in Afghanistan and Capra aegagrus (crescent horned) wild goat breeds living in the mountainous regions of Anatolia and Iran (Özcan, 1989).


Figure 9. Capra Prisca

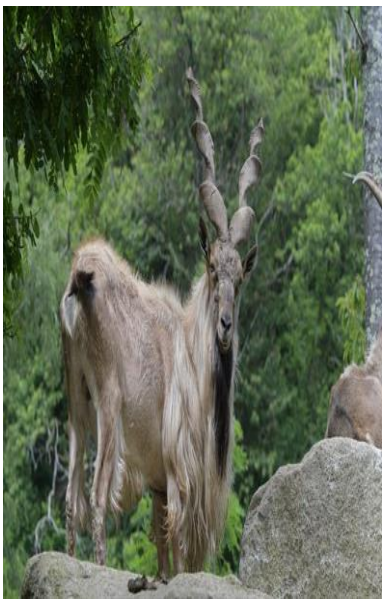
Figure 10. Capra Falconeri

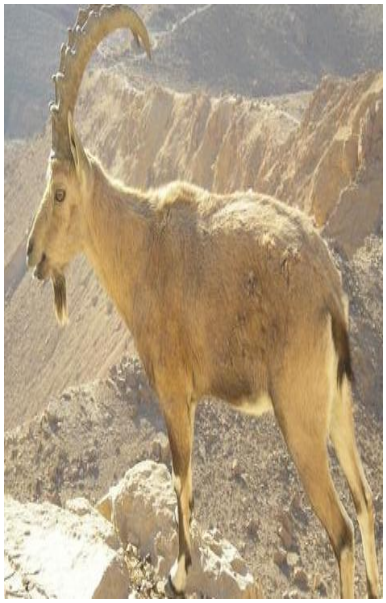
Figure 11. Capra Aegagrus

Domestication of Goat and Sheep Species

When human beings moved into the sedentary life, there is no clear information about the order of domestication in terms of animals and plants. In some sources animals first, in others plants first, in some sources are stated that domesticated together. Domestication in animals is thought to have started first with the domestication of dogs and then goats and sheep (Baskıcı, 1998). The time of domestication of the goat and sheep species is close to each other, but the goat species is thought to have been domesticated earlier. According to many archaeological studies the goat is the first domesticated herbivore (Joshi, 2004). This case shows that goat and sheep breeding is the first animal production activites of human. There are various views on the history of domestication of goats and sheep. Baskıcı (1998) reported that goat and sheep species were domesticated in 6000 BC. According to Yalcın and Kaya (2009), goat and sheep species were domesticated between 5000-9000 BC. Güney (2010) stated that goat species were domesticated in 8000 BC. Goat species for Ozcan (1989) were domesticated between 7000-9000 BC and Kaymakçi (2006) reported that sheep species were domesticated in 8000 BC. Although there is no clear information on the domestication history of goat and sheep, the dates given by the researchers indicated the Neolithic period. Domestication of sheep and goats is thought to have started due to the fact that underhand breeding is easier than hunting. In addition, domestication of animals allowed people to use the time spent on hunting to new pursuits and discoveries that would make their lives easier and improve their welfare. However, after domestication of wild animals by human and the transition to sedentary life, meeting the nutritional needs of the growing population was not possible due to the low yields of wild animals. Therefore, it has become a necessity to perform of various advanced studies to increase the yield of these animals. With the Neolithic period, the female/male animals kept in the enclosed areas at the beginning of the domestication processes were allowed to breed by mating, and then this breeding shape was changed. During this period, studies were initiated to completely isolate the wild forms of sheep and goats. In the following years, domesticated sheep and goats were completely isolated from wild and primitive forms. Although the wild goats and sheep gave enough milk to feed only their offspring, the milk yields of domestic goats and sheep were increased to be used for human feeding. Despite the body of wild sheep is covered with short and hard hairs, the wool of Merino which is one of domesticated sheep breeds, is very thin and soft. In addition, they give 5-6 kg wool. Even though wild goats and sheep are generally small and mobile, domestic goat and sheep are larger and less moving animals. In summary, there are significant differences between wild sheep and domestic sheep breeds in terms of external traits and yield characteristics (Kaymakçı, 2006). Priority was given to milk, wool and meat yields with the breeding studies and as a result of this, various sheep and goat breeds existed today.

CONCLUSION

Humans beings have the greatest positive or negative impacts on the order of the existing living and lifeless ecosystem on Earth. From the past to the present, human beings have constantly struggled for a comfortable and high welfare life. Life began with primitive societies and evolved over time into a modern

life. One of the most important developments affecting this change was that people moved into the sedentary life by domesticating and breeding of animals instead of hunting. Domestication of wild animals enabled societies to manage their food resources without being affected by the environment. Thus, human beings were able to develop new technologies and civilizations. In the domesticated animals, humans primarily attentioned to meat flavor and fur thickness. They also preferred animals that would be able to stay in groups and be kept under control. In the light of this information, most of the first domesticated species by human being consisted of ungulate living in herd form. Research showed that the migration of these animals with humans for thousands years was of great importance for the development of humanity. The first domesticated goat and sheep among these animals have been used by human communities since ancient times for economic, agricultural, cultural and even religious purposes.

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DETERMINATION OF MILK CONSUMPTION HABITS OF ÇUKUROVA UNIVERSITY STUDENTS

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ABSTRACT

The study consisted of primary data obtained from face to face surveys conducted with students who are studying at Çukurova University campus. In order to obtain the data used in the research, a questionnaire form was administrated to 140 students randomly selected from a total of 27,101 student enrolled in 1th education program at Çukurova University during the academic year 2018-2019. The present study was conducted to determine the milk consumption habits of studying students at the Çukurova University campus. Milk consumption habits were evaluated considering region, place of residence, income level and age factors of the students whose demographic characteristics. According to the results of the study, when the effects of the factors determined on the milk consumption habits are examined, it is determined that views on effective criteria to encourage milk consumption of students, effective criteria in milk purchase of students and various factors on type of milk package preferred by students are found important at 5% level.

Keywords: *Çukurova University, Milk Consumption Habits, Students, Human Health.*

INTRODUCTION

Every human has to feed to survive (Çalıştır et al., 2005). Nutrition is to take and use nutrient that will provide necessary energy and nutritional elements to live long periods of time in a growth, development, healthy and efficient way (Tanır et al., 2001). When any of these nutritional elements are not received or when received more or less than necessary, it has been scientifically demonstrated that growth and development are hindered and health is impaired (Baysal, 1993). At birth, milk is the first food that enters their body. Milk during infancy is a compulsory food for human beings but this necessity along with childhood period turns into a form of choice with various reasons. Milk is a important food for bone health in infancy, childhood and old age period. Research established the relationship between chronic diseases as such obesity, cancer, hypertension and milk (Jain et al, 1998; Heaney, 1999; Black et al, 2002). Milk, which people begin to consume after infancy, is an animal food especially rich in macro and micro minerals, B2 and B12 vitamins and protein content. Therefore, regular milk consumption is recommended in order to ensure adequate and balanced nutrition in childhood period in order to ensure an ideal growth of children (Toptaş, 2011). But the gained habits on nutrition with separating of individual from the family environment can change for reasons such as economic problems and efforts to adapt to a new order. University students, in particular, are the first group after childhood in the transition to an adult stage. Along with the start of university education of these students, start a new period in their nutrition especially as they make their own free choices more prominently. (Yılmaz ve Özkan, 2007). In this context, there are many studies on the milk consumption habits of university students (Karagözlü et al, 2005: Çetinkaya, 2010: Şimşek ve Açıkgöz, 2011: Şahinöz ve Özdemir, 2017). The present study was conducted to determine the milk consumption habits of studying students at the Çukurova University campus.

MATERIALS AND METHODS

The study consisted of primary data obtained from face to face surveys conducted with students who are studying at Çukurova University campus. Also in the study, was used books, articles and statistics published by various institutions and organizations studying on the topic as secondary data. In order to obtain the data used in the research, a questionnaire form was administrated to 140 students randomly selected from a total of 27,101 student enrolled in 1 th education program at Çukurova University during the academic year 2018-2019. Applied survey to students was applied equal number in terms of the region factor and completely randomly selected for other factors In the survey, 11 questions were asked on milk consumption habits based on the age of the students, their region, income level and place of residence. The results of the research were summarized in the tables and interpreted by giving frequency and percentage values. In addition, the statistical calculation of the data was calculated by the chi-square analysis method with the help of SPSS program.

RESULTS AND DISCUSSION

The frequency and percentage values of the demographics characteristics (gender, marital status, region, place of residence, income level and age) of the 140 students who made up the data of the current study were given in Table 1.

Table 1. Demographical characteristics of the surveyed students

Gender	**Frequency**	**%**
Woman	58	41.43
Man	82	58.57
Total	**140**	**100**
Marital Status	**Frequency**	**%**
Married	6	4.29
Single	134	95.71
Total	**140**	**100**
Place of Residence	**Frequency**	**%**
Dorm	73	52.14
Family	29	20.71
Your own house	15	10.71
Friend	23	16.43
Total	**140**	**100**
Region	**Frequency**	**%**
Mediterranean	20	14.29
Black Sea	20	14.29
Aegean	20	14.29
Marmara	20	14.29
Eastern Anatolia	20	14.29
Southeastern	20	14.29
Central Anatolia	20	14.29
Total	**140**	**100**
Household Income	**Frequency**	**%**
0-1000 ₤	3	2.14
1001-2500 ₤	25	17.90
2501-3500 ₤	49	35.00
3501-4500 ₤	33	23.57
4501₤ and Over	30	21.43
Total	**140**	**100**
Age Limits	**Frequency**	**%**
18-21 Age	53	37.86
22-24 Age	65	46.43
25 Age and Older	22	15.71
Total	**140**	**100**
Average Age of Respondents	**22.54**	
Average Number of Individuals in	**4.4**	

Milk consumption habits were evaluated considering region, place of residence, income level and age of the students whose demographic characteristics (Table 1). As shown in Table 1, 58.57% of the surveyed students were male and 41.43% were female. The average age of students was 22.54. Due to the fact that the survey was conducted in a university environment, the majority of the respondents constitute from students residing in dormitory, single and having family income (2501-3500 TL) slightly above the minimum wage. For the students surveyed, the most important periods for milk consumption were infancy and childhood periods. However, it was observed that consumption of milk is important in all periods. According to the statistical analysis of the study as shown in table 2, it was found that the region, place of residence, income level and age factors did not have any effect on the periods of milk consumption ($P>0.05$).

Table 2. Views on milk consumption periods of students

Ranking Criteria	Importance Level										Total		Chi-Square Analysis (P)			
	Very Unimportant		Unimportant		Undecided		İmportant		Very İmportant							
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Region	Place of Residence	Income	Age
Infancy period	0	0.00	2	1.43	1	0.71	22	15.71	115	82.14	140	100	0.407	0.537	0.882	0.404
Childhood period	1	0.71	0	0.00	2	1.43	21	15.00	116	82.86	140	100	0.675	0.944	0.348	0.536
Adult period	1	0.71	2	1.43	9	6.43	46	32.86	82	58.57	140	100	0.325	0.498	0.291	0.083
Old age period	3	2.14	3	2.14	7	5.00	44	31.43	83	59.29	140	100	0.285	0.623	0.433	0.129

*: P<0.05, **: P<0.01, ***: P<0.001

Because of rich nutritional content in human nutrition, the consumption of milk in every period is important for adequate and balanced nutrition. No milk consumption habits in the survey or for people who do not consume enough level milk, encouraging criteria milk consumption as regular were asked. As shown in Table 3, the results showed that the influencing factors of regular milk consumption were radio and television, internet access and school milk project. In a study conducted by Karagözlü et al (2005), %76.79 of the students stated that the most important tool promoting milk consumption was TV, newspaper and radio. In another study conducted by Şeker et al (2012), Radio and TV with 70.9% were determined as the most effective way to encourage people on drinking milk consumption. These results supported the results of our current study. Additionally, according to the statistical analysis of the study, it was determined that the region and age factors were important at the level of 5% on effective criteria to encourage milk consumption.

Table 3. Effective criteria to encourage milk consumption of students

Ranking Criteria	Importance Level										Total		Chi-Square Analysis (P)			
	Very Unimportant		Unimportant		Undecided		İmportant		Very İmportant							
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Region	Place of Residence	Income	Age
Scientific meetings	4	2.86	26	18.57	24	17.14	51	36.43	35	25.00	140	100	0.111	0.400	0.103	0.510
Radio and television	3	2.14	13	9.29	6	4.29	55	39.29	63	45.00	140	100	**0.015***	0.748	0.526	**0.030***
Internet access	1	0.71	15	10.71	17	12.14	46	32.86	61	43.57	140	100	0.096	0.517	0.971	0.089
Newspapers and magazines	3	2.14	15	10.71	23	16.43	61	43.57	38	27.14	140	100	**0.039***	0.957	0.966	**0.036***
The school milk project. etc.	3	2.14	9	6.43	23	16.43	49	35.00	56	40.00	140	100	0.185	0.100	0.142	0.220
The addition of additives such as honey. coffee	7	5.00	16	11.43	30	21.43	46	32.86	41	29.29	140	100	**0.034***	0.190	0.440	**0.026***

*: P<0,05, **: P<0,01, ***: P<0,001

Regarding the milk drinking habits and type of milk, it was determined that 91.43% of the students consumed milk while 8.57% did not have milk consumption habits. As shown in table 4, 73.57 % of students who consumed milk preferred cow milk. In the study by Şeker et al (2012), most of the participants (79.0%) reported that they preferred cow milk. These findings were to the ones reported by Çelik et al (2005) who indicated that 87.8% of consumers preferred cow milk. In another study conducted by Yalcin and Argun (2017) showed that 51.7%, 10.8% and 5.8% of the respondents preferred cow, goat or sheep milk respectively; while 21.7% stated that them did not give the source of milk. These various studies conducted on milk consumption habits were in concordance with our results and it was found that cow milk consumption was the most high. The main reasons for this result may be that cow's milk is easy to find and cheaper than other types of milk. Furthermore, the life style, livestock activities in the area where their lived and income of the people may affect the preference of milk consumption. As shown in table 4, it was found that the region, place of residence, income level and age factors did not significantly affect milk consumption preference (p>0.05). This can be explained with the adaptation period to a new life of incoming students from different regions and lifestyles.

Table 4. Milk consuming habit and type of consumed milk of students

Consumed Milk	**Frequency**	**%**	**Chi-Square Analysis (P)**	
			Region	0.300
Goat	17	12.14	**Place of Residence**	0.921
Cow	103	73.57		
Buffalo	2	1.43	**Income**	0.474
Sheep	6	4.29		
I don't consume milk	12	8.57	**Age**	0.744
Total	**140**	**100**		

*: P<0,05, **: P<0,01, ***: P<0,001

Many criteria positively or negatively affect milk consumption. Some of these criteria, which were effective on milk consumption, were asked to the students who participated in the survey. According to the answer of the students surveyed, the main criteria affecting milk consumption were the expiration date of milk, smell of milk and shelf life of milk. Also as seen in Table 5, ıt determined effective in other criteria on milk consumption. A study conducted by Şahinöz and Özdemir (2017), when purchasing milk, it was reported that 49.5% of the students were paid attention to the expiration date of milk, 33.3% of the students gave importance to the brand of milk. Another study conducted, it was stated that students first checked the expiration date secondly paid attention to the brand (Şimşek ve Açıkgöz, 2011). In another similar study Durmaz et al. (2002) reported that 40% of the students paid attention to the expiration date of milk, 23.8% of the students gave importance to the brand of the milk. The results of the current study were consistent with results of these studies. According to the statistical analysis of the study, it was determined that the region and income level factors were important at the level of 5% on effective criteria in milk purchase.

Table 5. Effective criteria in milk purchase of students

Ranking Criteria	Importance Level										Total		Chi-Square Analysis (P)			
	Very Unimportant		Unimportant		Undecided		İmportant		Very İmportant							
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Region	Place of Residence	Income	Age
Price	9	6.43	26	18.57	15	10.71	61	43.57	29	20.71	140	100	0.764	0.282	0.255	0.192
Smell	0	0.00	6	4.29	8	5.71	72	51.43	54	38.57	140	100	0.885	0.452	0.101	0.974
Colors	1	0.71	12	8.57	13	9.29	67	47.86	47	33.57	140	100	0.629	0.319	0.482	0.738
Fat Rate	1	0.71	6	4.29	21	15.00	66	47.14	46	32.86	140	100	0.698	0.807	0.319	0.565
Shelf Life	0	0.00	10	7.14	11	7.86	67	47.86	52	37.14	140	100	0.496	0.829	0.084	0.271
Mark	4	2.86	9	6.43	15	10.71	66	47.14	46	32.86	140	100	0.697	0.778	**0.035***	0.226
Package	2	1.43	16	11.43	12	8.57	68	48.57	42	30.00	140	100	0.352	0.270	0.330	0.977
Last consumption date	1	0.71	3	2.14	1	0.71	42	30.00	93	66.43	140	100	0.174	0.673	0.207	0.329
Processing Type	5	3.57	6	4.29	23	16.43	61	43.57	45	32.14	140	100	0.456	0.441	0.392	0.204
Accessibility	4	2.86	6	4.29	11	7.86	63	45.00	56	40.00	140	100	**0.015***	0.118	0.321	0.302

*: P<0,05, **: P<0,01, ***: P<0,001

The fat ratio is one of the most important parameters determining the quality standard of milk. The ratio of fat in milk may be the cause of preference of consumers according to the use way of milk. About the fat ratio of milk when buying milk and reason motivating the choice of considering the fat ratio, 53.57% of the participants declared taking into account the fat ratio, while 46.43% of them did not consider that selection criterion. As seen in Table 6, the most important stated reason was health driver factors 52% of students. Moreover the region, place of residence, income level and age factors did not have any effect on the reasons leading the attention toward the fat ratio of milk (P>0.05).

Table 6. Reasons for looking in the fat rate of purchased milk of students

Yes/No/Reason	Frequency	%	Chi-Square Analysis (P)	
Yes	75	53.57	**Region**	0.090
No	65	46.43		
Total	**140**	**100**	**Place of Residence**	0.183
In terms of health	39	52.00		
In terms of diet	16	21.30	**Income**	0.662
In terms of the form of consumption	8	10,70		
In terms of taste	12	16.00	**Age**	0.604
Total	**140**	**100**		

*: P<0,05, **: P<0,01, ***: P<0,001

According to the answers given by the students to the question on the frequency of milk consumption, 40% of the respondents were found to be in the habit of consuming milk. Moreover, was determined that 51.43% consumed irregular milk and 8.57% did not consume any milk. In a study conducted by Çetinkaya (2010), it was found that 33% of the participants had the habit of milk consuming and 67% did not milk consume. In another study conducted by Karagözlü et al (2005), it was determined that 63.71% of the participants had the habit of milk consuming and 36.29% did not milk consume. In another study conducted by Şahinöz ve Özdemir (2017), it was determined that 70% of participants had the habit of milk consume. According to researchs on milk consumption habits, it was seen that the milk consumption habits of the students who participated in our study were low. Based on results given in the table 7, the region, place of residence, income level and age factors were not significant on frequency of milk drinking (P> 0.05).

Table 7. Frequency of milk drinking of students

Milk Drinking Frequency	Frequency	%	Chi-Square Analysis (P)	
			Region	0.741
Once a day	39	27.86	**Place of Residence**	0.998
Multiple times a day	17	12.14		
Once a Week	46	32.86	**Income**	0.101
More than one a week, less than seven	26	18.57		
I don't consume milk	12	8.57	**Age**	0.200
Total	**140**	**100**		

*: P<0,05, **: P<0,01, ***: P<0,001

To make a habit of milk consumption to children of parents, they take care to consume 2 meals a day of milk especially in breakfast and before bedtime. However, acquired these habits can change with the individual's separation from the family due to his/her education life or with transition to his/her own family life in the subsequent. In order to determine the milk consumption meal of the students who participated in the survey, a question was asked as to what is your milk consumption meal. According to the most given answer by the students who participated in the survey, determined that 41.43% of them preferred to consume milk as a meal before bedtime in night. In the study conducted by Yalçın and Argun (2017) revealed that 21.7%, 5.8%, 16.7%, 31.7% and 12.5% of students consumed milk in the morning, at noon, at evening, at bedtime and between meals respectively. In another study conducted by Uzunöz and Gülşen (2007), it was found that 21.7% of the students consumed in the morning, 1.67% at noon, 53.67% at evening, 31.7% at any time milk. The results of many studies on the consumption of milk were similar to each other. According to the results of the research, it was determined that the meal in which milk is consumed the most is before bedtime in the evening. According to the statistical analysis of the study as shown in table 8, it was observed that the region, place of residence, income level and age factors were not significant on the milk consumption meal.

Table 8. Milk consumption meal of students

Milk Consumption Meal	Frequency	%	Chi-Square Analysis (P)	
Breakfast	27	19.29	**Region**	0.581
Lunch Break	2	1.43		
Dinner	3	2.14	**Place of Residence**	0.178
Evening before bedtime	58	41.43		
Intermediate meals	26	18.57	**Income**	0.339
Breakfast and evening before bedtime	12	8.57		
I don't consume milk	12	8.57	**Age**	0.153
Total	**140**	**100**		

*: P<0,05, **: P<0,01, ***: P<0,001

The taste and smell of milk are the two most important criteria affecting to milk consumption. People who cannot consume the white milk because of the taste and smell of milk consume by adding different sweeteners that change the taste and smell of the milk and thus is benefit from the rich nutrient content of the milk. In order to determine of the way milk consume of the students who participated in the survey, a question was asked as to what is the way you milk consume. 47.86% of participated in the survey preferred to consume milk without additives, 43.57% of participated in the survey preferred with adding of milk additives (sugary, coffee, cacao ve honeyed). In the study conducted by Yalçın and Argun (2017) found that 49.4% of participated in the survey preferred to consume milk without additives, 42.2% of participated in the survey preferred with adding of milk additives (25.2% sugary, 11.6% cacao, 5.4% coffee). It was found that the results of these two studies were parallel to each other, and that about half of the participated in the survey in both studies drank by adding of milk additives to milk. For this reason, various additives added to the milk are of great importance in terms of consumption by loving of milk and gaining the consumption habit of milk. According to the statistical analysis of the study as shown in table 9, it was observed that the region, place of residence, income level and age factors were not important on the way of consuming milk (p>0.05).

Table 9. Milk consumption way of students

Milk Consumption Shape	Frequency	%	Chi-Square Analysis (P)	
Sugary	24	17.14	**Region**	0.452
Without sugar	67	47.86	**Place of Residence**	0.725
Coffee	14	10.00		
Cacao	11	7.86	**Income**	0.990
Honeyed	12	8.57		
I don't consume milk	12	8.57	**Age**	0.403
Total	**140**	**100**		

*: P<0,05, **: P<0,01, ***: P<0,001

On the other hand it was determined that 36.43% of the students consumed warm milk, 30.71% consumed cold milk, and 24.29% had a habit of consuming hot milk. In the results gave in the table 10, indicated that the region, place of residence, income level and age factors were not important on the temperature of milk consumption (P>0.05).

Table 10. Milk consumption temperature of students

Milk Consumption Hot	Frequency	%	Chi-Square Analysis (P)	
Hot	34	24.29		
Cold	43	30.71	**Region**	0.063
Warm	51	36.43	**Place of Residence**	0.936
I don't consume milk	12	8.57	**Income**	0.650
Total	**140**	**100**	**Age**	0.410

*: P<0,05, **: P<0,01, ***: P<0,001

Milk supply and its availability can vary depending on many factors, particularly in rural or urban areas. The students surveyed indicated that they mostly preferred buying milk from supermarkets and few of them

buy from street sellers and dairies. As seen in table 11, the region, place of residence, income level and age factors were not important on where provided milk of students.

Table 11. Place where students supply milk

Ranking Criteria	Importance Level										Total		Chi-Square Analysis (P)			
	Never		Rarely		Sometimes		Mostly		Always							
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Region	Place of Residence	Income	Age
Street saler	70	50.00	28	20.00	21	15.00	13	9.29	8	5.71	140	100	0.791	0.171	0.257	0.166
Supermarket	7	5.00	14	10.00	35	25.00	63	45.00	21	15.00	140	100	0.775	0.823	0.905	0.186
Neighborhood grocery	46	32.86	38	27.14	36	25.71	16	11.43	4	2.86	140	100	0.573	0.773	0.717	0.307
Delicatessen	48	34.29	27	19.29	35	25.00	25	17.86	5	3.57	140	100	0.766	0.642	0.166	0.426
Dairy	65	46.43	28	20.00	29	20.71	14	10.00	4	2.86	140	100	0.691	0.088	0.122	0.222
Producer	37	26.43	29	20.71	33	23.57	24	17.14	17	12.14	140	100	0.335	0.211	0.673	0.724

*: P<0,05, **: P<0,01, ***: P<0,001

The type of packaging varies depending on where the consumer receives the milk. For example, if the milk is bought from dairies or farmers, the packaging type is usually plastic bottles or plastic bags. İf the milk is bought from place as such supermarket, neighbourhood grocery store, delicatessen, etc., the form of packaging is usually carton boxes or glass bottles. As seen in Table 12, the students involved in the current study mostly bought milk contained in glass bottles and carton boxes, plastic bags were least used as the packaging form. In a study conducted by Şeker et al (2012), 58% of consumers preferred cardboard boxes as packaging type. In a similar study, 52% of respondents preferred milk in glass, 31% cartonbox, 6% plastic bottles (Şimşek et al, 2005). According to the studies, the mostly preferred milk was the one contained in glass bottle and carton boxes. Among the main reasons for this, prolonging shelf life by subjecting of milk to a number of processes (pasteurization and UHT) and factors such as milk being ready to use directly can be counted. It was found that the place of residence factor were important at the level of 5% on the preference of milk packaging type.

Table 12. Milk package type preferred by students

Ranking Criteria	Importance Level										Total		Chi-Square Analysis (P)			
	Never		Rarely		Sometimes		Mostly		Always							
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Region	Place of Residence	Income	Age
Glass bottle	12	8.57	26	18.57	25	17.86	46	32.86	31	22.14	140	100	0.198	**0.030***	0.326	0.112
Plastic pochette	93	66.43	22	15.71	20	14.29	4	2.86	1	0.71	140	100	0.260	0.246	0.050	0.249
Cartonbox	13	9.29	20	14.29	34	24.29	20	35.71	23	16.43	140	100	0.447	0.905	0.276	0.807
Plastic bottle	56	40.00	35	25.00	28	20.00	17	12.14	4	2.86	140	100	0.541	0.816	0.211	0.257

*: P<0,05, **: P<0,01, ***: P<0,001

CONCLUSION

Milk is an animal food that forms the basis of adequate and balanced nutrition for human health in every period of human life. In the study it was found that 40% of the undergraduate students who studied at Çukurova University had milk consumption habits. This result showed that milk consumption habits of Çukurova University students were low. For this reason, for people who do not have milk consumption habits from the family or who gave up their milk consumption habits, the role of milk in human nutrition should be explained by the experts in the field. In this topic, departments related food in Universities, Media tools such as radio and television, newspapers and magazines, scientific studies such as school milk projects wıll have great impacts on the acquisition of milk consumption habits.

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AN EVALUATION OF DRY BEAN LANDRACES THROUGH THE LENS OF SUSTAINABILITY AND GENETIC RESOURCES IN TURKEY

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ABSTRACT

Turkey is the center of origin for many crop species, possibly also of plant domestication. This advantage source from diverse geological and climatic conditions and also its location which is at the intersection of the Mediterranean and Near Eastern gene centers. It is the center of genetic diversity for more crop plants. One of them is dry bean. Bean is an important crop in Turkey with the planted area of >138 thousand ha and 64.05% of it is dry bean. Annual production of dry bean is 235,000 tones and the yield is 2,654 kg/ha. However, Turkey has not gene center for dry bean, thanks to the fertile Anatolian land on which has hosted many civilizations and the ecological diversity of bean caused variation to occur in bean over many years. Therefore, different kinds of regional bean varieties have emerged in different regions due to the cultivation of the materials that enter the country from different sources for many years in the regions where they are located. The farmers are still producing dry bean in different local names as population in many places. Unfortunately, as time passes, these populations gradually disappear and the number of farmers producing these populations decreases. This study was conducted in Middle Kızılırmak Valley where is important production area of dry bean with 140 farmers who is producing dry bean landraces (DBL) by using survey method to determine the reasons why they are producing DBL and to evaluate DBL production in terms of sustainability approach. Total of 8 provinces (Ankara, Aksaray, Çankırı, Kayseri, Kırıkkale, Kırşehir, Nevşehir, Sivas) was included to the research. According to the survey results, especially the low-income and risk-loving producer group tended to produce more DBL. The fact that the main income source of more than half of the producers interviewed is non-agricultural activities (especially pension) indicates that DBL are produced for subsistence purpose. 63.57% of the local bean producers are over 50 years old and it shows that such local populations are maintained by older producers. For this reason, more efforts should be made to conserve genetic resources and need special policies for the protection of genetic resources, providing their sustainability and the registration of local population and landraces.

***Keywords:** Dry Bean Landraces, Genetic Resources, Sustainability, Turkey*

INTRODUCTION

The concept of sustainability continues to be the focus of everything today, and it would not be wrong to say that it will be a principle that needs further attention in the future. This terminology, which has come to the fore after 1987 in the international arena, is a necessity rather than a word for the survival of our billions of years old planet. As stated in the definition of the economy, it is impossible to find unlimited resources as long as there are unlimited needs to meet them. So if resources are not unlimited, we have to either limit needs or learn to use resources sustainably. Beyond the point we are, it would be a great mistake to assume that there is a linear relationship between input and production (Pretty, 2008). For this reason, sustainability is the backbone of development goals and each country tries to shape its policies more or less through this terminology.

As it is known, with the completion of the Millennium Development Goals process in 2015, the new development targets until 2030 were adopted by the UN member states (Sustainable Development Goals-2030). They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests. The 2.5.1 ve 2.5.2. indicators in the SDG Target 2 (Zero Hunger) are related with conservation of crop and animal genetic resources. It means that genetic resources are seen as a part of sustainability of the life and must be taken an action to conserve them for better life in the World (SDG, 2019).

The agricultural sector which is given the vital role in sustaining people lives, is the backbone of both development and sustainability. If we define sustainability as use of natural resources without risking their

exploitation by future generations, agriculture can only be considered as sustainable if it includes a suitable system of plant genetic resources conservation. The conservation of plant genetic resources can be achieved by different ways: *ex-situ* conservation, *in-situ* conservation and on-farm conservation. Agricultural sectors are major users of biodiversity but also has the potential to contribute to the protection of biodiversity. The agricultural sectors together manage the largest terrestrial, freshwater and marine areas on Earth. If managed sustainably, agricultural sectors can contribute to important ecosystem functions. These include maintenance of water quality, nutrient cycling, soil formation and rehabilitation, erosion control, carbon sequestration, resilience, habitat provision for wild species, biological pest control and pollination (FAO, 2016). Unfortunately, modern agriculture has caused a drastic reduction of fields' biodiversity and there is great pressure on genetic resources. As result of this dramatic change, many countries has been facing to negative impact on genetic resources such as genetic erosion, in despite of considerable efforts in collecting, characterizing and conserving crops genetic diversity.

Turkey is at the center of genetic diversity and is homeland of many plant and animal genetic resources (Davis, 1985; World Bank, 1993; Kaya et al. 1997; Tan, 1998). This advantage source from diverse geological and climatic conditions and also its location which is at the intersection of the Mediterranean and Near Eastern gene centers. It is the center of genetic diversity for more crop plants. One of them is dry bean. It is one of the most important plant species for Turkey in terms of direct use in human nutrition and nutrients it contains. Beans have come to Turkey in the 17th century and can be grown almost everywhere in Turkey as dry grain or fresh grain, it is a legume crops showed wide variations (Sözen et al. 2018). Dry bean (*Phaseolus vulgaris* L.), also known as common bean, is the most important food legume in the world, representing 50% of the grain legumes consumed worldwide (Urrea et al. 2009). In 2016, dry beans were grown on 29.3 million ha in 125 countries, producing 26.8 million tones. Turkey ranks in the top 25 countries in terms of dry bean production with 235 thousand tones (FAOSTAT, 2018).

In the absence of gene center; South-Eastern Anatolia and Samsun-Tokat-Amasya micro gene centers are centers of genetic diversity for beans (Şehirali et al. 2005). There are numerous studies in Turkey on the subject of both collection - evaluation and use in breeding of bean as a genetic resource (Sözen and Bozoğlu, 2013). Turkey; thanks to the fertile Anatolian land on which has hosted many civilizations and the ecological diversity of bean caused variation to occur in bean over many years, as in almost all plant species. Therefore, different kinds of regional bean varieties have emerged in different regions due to the cultivation of the materials that enter the country from different sources for many years in the regions where they are located. In the bean plant; there are locally grown and a large number of genetic material that different in their characteristics (Karataş et al. 2017). In the world and Turkey, despite the availability of varieties developed in corn, many producers still produce and sell local bean genotypes (Toklu et al. 2016). Therefore, in different regions of Turkey it is still possible to find local bean genotypes. Especially Middle Kızılırmak Valley that close to the Samsun-Tokat-Amasya micro gene centers, is an important center for the richness of the local dry bean populations.

With this study; in the Middle Kızılırmak Valley-Turkey, which is an important diversity center for dry bean landraces (DBL), perception and attitudes of the DBL producers through plant genetic resources and DBL was evaluated by the lens of sustainability of them. Thus, the obtained results will provide data for policy makers with the aim of ensuring the conservation and sustainability of genetic resources in future.

MATERIALS AND METHODS

The data of the study consists was obtained via interview with the farmers face to face by fulfilling a questionnaire forms. Total 140 DBL producers from a total of 8 provinces (Ankara, Aksaray, Çankırı, Kayseri, Kırıkkale, Kırşehir, Nevşehir, Sivas) in the Middle Kızılırmak Basin in Turkey attended the survey (Figure 1). The DBL producers were selected according to preliminary study conducted in 2017, because of lack of a specific database on the producers engaged in the production of landraces in Turkey. As results of the preliminary study, 179 DBL producers had been selected, but 140 DBL producer (78.21%) could be reached for the study.

In the study, chi-square independence tests were conducted in order to obtain information on whether or not they are independent of each other in the analysis of cut-off variables, and the results were interpreted according to the chi-square dependence coefficients (Çömlekçi, 2001). In the analysis of continuous variables for the 2-level groups, the T test was performed in parametric cases and the Mann-Whitney Test (M-W) and the Two-Sample Kolmogorov-Smirnov (KS) test were applied for nonparametric cases. Variance analysis was used in parametric cases and Kruskal-Wallis test in non-parametric cases to determine whether there was a statistically significant difference between groups with more than 2 levels. In case of significant difference in

statistics, Duncan Analysis of Multiple Comparison Methods was applied in order to determine which group the difference originates from (Kesici and Kocabaş, 2007).

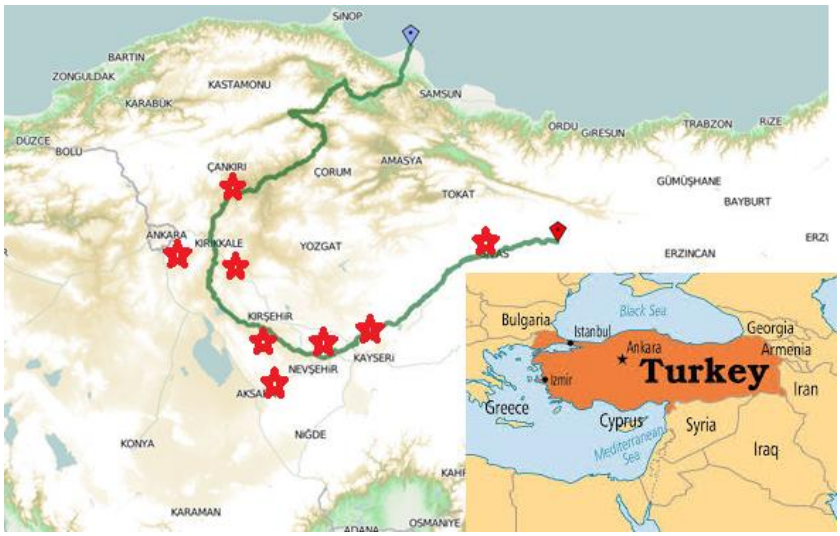

Figure 1. The map of survey area

RESULTS AND DISCUSSION

Demographic Factors of DBL Producers; Demographic characteristics include the variables that reveal the behaviors of enterprises in decision-making process as well as defining the population. In many studies, it is stated that demographic variables affect individuals' perceptions, attitudes and behaviors (Şahin and Yılmaz, 2008; Özyer and Azizoğlu, 2010; Kalkan, 2011; Kan, 2012; Kanbak, 2015; Coşkun, 2016). The results related to gender, age and educational status of the household head of the agricultural holdings in the 8 provinces constituting the research region are presented in Table 1. When the table is examined, it is seen that the majority of household heads are male individuals (97.9%). The average age of household heads was found to be 54.09 and it was found that the age difference between the provinces was not statistically significant (F: 1.69, p:0.12). The fact that the age difference between provinces is not statistically significant and the mean age of individuals is above 50 indicates that the producers working in the local dry bean population consist of the elderly population. The studies done before about the landrace producers in Turkey has shown that local populations/landraces which are also genetic resources are being produced by elderly population (Kan et al., 2016). Age is an important demographic factor in ensuring the sustainability of genetic resources is an important issue for the whole of the agricultural sector in Turkey. The migration of the young population, especially from rural to urban areas (which we can generalize from the agricultural sector to the services, construction and industrial sectors) is an important factor on aging in agriculture. Although local populations, called genetic resources, have a qualitative advantage over other developed varieties, cultivated varieties are more advanced in terms of quantitative criteria such as yield. Especially the economic criteria push the young population to search for more profitable production and varieties in agriculture, which leads to an increase in the average age of producers growing the local population.

Another demographic factor is the education level of the producers. When the educational status of the producers in the research region is examined, it can be seen that 82.1% of the household head producers have education at primary level. According to the Chi-Square analysis, it was determined that the differences occurred according to the level of education on the basis of provinces were not statistically significant (Chi-Square: 30.59; df.: 35; p: 0.68, Likelihood: 34.07; p: 0.51). At all provinces, the level of education of producers is similar to each other and is low (Table 1.).

General Information on DBL Producers' Production; In the research area, the share of DBL in the production patterns of the enterprises engaged in the DBL population was examined and shown in Table 2. Accordingly, the share of DBL in the irrigated agriculture system was calculated as 12.83% and 0.23% in the rain-fed agriculture system. In general, the share of the DBL in the production pattern of the agricultural holdings was determined as 2.79%. Especially in Kırşehir, Kayseri and Ankara provinces, it can be said that the production area of DBL is higher than other provinces. Statistically, it was determined that the cultivation areas of the DBL differed among the provinces (K-W Test 26.72).

Table 1. Sex, Age and Education Level of Household Heads

Provinces	Sex (%)		Age (Year)	Education Level (%)					
	Male	Female		Illiterate	Literate	Primary School	Secondary School	High School	University
Aksaray	100.0	0.0	59.13	0.0	12.5	87.5	0.0	0.0	0.0
Ankara	100.0	0.0	56.07	0.0	0.0	100.0	0.0	0.0	0.0
Kayseri	100.0	0.0	53.10	0.0	0.0	81.0	14.3	4.8	0.0
Kırıkkale	100.0	0.0	55.04	0.0	8.7	78.3	13.0	0.0	0.0
Kırşehir	100.0	0.0	55.75	0.0	0.0	83.3	8.3	0.0	8.3
Nevşehir	100.0	0.0	47.27	0.0	0.0	86.7	0.0	6.7	6.7
Sivas	92.3	7.7	55.51	2.6	7.7	76.9	12.8	0.0	0.0
Çankırı	100.0	0.0	48.75	0.0	0.0	75.0	12.5	0.0	12.5
Mean	**97.9**	**2.1**	**54.09**	**0.7**	**4.3**	**82.1**	**9.3**	**1.4**	**2.1**

Table 2. Local Dry Bean Population (DBL) Production Areas (Ha) By Provinces

Provinces	Irrigated DBL Area (Ha)	Rain-fed DBL Area (Ha)	Total DBL Area (Ha)	The Share DBL Product. Area in Total Product. Area (%)
Aksaray	0.769	0.000	0.769	0.139
Ankara	1.075	0.000	1.075	0.614
Kayseri	1.030	0,000	1.030	0.273
Kırıkkale	0.690	0.065	0.755	0.367
Kırşehir	2.694	0.083	2.777	0.402
Nevşehir	0.407	0.013	0.420	0.171
Sivas	0.131	0,000	0.131	0.083
Çankırı	0.025	0.575	0.600	0.302
Total	**0.732**	**0.052**	**0.784**	**0.279**
K-W Test			**26.72*** **	

Statistically significant at the confidence limit * 90%, ** 95% and *** 99%.

Sustainability Factors of DBL; Sustainability for DBL, which is the main subject of the study, has been examined around the factors that affect the sustainability of the production of these populations. In this context, sustainability factors were analyzed as geographical condition, distance to market places, and age, production type, risk attitude, income of DBL producers.

Especially with modernization in agriculture and the use of chemicals, it is seen that local populations are replaced by improved varieties with greater advantages in terms of yield. Studies on this subject show that this change is faster in areas where innovations progress faster (Kan et al., 2016). Some of the important criteria in this regard are the geographical structure of the agricultural areas and proximity to important centers (provinces, districts, market places, etc.). Altitude values of the study area have been given in Figure 2. When the figure is examined, it is seen that DBL productions are made in high altitude areas, especially in Kayseri and Sivas provinces. The average altitude of the study area was found to be 1171 m. Oguz et al. (2010) in their study in the province of Konya, 1200 m and above altitudes was defined as a mountainous area. Kan et al. (2016) stated that local wheat populations are mostly grown in high altitude areas. Dry beans agronomically in terms of growing conditions than wheat, prefer different areas (irrigated and more fertile). Therefore, in this study, it was showed that the DBL production areas were at a little further below the areas to be defined as mountainous areas. Nevertheless, it has been determined that production is also carried out in areas above 1200 m altitude.

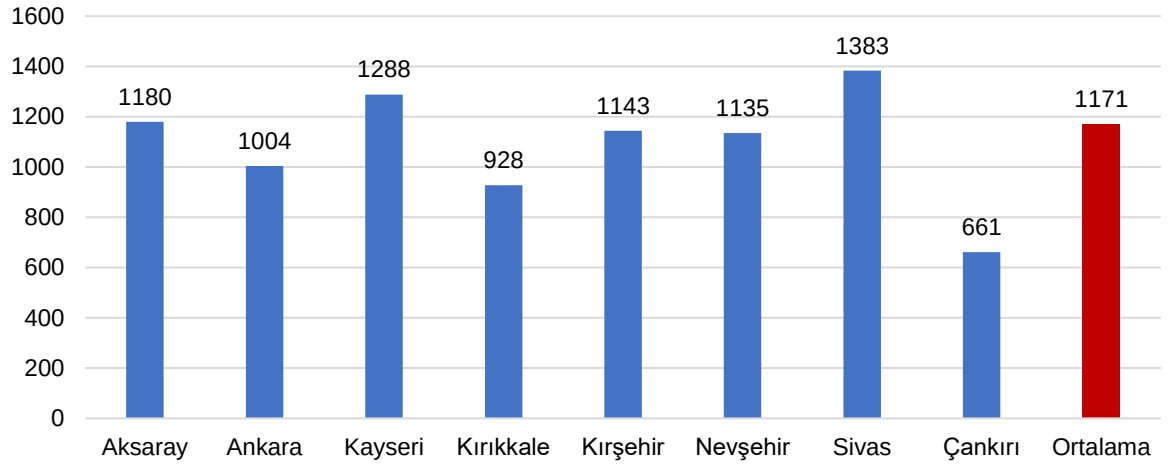

Figure 2. Altitude Values of DBL Production Areas (m)

The relationship between the geographical structure and the DBL production area can be better understood when the situation of the producers regarding the average DBL production areas is examined according to their altitude locations. When the Figure 3. is examined, it is observed that wider DBL production is produced especially in low altitude areas whereas production in high altitude areas shrinks significantly in DBL production areas. As a result of the statistical analysis, the difference was found to be statistically significant (K-W Chi Square: 19.11, p: 0.00). This situation was also reflected in the ratio of DBL production area in total production area and the difference was found to be statistically significant (K-W Chi Square: 6.24, p: 0.04). It is also shown that there is considerable increase in the ratio of DBL Production area in total production area in high places. It means that there is important potential in high places to conserve this genetic resources. This situation is similar to the results obtained in the wheat landraces study done by Kan et al. (2016).

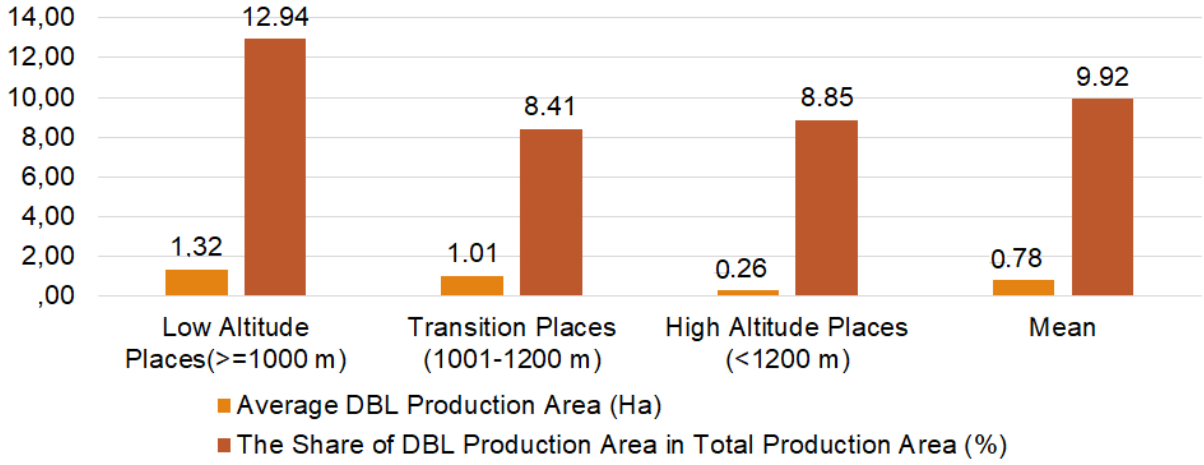

Figure 3. Change of DBL Production Areas According to Altitude Values (Decare)

Another variable regarding the relationship the characteristics of the places and amount of DBL production areas is the distance of the production area to the important market areas. Therefore, the distance of the interviewed producers to the market areas was tried to be determined and it was determined that 23.57% of the producers produced in areas 20 km away. When the relationship between DBL production area and distance were examined, it was found that DBL production area narrowed as the distance to the market increased (Figure 4) and the difference was found to be statistically significant (K-W Chi Square: 7.68, p: 0.02). In the light of the obtained data, it can be concluded that as the distance to the nearest market increases, the producers produce DBL production as subsistence rather than commercial purpose. When the results are analyzed, 23.57% of the producers producing 20 km away from the market place have only 7,43% of the total DBL production area. Distance to market, road quality, access to input and output markets are effective factors in determining production patterns of producers. Therefore, the distance from the market area is an important

factor affecting the production areas of genetic resources/landraces/local populations. In some studies, it was determined that producers were more likely to plant local populations at a distance from the market. Omamo (1998) stated that high transportation costs led to producers producing products with lower returns. Hintze (2002), in his study reported that the quality of the road affects transportation costs and in this case the adaptation of modern corn varieties positively affected. Meng (1997), reported in her study that the preferences of producers on the local wheat was affected from the distance from the market and the quality of the road and modern wheat varieties in Eskişehir, Kütahya and Uşak provinces of Turkey. Producers prefer to produce local wheat varieties/landraces in the area which is remote and has poor road quality. Kan et al. (2016), in their study on local wheat/landraces, determined that there is positive correlation between the number of producers producing only local wheat and the distance to the market place.

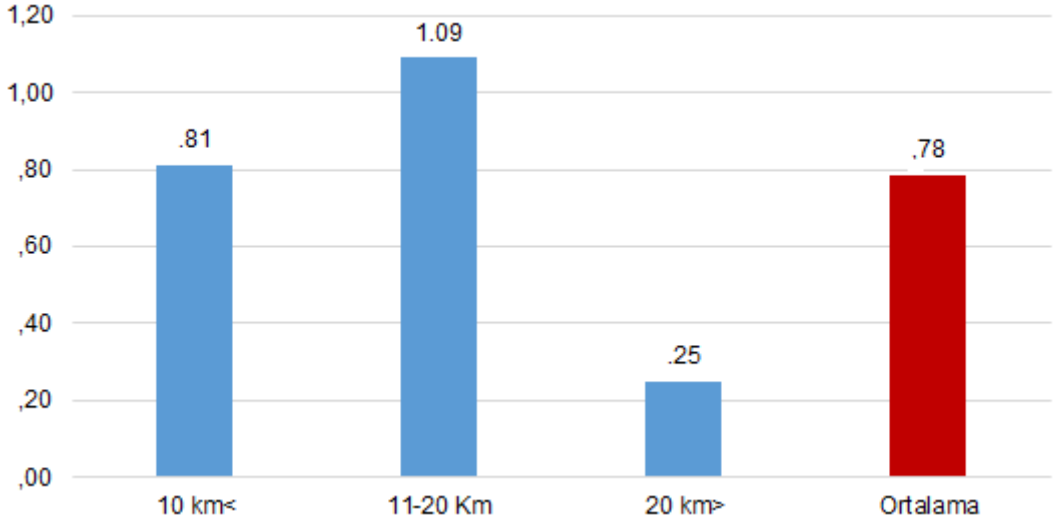

Figure 4. Change of DBL Production Areas by Distance to Nearest Market Center (Ha)

Figure 5 provides information on income status of DBL producers and risk sensitivity of DBL producers in Figure 6. It was determined that the mass of producers in the research area is mostly in the middle income group, but the high income group is higher than the low income group. This situation has also affected producers' attitudes towards risk. The risk aversion and risk-loving ratios of the producers were calculated close to each other. The share of these two groups in the total DBL producer is almost 90%. Changes in DBL planting area of DBL producers according to these groups are presented in Figure 5 and Figure 6. When the figures are examined, it is seen that the producer group with low income (F: 4.20; p: 0.02) and the risk-loving producer group (F: 5.71, p: 0.00) tend to produce more DBL. The fact that the risk-loving group is more likely to produce more DBLs may be an indication of the desire to generate more revenue. They have opinion on that the local populations will generate significant income for them. Furthermore, the fact that dried beans is an important foodstuff may be one of the reasons that the lower income group has the desire to produce more.

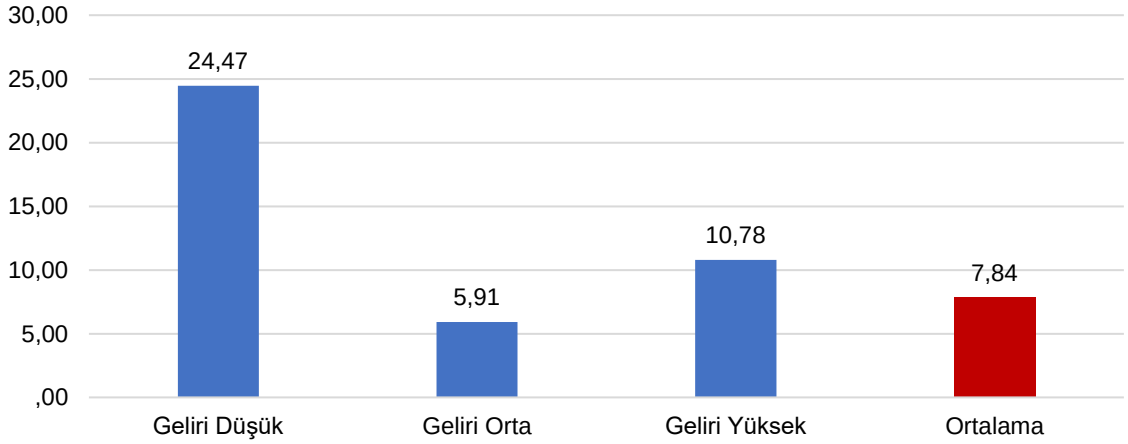

Figure 5. The Relationship Between DBL Producers' Risk Attitudes and DBL Production Area

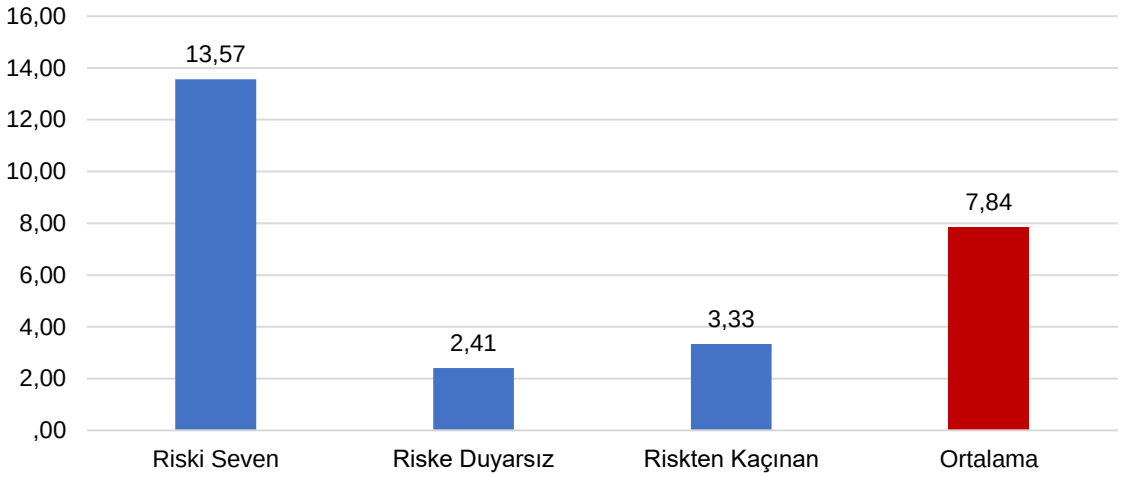

Figure 6. The Relationship Between Income Status of DBL Producers and DBL Production Area

In addition to being suitable for irrigated farming, dry beans require significant human labor in production. Particularly in the studies conducted on the areas where local populations are grown, it is stated that such populations are more concentrated in marginal areas. Results of the study indicating that local populations are more resistant to marginal conditions (Kimber and Feldman, 1987; Harlan, 1992; Frankel et al., 1998; Almekinders and Louwaars, 1999; Brown, 1999; Kan et al., 2016; Atak, 2017) it proves why such populations are seen mostly in rural areas. In many countries in the world such as Turkey, one of the common point of predominantly rural areas is high average of age. Therefore, the relationship between age and DBL was investigated in this study. As a result, it was determined that producers 50-aged and under produced DBL in more fields because dry beans required more labor. Producers over 50-aged produced DBL in less areas especially for meeting the family needs.

Table 3. The Relationship Between Age of Producers and DBL Production Area

Age Intervals	**Median**	**Mean**
50=<	6.00	9.88
50>	1.00	6.67
Mean	1.50	7.84
Mann Whitney U Test Z Value:-3.10; p: 0.00		

In the research area, there are DBL producers in very small garden areas as well as producers in open fields. For this reason, the producers are divided into two groups as garden type producers and field type producers. While 37.86% of the producers produce garden type, the rest produces field type and these producers have commercial purpose in their production. Table 4 shows the total and DBL production areas of the producers producing garden type and field type DBL. As can be seen from Table 4 that while the average DBL production area of garden-type producers were 0.049 ha, it was 1.231 ha (median 6.00) for field-type producers.

CONCLUSION

As can be seen from the DBL study, the production of such local populations is not based on commercial purposes. Garden type production model, which is made to meet the family needs, is widely applied in the research field and it is determined that this type of production is widespread in Sivas, Kayseri and Aksaray provinces. In addition, the fact that producers have more protective instincts against genetic resources in the form of garden type production shows that we cannot base our potentials on economic foundations. Therefore, Turkey will face more problems with the reduction of this type of production day by day. The conservation and sustainable production of such products is possible through the use of these products as a means of local development. In particular, it can be said that landrace production is mostly adopted by the elderly population and young people do not show much interest in these productions and this will trigger the loss of these varieties in the future. Therefore, supporting and raising the young population for these productions requires special policy tools.

Table 4. The Relationship between DBL Production Type and Production Areas of Producers

Production Types		Total DBL Production Area (Ha)	Total Production Area (Ha)
GardenType	Mean	0.049	18.000
	Median	0.025	7.650
	Standart Error	0.010	3.784
Field Type	Mean	1.231	34.206
	Median	0.600	20.400
	Standart Error	0.243	4.850
Mean	Mean	0.784	28.071
	Median	0.150	15.060
	Standart Error	0.159	3.393
T Test Value		-2.64***	-4.85***

Statistically significant at the confidence limit * 90%, ** 95% and *** 99%.

ACKNOWLEDGEMENTS

The data for the study was compiled from "Socio-Economical Characterizations of Farmers Producing Dry Bean Landrace Population" Work Package of the Project "*Morphological and Molecular Characterization of Local Dry Bean Populations in the Middle Kızılırmak Valley and Determination of Resistant Genotypes against Root Nematode"* supported by the Ministry of Food, Agriculture and Livestock, General Directorate of Agricultural Research and Policies (TAGEM / 16 / AR-GE / 55) in Turkey.

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EFFET DE DEUX ENGRAIS DE FOND ET DES PRÉCÉDENTS CULTURAUX SUR LE RENDEMENT DES SEMENCES DE MULTIPLICATION DE BLÉ DUR (*TRITICUM DURUM* DESF.)

EFFECT OF TWO BOTTOM FERTILIZERS AND PREVIOUS CROP ON YIELD OF DURUM WHEAT BREEDING SEED (*TRITICUM DURUM* DESF.)

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ABSTRACT

To improve the yield of durum wheat seed (Triticum durum Desf.), seven (07) varieties were grown in an experimental field (Tifech region in Souk Ahras). The study focused on planting the varieties on two cropping precedents (sorghum and fallow grazing), in addition to the use of two bottom fertilizers, one potassic (Fosfactyl) and the other phosho-nitrogen, (DAP).

The analysis of the results showed a clear improvement in grain yields in the varieties harvested from the previous crop (Sorgho) and having received Fosfactyl as fertilizer. The best grain yields were displayed by the Carioca, Boussallem and Sersou varieties.

After harvest; the study of soil parameters of the respective parcels showed soil with a sandy loam texture, with a low organic matter, with a slightly alkaline pH, while being low in salts.

Keywords: *durum wheat, yield, soil, fertilization, varieties, crops, previous crop.*

RÉSUMÉ:

Afin d'améliorer le rendement des semences de multiplication du blé dur (*Triticum durum* Desf.), sept (07) variétés ont été cultivées dans un champ expérimental (région de Tifech à Souk Ahras- Algérie). L'étude a porté sur le semis des variétés sur deux précédents culturaux (Sorgho et jachère pâturage), en plus de l'utilisation de deux engrais de fond, l'un potassique (le Fosfactyl) et l'autre phosho-azoté, il s'agit du (DAP).

L'analyse des résultats a montré une nette amélioration des rendements en grains chez les variétés récoltées sur le précédent cultural (Sorgho) et ayant reçues le Fosfactyl comme fertilisant. Les meilleurs rendements en grains ont été affichés par les variétés Carioca, Boussallem et Sersou.

Après récolte; L'étude des paramètres pédologiques des parcelles concernées a montré des sols avec une texture sable-limoneuse, possédant une faible matière organique, avec un PH légèrement alcalin, tout en étant pauvres en sels.

Mots clés: blé dur, rendement, sol, fertilisation, variétés, précédent cultural.

INTRODUCTION

The multiplication of cereals in Algeria is dependent on several abiotic factors (mainly precipitation and soil pedological nature) and biotic (genetic potentialities of varieties), expressed by their phenotypic variation and the difference in their yields. In addition the intervention of farmers by tillage, fertilizer input and phytosanitary treatments greatly influence the production from one year to another **(Chiahi 2009).**

The fact that professionals in the field, in collaboration with the Ministry of Agriculture and other agencies, are developing new methods such as the concept of viability / vigor of seeds, adaptation to biotic and abiotic stresses, Technological quality and rational fertilization **(Brinis 2012).**

The difference in agro-climatic zones in Algeria also accentuates the fluctuation of this production from one region to another.

This problem is based on the fact that the agro-climatic potentialities are poorly known. It is therefore almost impossible to foresee the crops to be developed in agro-climatic zones. It is equally evident that planning forecasts could be little related to the actual potentialities of these areas **(Derouiche 2007).**

The production of wheat in Algeria is characterized by very unstable fluctuations. It shows no particular trend, but from the 1994/1995 season onwards it undergoes a more or less linear trend. This sudden trend could

be due to one of the two main reasons, namely a marked improvement in rainfall and the adoption of new economic reforms during the period (1989-1995), the repercussions of which can be seen from 1994 **(Kellou 2008).**

But if we analyze the effect of all these factors, we can limit the influence of certain factors where the multiplier can intervene widely and maximize the production of these cereals, namely:

1. Planting of seedlings, with plowing, bottom fertilizers, selection of varieties and their doses of seedlings, cover fertilizers, phytosanitary treatment by the use mainly of herbicides and according to the regions of insecticide and even of fungicide.

2. Apart from these factors, linked to field cultivation, we can also add the seed storage conditions at the C.C.L.S. level. Which we describe as post-harvest factors and which can greatly influence seed viability and vigor.

All these reasons led us to consider how far the multiplier can improve cereal seed production! By adopting a system of cultivation grouping several parameters that it can vary itself.

In order to do this, we decided to install such a system in a region characterized by the production of cereal farming associated with the Tifech region (36˚14 latitude North and 7˚10 longitude East 25 km Northeast - wilaya of Souk Ahras-Algeria.

MATERIAL AND METHODS

Experimentation on field: **Description and location of the study site.**

A. Geographic location.

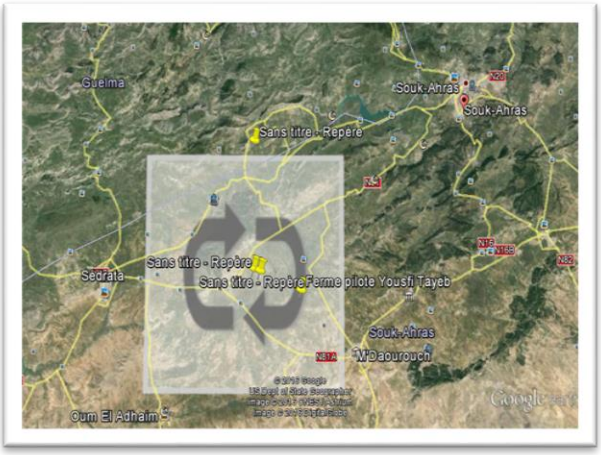
The experimental real-life study was carried out at the Yousfi pilot farm in the Souk Ahras region, north-east of Algeria 36˚14 latitude North and 7˚10 longitude East.

Figure N ° 01: Satellite image of the experimental site: Yousfi Tayeb pilot farm - ALGERIA.

The year 2012, date corresponding to the beginning of this thesis and as it was planned in the planning of the tasks and the methodology of the work to be carried out.

A field trial involved seeding seven (07) varieties of durum wheat at the pilot farm Yousfi Tayeb of Tifech "Souk Ahras" Algeria. Seeds of five "05" varieties (Boussallem, Gtadur, Ouarsenis, Sersou and Waha) were delivered to us by the CCLS of Souk Ahras.

Seeds of the local MBB variety were brought back from the CCLS GUELMA, in addition to the Carioca



variety seed, which has been proven to be very productive in the region, has been provided by one individual along with one of the bottom fertilizers, DAP (Diamonium of Phosphate).

The seeds of the varieties were sown on two (02) preceding different crops: Sorghum and fallow grazing.

The two neighboring plots simultaneously received two different bottom fertilizers, in addition to the DAP already mentioned, Fosfactyl was used.

Experimental apparatus.

For more representativeness and less variability, we opted for a BAC in split plot. The area of each large plot (Sorghum and fallow pastures) is:

700 m^2 x 2 =1400m^2

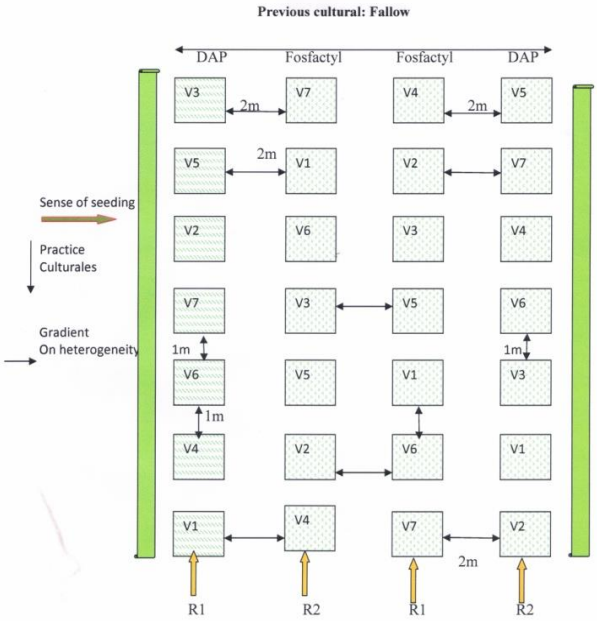


Figure 02: Device of the experimental trial of the previous crop Fallow.

NB : V1 : Boussallem V2 : Carioca V3 : Gtadur V4 : MBB V5 : Ouarsenis V6 : Sersou V7 : Waha

Each variety was represented twice in mini plots with an area of 25m^2. Each mini plot was sown with a dose of 350gr of seeds at the rate of (140kg / ha) arranged on 07 lines. The mini plots were separated by a distance of 01 m.

Conduct of the test

2.4.1. Date of sowing. Planting was carried out respectively on 11 and 12 January 2012 for grazing fallow plot and 15 and 16 January 2012 for the second Sorgho plot.

Phytosanitary treatment: Treatment of the plots by a mixed weedker DIALEN at the rate of 01 liter / ha. Plots were treated with the same herbicide (Dialen super) on 02/05/2012 to reduce interactions of other factors.

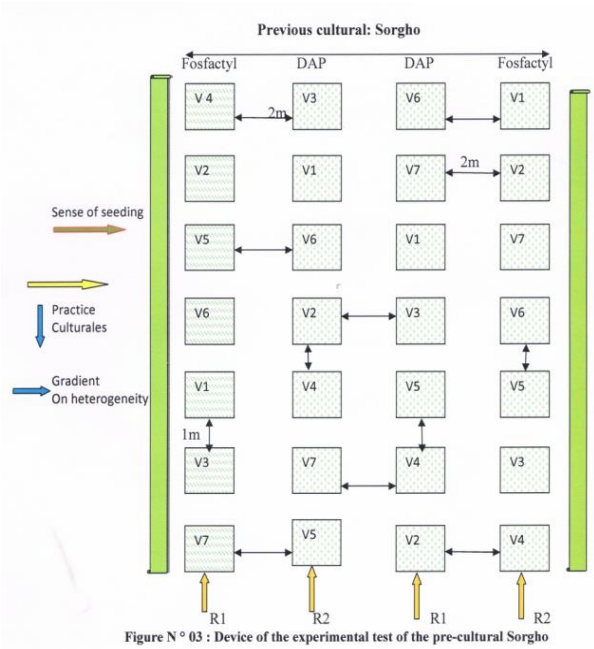


Figure N ° 03 : Device of the experimental test of the pre-cultural Sorgho

NB : V1 : Boussallem V2 : Carioca V3 : Gtadur V4 : MBB V5 : Ouarsenis V6 : Sersou V7 : Waha.

Crops.

The harvest was carried out 180 days after sowing, simultaneously for both plots, allowing us to determine the grain weight of each mini plot.

Table 1: Production of the previous plot crop Grain weight: Fallow pasture

Variety /Weight in grains (kg)	**Preceding cultural – Fertilizer Fallow / DAP**		**Preceding cultural – Fertilizer Fallow / Fosfactyl**		**Preceding cultural – Fertilizer Fallow / Fosfactyl**		**Preceding cultural – Fertilizer Fallow / DAP**	
	V3	2,7	V7	**4,8**	V4	3,2	V5	4,2
	V5	3	V1	**5,9**	V2	**6,9**	V7	3,8
	V7	3,7	V6	4,4	V3	3,2	V4	1,8
	V2	**7,3**	V3	4,9	V5	3,4	V6	**5,2**
	V6	4,1	V5	**6,8**	V1	**6,2**	V3	2,8
	V4	3,8	V2	4,6	V6	**5,8**	V1	**6,3**
	V1	**5,8**	V4	2,2	V7	2,4	V2	**5,9**

Table 2: Production plot preceding crop: Sorghum

Variety /Weight in grains (kg)	**Preceding cultural – Fertilizer Sorghum / Fosfactyl**		**Preceding cultural – Fertilizer Sorghum / DAP**		**Preceding cultural – Fertilizer Sorghum /DAP**		**Preceding cultural – Fertilizer Sorghum / Fosfactyl**	
	V4	**5,9**	V3	4,6	V6	**6,2**	V1	**7,7**
	V2	**8,3**	V1	**6,8**	V7	**5,9**	V5	**5,4**
	V5	**5,4**	V6	**7,3**	V1	**7,9**	V7	**6,2**
	V6	**6,1**	V2	**9**	V3	4,9	V6	**6,5**
	V1	**7,2**	V4	**6,1**	V5	**5,1**	V2	**10,2**
	V3	4,9	V7	**5,1**	V4	**5,1**	V3	**5,1**
	V7	4,4	V5	4,8	V2	**7,4**	V4	4,8

Statistical analysis.

Interpretation of the harvest results was performed using Statistical Analysis System (SAS) software version 9.

RESULTS AND DISCUSSION.

Yield on previous crops.

Table 3: The difference in the grain yields of the previous crops

Alpha			**0.05**
Error Degrees of liberty			26
Critical value of t			2.05553
Smallest significant difference			0.5518
Averages with the same letter Are not very different.			
T Grouping	Average	**Nb**	**Prec Cult**
A	**6.2250**	**28**	Sorghum
B	**4.4679**	**28**	Fallow

Alpha	**0.05**
Error Degrees of liberty	2
Middle Square Error	0.071429
Critical value of t	4.30265
Smallest significant difference	0.3073

The statistical treatment shows the clear difference in the crop on the two preceding crops; In fact, the crop on the previous crop (Sorgho) with an average of 6.22Kg (24.88 qx / ha) was better than that recorded on the previous crop (pasture fallow) with only an average around 4.50 kg (18qx / ha). This difference may be due to a few factors, mainly related to the cultivation of Sorghum, among them: at.

The cultivation period of Sorghum grown in warm weather, lack of precipitation and lack of irrigation prevents nitrogen leaching **(Brisson et al., 2007).** So the mineralization of the soil in full drought does not favor the absorption of all the available nitrogen, which leads to the enrichment of the soil by this mineral.
b. The behavior of sorghum in rotation: It has a greater nitrogen supplement than in the case of maize, the straws of all crops are recycled.
c. The photosynthetic nature of the plant such as corn, sorghum is a C4 plant that allows it to unfold its photosynthetic system and thus its metabolism during dry periods or the tolerance of C3 plants by closing of stomata and decreased absorption, induces side effects **(Brisson et al., 2007).**

Yield with fertilizers.

Table 4: Difference in grain yields with bottom fertilizers

Averages with the same letter Are not very different.			
T Grouping	Average	**Nb**	Fertilizer
A	5.45714	28	Fosfactyl
A			
A	5.23571	28	DAP

Regarding fertilizer, although the grain yield harvest after the use of both fertilizers was almost similar, the plots receiving Fosfactyl recorded a slightly higher crop with an average around 5.50kg (22qx / ha) than that obtained on plots that were fertilized by DAP, although the statistical treatment could not detect a significant difference in the harvest between plots that had been fertilized differently. In the field it was remarkable, the plots with Fosfactyl were better than those with the DAP. This slight difference could be due to the variation in the mineral composition of the two fertilizers. On the one hand, Fosfactyl contains potassium K, in spite of the fact that the wheat has little need for this element. mobile (K + ion) dissolved in intracellular fluid (especially in the vacuole) plays extremely important roles in the plant, such as the maintenance of osmotic pressure in the turgid vacuoles, and in some cases decreases, reducing sweating.

The risk of wilting (**Soltner 2005).** This clearly proves its relation with the hormonal action of ABA (abscisic acid) in tolerance to certain abiotic stresses, such as water deficiency or cold **(Gravot 2009).** On the other hand, Fosfactyl contains sulfur (S) and wheat crops require such an element for good growth **(Mallarino et al., 1999).**

Variety yield.

Table 5: The difference in the yields of the preceding crop: fallow

Alpha		**0.05**	
Error Degrees of liberty		12	
Middle Square Error		1.521429	
Critical value of t		2.17881	
Smallest significant difference		1.9003	
Averages with the same letter Are not very different.			
T Grouping	Average	**Nb**	**variety**

	A		6.1750	4	V2
	A				
	A		6.0500	4	V1
	A				
B	A		4.8750	4	V6
B	A				
B	A	C	4.3500	4	V5
B		C			
B		C	3.6750	4	V7
B		C			
B		C	3.4000	4	V3
		C			
		C	2.7500	4	V4

For the behavior of the varieties we obtained three groups of varieties according to their harvest (weight of their grains).

Group Carioca (V2) and Boussallem (V1), which showed the best weights, especially the Carioca variety with 7.45 Kg (30 qx / ha), could qualify it by variety of very good yields in grains.

Second group: These varieties were followed by Sersou and Ouarsenis with good yields of around 6.72 kg (27 qx / ha) and 5.70 kg (23 qx / ha).

Finally, the other varieties can be classified in the last group (3rd) which showed average yields, Waha, Gtadur and MBB which did not even reach 4.20 kg (17qx / ha).

Difference in yields in the previous crop fallow.

Concerning the behavior of the varieties on each previous crop as well as the influence of the fertilizers on the crops, always announce the same result and which is the low yield in grains recorded on the previous crop fallow and with the same classification of the varieties (in three groups); The best yields at Carioca and Boussallem around 6.1kg (24.40 qx / ha) followed by the Sersou and Ouarsenis varieties with weights of around 4.50 kg (18 qx / ha) and finally the varieties Waha, Gtadur and MBB displayed the weights the weakest grains not even reaching 3kg (12qx / ha).

Table 6: The difference in grain yields of varieties

Alpha				**0.05**
Error Degrees of liberty				**26**
Middle Square Error				**1.008736**
Critical value of t				**2.05553**
Smallest significant difference				**1.0322**
Averages with the same letter Are not very different.				
T Grouping		Average	**Nb**	**variety**
	A	**7.4500**	**8**	**V2**
	A			
B	**A**	**6.7250**	**8**	**V1**
B				
B	**C**	**5.7000**	**8**	**V6**
	C			
D	**C**	**4.7625**	**8**	**V5**
D				
D		**4.5375**	**8**	**V7**
D				
D		**4.1375**	**8**	**V3**
D				
D		**4.1125**	**8**	**V4**

3.5. Difference in yields between fertilizers on fallow.

For the fertilizer the yield with the application of the Fosfactyl slightly exceeds that of the parcel (sorghum) having received the DAP, with 4.60kg (18.40) qx / ha.

Table 7: Difference in yields between fertilizers on: Fallow pasture

Alpha		**0.05**	
Error Degrees of liberty		2	
Middle Square Error		0.228929	
Critical value of t		4.30265	
Smallest significant difference		0.7781	
Averages with the same letter Are not very different.			
T Grouping	Average	**Nb**	Fertilizer
A	4.6214	14	Fosfactyl
A			
A	4.3143	14	DAP

The yield in the pre-crop Sorghum.

Table 08: The difference in the yields of the varieties in the previous crop: Sorghum

Alpha		**0.05**		
Error Degrees of liberty		12		
Middle Square Error		0.547857		
Critical value of t		2.17881		
Smallest significant difference		1.1404		
Averages with the same letter Are not very different.				
T Grouping		Average	**Nb**	**variety**
	A	8.7250	4	V2
	B	7.4000	4	V1
	B			
C	B	6.5250	4	V6
C				
C	D	5.4750	4	V4
C	D			
C	D	5.4000	4	V7
	D			
	D	5.1750	4	V5
	D			
	D	4.8750	4	V3

While the best grain weights were recorded on the previous crop (Sorgho) and still in the Carioca V2 variety, which stands out in a separate group with 8.72 kg (35qx / ha) followed by the 2nd group with the same varieties Boussallem V1 With 7.40 kg (30 qx / ha) and Sersou V6, the third group with average harvests of the same MBB, Waha and Gtadur varieties.

Yields with sorghum fertilizer

Table 9: Differences in yields with sorghum fertilizers

Alpha			**0.05**
Error Degrees of liberty			2
Middle Square Error			0.540357
Critical value of t			4.30265
Smallest significant difference			1.1954
Averages with the same letter Are not very different.			
T Grouping	Average	**Nb**	Fertilizer
A	6.2929	14	Fosfactyl
A			
A	6.1571	14	DAP

Again, the difference between yields does not appear with the application of the two fertilizers but always with the classification of Fosfactyl first with 6.30 kg (25.20 qx / ha) followed by DAP with 6.16 kg (24.64 qx / ha).

CONCLUSION

In order to improve durum wheat in the cereal area at the Yousfi Tayeb Tifech pilot farm (Souk Ahras-Algeria), planting of seven (07) varieties on two previous crops (Grazing Fallow and Sorghum) Of the use of two fertilizers, one potash: Fosfactyl, the other binary (phospho-nitrogen): the DAP led to different crops between varieties and plots. By comparing the average of the grain yields of the varieties, we have deduced the following results:

at.

a. The difference in grain yields on the two preceding crops or the best grain yields were displayed on the previous Sorghum crop.

b. b. No differences in yields were found between the yields of the varieties with the incorporation of the two fertilizers, although the classification of the varieties was better following the fertilization by Fosfactyl, noted both in the set (of the two Previous crops) than within each plot.

c. A clear difference between the grain yields of the varieties, with a sometimes similar behavior towards the influence of the two factors of variation, previous crop and bottom fertilizer, a behavior that can be explained by:

d. The superiority of certain varieties introduced mainly Carioca, followed by Sersou (Simeto) and Ouarsenis (Ofanto).

e. In addition to its superiority, the local variety Boussallem showed a very good regularity in its yield, both on the two plots (previous crops) and in each plot with the implication of the influence of the fertilizer.

f. The introduced varieties Waha, Gtadur and especially the MBB variety showed the lowest grain yields.

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PLEOMORPHIC SARCOMA IN A DOBERMAN PINSCHER DOG

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ABSTRACT

In this report, we describe a case of storiform-pleomorphic type pleomorphic sarcoma in the dorsal region of a 3.5-month-old female Doberman Pinscher dog.

The masses that were initially pea-sized in the dorsal region of the puppy for a while and were growing over time were noticed and all of extirpated and brought to pathology. Macroscopic examination revealed 3 hard masses of 6x5x4 cm, 4x3x2 cm and 3x3x2 cm sized. When the cut surfaces of the masses were examined, the middle region was gelatinous and brownish in color, the edges were gray-white colored and hard in consistency.

Microscopic examination revealed mixed cellular infiltration, mostly composed of oval or polygonal histiocytic cells and fibroblast-like cells, as well as neutrophils, plasma cells, lymphocytes and sometimes eosinophils. Atypia and karyomegaly were evident in the nuclei of histiocytic cells. Multinucleated histiocytes were also detected. Fibroblast-like cells were seen to form a pattern of storiform or cartwheel-like. In some areas, the presence of tumoral foci (patch zone) consisting of fibroblastic and histiocytic cells within the collagen-rich fibrous tissue were noted. Tumor cells showed prominent atypia and many mitoses.

Although this tumor, previously known as malignant fibrous histiocytoma, has four subtypes reported in humans, two types are reported in animals as storiform and giant cell. In this presentation, the diagnosis of storiform-pleomorphic type pleomorphic sarcoma was made considering its histological structure. Tumor is mostly reported in dogs, middle aged and old golden retrievers and rottweilers. In this case, the tumor was seen in a young Doberman therefore it was considered appropriate to be presented.

Keywords: *Pleomorphic sarcoma, doberman, fibrous histiocytoma, storiform type*

DOBERMAN IRKI BİR KÖPEKTE PLEOMORFİK SARKOMA

Özet

Bu sunumda, Doberman ırkı 3,5 aylık dişi bir enikte sırt bölgesinde gelişen storiform-pleomorfik tip pleomorfik sarkoma olgusu tanımlandı. Bir süredir sırt bölgesinde başlangıçta bezelye büyüklüğünde olan ve zamanla büyüyen kitleler farkedilmiş ve total olarak ekstirpe edilerek patolojiye getirilmiştir. Makroskabik incelemede 6x5x4, 4x3x2 ve 3x3x2 cm ebatlarında 3 adet sert kıvamlı kitlenin kesit yüzünün kenarları boz beyaz renkte ve sert kıvamlı, orta kısmı ise jelatinöz görünümde ve kahverengimsi renkteydi.

Mikroskobik incelemede çoğunluğunu oval veya poligonal şekilli histiyositik hücreler ve fibroblast benzeri hücrelerin oluşturduğu, yanı sıra nötrofil, plazma hücreleri, lenfositler ve bazen de eozinofillerin de bulunduğu miksoid infiltrasyon görüldü. Histiyositik hücrelerde nükleer atipi belirgin olup, çekirdeklerde karyomegali vardı. Ayrıca çok çekirdekli histiyositlere de rastlandı. Fibroblast benzeri hücrelerin yer yer girdap yapıları ve araba tekerleği benzeri dizilim gösterdiği, bazı alanlarda kollajenden zengin fibröz doku içerisinde fibroblastik ve histiositik hücrelerden oluşan tümöral odakların bulunması (patch zone) dikkati çekti. Tümör hücrelerinde belirgin atipi ve yaygın mitoza rastlandı.

Önceleri malignant fibröz histiyositom olarak da adlandırılan bu tümörün insanlarda bildirilen 4 alt tipi olmasına rağmen hayvanlarda storiform ve dev hücreli olmak üzere iki tipi bildirilmektedir. Bu sunumda da histolojik yapısı dikaate alınarak storiform-pleomorfik tip pleomorfik sarkoma tanısı konuldu. Evcil hayvanlar içerisinde en çok köpeklerde,orta yaşlı ve yaşlı golden retriewer ve rotwailerlerde görülen bu tümörün, genç bir Dobermanda görülmesi sebebiyle sunulması uygun görülmüştür.

Anahtar kelimeler: *Pleomorphic sarkoma, doberman, fibröz histiositoma, storiform tip*

INTRODUCTION

This tumor, formerly known as malignant fibrous histiocytoma, has also led to the choice of different names such as undifferentiated pleomorphic sarcoma or anaplastic sarcoma with giant cells, considering histological and immunohistochemical properties (Fletcher *et al* 2002, Al-Agha *et al* 2008, Hendrick 2017). The morphology of the cells in the tumor, similar to the anaplastic versions of many other mesenchymal and

histiocytic tumors in animals and humans, makes the definitive diagnosis difficult. Malignant fibrous histiocytoma is divided into subtypes according to the structure of the cell type and the predominant cells. These are storiform - pleomorphic, giant cell, inflammatory, and myxoid type. The first two of these are found in storiform - pleomorphic and giant cell animals (Water *et al* 1994, Hendrick 2017).

This tumor, which is usually seen in the skin and subcutaneous tissues, is common in domestic animals, especially in dogs. This tumor is common in dog breeds Golden Retriever and Rottweiler and middle and old. It usually occurs as a single, large tumor mass in the skin. Sometimes it can be seen as tumoral masses in lungs, lymph nodes, spleen, liver, bones and kidneys. (Do *et al* 2009)

Storiform - pleomorphic type is the most common type seen in the skin and organs of dogs. Fibroblast-like cells of this type have been reported as a cartwheel (storiform), histiocytic cells mixed with these cells and lymphocyte, plasma cell neutrophil and eosinophil infiltrations have been reported. Multinucleated structure, karyomegaly and nuclear atypia are observed in histiocytic cells (Choi 2011, Hendrick 2017).

CASE HISTORY

In this report, we describe a case of storiform-pleomorphic type pleomorphic sarcoma in the dorsal region of a 3.5-month-old female Doberman Pinscher dog.

The masses that were initially pea-sized in the dorsal region of the puppy for a while and were growing over time were noticed and all of extirpated and brought to pathology. Macroscopic examination revealed 3 hard masses of 6x5x4 cm, 4x3x2 cm and 3x3x2 cm sized kitlenin (Fig. 1). When the cut surfaces of the masses were examined, the middle region was gelatinous and brownish in color, the edges were gray-white colored and hard in consistency (Fig. 2).

Figure 1. Tumoral masses.

Figure 2. Cross section of large mass in brown gelatinous appearance

Microscopic examination revealed mixed cellular infiltration, mostly composed of oval or polygonal histiocytic cells and fibroblast-like cells, as well as neutrophils, plasma cells, lymphocytes and sometimes eosinophils (Fig. 3A-B,F).. Atypia and karyomegaly were evident in the nuclei of histiocytic cells (Fig. 3C). Multinucleated histiocytes were also detected (Fig 3D). Fibroblast-like cells were seen to form a pattern of storiform or cartwheel-like (Fig 3F). In some areas, the presence of tumoral foci (patch zone) consisting of

fibroblastic and histiocytic cells within the collagen-rich fibrous tissue were noted (Fig 3E). Tumor cells showed prominent atypia and many mitoses (Fig 3B).

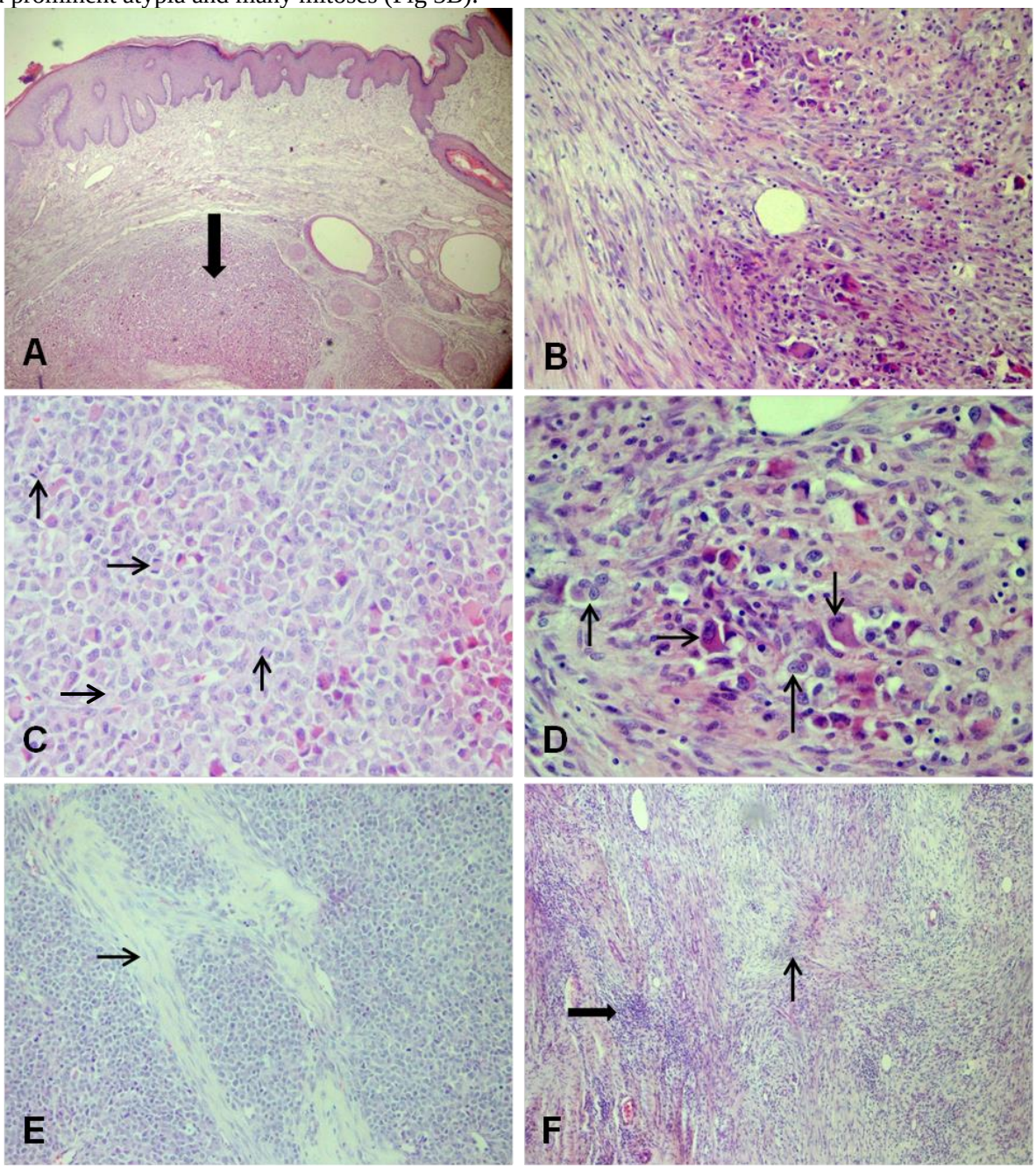

Figure 3. A. Tumor foci in subcutaneous tissue (arrow), H&E, x40. **B.** Myxoid infiltration of oval or polygonal shaped histiocytic cells and fibroblast-like cells, as well as neutrophils, plasma cells, lymphocytes, and sometimes eosinophils, was observed. H&E, x200. **C.** Tumor cells showed significant atypia and multiple mitoses (arrows). H&E, x400. **D.** Evident nuclear atypia in histiocytic cells, karyomegaly in nuclei and bizarre multinucleated histiocytes, H&E, x400. **E.** Tumor foci of histiocytic cells within the fibrous bands (thin arrow). H&E, x400. **F.** Whirlpool and cartwheel (storiform) structure of fibroblast-like cells (thin arrow), mononuclear cell infiltration (thick arrow). H&E, x400.

CONCLUSION

Although this tumor, previously known as malignant fibrous histiocytoma, has four subtypes reported in humans, two types are reported in animals as storiform and giant cell. In this presentation, the diagnosis of storiform-pleomorphic type pleomorphic sarcoma was made considering its histological structure. Tumor is mostly reported in dogs, middle aged and old golden retrievers and rottweilers. In this case, the tumor was seen in a young Doberman therefore it was considered appropriate to be presented.

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A CASE OF ENZOOTIC NASAL ADENOCARCINOMA IN A 13-MONTH-OLD FEMALE GOAT

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ABSTRACT

In this case report, a fatal enzootic nasal adenocarcinoma was described in a 13-month-old female goat. The patient with a history of continuous nasal discharge followed by coughing and wheezing breath, occasional swelling of the nasal and facial region has been reported to die within 1-2 months.

In the necropsy, numerous and variable sized tumor masses with a rough surface and filling the nasal turbines completely and bilaterally were observed. On macroscopic examination of the mass, it was a soft consistency, friable structure and gray-white colored on cut surface.

Microscopic examination revealed both tubular and papillary structures. Tumor cells were generally oval-round shaped and similar in appearance. But pleomorphic cells and a few mitosis were noted in some areas. The increase in pseudostrafied epithelium and spindle-shaped appearance in the nuclei were prominent. Among the tumor cells, mononuclear cell infiltrations, mostly composed of lymphoid cells, were found.

It has been reported that the tumor is usually seen in goats over 2 years of age and rarely encounters in youngs. This case has been encountered in an under 2 years of age (13-month-old) goat. Reports of this tumor are generally in Burdur-Isparta region and rare in other provinces. In this case, the tumor was found in a goat brought from Karaman region. It has been found to appropriate presenting the tumor case because it had the viral etiology and can easily spread to different sites through animal transplants.

Keywords: *Enzootic nasal adenocarcinoma, goat, pathology.*

13 AYLIK DİŞİ BİR KEÇİDE ENZOOTİK NAZAL ADENOKARSİNOM OLGUSU

Özet

Bu vaka sunumunda 13 aylık dişi bir kıl keçisinde ölümle sonuçlanan enzootik nazal adenokarsinom tanımlandı. Sürekli burun akıntısı şikayetiyle başlayan, ilerleyen dönemde öksürük ve hırıltılı solunum ve burun yüz bölgesinde zaman zaman şişkinlikle devam eden ve 1-2 ay içerisinde ölümle sonuçlanan bir hastalık tablosu bildirilmiştir.

Nekropside nazal konhaları bilateral olarak tamamen doldurmuş, bazıları elma büyüklüğünde yüzeyi pürüzlü görünümde çok sayıda tümöral kitlelere rastlandı. Makroskobik incelemede genelde yumuşak kıvamlı, kolay parçalanabilen yapıda, kesit yüzü gri-beyaz renkteydi.

Mikroskobik incelemede hem tubuler hem de papiller yapılar belirgindi. Tümör hücreleri genelde oval yuvarlak yapıda ve birbirine benzer görünümdeydi. Bazı alanlarda pleomorfik hücreler ve az sayıda mitoz dikkati çekti. Psöydostrafied epitellerde artış ve çekirdeklerinde mekik şekilli görünüm belirgindi. Tümör hücreleri arasında çoğunluğu lenfoid hücrelerden oluşan mononükleer hücre ilfiltrasyonlarına rastlandı.

Genellikle 2 yaş üstü hayvanlarda görülen tümöre nadiren de olsa gençlerde de rastlanabileceği bildirilmiş, bu olgu da 13 aylık bir keçide tümöre rastlanmıştır. Bu tümöre ait bildirimler genelde Burdur-Isparta bölgesinde olup diğer illerde fazla bildirilmemiştir. Bu olguda ise tümöre Karaman bölgesinden getirilen keçide rastlanmıştır. Tümörün etiyolojisinin viral olması ve hayvan nakilleriyle kolaylıkla farklı bölgelere yayılabileceğini göstermek için vakanın sunulması uygun bulunmuştur.

Anahtar kelimeler: *Enzootic nasal adenocarcinoma, keçi, patoloji.*

INTRODUCTION

Enzootic intranasal (ENA) tumors of sheep and goats are common all over the world, except in the UK and Australia. The disease is caused by genetically specific retroviruses in the enzootic nasal tumor virus (ENTV) of the betraretrovirus group, which is very similar to sheep jaagsiekte virus (JSRV) genetically. Viral envelope protein triggers tumor formation, but the mechanism of tissue tropism remains unclear (Serpin and Özmen 2016, Wilson 2017).

The disease is usually transmitted through respiration. In experimental studies in sheep, it has been reported that neoplastic tissue homogenates are transmitted by intranasal and intrasinusoidal inoculation and

nasal exudates of naturally infected goats. The disease is usually spread by the addition of infected animals to the herd. (Cohr 1953, De las Heras *et al* 1995). The reports about the disease are mostly found in Isparta and Burdur regions in our country (Oruç 2010, Özmen *et al* 2010, Serpin and Özmen 2016)

Clinically affected sheep and goats have plenty of seromucous nasal discharge, difficulty breathing, wheezing and coughing. The most prominent finding in the herd is continuous nasal discharge. Open mouth breathing, exophthalmos and facial deformity are possible complications. The incidence of affected flocks ranges from 0.1 to 15%. Macroscopically, tumors appear as unilateral or bilateral masses in the ethmoid region, polypoid or conjugated. The tumor is already known to originate from the ethmoid mucosa. Tumor tissue is whitish to pink or even dark red in color and easily friable. Polypoid masses have a papillary or granular surface and are usually covered with mucus (Oruç 2010, Özmen *et al* 2010, Serpin and Özmen 2016, Wilson 2017).

Advanced tumors cause local bone destruction, invade the anterior or maxillary sinuses, and can invade the gingiva and orbit. Rarely, tumor tissue may protrude through the anterior nose or into the nasopharynx. Non-neoplastic nasal polyps adjacent to the neoplastic tissue have been reported for goats (Serpin and Özmen 2016, Wilson 2017).

Histologically, tumors are considered low-grade adenocarcinomas. Although mucinous, tubular and acinar structures are also seen, papillary subtype is common in sheep. Although the tumors in the goats, papillary, tubular or acinar structures are distinct, they are interpreted as well differentiated carcinomas (low grade). There is no significant difference between the types of tumors in sheep and goats (Serpin and Özmen 2016, Wilson 2017). In ENA, the tumor can be observed microscopically in tubular, papillary and mixed forms. Tumor cells are usually uniform, but in some cases atypia can be observed. Mitotic figures are not common. Tumor cells are cubic and sometimes cylindrical in shape, with chromatin having a distinctively large round nuclei. Metastasis and invasion may be observed. Lymphocyte, neutrophil, macrophage and plasma cell infiltrations may be seen in tumor stroma (De Martin *et al* 1997)

Although tumor cells form well-regulated polarized glandular structures, they are considered to be well-differentiated adenocarcinomas due to their infiltrative and destructive properties. No regional lymph nodes or systemic metastases have been reported (Wilson 2017).

CASE HISTORY

In this case report, a fatal enzootic nasal adenocarcinoma was described in a 13-month-old female goat. The patient with a history of continuous nasal discharge followed by coughing and wheezing breath, occasional swelling of the nasal and facial region has been reported to die within 1-2 months.

In the necropsy, numerous and variable sized tumor masses with a rough surface and filling the nasal turbines completely and bilaterally were observed (Fig 1A). On macroscopic examination of the mass, it was a soft consistency, friable structure and gray-white colored on cut surface (Fig 1B).

Microscopic examination revealed both tubular and papillary structures (Fig. 2A-B,D). Tumor cells were generally oval-round shaped and similar in appearance (Fig. 2D). But pleomorphic cells and a few mitosis were noted in some areas (Fig. 2C). The increase in pseudostrafied epithelium and spindle-shaped appearance in the nuclei were prominent (Fig. 2E-F). Among the tumor cells, mononuclear cell infiltrations, mostly composed of lymphoid cells, were found (Fig. 2B)

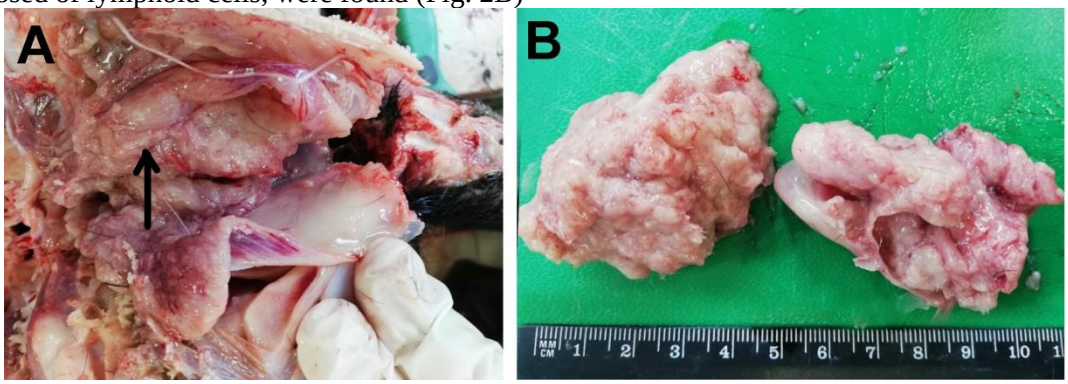

Figure 1. A. Tumoral mass in the concha. B. Rough surface, soft consistency, easily disintegrating tumor masses.

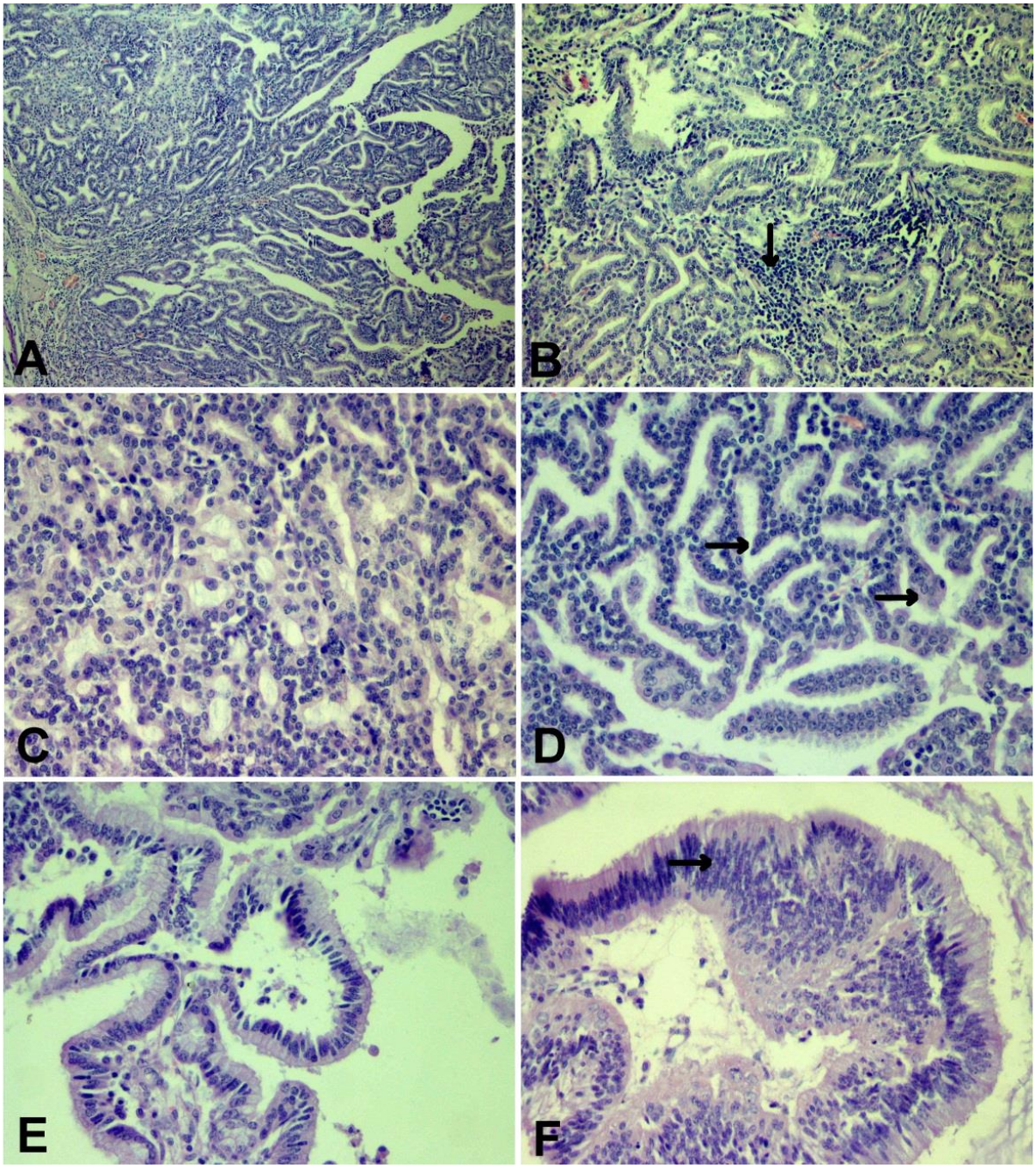

Figure 2. A. ENA overview, tubulopapillary structures, H&E, x100, **B**. Mononuclear cells (arrows)among tubulopapiller structures, H&E, x200, **C.** Pleomorphic tumor cells, H&E, x400, **D.** Oval round shaped and uniform appearance of tumor cells forming tubular and papillary extensions (arrows), H&E, x400, **E-F .** Increased pseudostrafied epithelium and spindle-shaped appearance in nuclei, H&E, x400.

CONCLUSION

It has been reported that the tumor is usually seen in goats over 2 years of age and rarely encounters in youngs. This case has been encountered in an under 2 years of age (13-month-old) goat. Reports of this tumor are generally in Burdur-Isparta region and rare in other provinces. In this case, the tumor was found in a goat brought from Karaman region. It has been found to appropriate presenting the tumor case because it had the viral etiology and can easily spread to different sites through animal transplants.

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VIROLOGICAL INVESTIGATION OF PARVOVIRUS INFECTIONS IN GEESE

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ABSTRACT

Derzys's Disease (DD) that cause high mortality in juvenile goose is one of the most important viral infections of goose. It is etiologically classified in the Dependoparvovirus genus of the Parvoviridae family. Although attenuated live or inactivated vaccines are widely used, it is still epidemiologically exist. In order to effectively control DD, monitoring of maternal antibody levels in young goose is crucial and the test ELISA can be used for this purpose. Affected animals have clinical signs such as fatigue, ataxia and watery diarrhea. In necropsy examinations, pale myocardium, catarrhal enteritis and hemorrhagic lesions in liver and kidney are generally observed. Despite all prophylaxis measures taken against DD, it still poses a significant threat to waterfowl. In this study, spleen, liver and intestinal tissue obtained by necropsy examinations of 9 animals submitted to Selcuk University Faculty of Veterinary Medicine Microbiology Laboratory with symptoms weight loss, dysphagia, bilateral ocular swelling and discharge, diarrhea and weakness were used. All the samples were evaluated by PCR for the presence of etiological agent of DD. As a result, all organ samples taken from 9 young gooses were found positive. Taken together, the infection was thought to be in advanced stage and that is why systemic infections occurredin the birds. To isolate the virus bygoose embryonic egg inoculation is the matter of future work.

***Keywords**: Goose, Parvovirus, PCR*

INTRODUCTION

Goose parvovirus (GPV) infections, also known as Derzsy's Disease (DD), are among the high mortality-infections in offsprings (Takehara et al. 1995). Especially in young animals (under 3 weeks) the mortality rate can reach up to 95% (Syamsiah et al. 2017). They are etiologically classified in the *Dependoparvovirus* gene of the *Parvoviridae* family (ICTV 2018b).

In 1956, Fang first time described Derzsy's Disease. Later, the disease was reported in many countries including the UK, Sweden, Poland, Hungary, Japan, and Taiwan. None of the major goose farms in these countries are GPV-free. Although widespread vaccination programs have been used throughout the world for the last thirty years, it remains epidemiological (Tarasiuk et al. 2019).

The diameter of the virion is 20-22 nm and it consists of 32 capsomeres (Woźniakowski et al. 2009). The GPV genome has single-stranded DNA, is non-enveloped, and it is approximately 5.1 kb long. The replication stage does not require helper viruses in the host cell (Li et al. 2018). The genome contains 2 Open Reading Frames (ORF); the regulatory proteins are on the left and the ORF on the right contains the capsid proteins VP1, VP2 and VP3. Many phylogenetic analyzes of GPV have been performed based on the VP3 gene (Syamsiah et al. 2017).

Clinical findings observed in the affected animals are such as fatigue, ataxia, and watery diarrhea. Although clinical signs such as leg weakness can be observed in infected animals, many cases have been shown to be asymptomatic (Liu et al. 2019). Infected water birds spread the virus mostly with feces and transmit directly and indirectly to other sensitive animals. The virus can be transmitted horizontally and vertically. Contamination of the eggshell can lead to the emergence of infection in disease-free hatcheries (Tarasiuk et al 2019). At the onset of the disease, watery diarrhea, wheezing, and locomotor dysfunction are observed followed by sudden death. Young animals surviving an acute infection have growth retardation and especially red hair on the dorsum. Infection and mortality rates are lower in adult animals, but their reproductive performance after infection is also low (Yu et al 2016). Pale myocardium, catharal enteritis and hemorrhagic lesions in the liver and kidney are observed in necropsy after the death of infected geese.

Although attenuated live or inactive vaccines are widely used in many countries, the causative agent of infection remains epidemiological (Kisary et al 1978). Monitoring maternal antibody levels in young goose is crucial in order for the effective control of Derzsy's Disease. ELISA tests can be used for this monitoring (Tarasiuk et al. 2015). Plaque Test, virus neutralization (VN), agar gel precipitation (AGP) could be performed (Takehera et al 1995, Alexandrov et al 1999). A variety of serological methods such as immunofluorescence

testing (IFA) and Western blot have been used to detect GPV antibodies. IFA and AGP are low-precision methods that detect only high levels of antibodies and do not allow quantitative determination.VN is an effective method, but also time-consuming and labor-intensive since it takes time, the virus must multiply in cell culture, and goose fibroblast cell culture has not been used for many years (Tarasiuk et al 2019). GPV genome can be detected quickly by PCR (Limn et al 1996).

In Turkey so far, there are no epidemiological studies on GPV. The aim of this study was to investigate the Goose parvovirus agent by PCR from the spleen, liver and intestinal tissue of the animals that died after symptoms such as weight loss, dysphagia, bilateral ocular swelling and discharge, diarrhea and weakness.

MATERIAL AND METHOD

Material

Animal Material

In this study, liver, intestine and spleen tissues which were taken from 9 goose cub cadavers who had symptoms of Derzsy's Disease were used. The animals with symptoms weight loss, dysphagia, bilateral ocular swelling and discharge, diarrhea and weakness had been brought to the Selcuk University Veterinary Faculty Department of Microbiology.

Method

Collection of samples

The thoracic and abdominal cavity was opened with the incision starting from the beak edge under sterile conditions for organ sample collection. Following general evaluation and necropsy, intestinal, spleen and liver tissues were ligated and placed in petri dishes. After washing with antibiotic-containing PBS in order to prevent organ deterioration and contamination, the samples were transported on ice to the Virology Laboratory of Selcuk University Veterinary Faculty. Cadavers and other biological wastes were disposed of by appropriate methods.

Homogenization of Tissue Samples and Virus Isolation

Tissue samples were homogenized mechanically with one organ sample from one animal at a time. For this purpose, unwanted biological materials around the organ were removed and it was washed with PBS solution containing antibiotics and antifungals. After mechanical homogenization, the homogenate was diluted 1/10 with antibiotic- PBS solution and mixed for 10 minutes in a vortex. After the procedure, the samples were centrifuged at 3000 rpm for 10 minutes (Eppendorf Centrifuge 5810 R) to remove the supernatant which was then passed through a filter having a pore diameter of 0.22 µm with the help of a syringe and stored in sterile tubes at -20 °C.

DNA Extraction

Frozen supernatant samples, after contamination control,were treated with commercial DNA extraction kit (QIAGEN DNeasy Blood & Tissue Kit 250 Cat.No. 69506) to extract DNA according to the manufacturer protocol.

Polymerase Chain Reaction (PCR)

The conventional PCR method was used for the detection of goose parvovirus. Commercially synthesized Goose parvovirus VP3 gene region-specific primers (GPV F 5'-CCGGATCCATGGCAGAGGGAGGAGGC-3' ve GPV R 5'–GCGCTCGAGTTACAGATT TTGAGTTAG-3') were used (Shao et al. 2015).

PCR mix (1 µl dNTP (10mM), 2.5 µl MgCL (25mM), 2 µlFP, 2 µl RP, 1.5 µl tag polymerase, 31 µl nuclease-free distilled water) and 5 µl DNA samples were used. In a thermal cycler device (BIO-RAD T100), 5 minutes preheating at 95ºC, 94ºC 1 minute, 52ºC 1 minute 72ºC 2 minutes and 30 cycles of reaction protocol was performed.

The PCR products obtained were run on a 1.5% agarose gel with EtBr and imaged on the gel imaging system (Genline Image SCI).

RESULT

Extracted DNA samples were analyzed for GPV by looking at VP3 region. A total of 27 samples (100%) of 9 animals were positive for GPV (Figure 1).

Figure 1: PCR gel electrophoresis images of tissue samples. Samples showing 1605bp band were accepted as positive. M: 1kb DNA Marker, S: Spleen, L: Liver, I: Intestinal Tissue , + : Positive control, - : Negative control

DISCUSSION

Deaths or loss of productivity due to acute or chronic diseases that are largely incurable for the treatment of viruses by poultry remain a global economic threat both in animal health and in the poultry sector. Poultry sector includes chicken, turkey, goose, and ducks and these animals are kept mainly for meat and eggs in the world as well as in Turkey. Although the geese and ducks breeding has an important economic position in many countries in the world, thepoultry sector in Turkey relies on chicken at 99% level in 2017while the 1% section of poultry consists of geese, ducks, and other poultry such as quail (TAGEM 2018b).

The rapid growth of the poultry sector is increasing investments in goose and duck breeding. One of the most important problems in the poultry sector is viral infections. Goose parvovirus infection is a highly contagious viral disease with a mortality rate of almost 100%, especially when it affects young animals of geese and Muscovy ducks. It has been reported in many duck and goose breeding countries in Europe, Asia and the USA (Mulqueen et al. 2012).

Turkey, in terms of wetlands, is known to be one of the most important countries in the Europe and Middle East and is located on the migration route of birds. Ducks and geese of the Anatidae family use these migration routes (Gündoğdu 2013). Located in the middle of the migration route Turkey is potentially at risk for a variety of viral infections such as avian GPV.

Due to very small numbers of geese and ducks in Turkey, investigation on viral diseases is limited and this study focuses on epidemiological data collected. Yang et al (2009) reported that spleen, liver, bursa fabricus, thymus, and harder glands contain GPV in an experimental study. The presence of the disease was investigated in this study in the spleen, intestine and liver samples obtained from the necropsy of 9 dead geese brought to Selçuk University Faculty of Veterinary Medicine Microbiology Laboratory. These geese had symptoms as weight loss, dysphagia, bilateral ocular swelling and discharge, diarrhea and weakness. Samples were analyzed in the Virology laboratory. In this study, the presence of GPV VP3 region known to be related to immunogenicity was evaluated by PCR method. All organ samples taken from 9 goose hatchlings were positive. Limn et al (1996), in a study of 3-day old Muscovy duck offspring, induced experimental GPV infection, collected liver, spleen, lung, kidney, intestine, brain, heart muscle, and striated muscle 2,4,6 and 8 days following the infection, and performed PCR analysis from bone marrow and bursa fabricius tissue samples. They reported that all organ samples were positive for GPV starting from day 4. When the results obtained in this study were evaluated, we concluded that the infection was at advanced stage and therefore systemic infection had already occurred.

In the diagnosis of GPV, tests such as virus neutralization, immunofluorescence, and agar gel precipitation may also be used (Yang et al. 2009), however, PCR can be used to diagnose the virus faster more specifically and precisely without virus isolation.

This study is the first to demonstrate the presence of the GPV in the goose in Turkey. It is highly likely that the source of identified infection was wild birds. Contact between wild birds and breeding animals in the pasture may allow the agent to pass to the egg in a vertical way. Egg transfer between enterprises can also be important in spreading the infection. In addition, there is mechanical contamination through the employees (Jansson et al. 2007). Currently, treatment of GPV is not possible, but prophylaxis includes attenuated live

vaccine or inactivated vaccines. Parvovirus infections of waterfowl require a consistent and effective vaccination strategy (Palya 2010). There is no official immunization program in Turkey. Since geese and ducks breeding in Turkey is generally made in conventional extensive methods (TAGEM 2018a), infection can spread quickly among farms.

Unlike other birds, geese are known to be resistant to harsh weather conditions and disease (Boz et al. 2014). Demir et al (2013), in a study that investigated geese breeding in Turkey, reported that breeders give vitamins and minerals to increase the body resistance in chicks and also documented medicinal preparations given when they are sick. The breeders stated that this type of drug application is due to the high mortality rate of goose chicks in the region.

The GPV infection is likely to have appeared in Turkey in the past based on the facts and previous researches. GPV is a viral disease that is important for the economy of goose and duck breeding and is also a potential risk factor for animal breeding.Therefore, samples to be collected from the wild geese and farms in Turkey will help to map the prevalence of the infection. It is also clear that the phylogenetic analysis of the collected positive samples will give us more detailed information on the subject. In light of this information, our prospective studies are planned to perform sequence analysis and to develop rapid diagnostic methods with LAMP, RPA, and PCR.

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PATTERN OF FARM LAND USE ON CROP DIVERSIFICATION IN IDO LOCAL GOVERNMENT AREA OYO STATE, NIGERIA

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ABSTRACT

The study examined the pattern of farmers land use on crop diversification in Ido Local Government Area of Oyo State. Multistage sampling technique was used to sample eighty (80) crop famers in the study area, with the aid of a well structured questionnaire and analysed using descriptive percentage, mean, frequency count and inferential statistic. The result showed that 73.8% of the crop farmers were male with mean age of 49.8 years, 83.7% were married with mean family size of 8 persons, and 43.8% of the farmers had one form of formal education, 60% used hired labour for their farm operation with minimum labour cost of ₦ 1000- ₦ 10000 on daily basis. 67.5% source their farm land through hired/rent and 61.2% source their capital through personal saving, 62.5% of them acquired information through radio and television. 93.7% of the farmer cultivated farm size less than 5 hectare with mean farming experience of 16.01years, 45% practice four cropping combination, which showed the extend of crop diversification among farmer in the study area. It was also revealed that 58.7% realize income of ₦ 80,000- ₦ 200,000, from their farm output per season, 75% of the crop farmer used inorganic fertilizer. The major dominant of crop in the area was cassava (91.3%), maize (86.3%) and vegetables (48.8%) different species, which may be inter/mixed cropping. The major land management practices adopted by the farmer in the study area were, manual method of land clearing (95%), Inorganic fertilizer (67.5%), improve varieties of crop specie(65%), crop rotation (61.2%) and cover cropping(21.3%), while 72% apply chemical for weeding. The major problem of farmer on the land use on crop diversification, are basically land tenure, pest infestation among others. It was therefore concluded that there should be good land tenure system, farmer should be encouraged to adopt organic input method of farming, effort should be made by extension workers and research institute to the need of orientating and organizing organic farming system training program in other to improve soil fertility through combination of leguminous based cropping system should be encouraged in the study area.

Keywords*: Farmland, Crop, Diversification, Pattern, Determinants, Oyo State Nigeria*

INTRODUCTION

Land as part of the earth surface that is not covered by water, MichaelAllaby, Chras (2013), with no cost, but as an input and factor of production, and as a natural resource is a critical input in agriculture production. The critically is imposed by it availability, accessibility, quality and quantity. Land use is the total arrangement or input activities of human on certain land cover in other to produce and obtain benefit; it depends largely on the topographic, condition and fertility of the land area. The land use management practice had had a major impact on natural resources including water, soil, nutrient, plants and animals.

According to Fabiyi (1990), land to a farmer is home and work which involve Nigerian agriculture, the quality factors of land stand out as major determinant of agricultural productivity. Raufu and Adetunji (2012) Apart from this, land is the major resources for live-hood of the poor in Nigeria, different communities in their effort to obtain maximum return from their land, Farming systems contribute tremendously to the growth of economic sector of the country. Cropping pattern are the product of the decision of farmer operating a farming system, (Fresco 1996) while farming activities is carried out on the piece of land such as crops, live – stock, processing and marketing, which interact because of the joint use of inputs they receive from the environment and delivery of output to the environment, by having a common objective of satisfying the farmers' aims and the community at large, it can be identify by it predominant functional unit, hence a yam based system is a system in which yam production is the predominant among several other, these can be characterized by the fertility management, shifting cultivation, rotational bush fallow, of the farming system.

Crops diversification is a cheaper way of overcoming income uncertainties caused by market Conditions as well as Climate changes (Joshi *et al.*, 2005). On the other hand crop diversification, Also increase soil fertility and brings yield stability in crop production (Lin, 2011), this could only be utilized if there are enough resources, heterogeneity in the soil to support different crops at a time, the success of crop diversification depends upon the skills of handling a diversified farmland (Jill and Erin, 2005). The cultivation and

combination of more than one crop in a certain area in form of rotation or intercropping at any given time is term crop diversification, (Makate *et al.,* 2016).

Land has always been at the centre of struggles because of the opportunity cost of alternative uses. Nigeria largely remained an agrarian economy since a high percentage of the labour force continues to engage in agricultural production (Adefila, 2014). The sector however remains labour intensive and this explains in part the reason for downward trend in productivity.

In Nigeria, the distance of farmlands and types of crops grown are of importance in the type of pattern of agricultural land use that emerges. However, a lot of problems affect agricultural land use pattern. Pressure on nearby farmlands as a result of increasing demand for land by non-professional farmers such as teachers, clerical workers and also the aged farmers had led to small holding and shorter fallow period, (Adelana Ojo-atere1997, Aromolaran 1998, Agbonlahor *et al.,* 2003, Bamire 2003, Oyekale 2007).

Crop diversification is self-motivated low-cost protective measure against certain risks to decrease income invariability. It is indeed very difficult for the small farmers to improve their earnings only by raising the yields of the existing crops, mainly cereals. Thus, the high-value crops being more labour intensive usually provide stable employment and income to a large section of the rural households who face the severe problem of seasonal unemployment and underemployment under the mono-crop economy (De and Chattopadhyay, 2010).

The need for increase food production call for knowing socio-economic characteristic of farmers, in term of physical input as well as highlighting the farmer pattern of land use and crop diversification, poor farming practices, mainly those of continuous cropping with few external inputs, have gradually led to the depletion of soil fertility in smallholder systems. It was for this reasons that the following objectives were considered

- describe the socio-economic characteristic of the farmers in the study area.
- highlight the type of crop combination practiced by farmers in the study area.
- examine the type of land management adopted in the study area.
- examine the problems to the pattern of land use in the study area .
- analyse the determinant of land management use diversification.

Study Area

The study was carried out in Ido-local government area of Oyo state, Nigeria. This was between Latitude 7.506780 and Longitude 3.711860. Ido- local government area of Oyo state was an area of 986km^2 and a population of 103,261 using a growth rate of 3.2% from 2006 census; it is located between 7^0 N 9 and 3^0 E 5, The Government was created during the second republic on May 29, 1989 with the administrative headquarter located at Ido and it shares boundary with Oluyole Local Government, Ibarapa East Local Government, Akinyele Local Government, Ibadan North West Local Government, Ibadan South west Local Government, Ibadan North Local Government areas of Oyo state and Odeda local Government in Ogun state.

Like most cities in Southern Nigeria, Ido is characterized by two distinct seasons: the dry and the rainy season. It enjoy rainfall of between 1250mm and 1800mm, temperature ranges between 27^0C and 32^0C with relative humidity of about 75% and 70%, annually Ido Local Government covers the area spanning Apata, Ijokodo, Omi-Adio, Akufo and Apete. The council formerly has six wards, which had been sub-divided to ten wards for easy exercise of franchise. The people are predominantly Yoruba's, scribe of various parts the area is blessed with fertile land, which is suitable for agriculture. The soil fertility has enhanced the production of Cocoa, Oil palm, Maize, Cassava, Cocoyam, Yam, Kola nut and Vegetables. The people of Ido are mainly small scale farmers with significant proportion of the farmers engaging in secondary occupation such as hunting, trading, artisan, civil service.

Sampling procedure and Data collection

The data for this research was collected in form questionnaire thereby increasing and aid in deducing the true information. The population of the study consist of mainly crop farmers in the study area, A multiage sampling technique was employ in selecting farmers respectively in study area. The first stage consist of selecting four wards in the local government area namely ward Ido, Apata, Omi- adio, and Bakatari were intentionally selected due to crop farmers available in the areas. Second stage involved random selection of two villages from each selected ward, which are: Alako, Idi-iya, Oke-siba, power-line Omi-adio, Lade-owo, Aba-tisa, Bakatari-eleso. The last stage involved random selection of 10 farmers from each village, which were determined by the probability of the household, thereby making a total of 80 respondents for the study.

Data Analysis

Data collected were analyzed using descriptive statistics such as distribution tables, frequency, percentage, mean and inferential statistics to analyze the data collected for the study.

The regression analysis was applied with the following implicit relationship to analyze the determinant of land management use diversification.

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7 + U)$
Y= Pattern of land use (Crop diversification)
X_1= Age of farmer
X_2= Gender
X_3= Educational level
X_4= Farming experience (year)
X_5= Farm size (Hectare)
X_6= Source of farm
X_7= Source of capital
b=parameter estimated
u= error term

RESULTS AND DISCUSSION

Table 1a: Socio- Economic Characteristics of the Respondents in the Study Area

Variable	Frequency (N=80)	Percentage (%)	Mean
Gender			
Female	21	26.2	
Male	59	73.8	
Age			
30- 40	23	28.75	
41-50	23	28.75	
51-60	26	32.50	
61 and above	8	10.00	49.7
Educational level			
No former education	14	17.5	
Primary education	35	43.7	
Secondary education	21	26.2	
Tertiary education	5	6.3	
Adult	5	6.3	
Marital status			
Single	6	7.5	
Married	67	83.7	
Separated	4	5.0	
Widow/Widower	3	3.8	
Family size			
1-5	21	26.3	
6-10	46	57.5	
11-15	7	8.7	
16-20	6	7.5	
Source of labour			
Hired	48	60.0	
Family	6	7.5	
Both	26	32.5	
Labour cost (~~₦~~)			
1000-10000	37	46.2	
12000-50000	25	31.3	
120000and above	14	17.5	
None	4	5.0	45082.89

Secondary occupation		
No	26	32.5
Yes	54	67.5
Source of land		
Hired/ rented	54	67.5
Purchase	7	8.7
Inherited	12	15.0
Government	1	1.3
Gift	6	7.5
Mode of information		
No access to information	12	15.0
Radio/Television	50	62.5
Extension agent	1	1.3
Other farmer	8	10.0
Internet	1	1.3
Research institute	8	10.0

Source: Field Survey, 2018

Table 1b: Socio- Economic Characteristic of the Respondent's continued

Variable	Frequency (N=80)	Percentage (%)	Mean
Belonging to association			
Do not belong	53	66.3	
Belong	27	33.7	
Adequacy of Labor			
Very adequate	23	28.7	
Moderately	54	67.5	
Inadequate	3	3.8	
Farming Experience (year)			
1-10	41	51.2	
11-20	20	25.0	
21-30	11	13.8	
31 and above	8	10.0	16.01
Source of credit			
Bank loan	2	2.5	
Cooperative	28	35.0	
Personal savings	49	61.2	
Government	1	1.3	
Cropping system			
Mixed cropping	41	51.2	
Continual cropping	9	11.3	
Land rotation	20	25.0	
Shifting cultivation	10	12.5	
Type of fertilizer			
Inorganic fertilizer	60	75.0	
Organic	20	25.0	
Quantity of fertilizer (Kg)			
None	22	27.5	
1-10	21	26.2	
11-20	5	6.3	
50-400	32	40.0	62.67
Amount of fertilizer (₦)			
None	21	26.3	
100-1000	14	17.7	
2000-10000	24	30.3	
11000-20000	12	15.1	

21000-30000	6	7.7	
31000 and above	3	3.8	9830.51
Extension agent visit			
Do not have contact	63	78.8	
Had contact	17	21.3	
Water source on farm			
Irrigation system	7	8.7	
Rain	73	91.3	
Output / season of the farmer			
80000-200000	47	58.7	
250000-400000	20	25.0	
460000 and above	13	16.3	
Farm size (hectare)			
Small size 0.10-4.99	75	93.75	
Large size 5.0-10.0	5	6.25	

Source: Field Survey, 2018.

Table 1a and b, Present the socio-economic characteristic of the respondent in the study area; it revealed that 26.2 % of the respondents were female while 73.8% are male. This shows that majority of the farmers in the study area were male, 28.7% were between the age of 30 and 40 years, while 30 % of them were between 51-60 years old, with the mean age of 49.8 Years, this shows that majority of the farmers are within the active stage of working age, 17.5% of the farmer had no formal education, 26.3% had secondary education, 26.3% had tertiary education, 6.3% of them had adult education, while 43.8% of the crop farmer had primary education, This implies that majority of the farmer could not go beyond Secondary education. However majority of them had one form of formal education, education cannot be over emphasis in development and production of agricultural system, 83.7% of the farmer were married, 7.5% were single, 3.8% widower/widow, 5.0% of them farm were separated, this shows that majority of the farmer are married, this is in with Mesfin *et al.,* (2011) statement about agricultural practice among the married people. 26.3% had family size of 1-5 household, 57.5% had family size of 6-10 house hold, and 8.7 % had family size of 11-15 household, while 7.5% had family size of 16-20 household, with mean household size of 8 persons which is fairly large and may be used as family labour. 60% used hired labour, 7.5% used family labour, while 32.5% used both the family and hired labour for their farming operation indicating that the farming system practiced by the farmers is labour intensive, labour cost vary in term of payment most worker are paid daily, monthly and yearly. 46.2% of the worker were paid ₦1000-₦ 10000, which implies that workers in this range obtain daily payee, 31.3% were paid ₦12000-₦50000, which are likely to be monthly payee, while 17.5% were paid ₦120000 yearly payee, while 5% of the farmer did not pay labour, this may be due to the use of family labour only, 67.5% crop farmer are off farm, they are having secondary occupation apart from farming, while 32.5% of the farmer are full time farmer, 15.0% of farmer source their farm land through inheritance,8.7% through purchase, 7.5% through gift, 1.3% source through government, and 67.5% source through hired/rented which may not enhance crop diversification practices. Buyinza (2009) noted th land fragmentation result in small holder farmer to depend less on farming.

This revealed that majority of farmer acquire their farm land through hired/rented source, 62.5% of the farmer source information through radio and television, 1.3% source through extension agent, 10% through fellow or experience farmers, also 10% source through Research institute like (IAR&T and NIHORT). Only 1.3% source information from internet, while 15% had no access to information, this show that majority of the farmer source information on use of land on crop diversification was radio and television this implies that knowledge towards the use of land on crop diversification as bring about early majority of diversifying crops, while farmers do not have adequate contract with extension agent in the study area, information and awareness is not effectively created among farmers about improved Agricultural technologies for adoption, this is in line with the work of Agbamu (2006) that information is the first and Indispensable step of an adoption process.

The study further explain that 66.3% of the farmers belongs to farmer association while 33.7% does not belong to any association, labour used on the farm land were moderately adequate at 67.5%, 28.7% very adequate, while 3.8% are inadequate, the result reveals that 51.2 % of the crop farmer had farming experience of 1-10 years, 25% and 13.8% had farming between 11-20 years and 21-30 years respectively, while 10% of the respondent had 31 years and above farming experience, 16.01% mean value of the farming experience show the farmers had long years of farming experience which can also be use by farmer in method diversifying

cropping pattern, this is in line with the work of (Hasam, 1996). 2.5% source their capital through bank loan, 1.3% the crop farmer source capital through government, while 61.2% and 35% source capital through their personal savings and cooperative respectively. This revealed that majority of farmer in the study area depend on their personal savings for capital which may therefore not be enough to improved the efficiency of the output, the study further revealed that 35% of the crop farmers were practicing mixed cropping in other to improve the yield and varieties of crop, 11.3% practice continuous cropping system, while 25% and 28.7% were practicing land rotation and shifting cultivation respectively, 75% of the crop farmer uses inorganic fertilizer to improve the soil nutrient since the soil is in use continually. While 25% depend on organic fertilizer for their soil improvement. 26.2% of the crop farmer used 1-10 (kg) of fertilizer, 6.3% and 40% uses 11-20 (kg) and 50-400(kg) quantity of fertilizer respectively, while 27.5% does not use fertilizer, having the mean of 62.67 shows that most of the farmer depend on inorganic fertilizer in large amount Pasquini *et al*., (2015) to improve their soil nutrient, the amount of purchasing fertilizer varies depending on size of the farm land, 17.7% purchase 100-1000(₦), 30.3% and 15.1% of the respondent purchase fertilizer amounting to 2000-10000(₦), and 11,000-20,000(₦), respectively, while 7.7% and 3.8% purchase 21,000-30,000(₦), and 31,000(₦), above, 26.3% does not purchase fertilizer. The mean value of the respondent purchasing fertilizer is 9830.51%, 21.3% of the respondent are having contact with visit of the extension agent, while 78.8% did not, this implies that crop farmer in the study area did not have contact with the extension agent, 91.3% of the farmer wait for rain for their source of irrigation while only 8.8% of farmer in the study area used irrigation system of supplying water to the farmer, 58.7% of the farmer earn 80,000-200,000(₦) output/season, 25.0% earn 250,000-400,000(₦) output/season, while 16.3% earn 460,000 and above, 93.75% of the respondent cultivated farm less than 5 hectare, while only 6.25% of the respondent cultivated farm size between 5.0-10.0 hectares, small size of the farm land is as a result by which land is availablsse to farmer in the study area. (Brown, 2005) Bamire and Manyaga (2003) also attributed the decline to population growth and the consequent pressure from completing demand for land over times; which have resulted in cultivable land being withdrawn from its traditional agricultural uses, reduction in land man ratio and average size of farmland.

Table 2: Crop combinations practiced by the respondent on pattern of land used.

Variable	Frequency (N=80)	Percentage (%)
Sole cropping	0	0.0
Two cropping combination	5	6.3
Three cropping combination	29	36.3
Four cropping combination	36	45.0
Five cropping combination	10	12.5

Source: Field survey, 2018.

Table 2 Shows the type of crop diversification combination practiced by respondent in the study, it was revealed that 6.3% of the farmer practiced two cropping combination, 36.3% practiced three cropping combination, four cropping combination were practiced by 45% of the farmer, while 12.5% practiced five cropping combination, this implies that majority (100%) of the farmer practice more than one cropping combination however, majority of them 45.0% and 36.3% practiced four cropping and three cropping combination, which shows the extent to which crop diversification is been practiced by the farmers, this is in line with work of Raufu and Adetunji (2012). Small scale farmer depending on small piece of land practice continuous farming and having no alternative sources of employment and income Oyekale (2007) due to increasing or continual growth of population would always try to produce the maximum output on their farm land by cultivating as many crops as possible in other to meet their various needs.

Table 3: Type of crop diversification practiced by the respondent on the pattern of land used

Variable	Frequency (N=80)	Percentage (%)
Crops		
Potato	2	2.5
Cassava	73	91.3
Maize	69	86.3
Yam	32	40.0
Cowpea	5	6.3
Pepper	23	28.7

Okra	2	2.5
Plantain	6	7.5
Groundnut	4	5.0
Cocoyam	14	17.5
Vegetable	39	48.8
Tomato	15	18.8
Melon	6	7.5
Rice	1	1.3
Pineapple	1	1.3

Source: Field survey, 2018.

Table 3, shows the different type of crops been diversified and cultivated by the farmer in the study area. 2.5% of the respondent cultivated potatoes, 91.3% planted cassava, maize was cultivated by 86.3%, 40% plant yam, only 6.3% planted cowpea, 28.7% planted pepper, 2.5% pant okra, 7.5% planted plantain, groundnut was planted by 5.0%, 17.5% of the crop farmer planted cocoyam, 48.8% planted vegetables, 18.8% planted tomato,7.5% planted melon, while 1.3and 1.3 planted rice and pineapple respectively.

This implies that majority of crop farmer plant cassava, maize, and vegetable in high amount, with prominent crop combination as maize/cassava, maize/cassava/yam are the commonest crop grown in the study area.

Table 4: Land management practices adopted by the respondents

Variable	**Frequency (N=80)**	**Percentage (%)**
Manual clearing		
Not adopted	4	5.0
Adopted	76	95.0
Mechanical clearing		
Not adopted	60	75.0
Adopted	20	25.0
Fertilizer application		
Not adopted	26	32.5
Adopted	54	67.5
Improved varieties		
Not adopted	28	35.0
Adopted	52	65.0
Crop rotation		
Not adopted	31	38.8
Adopted	49	61.2
Bush fallow		
Not adopted	40	50.0
Adopted	40	50.0
Planting of cover crop		
Not adopted	63	78.7
Adopted	17	21.3
Application of spacing		
Not adopted	5	6.3
Adopted	75	93.7
Ploughing and ridging		
Not adopted	6	7.5
Adopted	74	92.5
Application of pesticide and insecticide		
Not	20	25.0
Adopted	60	75.0
Planting time		
Not adopted	3	3.8
Adopted	77	96.2

Chemical for weed		
Not adopted	22	27.5
Adopted	58	72.5

Source: Field survey, 2018.

Table 4 shows the type of land management practices adopted by the farmers in the study area, it revealed that 95.0% of the farmer adopted manual method of land management system, this explain that majority of the farmer in the study area only depend on the manual method of farming activities, this could be due to the cultural norms, of the farmer in the study area.67.5% the use of fertilizer, in their believe to improve the soil fertility before planting, 65% of the farmer adopted the use of improve varieties, 61.2% adopted the practice of crop rotation, 50% practices bush fallow, while 21.3% adopted the cultivation of cover crop, 93.7% adopted spacing, 92.5% adopted ploughing and ridging, 75% adopted the application of insecticide and pesticide, 96.2 % of the crop farmer observed the planting time, while 72.5% apply chemical for weeding.

Table 5: Problems faced by the respondent on pattern of land used

Variable	**Frequency (N=80)**	**Percentage (%)**
Problem		
Topography of land	3	3.8
No credit facilities	4	5.0
Inadequate storage facilities	2	2.5
Inadequate rainfall and weather	8	10.0
High cost of rent and machinery	6	7.5
Infestation of pest and disease	34	42.5
Lack of soil nutrient	5	6.3
High cost of input (insecticide, fertilizer)	6	7.5
Loss of land to building	7	8.6
Low return and yield of crop	5	6.3

Source: Field Survey, 2018.

Table 5, explains the problems encounter on pattern of land use on crop diversification by respondent in the study area. It was revealed that 3.8% of the crop farmer are likely to experience unfavorable topography of farm land, 5.0% of the farmer have no access to credit facilities which can help in enhancing and improving the farming system, 2.5% have no adequate storage facilities for storing their farm produce thereby causing reduction in output, the study further revealed that only 10% of the respondent experience drought, 7.5% of high cost of machinery, crop farmer having large farmland were unable to improve their farming due to the high cost of machinery. 42.5% of the respondent was facing the challenges of diseases and pest infestation on their farm land, 6.3% of farmer experience lack of soil nutrient; this can be due to continuous use of farmland, 7.5% of famer are unable to purchase some farm input like insecticide, pesticide and fertilizer due to high cost, 2.5% of farmer experience loss of farm land to building, 6.3% farmer experience low return from the land. Ashfaq *et al*., (2008); Mesfin *et al*., (2011) also found that presence of own agricultural equipment such as tractor increases the probability of crop diversification.

Table 6: Determinant of Land Management Use diversification

Variable	**Beta**	**Standard Error**	**T-Value**
Constant	3.870	0.490	7.893
Age (X_1)	-0.023***	0.009	-2.549
Gender (X_2)	0.447**	0.220	2.032
Educational (X_3)	0.023	0.085	0.271
Farming Experience (X_4)	0.018**	0.009	2.042
Farm Size (X_5)	0.258***	0.056	4.573
Source of farm land (X_6)	0.070	0.064	1.097
Source of Capital (X_7)	-0.107	0.08	-1.209
R^2	0.40		

Source: Authors Computation, 2018.
Note: (**) and (***) mean significant of 5% and 1% respectively.

The Regression table 6 of the determinant of land management use diversification revealed that farmer experience and gender were significant at 5% and has a positive relationship to the pattern of land use diversification. This implies that the more the year of experience and increase in male gender in the study area. The likelihood that land use diversification will be enhanced through the cropping system of more than three cropping combinations, farm size used by farmer was significant at 1% and positively signed, this shows that the more the farm size used or expand in cropping the better the crop diversification will be enhance by the farmer, through the practice of two to four cropping combinations, also Age of farmers was signed at 1% and negatively signed, this shows that, the more aged the farmer becomes the less the land use diversification on cropping system will be enhance, this could be due to the aging or old age of the farmers to be able to combine various cropping combination of about two to four crops together, because of the intensive labour that could be involved.

R^2 was 0.40% indicating that the model specified can only explain 40% in the combination of variable used; while 60% can be explain by the error term.

How ever, it was however concluded that Age of farmers, Gender, Year of farming experience and farm size were the major determinants of pattern of land use diversification on cropping system in the study area.

It was therefore recommended that:

- Government should also seek to the provision and availability of land and it policy among farmers.
- Farmer should therefore be encouraged to practices organic manure farming system and the appropriate use of land in cropping combination system, the planting of legume crops with other crop which will modify and enhance the soil fertility.
- An Effort should be made by the government to encourage the visit of the extensions agent in the study area in other to disseminate to the farmer on current issue related to adaptation of land use and diversification of crop.
- Successful farmer should organize themselves in group and put resources together for the purchase of mechanical implement for the enhancement of land management practices.

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EFFECT OF DIFFERENT ROOTSTOCK FOR HIGHER EGGPLANT PRODUCTION

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ABSTRACT

A field experiment was conducted at Olericulture Division, Horticulture Research Center (HRC) of Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh, during the period from September 2018 to April 2019 to study the effect of different rootstock for higher eggplant production. Among the five treatments, it could be concluded that eggplant can be grafted on four rootstocks viz., BARI Begun-8 (BB8), EG203, S. sisymbriifolium (SS), F_1 (21x11) with desired scions- BARI Begun-5. In case of important yield and yield contributing characters viz., average fruit weight, fruit yield/ plant, fruit length and fruit width showed better performances when BB5 was grafted onto BB5/BB8 [186.67 g, 3.92 kg/ plant, 10.37 cm, 8.20 cm] and BB5/F_1 (21x11) [186.67 g, 3.98 kg/ plant, 10.17 cm, 7.90 cm]. Among the 4 grafted treatments, BB5/F_1 (21x11) (51.70 t/ha), BB5/BB8 (50.96 t/ha) and BB5/EG203 (45.61 t/ha) produced more than 45 t/ha. So, these three rootstocks may be selected considering higher yield. However, the study was conducted during winter season. So, to draw a complete conclusion it is needed to conduct this experiment during summer season.

INTRODUCTION

The advantages of vegetable grafting have been noticed by many workers. Grafts were used to induce resistance against low and high temperatures (Rivero *et al*. 2003, Venema *et al.* 2008), enhance nutrient uptake (Pulgar *et al.* 2000, Colla *et al*. 2010a), increase synthesis of endogenous hormones (Dong et al. 2008), improve water use efficiency (Rouphael *et al.* 2008), reduce uptake of persistent organic pollutants from agricultural soils (Otani and Seike 2007), improve alkalinity tolerance (Colla *et al*. 2010b), raise salt tolerance (Martinez-Rodriguez *et al.* 2008, He *et al*. 2009), and limit the negative effect of heavy metal toxicity (Savvas *et al.* 2010). The scion variety affects size, yield, and quality of fruit in grafted plants, but rootstock effects can drastically alter these quality characteristics (Davis *et al*. 2008a). The quality characteristics might be affected by grafting as a result of the translocation of metabolites associated with fruit quality to the scion through the xylem and/or modification of physiological processes of the scion (Rouphael *et al*. 2010).

Eggplant (*Solanum melongena* L.), belonging to the family Solanaceae, is the most important and extensively consumed vegetable in Bangladesh. Brinjal is a very common and favorite vegetable in Bangladesh which has a link with the social, cultural and economic lives of rural people. It has been a staple vegetable in our diet since ancient times. Eggplant is rich in nutrition with appreciable amount of vitamins (A, B) and minerals like, B, Fe, I, Mg (Bose and Som, 1990). In Bangladesh, vegetable production is uniform round the year. Most of the vegetable are produced in the winter. Among the vegetables, eggplant is very important. Eggplant is the most important vegetable crop in respect of total acreage (50415 ha) and production (504817 ton) in Bangladesh with an average yield of 10.00 tons per hectare (Anon, 2017), which is very low as compared to that other producing countries. The yield is quite low as compared to those advance country. One of the major reasons for low yield in Bangladesh is bacterial wilt disease. A report from India reveals that bacterial wilt can causes 27% losses eggplant (Peddy 1986). To causal organism resistant rootstock is an effective technology to prevent the bacterial wilt. A report from Bangladesh indicated that grafting of eggplant on resistant rootstocks to present bacterial wilt (Ali *et al*., 1994).

Grafting has proved to be an efficient tool for increasing the yield, disease resistance and quality of a number of vegetable crops (Davis *et al*., 2008a,b; King *et al*.,2008, 2010; Lee,1994; Lee and Oda, 2003; Rivero *et al*., 2003). Ideally, rootstocks may improve the yield and/or quality of the produce. This can be achieved by using rootstocks that have resistance to soil diseases or pests, tolerance to abiotic stress, selective absorption of available soil nutrients, or that confer a high degree of vigour to the scion (Davis *et al.*,2008a,b; Lee, 1994; Lee and Oda, 2003; Rivero *et al*., 2003). Here, we have tested the effects of grafting the eggplant cultivars onto different species of rootstocks and have found that improvements in the production of eggplant can be achieved by using this technique. Benefits realized through rootstock grafts often justify the challenges that successful production of grafted plants requires including synchronization and good germination rates of the rootstock and scion, and high rates of graft success and stand establishment after transplant.

Grafting is an ideal technique for vegetable production because scions with desirable fruit-producing traits that are also susceptible to soil-borne disease or climatic pressures can be grafted onto rootstock that is more resistant to these pressures. The resulting union often results in a more productive plant. Proper grafting practice may lead to the production of relatively large size fruit, increase yield, early harvest, and longest time of harvesting of fruits and conveniences in intercultural operation less damage to the fruit or plants. But in Bangladesh, majority of the grower do not get high quality fruit and high yield because of their ignorance about proper grafting technology practices. In a fertile soil with favorable condition, eggplants particularly grow continuously and produce large number of fruits. In this case, appropriate grafting method is necessary because to increase the yield and quality fruit of eggplant. Eggplant can be severely pruned without affecting the yield (Rahman *et al*., 2002, Rashid *et al.*, 2002).

Grafting can reduce cost of production, increase the yield and improve the fruit quality of fruit. In this work, we assess the potential vigour and influence on eggplant yield and fruit quality traits of BARI Begun-5 when it was grafted on BARI Begun-8, EG203, *S. sisymbriifolium and* F_1 (21X11) [*hybrid]* rootstocks. Hybrids of vegetable crops frequently present heterosis for vigour (Bassett, 1986) and, in consequence have a potential utility as rootstocks. Apart from vigour, hybrids are used as rootstocks in many vegetable crops since they can incorporate resistances to pathogens from both parents (Daunay, 2008; Lee and Oda, 2003).

Rootstock–scion interactions are commonly observed in different crops (Cohen et al., 2002; Leonardi and Giuffrida, 2006; Yetisir and Sari, 2003). Increased earliness has also been reported for eggplant grafted onto two tomato hybrids (Khan *et al*., 2006) and in melon plants grafted onto Cucurbita rootstocks (Cohen etal.,2002; Fitaetal.,2004). Fruit quality is important for the marketability of fruit, and grafting can influence traits related to quality (Alexopoulos *et al*., 2007; Davis *et al*., 2008a,b; López-Galarza *et al*., 2004; Proietti *et al*., 2008). So, there is a positive impact of rootstock on quality and higher eggplant production. Keeping this information, our objective is to identify new potential rootstocks either OP or hybrid for quality and higher eggplant production.

MATERIALS AND METHODS

The field experiment was conducted at Olericulture Division, Horticulture Research Centre, Bangladesh Agricultural Research Institute, BARI, Joydebpur, Gazipur during 05 September, 2018 to 05 April 2019.The experimental field was at 23.99ºN Latitude and 90.41º E Longitudes having an elevation of 8.2 m from sea level.

Plant material

The eggplant cultivar BARI Begun-5 (BARI released OP eggplant variety, Bangladesh) was used as the scion variety as well as the non-grafted control. Four rootstocks that included viz., BARI Begun-8, EG-203, *S. sisymbriifolium and* F_1 (21X11) rootstocks, were evaluated (Table1). Data for morphological characters of the aerial part of these materials used as rootstocks were obtained from the database of the germplasm bank of the olericulture Division [Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute, Gazipur, Bangladesh (BARI)]. These data are useful to estimate the vigour of the rootstocks used.

Table 1. Plant materials used for the eggplant grafting experiments, type of material, and their origin

Plant materials	Code	Species	Type of material	Origin
BARI Begun-8	BB-8	*Solanum melongena*	Cultivated, commercial OP variety	BARI, Gazipur, Bangladesh
EG-203	EG-203	*Solanum melongena*	Commercial OP rootstock	World Vegetables Centre
S.*sisymbriifolium*	SS	*S. sisymbriifolium*	Wild	Bangladesh
F_1 (21X11)	F_1(21X11)	*Solanum melongena*	Cultivated, commercial F_1 variety	BARI, Gazipur, Bangladesh
BARI Begun-5 (Control)	BB-5	Solanum melongena	Cultivated, commercial variety	BARI, Gazipur, Bangladesh

Seed germination

Seeds of all genotypes [BB8, EG203, SS, F_1 (21X11) and BB5] were surface-sterilized for the grafting trial and sown on Petri dishes as detailed in Gisbert *et al*. (2006, 2010). Gibberellic acid at 1 mgL−1 was added to the sterile nutrient medium after filter sterilization. The pH of the medium was adjusted to 5.8 before

sterilization at 120°C for 20min. In order to obtain uniform rootstock plantlets, and given that variability for seed germination rates and vigour was previously observed by us for some materials used in this work, seeds from all accessions were sown twice in two consecutive weeks (Carmina *et al*., 2011). Germinated seeds were subsequently transferred to seedling trays with cell sizes of 10 cm x 10 cmx 10 cm depth filled with mixture of Soil: Vermicompost (50: 50).

Grafting

The eggplant cultivar BB-5 was grafted onto BB-8, EG-203, SS, F_1 (21X11) rootstocks using the cleft procedure described by Lee (1994). Plants at the 4–5 leaf stage (30-35 day old) were used as rootstocks except SS (45-50 days). The BB-5 scion source plants selected for grafting had a lower development stage (3–4 leaves; 25–30 days old). For grafting, the stem for both the scions and the rootstocks at right angles was cut using a razor blade. Rootstocks were cut over cotyledons and had a total length of 5–6 cm. Scions of 1.5–2cm with one or two small leaves were subjected to the rootstocks using a tiny grafting clip (Carmina *et al*., 2011). After grafting, plantlets were incubated within a plastic tunnel in a plastic tunnel with a mean air temperature of 28±3◦C and 80–85% relative humidity for 8 days. Plantlets were subsequently acclimatized outside of the plastic tunnel for 7 days in open condition. Fifty plantlets of each rootstock were grafted.

Growing condition

Forty-five to Fifty days-old healthy grafting plant were transplanted in experimental plots on 25 October, 2018. The experiment was laid out in a RCB design with three replications. The unit plot size was 7.5 x 0.70 m and 10 plants were accommodated in a plot with a plant spacing of 70 cm apart in single row maintaining a row to row distance of 1 m with 30 cm drain. The land was fertilized with cowdung, N, P, K, S, Zn and B @ 10,000 100, 30, 75, 13, 1.5 and 0.8 kg/ha, respectively (Quamruzzaman *et al.*, 2019). One third of the cow-dung and half of P and full of S, Zn and B were applied during final land preparation. Rest of cow-dung and P and 1/3 of K were applied as basal in pit. Entire amount of N and rest of K were applied in four equal installment starting from 20 days after transplanting. Rest three installments were applied at vegetative, flowering and initial fruiting stage. Irrigation, weeding, crop protection measures and other intercultural operations were done following standard practice.

Data recorded

Data on germination (%), graft success (%), plants dead before initiation of fruit set (%), plants dead at the end of the experiment (%), stem diameter at last harvest (cm), days to 1st harvest, plant height at first harvest (cm), plant height at last harvest (cm), number of marketable fruits, average fruit weight (g), fruit length (cm), fruit width (cm), fruit length/ fruit width ratio, fruit yield/ plant (kg), eggplant fruit and shoot borer (EFSB) infection (%), fruit yield (t/ha) were recorded from five randomly selected plants per Treatment.

Data analysis

Data for each of the traits evaluated was analyzed via one-factor analysis of variance (ANOVA) using a fixed-effects model for the effect of rootstock treatment. For data expressed in percentage, the logarithmic transformation was applied. Significance of the treatment effects was obtained from the ANOVAs, and where the F-test proved significant (P=0.05), means were compared using the Duncan multiple-range test.

RESULTS AND DISCUSSION

Germination, graft success and plant survival

Germination of seeds sown in Petri dishes with GA3 containing medium for BB8 (BARI Begun-8), EG203, SS (*S. sisymbriifolium)*, F_1 (21X11), BB5 (BARI Begun-5) (Control). At 8-10 days after sowing, BB8 and BB5 (Control) exhibited high percent germination (100%) followed by F_1 (21X11) (96%), while lowest germination was obtained by SS *(84%)* (Table 2). EG203 displayed moderate germination (92%).

However, it was possible to obtain the necessary number of SS plantlets for the grafting experiments using a large amount of SS seeds sown in commercial substrate. Similar to our results, the commercial seed supplier warns that even under good conditions, S*S* germination may be erratic. The cleft grafting method proved highly efficient with success percentages ≥88% in all materials used (Table 2), while Carmina *et al*., (2011) mentioned that 'Black Beauty' and the interspecific hybrids SI×SM and SM×SA exhibited high percent germination (≥90%). There was significant differences found in the success rate among the cultivated and wild rootstocks. BB8 and F_1(21x11) rootstocks, which had percentages of graft success that ranged from 96% [F_1 (21x11)) to 98% (BARI Begun-8]. In contrast, SS had a significantly lower percentage of success (88%) with

respect to the other rootstocks (Table 2). No over growth at the graft junction was observed for any rootstock–scion combination.

All transplanted grafted plants from the BB5/BB8 and BB5/F_1 (21x11) developed well and survived (100%) until the fruit set, while maximum mortality was obtained from BB5 (non-grafted plants) (20.00 %) followed by BB5/EG203 (13.33%) and BB5/SS *(*6.67 %). Plants died at the end of the experiment was noticed in only BB5 (non-grafted plants) and it was 33.33 %, while other grafted plants were alive. Physiological disturbances induced by vascular bundle discontinuities at the graft union may lead to growth inhibition and high mortality; however, in this case, soil that was heavily infested with bacterial wilt may have been a major reason for the loss of plants. In fact, a high sensitivity to *Ralstonia solanacearum* has been reported for several accessions of *S. melongena* (Carmina *et al*., 2011; Afouda *et al*.,2008).

In case of stem diameter at last harvest, the maximum diameter was obtained by BB5/BB8 (2.65 cm), followed by BB5/F_1 (21x11) (2.60 cm) and narrow diameter was obtained by BB5/SS *(*2.36 cm) followed by BB5/EG203 (2.42 cm).

Plant of all eggplant treatment grafted and non-grafted started 1st harvest 104.00 - 111.33 days after sowing. It was observed that non grafted plants 1st harvest was earlier than grafted ones. Early 1st harvest was done in non-grafted plants after 104.00 days in BB5 (control). In case of grafted plants, earlier 1st harvest was in BB5/BB8 (104.33 days) followed by BB5/F_1 (21x11) (107.00 days), BB5/EG203 (108.00 days). The delayed 1st harvest in grafted plant was observed in BB5/SS *(*111.33 days), while Carmina *et al*., (2011) mentioned that the first plants to flower and set fruit were from 'Black Beauty' grafted on SI×SM and SM×SA rootstocks. Fruit harvest for these plants began 50d after transplanting, and fruit harvested until 57d after transplant were considered as early harvest fruit.

In this study it is clearly discussed that non grafted plants were earlier harvested compare to grafted plants. It is due to the delayed flowering in grafted plant, reported by Matsuzoe *et al.* (1990) and Ali (1994).

Plant height at first harvest and plant height at last harvest showed significant difference among the different treatments (Table 2). Plant height at first harvest of all eggplant treatments of grafted and non-grafted were 57.67 - 64.33 cm, while tallest plants were from BB5 (Control) and shortest were from BB5/SS. Same trend was observed in plant height at last harvest and it was 106.00 cm, 100.67 cm, respectively, while Carmina *et al*., (2011) mentioned that the mean plant height among different treatments varied between 108.9 and 127.0 cm for the SMA and SI×SM rootstocks, respectively.

Table 2. Germination, graft success, plant survival and plant vigour traits of rootstocks and scion

Treatment	Germination (%)	Graft success (%)	Plants dead before initiation of fruit set (%)	Plants dead at the end of the experiment (%)	Stem diameter at last harvest (cm)	Days to 1st harvest	Plant height at first harvest (cm)	Plant height at last harvest (cm)
BB5/BB8	100 a	98 a	0.00	0.00 b	2.65 a	104.33 cd	62.33 a	103.33 ab
BB5/EG203	92 b	92 b	13.33 b	0.00 b	2.42bc	108.00 b	63.67 a	104.00 ab
BB5/SS	84 c	88 c	6.67 c	0.00 b	2.36 c	111.33 a	57.67 b	100.67 b
BB5/F_1 (21x11)	96 ab	96a	0.00	0.00 b	2.60 ab	107.00 b	62.33 a	102.33 ab
BB5 (Control)	100 a	-	20.00 a	33.33 a	2.50 b	104.00 d	64.33 a	106.00 a
Level of significance	*	*	*	*	*	*	*	*
CV (%)	2.40	2.10	8.50	24.55	1.55	1.70	3.54	2.70

Significant differences among treatments were also evident for number of marketable fruits per plant (Table 3). The number of marketable fruits per plant ranged between 16.33 and 21.33 for 'BB5' respectively grafted onto SS and EG203 or F_1 (21x11) rootstocks, while non-grafted BB5 produced also 16.67 fruits. In case of average fruit weight, the heavier fruits (186.67 g) were produced from BB5/BB8 and BB5/F_1 (21x11), while lightest fruits were produced from non-grafted BB5 (control). Significant differences among treatments were also evident for fruit yield/ plant, which followed a similar pattern. The fruit yield/ plant ranged between 2.58 and 3.98 for 'BB5' respectively non-grafted BB5 and grafted onto BB8 rootstock. Carmina *et al*., (2011) mentioned that the total fruits per plant ranged between 7.6 and 15.8 for 'Black Beauty' respectively grafted onto SMA and SI×SM rootstocks, while the total yield ranged between 3.4 kg plant−1.

Fruit length ranged between 9.77 – 10.53 cm for those with SS and EG203 rootstocks, respectively (Table 3), while other larger length fruits were harvested from BB8 (10.37 cm) and F_1 (21x11) (10.17 cm). Non-grafted BB5 (Control) produced also lower length fruits (9.90 cm). Significant differences among treatments were also evident for fruit width, while maximum was obtained from BB8 rootstock (8.20 cm) followed by rootstocks F_1 (21x11) (7.90 cm), EG203 (7.67 cm) and minimum was obtained from SS rootstock (8.20 cm).

In contrast, differences among treatments were found for fruit length and fruit width, which resulted in differences in the fruit length/width ratio. In this respect, fruit from 'BB5' grafted onto SS and EG203 rootstocks were significantly more elongated (length/width ratio of 1.43 and 1.37, respectively) than those from plants grafted onto BB8 and F_1 (21x11) rootstocks plants which had fruit length/width ratios of 1.26, and 1.28, respectively.

Though the incidence of eggplant fruit and shoot borer (EFSB) infection is lower during winter season compare to summer season, but significant amount of infection was noticed in the study. Minimum infection by EFSB (10.0%) was observed in 'BB5' while grafted onto F_1 (21x11) rootstock and non-grafted BB5 (Control) which is a very optimistic to select good treatment. The overall infection (%) rate was 10.00 – 14.00%, maximum infection 14.00% was observed in 'BB5' when grafted onto rootstock 'SS'. Other two rootstocks viz., BB8 and EG203 grafted 'BB5' were infected by ESFB @ 11.00%.

The yield of marketable fruit per plot was converted into per hectare basis and was expressed in tones. Different grafted and non-grafted treatment significantly influenced the yield of production fruit per hectare (Table 3). The highest yield (51.70 t/ha) was recorded from BB5 when it was grafted onto rootstock F_1 (21x11) followed by BB8 (50.96 t/ha). The yield ranged between 33.56 - 51.70 t/ha for 'BB5' when it was non-grafted (control) and was grafted onto rootstock F_1 (21x11), respectively. Moderate level yield (45 t/ha) was obtained from rootstock EG203. So, these three rootstocks viz., F_1 (21x11), BB8, EG203 produced high fruit yield and may be selected best rootstocks for higher eggplant fruit yield.

Table 3. Yield and yield contributing traits of rootstocks and scion

Treatment	Number of marketable fruits	Average fruit weight (g)	Fruit yield/ plant (kg)	Fruit length (cm)	Fruit width (cm)	Fruit length/ width ratio	Eggplant fruit and shoot borer infection (%)	Fruit yield (t/ha)
BB5/BB8	21.00 a	186.67 a	3.92 a	10.37 ab	8.20 a	1.26 b	11.00 b	50.96 a
BB5/EG203	21.33 a	165.00 b	3.51 b	10.53 a	7.67 ab	1.37 ab	11.00 b	45.61 b
BB5/SS	16.33 b	160.00 b	2.61 c	9.77 c	6.90 c	1.43 a	14.00 a	33.95 c
BB5/F_1 (21x11)	21.33 a	186.67 a	3.98 a	10.17 a-c	7.90 ab	1.28 c	10.00 c	51.70 a
BB5 (Control)	16.67 b	155.00 b	2.58 c	9.90 bc	7.30 bc	1.35 b	10.00 c	33.56 c
Level of significance	*	*	*	*	*	*	*	*
CV (%)	6.97	5.21	6.59	2.98	4.60	1.25	11.39	6.59

Rootstock–scion interactions are commonly observed in different crops (Cohen et al., 2002; Leonardi and Giuffrida, 2006; Yetisir and Sari, 2003) and it was observed that rootstock source can have an important effect on eggplant vigour, earliness, yield and fruit quality characteristics. In the absence of scion/rootstock incompatibility problems, grafted plants may also develop faster, thus contributing to earliness. In the present study, greater earliness was observed in the most vigorous rootstocks, i.e., the BB5/BB8. Increased earliness has also been reported for eggplant grafted onto two tomato hybrids (Khan et al., 2006) and in melon plants grafted onto Cucurbita rootstocks (Cohen etal.,2002; Fitaetal.,2004). It was also found that grafted plants with BB8, F_1 (21x11) and EG203 rootstocks had higher yield than non-grafted plants and that grafted plants with SS rootstocks had a much lower yield than other treatments, confirming that this latter rootstock has little value for improving eggplant yield. In contrast, BB8 and F_1 (21x11) rootstocks demonstrated positive benefits for agronomic performance in grafted eggplant. In this respect, grafting tomato plants onto an interspecific tomato rootstock also resulted in higher vigour when compared with tomato plants self-grafted or grafted onto other cultivated tomato rootstocks (Leonardi and Giuffrida, 2006).

Fruit quality is important for the marketability of fruit, and grafting can influence traits related to quality (Alexopoulos *et al*., 2007; Davis *et al*., 2008a,b; López-Galarza *et al*., 2004; Proietti *et al*., 2008). Although no differences were found for most eggplant traits of apparent quality, but some differences were found for some relevant characters. For example, although fruit shape in eggplant is highly heritable and under genetic control (Mu˜noz-Falcón *et al*., 2008a), rootstocks influenced fruit length and fruit length/width ratios, possibly due to changes in the concentration of growth regulators induced by the rootstock.

CONCLUSION

Among the five treatments, it could be concluded that eggplant can be grafted on four rootstocks viz., BARI Begun-8 (BB8), EG203, *S. sisymbriifolium* (SS), F_1 (21x11) with desired scions- BARI Begun-5. Incase of important yield and yield contributing characters viz., average fruit weight, fruit yield/ plant, fruit length and fruit width showed better performances when BB5 was grafted onto BB5/BB8 [186.67 g, 3.92 kg/ plant, 10.37 cm, 8.20 cm] and BB5/F_1 (21x11) [186.67 g, 3.98 kg/ plant, 10.17 cm, 7.90 cm]. Among the 4 grafted

treatments, BB5/F_1 (21x11) (51.70 t/ha), BB5/BB8 (50.96 t/ha) and BB5/EG203 (45.61 t/ha) produced more than 45 t/ha. So, these three rootstocks may be selected considering higher yield. However, the study was conducted during winter season. So, to draw a complete conclusion it is needed to conduct this experiment during summer season.

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PRODUCTIVE PERFORMANCES FOR AWASSI LAMBS FED RATIONS SUPPLEMENTED BY BLACK CUMIN (*NIGELLA SATIVA)* OR FENUGREEK(*TRIGONELLA FOENUM*) OR ROCKET(*ERUCA SATIVA*) SEEDS DURING DIFFERENT FATTENING PERIODS

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ABSTRACT

The present study was carried out on 24 male Awassi lambs aged 3.5-4 months and weights 22-23Kg,lambs were assigned randomly into four main groups(6 lambs/group),each main group was divided into two subgroup(3 lambs/ group), and these groups were fed ad libitum on ration consisted as experimental ration,1st lamb group was fed on experiential ration only, while 2nd,3rd and 4th lambs groups were fed on experiential rations and supplemented with 600 mg.of black cumin (Nigella sativa) or fenugreek (Trigonella foenum) or rocket (Eruca sativa) seeds/ kg.B.W./day, respectively for four fattening periods (30,60,90 and 120 days).The results indicated that average daily gain, total gain ,final weight, body length and different body dimensions, were increased significantly (P≤0.05),for the lambs groups fed rations supplemented with black cumin or fenugreek or rocket seeds for 1-120 days as compared to those fed on experiential ration only for1-30 ,1-60 and 1-90 days, respectively. The results also indicated that there are a significant (P≤0.05) and positive correlation coefficients between body weight and body length and measurements. It conclude that using black cumin or fenugreek or rocket seeds had improved the productive physiological performances of lambs that fattening for 120 days

***Keywords**: male lambs, seeds of black cumin, fenugreek or rocket, productive performance*

INTRODUCTION

The history of medicinal plant dates back to the time of Sumerian civilization more than 3000 years BC. (1) and the number of medicinal plants in the world is around 52,885, which are used in popular medicine and registered worldwide up to 750 species(2).In Iraq, there are various varieties of medicinal seed plants available in Iraqi local markets. In the last decade, the World Health Organization (WHO) has encouraged the use of alternative sources of antibiotics used as feed additives in animal meat diets after they discovery that the use of antibiotics and hormones as food additives in animal meat diets may cause an accumulation of these compounds in the animal's body which may caused unwanted side effects on the consumer(3).WHO has determined that 80% of medicinal plants are of medical benefit, which are added to animal meat stock from cows, buffaloes, sheep and goats in order to increase the speed of growth and increase body weight, especially in species characterized by a slow growth rate because of the ability of these seeds to improve digestion in the stomach (4) and improve the efficiency of feed utilization by increasing the ability of bacteria to benefit from food compounds and to identify the growth and activity of harmful microorganisms (5) and a positive reflection on some of the productive traits for animals (6).

There are many herbaceous plant in local market in Iraq are used in folk medicine and its named as medicinal herbs (7).There are about 360-370 herbs kinds in local market such as black cumin seed (*Nigella Sativa Linn*) belong to botanical family Ranunclocea , fenugreek seed *(Trigonella foenum graecum L.)* belong to botanical family Leguminosae and rocket (taramira) seed (*Eruca sativa mill)* belong to botanical family Brassicaceae, and the seeds of these plants have some properties that contribute to raising the productive efficiency of the different farm animals (8)

The study of the body weight and dimensions of different fattening periods of lambs, is one of the important measures can be used to infer the growth and development of the body and its impact on body weights and subsequent measurements in different types of sheep (9 and10) found that there is a positive and highly significant correlation between weight and different body dimensions during different periods of fattening lambs.

The aim of this study is to find out the effect of supplementation seeds of black cumin or fenugreek or rocket to the experimental rations on the growth characteristics and various body measurements of male Awassi lambs during different fattening periods.

MATERIALS AND METHODS

Twenty four male Awassi lambs aged 3.5-4 months and weights 22-23 Kg were selected randomly from the sheep herd at the Agricultural Technical College, Mosul.Iraq. The lambs were divided into four main groups (6 lambs /group) and each main was divided into to 2 subgroup (3 lambs /subgroup) according to their live body weight (B.W.) of the lambs group. The lambs groups were placed in a large barn (4×10 m) , which was divided from the inside to 8 pens. Lamb groups were fed on the experiential ration(table1) to cover the needs of developing lambs according to (11) ,as follows

1st lambs group: fed 1st ration (experimental ration only, table1).

2nd lambs group : fed experimental ration + 600 mg black cumin seed/kg . B.W./ day.

3rd lambs group: fed experimental ration +600 mg fenugreek seed/ kg.B.W. / day

4th lambs group: fed experimental ration + 600 mg rocket seeds / kg. B.W./ day.

The experimental rations were fed *ad libitum* twice daily at 8 a.m. and 5. p.m., while straw was offered at 1% of their body weight for the experimental groups for four months. The remaining amount of feed was calculated the next morning and calculated the amount of feed consumed for animal groups per week. During the trial period, black cumin, fenugreek and rocket seeds were added daily and mixed manually with the experimental rations .Fresh water and minerals blocks were freely available at all times. All lambs were free from diseases and parasites and have undergone veterinary and preventive health care and housed in semi-shaded well ventilated pen.

The body length and somebody dimensions were measured for all lambs after 30, 60, 90 and 120 days of fattening periods and before the morning meal were taken by using a measuring tape and instrument measuring the dimensions of the body and numbered ruler, which included the circumference of the chest and abdominal calculated by using the measuring tape, and measuring body height at the front and wither were measured by the use of the ruler numbered and vertically from the area of contact the neck of the body towards the ground or the end of the body to the ground, the thickness of the body in the front and wither were measured using the measure of the removal of the body caliber, while measuring the length of the body it has been measured by using the measuring scale bar (0.1 cm) from the chest Introduction to the end of the body (9).

Table 1:Feedstuffs (gm./kg.feed)and chemical analysis (%) of experimental ration and seeds

Feed stuffs		**Chemical analysis%**				
Ingredients	gm./kg. feed	Items	Exp. ration	Black cumin	fenugreek	rocket
Barley grain	420	Dry matter% (Deter.)*	93.1	93.67	93.51	93.11
Wheat bran	420	Crude protein%(Deter.)*	15.26	26.64	27.88	٢٩,٩٤
Soy bean meal	70	Ether extract%(Deter)*	2.58	10.67	.89٦	٩,٦٤
Yellow corn	70	**(Calc.) %Crude fiber	6.21	٨,١٢	9.92	٤,٣٨
Nacl) (Salt	١٠	Ash %(Deter.)*	5.44	٤,٥٣	4.42	٦,٨٩
Limestone(Caco3)	١٠	**(Calc.) %NFE	٦٣,٦١	٤٣,٧١	٤٤,٤٠	٤٢,٢٦
Metabolism energy (MJ/Kg.feed)(Calc.)***			11.85	١٣,٠٣	١٢,١٩	١٢,٧٢

*Determined on dry matter base according to (12)

*Calculated from chemical analysis tables for Iraqi feed stuffs according to (13) *

***Calculated according to equation of.(14)

The experiment was designed by the complete randomized design (CRD) factorial experiment 4×4,where indicate four types of rations (1st,2nd,3rd and 4th rations) and four different fattening periods (30,60,90 and 120 days).Data generated from the experiment were statically analyzed by analysis of variance was carried out on all data according to (15).Then means were separated by Duncan's multiple range tests to determine the significant at 0.05 % level of probability (16).The treatment was partitioned into main effects and their interaction (17). The correlations between body weight and different body dimensions of lambs at the four feeding periods (30, 60, 90 and 120 days) were measured in the Person Moment Correlation method (17).

RESULTS AND DISCUSSION

Productive performance١

The results in table(2) showed that there was a significant (P≤0.05) increase in the daily feed consumption in 2nd ,3rd and 4th lambs groups ,respectively as compared to the 1st lamb group .The

second lambs group that fed on the experimental ration supplemented with 600 mg black cumin seeds/ kg.B.W/day had the highest significant($P \leq 0.05$)daily feed consumption as compared with those in 1st lambs group (table 2),this may be attributed to that consumed black cumin seed had improvement the digestion of dry matter and protein (18)because the black cumin is used as a bacterial antagonist because it contains thymoquinine(19),and the black cumin is used as tonic against microorganisms in the stomach and intestines (5) ,which contribute to improving the health of the animal by increasing the defense effectiveness of the body against inflammation. While The higher significant ($P \leq 0.05$) daily feed consumption of the 3rd lambs group ration that supplemented by 600 mg fenugreek seed / kg. L.W./ day as compared to those in 1st lambs group ration, may be due to that fenugreek seed caused improvement in the digestion of dry matter and protein (20),or perhaps that caused increased appetite the feed intake (21).But the significant($P \leq 0.05$) daily feed consumption of the 4th lambs group ration that supplemented by 600 mg rocket seed / kg.L.W./ day,as compared to those in 1st lambs group ration, may be due to that rocket seed have positively influenced the increase in animal appetite, resulting in increased feed intake (22),or perhaps the rocket seeds containing high percentage of carotenoids (23),vitamin C and isothiocyanate (24),which have an effect against the growth of bacteria and anti-oxidants, which have a positive effect on the activation of the movement of the digestive system and improve digestion of food compounds in the digestive system (22).The results were consistent with the results of the (25), which observed that there were differences in the amount of dry matter intake in favor of the ration that added 7.5 g.black seeds / kg.dry matter as compared to control treatment ,and the results were consistent with the results of (26), who pointed to the existence of differences in the amount of dry matter intake in favor of the diet added 400 mg fenugreek seeds / kg live weight as compared to control treatment, also the results were consistent with the results of (22) who indicated that there were differences in the amount of dry matter intake in favor of the ration added to 3.5 or 7% rocket seeds as compared to control treatment

The results presented in table (2)showed that the addition of seeds to the 2nd, 3rd and 4th lambs groups rations respectively, had improved significantly($P \leq 0.05$) the efficiency of food conversion, with values of 8.02, 7.97 and 7.87gm.feed intake /gm. ADG ,respectively as compared to the 1st lambs group (9.60).The 4th lambs group ,that added rocket seeds to the experimental ration gave the best food conversion efficiency(7.87),while the 1st lambs group gave the less food conversion efficiency (9.60). The results were consistent with the results of (25), which observed the differences in the calculation of the efficiency of food conversion in favor of Hamdani sheep fed on a diet supplemented with 7.5 g black cumin seeds / kg. dry matter as compared to control group ,and the results of (26), which observed differences in the calculation of the efficiency of food conversion in favor of Hamdani sheep fed on a diet supplemented with 400 mg fenugreek seeds /kg. live weight as compared to the control treatment, and results of (22) which observed the differences in the calculation of the efficiency of food conversion in favor of Awassi sheep fed on a diet supplemented with added 3.5 or 7% rocket seeds as compared to control treatment.

The results in table (2) indicated that there was a significant effect ($P \leq 0.05$) to supplemented the seeds to the experimental rations of 2nd ,3rd and 4th lambs groups , respectively in the average daily and total gains as compared to 1st lambs group, this was reflected in the significant ($P \leq 0.05$) differences in the final weights between the lambs groups ,this may be due to the fact that the quantities of feed consumed for the seeds added to the 2nd ,3rd and 4th lambs groups respectively were significantly($P \leq 0.05$) higher than those of the 1st lambs group, which was reflected in the significant ($P \leq 0.05$) differences in the daily weight

Table 2: Effect of supplemented seeds, fattening periods and interaction in productive performances of lambs (Mean ±S.E.)

Traits ⟶	Lamb weight(kg.)		Average gain/lamb		Feed consumption	Feed efficiency
Factors ▼	Initial	Final	Daily(gm.)	Final(kg.)	(gm./day/lamb)	(gm.feed/gmADG)
1:Effect of supplemented seed						
ER	b٢١,٤٦ ٠,٢٨±	b٣٥,٧٩ ٠,٥١±	b١١٩,٤٢ ٤,٢٤±	b١٤,٣٣ ٠,٤٤±	b١١٤٦,٩٠ ٨٧,٦٠±	b٩,٦٠ ٠,١٨±
ER+B	a٢١,٦١ ٠,٢٥±	a٤١,٥٧ ٠,٤٨±	a١٦٦,٣٣ ٣,١١±	a١٩,٩٦ ٠,٦٢±	a١٣٣٥,٦٠ ٩٦,٥٠±	a٨,٠٢ ٠,٢١±
ER+F	a٢١,٥٧ ٠,٢٥±	a٤١,١٢ ٠,٥٢±	a١٦٢,٩٢ ٣,٤٣±	a١٩,٥٥ ٠,٣١±	a١٢٩٨,٨٠ ٩١,٧٠±	a٧,٩٧ ٠,٢٤±
ER+R	a٢١,٤٨ ٠,٢٤±	a٤١,٠٠ ٠,٥٥±	a١٦٢,٦٧ ٤,٨٠±	a١٩,٥٢ ٠,٤٣±	a١٢٨٠,٧٠ ٩٠,١٠±	a٧,٨٧ ٠,٢٣±
2-Effect of fattening periods(days)						
٣٠	a٢١,٥٩ ٠,٣٦±	c٢٩,٦١ ٠,٦٨±	a٢٣٤,٠٠ ٤,١٦±	d٧,٠٢ ٠,٢٨±	C١٠٠٩,٧٨ ٦٣,٤٠±	٤,٣٢ ٠,٣١±
٦٠	a٢١,٥٩ ٠,٣٦±	b٣٥,٠١ ٠,٦٨±	a٢٢٣,٦٧ ٤,١٦±	c١٣,٤٢ ٠,٢٨±	b١١٣٤,٤٠ ٨٥,٦٠±	٥,٠٧ ٠,٣١±
٩٠	a٢١,٤٧ ٠,٣٦±	a٤٠,٢١ ٠,٣٥±	ab٢٠٨,٢٢ ٥,٣٤±	b١٨,٧٤ ٠,٦٦±	a b١٢٨٧,٨ ٩٨,٣٠±	٦,١٨ ٠,٢٨±
١٢٠	a٢١,٤٨ ٠,٢٤±	a٤٤,٣٩ ٠,٢٨±	b١٩٠,٩٢ ٦,٦٧±	a٢٢,٩١ ٠,٧٢±	a١٣٧٤,٦٠ ٩٦,٥٠±	٧,٢ ٠,٢٤±
3-Interaction between supplemented seed and fattening periods(1×2)						
ER ×30	a٢١,٥٨ ٠,٣٦±	e٢٧,١٣ ٠,٣٦±	bc١٨٥,٠٠ ٥,١٤±	e ٥,٥٥ ٠,١١±	c٩١٦,٦٨ ٦٣,٤٠±	cd٤,٩٥ ٠,٢٥±
ER+B×30	a٢١,٥٥ ٠,٢٤±	e٢٩,٥٧ ٠,٣٦±	a٢٦٧,٣٣ ٦,٧٢±	de٨,٠٢ ٠,١٩±	b١٠٩٥,٧٨ ٦٣,٤٠±	d٤,٠٩ ٠,٢١±
ER+F×30	a٢١,٥٤ ٠,٣٦±	e٢٩,١٩ ٠,٣٦±	a٢٥٥,٠٠ ٦,٦١±	de٧,٦٥ ٠,١٧±	b١٠٥٧,٦٨ ٦٣,٤٠±	d٤,١٤ ٠,٢١±
ER+R×30	a٢١,٦٦ ٠,٣٦±	e٢٨,٥٣ ٠,٣٦±	ab٢٢٩,٠٠ ٥,٣٣±	de٦,٨٧ ٠,١٧±	c٩٦٨,٨٤ ٦٣,٤٠±	d٤,٢٣ ٠,٢١±
ER ×60	a٢١,٤٠ ٠,٢٩±	d٣١,٦٦ ٠,٥٨±	c١٧١,٠٠ ٣,٩٩±	d١٠,٢٦ ٠,٢٢±	b١٠٤٠,٢٠ ٨٧,٨٠±	bc٦,٠٨ ٠,٢٧±
ER+B×60	a٢١,٦٦ ٠,٢٨±	c٣٦,٢٦ ٠,٦٨±	a٢٤٣,٣٣ ٦,٦٤±	c١٤,٦٠ ٠,٣١±	b١١٩٩,٩٠ ٨٣,٣٠±	cd٤,٩٣ ٠,٢١±
ER+F×60	a٢١,٧٠ ٠,٣٥±	c٣٦,١٠ ٠,٥٧±	a٢٤٠,٠٠ ٦,٥٨±	c١٤,٤٠ ٠,٢٧±	b١١٥١,٩٠ ٨٦,١٠±	cd٤,٨٠ ٠,٢٤±
ER+R×60	a٢١,٦٠ ٠,٢٦±	c٣٦,٠٠ ٠,٤٩±	a٢٤٠,٠٠ ٦,٥٤±	c١٤,٤٠ ٠,٢٨±	b١١٤٥,٦٠ ٨٥,٦٠±	cd٤,٧٧ ٠,٢٣±
ER ×90	a٢١,٤٣ ٠,٣٣±	c٣٦,٤٣ ٠,٢٥±	c١٦٦,٦٧ ٣,٨٩±	c١٥,٠٠ ٠,٣٤±	b١١٦٠,٨٠ ٨٧,٣٠±	b٦,٩٦ ٠,٢٩±
ER+B×90	a٢١,٥٠ ٠,٢٨±	b٤٢,١٥ ٠,٣٥±	ab٢٢٩,٤٤ ٥,٣٣±	b٢٠,٦٥ ٠,٥٨±	ab١٣٥١,٩٠ ٩٧,٩٠±	c٥,٨٩ ٠,٢٤±
ER+F×90	a٢١,٥٢ ٢٢.±	b٤١,١٦ ٠,٣٥±	ab٢١٨,٢٢ ٥,٢٤±	b١٩,٦٤ ٠,٦٢±	ab١٣٣٠,٨٠ ٩٨,٢٠±	bc٦,٠٩ ٠,٢٧±
ER+R×90	a٢١,٤٣ ٠,٢٧±	b٤١,١١ ٠,٣٥±	ab٢١٨,٦٧ ٥,٢٢±	b١٩,٦٨ ٠,٦٧±	ab١٣٠٧,٨٠ ٩٦,٠٠±	bc٥,٩٨ ٠,٢٥±
ER ×120	a٢١,٥٠ ٠,٣٦±	b٣٩,٢٤ ٠,٢٩±	c١٤٧,٨٣ ٣,٢٩±	bc١٧,٧٤ ٠,٤٤±	ab١٢٣٩,٧٠ ٩٤,٤٠±	a٨,٣٨ ٠,٣٣±
ER+B×120	a٢١,٦٢ ٠,٢٨±	a٤٦,٣٠ ٠,٣٤±	b٢٠٥,٦٧ ٥,١٤±	a٢٤,٦٨ ٠,٧٧±	a١٤٥٨,٠٠ ٩٩,٢٠±	ab٧,٠٨ ٠,٣١±
ER+F×120	a٢١,٤٤ ٠,٢١±	a٤٦,١٠ ٠,٣٣±	b٢٠٥,٥٠ ٥,١١±	a٢٤,٦٦ ٠,٧٢±	a١٤١٦,٧٠ ٩٨,٥٠±	bc٦,٨٩ ٠,٢٩±
ER+R×120	a٢١,٣٦ ٠,٢٤±	a٤٥,٨٩ ٠,٣٢±	b٢٠٤,٤٢ ٥,١٢±	a٢٤,٥٣ ٠,٦٩±	a١٣٩٤,٧٠ ٩٥,٥٠±	bc٦,٨٢ ٠,٢٨±

*Means with different letters vertical show significant difference at($P \leq 0.05$).

** ER =experiential ration, ER+B = experiential ration +black cumin seed, ER+ F= experiential ration +fenugreek seed, ER+R= experiential ration+rocket seed.

gain and accumulating significantly (P≤0.05) in the final weight. The second lambs group that fed on the experimental ration supplemented with 600 mg black cumin seeds/ kg.B.W/day had the highest significant (P≤0.05) average daily and total gains and final weight as compared with those in 1st group. The results were consistent with the results of (27) who pointed out that the use of 2% of black seed seeds in the feeding of the lambs significantly improved the increase in daily weight and total gain, which reflected on the superiority in the final weight as compared to the control group. and the results of (28), who pointed out that the use of 30 gm. of seeds of the fenugreek/ day in feeding the Egyptian lambs has significantly increased the daily weight and total gain, which was reflected in its superiority in the final weight, and the results of (22),who indicated the superiority in average daily and total gain and the final weight of the lambs fed on the diet supplemented by 3.5% or 7% rocket seeds as compared to those fed on the control ration only.

The fattening period had significantly (P≤0.05) effect the daily feed consumption (table 2), and the daily feed consumption was increased significantly (P≤0.05) by increasing the length of fattening period ,this may be due possibly to a significant increasing the food needs for maintains and growth of lamb (NRC,1994).The daily weight gain was significantly higher (P≤0.05) in lambs fed for 1-30 and 1 - 60 days as compared to the lambs fed for 1-120 days, while the differences were not significant between the daily weight gain during the period 1- 30 and 1-60 and 1-90 days on the one the hand and the periods of 1-90 and 1- 120 days, the reason may be due that the growth during the period of fattening 1-30 and 1 - 60 days is to increase the weight of the skeleton of lambs body and that the experimental lambs were animals has relied on food needs to meet what is available in the poor pastures of the remnants of the harvest and the few pastoral plants, which meet the food needs of the animals for sustaining and growth, and when good nutrition for these lambs during the period 1-30 and- 60,these lambs consumed a large amount of feed to compensate for the growth that the lambs did not achieve during the period leading up to the experiment (29). After that rate of daily gain was decreased significantly(P≤0.05)by increasing the length of the fattening period during the period 1-120 days.On the other hand, the final total weight gain of the lambs was reversed in terms of the daily weight gain. The laminated lambs for 1- 90 and 1-20 days significantly(P≤0.05)exceeded those laminated lambs in total weight gain and final live weight of lambs for 1-30 and 1-60 days (Table 2).This significantly increasing (P≤0.05) in the final weight may be attributed to the fact that the increasing the period of fattening, that caused the cumulative weight gain, even if the increase is low and insignificant may be due to the increasing the animal requirements for maintains (11),because increasing animal weight with advance fattening periods. (29).This increase was reflected in the live weight of lambs due to the length of the period of fattening. Moral superiority in the final weight may be attributed to the higher the period of fattening and the higher the fat to the bone ratio. The results were consistent with the results of (10),which found a significant effect of the duration of fattening periods(1-55,1-85 and 1-115 days) in the final weight of the Awassi lambs that fattening at different periods and the results of (9),they found a significant effect of the duration of fattening periods (1-60, and 1- 90 days) in the final weight of the Awassi lambs that fattening at different periods.

The results of the statistical analysis (Table 2) showed that the interaction effect of the addition of the black cumin or fenugreek or rocket seeds to the experimental rations and the period of fattening (30, 60, 90 or 120 days) showed a significant effect (P≤0.05)on feed intake ,daily and total intake and final weight of lambs .Also noticed that increasing significantly in final weight for lambs fattening for 0-120 day on experimental ration only and experimental ration supplemented by black cumin ,or fenugreek or rocket seed as compared to those groups fattening on same experimental rations but fattening for 1-30, 1-60 and 1-90 day respectively.

Somebody measurements ٢

The results in table (3) indicate that there is a significant effect (P≤0.05) to supplemented seeds to the experimental rations of 2nd,3rdand 4th lambs groups, respectively as compared to 1st lambs group in all dimensions of body measurements, this significant(P≤0.05) increase in all dimensions of body measurements may be due to that supplemented of seeds to the experimental rations of the 2nd,3rd and 4th lambs groups, respectively had caused significant (P≤0.05) increase in final weigh was reversed in the significant(P≤0.05) increase in the different body measurements of the 2nd,3rdand 4th lambs groups as compared to the 1st lamb group, or possibly due to the presence of positive correlation coefficients

among the live weight and measurements of different body dimensions (9),and the results were consistent with the results of (22) who indicated a significant effect of using of 3.5 or 7% rocket seed in the experimental ration in the different body measurements.

The results presented in table (3) showed a significant effect (P≤0.05) of fattening period in all measurements of body dimensions. The measurements of body dimensions were significantly (P≤0.05) higher for lambs fattening for 1-120 days on the body length, the height of the body at the front and wither and the body thickness at the front and wither, and the girth of chest and abdomen than those lambs fattening for 1-30,1-60 and 1-9o days respectively. This may be due to the fact that the lambs with advance of fattening periods complete the physiological development of the digestive system ,which leading to a significant increase in the rates of live weight, which is reflected in the increase in consumption of feed and the consequent size of the animal and increase in the various physical measurements of body dimensions, and this results were consistent with the results of (10),which was found to have significant effect on the body length , the height of the body at the front and back , body thickness at the front and back and the circumference of the chest and abdomen when feeding lambs groups of for three consecutive fattening periods (1-55,1-85 and1-115 days),and the results of (9)who found a significant superiority of lamb fattening for 1-90 days as compared to those fattening for period of 1-60 days in the body length , the height of the body at the front and wither , the body thickness at the front and wither, and the girth of chest and abdomen.

Table 3:Effect of supplemented seeds, fattening periods and interaction in somebody measurements (Mean ±S.E.)

Traits⟶	**Body length**	**height**		**Thickness**		**Girth**	
Factors ▼		**front**	**Wither**	**front**	**Wither**	**Chest**	**Abdomen**
1- **Effect of supplemented seeds**							
ER	b٥٨,٨٩ ٠,٣٠±	b٥٧,٧٥ ٠,٣٧±	b٥٩,٥١ ٠,٥١±	b١٥,٥٥ ٠,٢٧±	b١٨,٤٤ ٠,٣٨±	b٦٧,٦٥ ٠,٥٦±	b٧٧,٢٤ ٠,٣٨±
ER+B	a ٦٢,١٧ ٠,٣١±	a٦١,٩٤ ٠,٣٨±	a٦٤,٨٢ ٠,٥٣±	a١٧,٥٤ ٠,٢٨±	a ٢٠,٧٥ ٠,٣٩±	a٧٠,٨٨ ٠,٦١±	a٨١,٢٨ ٠,٤٣±
ER+F	a ٦٢,٠٩ ٠,٢٨±	a٦١,٦٥ ٠,٣٤±	a٦٣,٥٦ ٠,٤٥±	a١٧,٢٧ ٠,٢٥±	a٢٠,٥٨ ٠,٣٤±	a٧٠,٤٦ ٠,٤٨±	a٨١,١٢ ٠,٤٠±
ER+R	a ٦١,٩٩ ٠,٣٢±	a٦٠,٩٦ ٠,٣٦±	a ٦٢,٣٣ ٠,٥١±	a١٧,١١ ٠,٢٦±	a٢٠,٢٩ ٠,٣٨±	a٧٠,٣٥ ٠,٥٥±	a٨٠,٥٦ ٠,٤٢±
2- Effect of fattening periods(days)							
٣٠	d ٥٣,٢٤ ٠,١١±	d٥٣,٥٦ ٠,٢٨±	d٥٥,١٧ ٠,٢٧±	d ١٢,٧٦ ٠,١٩±	d١٥,٣٢ ٠,١٩±	d٦٢,٧٧ ٠,٣٩±	d٧٣,٤٥ ٠,٣١±
٦٠	c٥٦,٣٤ ٠,٢٧±	56.97 c ٠,٣٣±	58.28 c ٠,٤٥±	14.69c ٠,١٨±	17.51c ٠,٢٧±	65.78 c ٠,٤٢±	75.67c ٠,٤٢±
٩٠	61.12b ٠,٢٧±	60.53 b ٠,٤٧±	62.59 b ٠,٥٦±	16.98b ٠,٣٤±	20.04b ٠,٤٥±	b٧٠,١١ ٠,٦٧±	78.83 b ٠,٤٢±
١٢٠	a٦٦,٤١ ٠,٣١±	a٦٤,٢١ ٠,٣٤±	a٦٦,٨١ ٠,٥٣±	a١٨,٩٤ ٠,٢٥±	a٢٢,٤٩ ٠,٤٥±	a٧٣,٧٠ ٠,٥٥±	a٨٥,٦٥ ٠,٤٠±
3-Interaction between supplemented seed and fattening periods(1×2)							
ER ×30	d ٥١,٢٤ ٠,١١±	d٥١,٥٩ ٠,٠٨±	d٥٢,١٧ ٠,٢٧±	d ١٢,٧٦ ٠,١٩±	d١٥,٣٢ ٠,١٩±	d٦٢,٧٧ ٠,٣٩±	d٧٣,٤٥ ٠,٣١±
ER+B×30	dc ٥٤,٣٨ ٠,١١±	d٥٥,٣٤ ٠,٣١±	d٥٧,٧٥ ٠,٤٦±	d ١٢,٧٦ ٠,١٩±	d١٥,٣٢ ٠,١٩±	d٦٢,٧٧ ٠,٣٩±	d٧٣,٤٥ ٠,٣١±
ER+F×30	dc ٥٣,٩٦ ٠,١١±	d٥٣,٨١ ٠,٣١±	d٥٥,٦٢ ٠,٤٥±	d ١٢,٧٦ ٠,١٩±	d١٥,٣٢ ٠,١٩±	d٦٢,٧٧ ٠,٣٩±	d٧٣,٤٥ ٠,٣١±
ER+R×30	dc٥٣,٣٣ ٠,١١±	d٥٣,٥٧ ٠,٢٨±	d٥٥,١٧ ٠,٤١±	d ١٢,٧٦ ٠,١٩±	d١٥,٣٢ ٠,١٩±	d٦٢,٧٧ ٠,٣٩±	d٧٣,٤٥ ٠,٣١±
ER ×60	c٥٥,٣٨ ٠,٢٧±	c٥٤,٠٢ ٠,٣٣±	c٥٥,٤٣ ٠,٤٥±	c١٣,١١ ٠,١٨±	16.21 c ٠,٢٧±	64.18c ٠,٤٢±	72.88d ٠,٤٢±
ER+B×60	c٥٦,٨٩ ٠,٢٧±	c٥٨,٢٨ ٠,٣٣±	60.26c ٠,٤٥±	15.38c ٠,١٨±	18.18c ٠,٢٧±	66.91c ٠,٤٢±	76.81c ٠,٤٢±

ER+F×60	c٥٦,٥٠ ٠,٢٧±	c ٥٨,١٥ ٠,٣٣±	59.28c ٠,٤٥±	15.18c ٠,١٨±	17.99c ٠,٢٧±	66.29c ٠,٤٢±	76.72 c ٠,٤٢±
ER+R×60	c٥٦,٥٩ ٠,٢٧±	57.53c ٠,٣٣±	58.05c ٠,٤٥±	15.07c ٠,١٨±	17.68c ٠,٢٧±	66.17c ٠,٤٢±	76.27 c ٠,٤٢±
ER ×90	٥٨,٤٠c ٠,٢٧±	c٥٧,٧٨ ٠,٤٧±	b ٥٩,٥٧ ٠,٥٦±	5.96 b١ ٠,٣٤±	b١٨,٣٤ ٠,٤٥±	b٦٨,٤٥ ٠,٦٧±	b٧٦,٠٤ ٠,٤٢±
ER+B×90	62.15b ٠,٢٧±	62.07b ٠,٤٧±	b٦٤,٨٤ ٠,٥٦±	17.53b ٠,٣٤±	b٢٠,٨١ ٠,٤٥±	b٧٠,٩٤ ٠,٦٧±	b٨٠,١٢ ٠,٤٢±
ER+F×90	b٦٢,١٠ ٠,٢٧±	b٦١,٥١ ٠,٤٧±	b٦٣,٦٠ ٠,٥٦±	17.30b ٠,٣٤±	b٢٠,٦٧ ٠,٤٥±	b٧٠,٥٢ ٠,٦٧±	b٧٩,٨٦ ٠,٤٢±
ER+R×90	b٦١,٨٣ ٠,٢٧±	b٦٠,٨٠ ٠,٤٧±	b٦٢,٣٥ ٠,٥٦±	17.1 3b ٠,٣٤±	b٢٠,٣٦ ٠,٤٥±	b٧٠,٤٤ ٠,٦٧±	b٧٩,٣٠ ٠,٤٢±
ER ×120	62.89b ٠,٣١±	b٦١,٥٢ ٠,٣٤±	a٦٣,٤٥ ٠,٥٣±	17.60a ٠,٢٥±	a٢٠,٧٩ ٠,٤٥±	٧٠,٧٧b ٠,٥٥±	ab٨٢,٨١ ٠,٤٠±
ER+B×120	a٦٧,٥٣ ٠,٣١±	a٦٥,٥٣ ٠,٣٤±	a٦٩,٣٦ ٠,٥٣±	a١٩,٧١ ٠,٢٥±	a٢٣,٢٦ ٠,٤٥±	a٧٤,٩٨ ٠,٥٥±	a٨٦,٨٩ ٠,٤٠±
ER+F×120	67.67a ٠,٣١±	a٦٥,٢٨ ٠,٣٤±	a٦٧,٨٠ ٠,٥٣±	a١٩,٢٧ ٠,٢٥±	a٢٣,١٠ ٠,٤٥±	a٧٤,٦٦ ٠,٥٥±	a٨٦,٧٨ ٠,٤٠±
ER+R×120	a٦٧,٥٥ ٠,٣١±	a٦٤,٥٥ ٠,٣٤±	a٦٦,٦١ ٠,٥٣±	a١٩,١٨ ٠,٢٥±	a٢٢,٨٣ ٠,٤٥±	a٧٤,٤٩ ٠,٥٥±	a٨٦,١٢ ٠,٤٠±

*Means with different letters vertical show significant difference at($P \leq 0.05$).

** ER =experiential ration, ER+B = experiential ration +black cumin seed, ER+ F= experiential ration

+fenugreek seed, ER+R= experiential ration+rocket seed.

The results of the statistical analysis (table 3) showed a significant effect ($P \leq 0.05$) due to the interaction between the supplementation of the black cumin ,fenugreek or rocket seeds to the experimental rations and the fattening period 1-30-1,-1-60,-1-90 or -1-120 days . The length of the body, the height of the body at the front and wither, the body thickness at the front and wither ,the girth of the chest and the abdomen in the fattening lambs, and when comparing each type of seeds , the seeds of black cumin ,or fenugreek or rocket and under each period of fattening 1-30 or 1-60 or -1-90 or1-120 days .Also notice a significant increase in all body measurements for lambs fattening for 1-120 days that fed experimental ration only, experimental ration supplemented by black cumin , fenugreek or rocket seeds as compared to others lamb groups fattening for 1-30 or 1-60 or -1-90 days ,respectively.

3:The correlation between the body weights and different measurements

The results listed in table (4) indicate a positive and significant correlation coefficients between the final body weight and the different body measurements and different fattening periods 1- 30, 1-60,1-90 and 1-120 days, where correlation coefficients were positive and significant ($P \leq 0.05$) between the final body weight and the thickness of the body at the front and wither ,while the correlation coefficients were positive and highly significant ($P \leq 0.01$) between the final body weight and the body length, the height of the body at the front and wither, this explain that somebody measurements like body length, the height of the body at the front and wither have to do with the growth of the bones, and the bones make up the largest proportion of weight of the body weight and that growth is occurring in the different body directions (29).These results were consistent with the results of (30) who observed a positive and highly significant($P \leq 0.01$) correlations between live body weight and the body length,body height at the front ,body thickness at the front and chest circumference in Ethio-pia's Washera sheep and with the results of (10)which found positive and a significant correlation coefficients between the body weight and the body measurements of the Awassi lambs for three successive fattening periods (1-55, 1-185 and 1-115 days),and the results of (9) which found a positive and significant correlation coefficients between the body weight and the different body measurements of lambs fattened for two fattening periods(1-60 and 1-90)days

Table 4:Correlation coefficients between weight, length and dimensions of the body

Studied traits	Weight at ( ) days			
	٣٠	٦٠	٩٠	١٢٠
Body length	٠,٤٧٨**	٠,٥٠٩**	٠,٥٢٤**	٠,٥٥١**
Front height	٠,٤١٨**	٠,٤٣٢**	٠,٤٦١**	٠,٤٨٧**
Wither height	٠,٤٩٧**	٠,٥١٣**	٠,٥٢١**	٠,٥٤٤**
Front thickness	٠,٤٢٢**	٠,٤٢٢**	٠,٤٥٤**	٠,٤٨٩**
Wither thickness	٠,٤٣٤**	٠,٤٨٧**	٠,٥١٣**	٠,٥٣٥**
Chest girth	٠,٤١٨*	٠,٤٧٦*	٠,٥٠٨*	٠,٥٥٤*
Abdomen girth	٠,٥١٨**	٠,٥٨٥**	٠,٦٣٧**	٠,٦٦٢**

*significant ($p \leq 0.05$),** significant ($p \leq 0.01$)

All the results showed that supplementation of black cumin or fenugreek or rocket seeds to the experimental rations had improved the performance of lambs consumed for these seeds, which was reflected in their superiority in production performance and different body measurements and without adverse effect on the animal health as compared to lambs in 1st that fed experimental ration only for 120 days.

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SOME CHEMICAL CONTENTS OF *Urtica dioica* L. SPECIES DISTRIBUTED IN FLORA OF VAN/TURKEY

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ABSTRACT

The majority of the plants belonging to the genus Urtica and the Urticaceae family are perennials and some of them are annuals. Urtica dioica L. is a perennial, dioic and herbaceous plant. Turkey had growing areas are quite wide. It has a wide distribution area in tropical and subtropical areas in the world. Root, stem, leaves and seeds of Urtica dioica L. are used for therapeutic purposes. However, nettle is also used in cosmetics, dyes, fiber, food and fertilizer. In the study, it is aimed to determine some nutrients and mineral contents of Urtica dioica L. species which are naturally distributed around Lake Van in Eastern Anatolia Region. Some chemical contents such as total ash, crude protein, pH, crude cellulose, N, Na, Mg, K, Ca, P, S, Mn, Fe, Cu, Zn, Cr, Cd, Co and Pb in plant samples were investigated.

As a result of the research; it was determined crude protein content (11.47 %), pH (8.73), total nitrogen content (1.84 %), total ash content (16.33 %) and crude cellulose content (29.88 %). In addition, some mineral substances such as K (8.92 g kg^{-1}), Ca (23.47 g kg^{-1}), P (3.48 g kg^{-1}), Mn (75.70 mg kg^{-1}), Fe (334.4 mg kg^{-1}), Cu (9.36 mg kg^{-1}), Zn (38.23 mg kg^{-1}) and heavy metals concentrations such as Cr (0.61 mg kg^{-1}), Co (0.51 mg kg^{-1}), Cd (0.09 mg kg^{-1}), Pb (0.46 mg kg^{-1}) were determined.

Keywords: *Eastern Anatolia, heavy metal, medicinal plants, Urtica dioica L.*

INTRODUCTION

Urtica dioica L. has been a staple in herbal medicine since ancient times. It is a kind of plant which is a member of *Urticaceae* family (Anonymous, 2019). Stinging nettle which is belonging *Urticaceae* family is one of the plants grown in our region known for its functional properties. Also, it is a large group that is widespread in tropical and subtropical areas of both hemispheres. (Aydın, 2019). Most of the plants in the *Urticaceae* family are perennials, while the others show a one-year development. Usually, it is in the herbaceous form, although there are also in the shrubs form (Ayan et al., 2006). There are 50 general and 700 species in the family of stinging nettle. In our country, it is represented by 3 species. *Urtica urens* L. (small nettle) and *Urtica pilulifera* L. (black nettle) are also species that grow in our country (Kalaycıoğlu, 2005). *U. dioica* is a one of these species, which includes high diversity of chemicals. Because of that diversity, all parts of the plants are used in medical treatment, nutrient, dye, fiber, fertilizer and cosmetic industry from past to today (Akdeniz, 2010). Its scientific name, *Urtica dioica*, comes from the Latin word uro, which means "to burn," because its leaves can cause a temporary burning sensation upon contact (Anonymous, 2019). There are various chemical substances in the burning hairs on the surface of the leaf. It is reported that this burning characteristic of nettle is caused by formic acid, histamine, serotonin and choline. Nettle leaves are rich in minerals, chlorophyll, amino acids, lecithin, caretenoids, flavonoids, sterols, tannins and vitamins. Plant roots contain chemicals such as scopoletin, sterols, fatty acids, polysaccharides and isolectin (Aydın, 2019). The dry matter of nettle contains 18% protein, 14.5-17% albumin, 2.5% fatty substances. Seeds contain about 8-10% fixed oil. 1 kg of fresh herbs contains 130 mg of vitamin C, 730 mg of carotene and oxalate. The burning feathers include antic acid, acetylcholine, histamine and formic acid. Leaves; K, vitamin B1, provitamin A, urticin glycoside, cystosterin, sepi substances, xanthophyll while ash contains demirtrioxide (6.3 %), silicon, potassium, calcium (Koc, 2002). Due to the versatile chemical richness of nettle, all plant parts are used for folk medicine, food, dye, fiber industry, fertilizer and cosmetic purposes from past to present (Manganelli ve ark. 2005). Plant is used to treat discomfort such as treat anemia, menstruation, hemorrhoids, inflammation, rheumatism, eczema, expectoration, diarrhea, burns, diuretic, hypertroit, bronchitis, cancer, diabetes, gout, arteriosclerosis, stomach, asthma and iron deficiency (Grieve, 1984; Bown, 1995).

Elements such as potassium (K), phosphorus (P), calcium (Ca), magnesium (Mg) and sodium (Na) are very necessary elements for human and animal health. However, some elements (Mn, Mo, Cu, Zn etc.) are essential for the organisms. In their absence both growth and reproduction are stopped (Bat et al., 1999). They have poison effect when they reach certain levels the heavy metals such as Cr, Pb, Cd, Co, Hg, Ni in the plants (Ozcan, 2004; Bedir, 2010). In this study was aimed to determine the nutritional values and mineral

compositions of *Urtica dioica* L. species which grew as wild plants in the Van region of Eastern Anatolia, Turkey.

MATERIAL AND METHODS

Some chemical compositions of *Urtica dioica* L. which located in natural flora at around Van Lake in Eastern Anatolia region, were determined. The plants were collected from natural flora in 2013 and botanical identifications were made by the *Department of Biology, Science Faculty, Van Yuzuncu Yil University* according to 'Flora of Turkey' (Davis, 2007) Some information for *Urtica dioica* L. species are given in Table 1.

Table 1. Some introductory information of *Urtica dioica* L. species

Plants Scientific Name	Family	Local Name	Benefits	Used Parts	Locality
Urtica dioica L.	*Urticaceae*	Dızlagan, Dalagan, Cıncar, Agdalak, ve Isırgan otu	For all cancers Analgesic, rheumatism, diüretic, admonitory	All plants	B9

B9: Bitlis, Tatvan, Alacabuk Mountain, South slopes, Aksogan locality, step, 1990m.

Plants were cleaned from foreign materials, separated to parts used and washed with deionized water, dried in room temperature, ground, packaged in plastic bags and kept in desiccators until analysis. To determine dry matter content, the materials were dried at 105 ºC for 24 hours in oven. Electric Muffle Furnace set at 550 ºC were used for determination of total ash content (inorganic matter). Kjeldahl apparatus and method were used to find the nitrogen content of the samples.

After total nitrogen content determination, crude protein contents were calculated by formula. pH values were determined by pH-meter in the plant samples. Crude fiber analyses were accomplished by AOAC (Association of Analytical Chemists) method (AOAC 2000). Mineral compositions of the samples were determined as follows; dried plant samples were ashed in a furnace by nitric (AR) and hydrochloric acid (AOAC). Afterwards, distilled water (50 ml) was added to samples in a volumetric flask. All the analyses were repeated three times and standard materials were used for chemical analyses. Atomic Absorption Spectrometry was used for determination of mineral contents. Phosphorus (P) was determined by molybdate-vanadate and sulphur (S) was observed according to the Mitchell, (1992) method in conjugation with a UV-Visible spectrophotometer (Shimadzu UV-1201 V; Shimadzu, Kyoto, Japan). The average data obtained from chemical analyses have been shown in Table 2, 3, 4 and 5 with their standard deviations.

RESULTS AND DISCUSSION

In study, nutrient content of *Urtica dioica* L. species that are important for human health for the prevention and control of diseases were investigated and some properties such as the values of total ash, total nitrogen, crude protein, pH and crude fiber contents are given in Table 2, macro mineral compositions in Table 3, micro mineral composition in Table 4 and heavy metal compositions in Table 5. The values are given as mean ± SD.

Table 2. The average chemical composition values of *Urtica dioica* L.

Parameters	*Urtica dioica* L.
Total ash (%)	16.33 ±0.58
Total nitrogen (%)	1.84 ± 0.05
Crude protein (%)	11.47 ± 0.28
pH	8.73± 0.23
Crude fiber (%)	29.88 ± 0.10

Stinging nettle (*Urtica dioica* L.) leaf has a long history as an herbal remedy and nutritious addition to the diet (Rapoti and Romvary, 1987). Nettle leaf is rich in minerals and vitamins such as iron which is found in large concentrations (Guil-Guerrero and Rodriguez-Garcia, 1999).

The total ash, total nitrogen, crude protein, pH and crude fiber contents of *Urtica dioica* L. situated in Van flora were determined as 16.33 %, 1.84 %, 11.47 %, 8.73 and 29.88 %, respectively. Hipps et al., (2005)

recorded that total nitrogen content was found between 0.8-0.17 % in the stinging nettle and Khan and Joergensen (2006), between 1.97-2.14 %. Also, Mullerova et. al., (2014) determined that the total ash content found between 11.70-14.43 %, CF 25.72-29.36 % and total nitrogen 2.12-2.99 % . However, Radman et. al., (2015) determined that it was found between 16.69-29.81 % rate of crude protein, also total nitrogen content between 0.08-0.16 % in nettle. For total ash and CF content, the results obtained from this study were higher than results of Mullerova et al., (2014) but, crude protein content was lower from this researcher. Also, for nitrogen content, ours research results were higher from Hipps et al., (2005) and Radman et. al., (2015) while the lower from Khan and Joergensen (2006) with Mullerova et. al., (2014).

The daily sodium need per person is of 5-15 gr. It is known that hypertension is triggered by excessive consumption. The World Health Organization (WHO) declared that a minimum daily potassium requirement is 3.51 gr kg^{-1} of a person for the protection against heart disease and the regulation of blood pressure (Saltan and Canbay 2015). In adults daily Mg consumption, but its amount must be up to 300-420 mg (Saltan and Canbay 2015).

Table 3. Mean values of macro mineral compositions of *Urtica dioica* L.

Macro minerals	***Urtica dioica* L.**
Na (g kg^{-1})	0.57 ± 0.02
Mg (g kg^{-1})	1.77 ±0.10
K (g kg^{-1})	8.92 ± 0.45
Ca (g kg^{-1})	23.47 ± 0.92
P (g kg^{-1})	3.48±0.20
S (g kg^{-1})	2.70 ± 0.08

In this research, Na, Mg, K, Ca, P and S contents were determined as 0.57, 1.77, 8.92, 23.47, 3.48 and 2.70 gr kg^{-1} from *Urtica dioica* L. species, respectively. In the different studies on nettle, Hipps et al., (2005), were recorded that potassium (K) content varied from 25.0 to 27 gr kg^{-1}, phosphorus (P) content changed between 3.8-4.6 gr kg^{-1}. Khan and Joergensen (2006) were determined Mg, K, Ca, P and S contents between 1.8-3.0 mg gr $^{-1}$,17.0-20.0 gr kg^{-1}, 31.0-34.0 gr kg^{-1}, 2.0-4.3 gr kg^{-1}, 3.4-4.6 gr kg^{-1}, respectively. Mullerova et al., (2014) determined that found Mg content between 2.3 to 5.1 gr kg^{-1}, K content between 20.3-26.3 gr kg^{-1}, Ca content between 21.5-33.0 gr kg^{-1} and P content between 3.9-5.6 gr kg^{-1}. Also, Radman et al., (2015) were determined that K content was found between 18.3-27.7 gr kg^{-1} and Ca contents between 43.0-62.9 gr kg^{-1}. The high concentration of calcium inhibits the uptake of other non-essential ions, especially heavy metals (Radman et al., 2015). Some researchers recorded higher levels of potassium (Hipps et al., 2005; Khan and Joergensen, 2006; Mullerova et al., 2014; Radman et al., 2015), calcium (Khan and Joergensen, 2006; Radman et al., 2015) and phosphorus (Hipps et al., 2005; Mullerova et al., 2014) in nettle than those that were obtained in this study. But for Ca and P, these results are similar with results of researchers (Khan and Joergensen, 2006; Mullerova et al., 2014). Sodium (Na) values of medicinal and edible plants were found between 0.21 and 63.32 gr kg^{-1} (Akgunlu, 2012) and S concentrations 1.12-3.27 gr kg^{-1} (Tuncturk et al., 2017; Tuncturk et al., 2017) in wild vegetables. Nutrition element contents of the plants are affected from a number of factors such as growing conditions, soil characteristics, plant genetic structure, water availability, growing seasons etc.

Table 4. Mean values of micro mineral compositions of *Urtica dioica* L.

Micro minerals	***Urtica dioica* L.**
Mn (mg kg^{-1})	75.70 ± 0.72
Fe (mg kg^{-1})	334.40 ± 48.50
Cu (mg kg^{-1})	9.36 ± 0.16
Zn (mg kg^{-1})	38.23 ± 1.87

In the present study, we also determined some micronutrients and heavy metal contents. As seen in Table 4, the concentrations of Mn, Fe, Cu and Zn in studied samples were determined as 75.70, 334.40, 9.36 and 38.23 mg kg^{-1}, respectively. Cupper is necessary for proteins and enzymes as a cofactor for plants to grow up, but its excess intake might cause health problems. 2.5 mg of daily cupper intake can meet the daily requirement of adults (Altıntıg et al., 2014). Zinc is required for normal growth, a healthy immune system function, DNA synthesis, new protein synthesis and cell division as well for different chemical reactions (Maiti et al., 2016). In previous studies, Zn contents were determined between 27.0-140.0 mg kg^{-1} (Khan and

Joergensen, 2006) and between 44.9-75.8 mg kg^{-1} (Mullerova et al., 2014) of *Urtica dioica* L. species. For Fe contents Mullerova et al. (2014) and Radman et al. (2015) were recorded that found between 85.8-135.9 mg kg^{-1} and 501.0-11495.0 mg kg^{-1}. Cu contents of nettle were determined between 9.5-12.2 mg kg^{-1} (Mullerova et al., 2014) and 7.0-10.0 mg kg^{-1} (Khan and Joergensen, 2006) while Mn content was found between 160.0-206.3 mg kg^{-1} (Mullerova et al., 2014). Our research results are partially compatible with results of other researchers. In the some medicinal plants species Mn rate was determined between 7.0 and 315.0 mg kg^{-1}, (Esetlili et al., 2014). In ours study, determined concentrations of Mn, Fe, Cu and Zn are in accordance with previous studies.

Table 5. Mean values of heavy metal compositions of *Urtica dioica* L.

Heavy metals	***Urtica dioica* L.**
Cr (mg kg^{-1})	0.61 ± 0.04
Co (mg kg^{-1})	0.51 ± 0.10
Cd (mg kg^{-1})	0.09 ± 0.01
Pb (mg kg^{-1})	0.46± 0.09

In the current study; analyzed plant samples had limited and trace levels of chromium (Cr), cobalt (Co), cadmium (Cd) and (Pb) as 0.61, 0.51, 0.09 and 0.46 mg kg^{-1}, respectively. These metals known as heavy metals and their hazardous effects on living organisms in certain quantities were reported. Dogan (2003) determined that accumulation of 6.15 µg gr^{-1} Cd in onion plant. Also, researher did determined that this situation can cause significant health hazards. In addition, it is stated that more than 1.0 ppm Cd is toxic in plants and it has poison effect on people who regularly consume plants containing more than 3 ppm Cd. In some studies, Cd and Pb concentrations in the nettle plants were determined between 0-0.21 mg kg^{-1} and 0-13.0 mg kg^{-1}, respectively (Khan and Joergensen 2006). Khan and Joergensen (2006), recorded quite higher levels of lead (Pb) and cadmium (Cd) in nettle than those that were obtained in this study. Cr concentrations of some edible and medicinal plants were found as 0.05-37.91 mg kg^{-1} and Co concentrations were reported between 0.04-1.69 mg kg^{-1} (Akgunlu, 2012; Esetlili et al., 2014; Saltan and Canbay, 2015; Tuncturk et al., 2017). Ours findings with findings of previous studies are within the same limits.

CONCLUSIONS

In order for our body to function properly, there are certain amounts of Macro and Micronutrients that we must take from the foods we eat. But, these nutrients must be within the tolerance limits determined by world health organization. Otherwise, it may have adverse and undesirable effects on human health. When heavy metals exceed the concentration limit, they act toxic. The findings showed that stinging nettle was found to be within tolerance limits for heavy metals. Furthermore, it is important to consciously make of plant consumption by considering that heavy metals deposited in excess on humans and animals may be toxic.

THANKS

This research was supported with FAP-2019-8538 code number by Van Yuzuncu Yil University BAP coordinatory (APGD).

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DETERMINATION OF SOME AGRICULTURAL CHARACTERISTICS IN *POA* SPP. L. GENOTYPES COLLECTED FROM NATURAL FLORA

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This article is taken from Rabiya Koyuncu's master thesis titled "Determination of morphological diversity in poa genotypes collected from nature".

ABSRACT

In this study, it was aimed to determination of some agricultural properties in terms of usability as green area and forage crops in the bluegrass (Poa spp.) genotypes collected from natural flora. Genotypes which were superior to these characteristics were selected. The selected genotypes are genotypes of three different bluegrass species within the scope of TUBITAK project numbered 113O919. These species are Canada bluegrass (P. compressa L.), Kentucky bluegrass (P. pratensis L.) and Rough bluegrass (P. trivialis L.). Agricultural characteristics of these plants were examined for two purposes including grass and forage plants. Measurements were made in 2016. By evaluating the obtained data, the potential of genotypes to be used in pasture and forage crops cultivation and also in green areas were investigated. Differences between genotypes were determined in terms of investigated properties. The large variation of these differences increases the chances of choosing the plants with the appropriate characteristics desired for breeding. As a result of the study, superior-specific bluegrass genotypes were identified that could be used in future breeding trials.

Keywords: *Agricultural property, Bluegrass, Genotype, Grass quality,*

DOĞAL FLORADAN TOPLANAN *POA* SPP. L. GENOTIPLERINDE BAZI TARIMSAL ÖZELLIKLERIN BELIRLENMESI

ÖZET

Bu çalışmada doğal floradan toplanmış olan (Poa spp.) salkımotu genotiplerin de yeşil alan ve yem bitkisi olarak kullanılabilirlik bakımından bazı tarımsal özelliklerin belirlenmesi amaçlanmıştır. Bu özellikler doğrultusunda üstün olan genotipler seçilmiştir. Seçilen genotipler, 113O919 no'lu TÜBİTAK projesi kapsamında 3 farklı poa türünün genotipleridir. Bu türler Poa compressa L., Poa pratensis L., ve Poa trivialis L.'dir. Bu bitkilerde çim ve yem bitkisi olmak üzere iki amaca yönelik tarımsal özellikler incelenmiştir. Ölçümler 2016 yılında yapılmıştır. Elde edilen veriler değerlendirilerek genotiplerin mera ve yem bitkileri tarımında, ayrıca yeşil alan tesisinde kullanılabilme potansiyelleri araştırılarak ıslah çalışmaları için temel verileri belli olan genetik materyaller kazandırılmıştır. İncelenen özellikler bakımından genotipler arasında farklılıklar tespit edilmiştir. Bu farklılıkların değişim genişliğinin fazla olması ıslah için istenilen amaca uygun özellikteki bitkileri seçme şansını artırmaktadır. Araştırma sonucunda gelecekteki ıslah çalışmalarında kullanılabilecek üstün özellikli poa genotipleri belirlenmiştir.

Anahtar Kelimeler; *Çim kalitesi, Genotip, Poa, Tarımsal özellik*

INTRODUCTION

The world's population is growing rapidly. The world population, which was 2.5 billion in 1950, is expected to reach 7.5 billion in 2020 (Gürel ve Irmak, 2017). Despite this increase, agricultural growth in the world is gradually decreasing (Alexandratos, 1995). Increasing the production of food in parallel with the increasing population needs is inevitable for the continuation of human life. Apart from plant production, the production of animal products is possible by providing feed to feed animals. The principle of economic farming in animal production is based on obtaining cheap and nutritious feed. Livestock in advanced countries is mainly based on forage crops and meadow-pasture farming (Bıçakçı ve Açıkbaş, 2018).

Meadows and pastures, which are a source of cheap roughage since they contain various types of plants, are of high quality and generally utilized without any planting and maintenance; it also contains plant genetic resources, creates an environment for wildlife, green areas and resting places are the most valuable assets with

no alternative (Bakır, 1987; Açıkgöz, 2001). In addition, plants in the pasture, thanks to their leaves reduce the speed of raindrops, increases the permeability of the soil (Altın ve ark., 2005). In addition, the plants in the pasture, thanks to their leaves, reduce the speed of raindrops, increase the permeability of the soil (Altın ve ark., 2005); and play an important role in the control of water and wind erosion (Gençkan, 1985). Meadows and pastures also play an active role in reducing the greenhouse effect in the earth's warming and reduce the greenhouse effect caused by the increase of carbon dioxide by assimilation (Cevher, 2012). Considering all these characteristics, any application and precautionary costs for the sustainability and protection of meadows and pastures are not wasted. However, it should be aimed to protect the meadows and pastures in all kinds of agricultural activities (Ertuş, 2018). Pasture grazing with large numbers of animals, early grazing in the spring or late grazing in the autumn leads to inefficient pastures. Pasture areas are not only under grazing pressure. At the same time, it is threatens to decrease for reasons such as roads, dams and new settlements (Sabancı ve ark., 2005). In our country, meadows, pastures, grassland, summer pastures and similar natural resources are the main areas that need to be addressed in terms of sustainable agriculture. In our country, meadows, pastures, grassland, summer pastures and similar natural resources are the main areas that need to be addressed in terms of sustainable agriculture. These areas occupies an important place in the development of animal husbandry and in obtaining low cost animal products (Ertuş, 2018).

Poa species in this sense, our pastures are both a source of plants that can feed the animal and protect the soil. Similarly, it is successfully grown in the green area facility with its rapid settlement, dark green leaves and dense grass formation. The bluegrass genus covers about 500 species, especially in temperate and cold regions and even in high mountain regions of the tropical regions (Avcıoğlu ve ark 2009). While there are about 500 species and subspecies of the bluegrass genus in the world, 25 species are naturally distributed in our country (Anonymous, 2019). Although most of the bluegrass species are located in natural pastures, some are used for feed production and some are used in green areas. Some bluegrass species are very difficult to distinguish morphologically. Except for a few of all the bluegrass species, the grass is delicious and nutritious. Some of the species are perennials and most of them are annual. Some of the species form a tight grass cover on the soil surface with bunch-type, stoloniferous and rhizomatous. This situation is very important for the conservation of soil and water resources in pastures and natural areas with high slope (Anonymous, 2016).

In order to improve the meadows, increase the production of high quality fodder and meet the increasing green area requirement, forage species and varieties suitable for the region should be developed. For this reason, forage crops which have been cultured in different regions of our country, adapted to the region where they were cultured and developed for different purposes can be used. New varieties need to be developed by taking advantage of the populations in natural vegetation that fully adapt to the ecological conditions of the region (Doğrusöz, 2012). Although our country has a great genetic potential in terms of grass breeding, commercially sold grass species are all varieties obtained from the breeding studies of foreign countries. These varieties do not show the desired properties under conditions of our country (such as climate, soil, resistance to diseases and pests) and plant life is short. This necessitates more fertilization, irrigation and other maintenance in the lawn areas and requires a quick renovation of the plant. The construction and maintenance costs of the lawns increase significantly. If we breed new varieties using grass plants found in our natural flora and use our potential to produce grass seeds; significant added value to the economy will be provided by utilizing our valuable gene resources such as underground and overground riches of our country. Thus, our country will not pay money to other countries for importing a significant amount of grass seed every year and construction and maintenance costs of grass fields will be reduced. Although limited in our country, the seeds used in breeding study in meadows do not comply with the regional conditions because they are imported. Therefore, success rate decreases in breeding studies. This case will be reversed if native grass varieties are developed for meadows. The development of domestic grass varieties will not only contribute to the seed needs of our country, but will also contribute to the development of export opportunities by meeting the grass needs of countries with similar ecologies. Scientific studies on the subject will increase the number of trained people, information and resources will increase.

In our country, there are not enough researchers, researches and publications for such subjects. In this study bluegrass materials collected from nature for the purpose of both green area and forage crops will be beneficial for the solution of the problems mentioned above since it is an infrastructure study for breeding studies. In the use of bluegrass genotypes collected from nature for breeding, morphological characteristics should be evaluated as in breeding of other plants. The aim of this study is to determine the morphological characteristics of bluegrass genotypes and to ensure their use in future breeding studies.

MATERIALS AND METHODS

Materials used in the study are 333 genotypes of genus *poa* collected in 2014-2015 within the scope of TÜBİTAK Project No. 113O919 conducted by Assoc. Dr. Mehmet Ali AVCI. Poa genotypes were collected as both rooted plants and seeds. The number of provinces collected is 27. In 2014, the rooted plant and seed collection trip lasted 103 days. Vegetation formation periods were followed in the trips The collected seeds and the rooted plants were sown to pots in greenhouse.

Figure 1. detection and collection of genotypes

Figure 2. land and greenhouse studies

Seedlings of the genotypes which were sufficiently grown up were sown to the trial field of Selcuk University Agricultural Faculty on July and August months in 2015 year by 0.5m x 0.5m spaces. Identification was realized as species and subspecies when the bunch formation was observed. Cultural practices such as irrigation, fertilization, weed control and cut out practices were made regularly. Measurements were made in 2016.

RESULTS AND DISCUSSION

Poa compressa

Of the Poa compressa genotypes measured, 14 out of 93 plants were collected as rooted. Measurements of Poa compressa genotypes are given in Table 1. The average values of Poa compressa genotypes are as follows. 30.13 cm plant height, 0.23 cm leaf width, 7.61 cm leaf length, 10.43 cm plant diameter, 7.37 cm spike length, 21.98 cm last node length and 0,52 seed yield. Most of the investigated parameters showed higher CV values which means higher genetic diversity.

Table 1. Average, highest, lowest, standard deviation (Sd) and coefficient of variation (CV) of some properties examined in *Poa compressa genotypes*

	Poa compressa L.					
Properties	**Number of material**	**Average**	**Highest**	**Lowest**	**Sd**	**CV(%)**
Plant height (cm)	93	30,13	59,00	3,00	14,79	49,08
Leaf width (cm)	93	0,23	1,00	0,01	0,14	61,65
Leaf length (cm)	93	7,61	18,00	2,00	3,23	42,46
Plant diameter (cm)	93	10,43	22,00	3,00	3,65	35,00
Spike Length (cm)	59	7,37	16,00	2,00	3,48	47,18
Last node Length (cm)	59	21,98	37,00	6,00	8,51	38,71
Seed yield (g)	79	0,52	3,30	0,01	0,66	126,40

***Poa pratensis* L.**

Of the *Poa pratensis* genotypes measured, 14 out of 76 plants were collected as rooted. Measurements of Poa pratensis genotypes are given in Table 2. The average values of Poa pratensis genotypes are as follows. 26.21 cm plant height, 0.24 cm leaf width, 6.80 cm leaf length, 11.27 cm plant diameter, 7.63 cm spike length, 20.06 cm last node length and 0,73 seed yield. These values will be healthier with long-term studies. Because the plant characteristics of the perennials examined can vary each year. What is important here is to be able to maintain efficiency and quality for many years. Gençkan (1983) says that the Poa pratensis L. is about 60 cm tall and the leaves are narrow and medium in width. Davis (1985), in *poa pratensis* plant height 20 - 80 cm, leaf width 1.5 - 4 mm, spike length of 3.5 - 12 cm determined that the change. Öztan ve Okatan (1985), in poa pratensis reported that plant height varies between 30-100 cm, leaf length 5-40 cm, leaf width 2-5 mm. In the Poa pratensis Açıkgöz (2001), plant height 30 - 70 cm; Serin et al. (1999), plant height 30 - 75 cm, leaf length 15 - 40 cm, leaf width of 2 - 5 mm and a thousand grain weight of 0.25 g stated that. Tamkoç et al. (2007),in poa pratensis reported that plant height varies between 64.3-71.3 cm, leaf length 9-11.6 cm, spike length 38.3-49.1 seed yield 6.2-10 g. They stated that the difference between poa genotypes in terms of leaf width was statistically insignificant and that the narrowest width of the leaf was 0.43 cm and widest width of the leaf was 0.5 cm.

Table 2. Average, highest, lowest, standard deviation (Sd) and coefficient of variation (CV) of some properties examined in *Poa pratensis genotypes*

	Poa pratensis L.					
Properties	**Number of material**	**Average**	**Highest**	**Lowest**	**Sd**	**CV(%)**
Plant height (cm)	76	26,21	67,00	3,00	18,63	71,06
Leaf width (cm)	76	0,24	0,60	0,01	0,15	61,87
Leaf length (cm)	76	6,80	14,00	0,10	2,69	39,48
Plant diameter (cm)	64	11,27	25,00	2,00	5,09	45,16
Spike Length (cm)	35	7,63	16,00	2,00	3,56	46,63
Last node Length (cm)	35	20,06	36,00	5,00	7,81	38,94
Seed yield (g)	54	0,73	2,81	0,50	0,86	47,98

Poa trivialis L.

Of the *Poa trivialis* a genotypes measured, 36 out of 164 plants were collected as rooted. Measurements of Poa trivialis genotypes are given in Table 3. The average values of *Poa trivialis* genotypes are as follows. 30.02 cm plant height, 0.32 cm leaf width, 6.64 cm leaf length, 12.67 cm plant diameter, 5.74 cm spike length, 17.31 cm last node length and 0,80 seed yield. Gençkan (1983), in *Poa trivialis* plant length 50-75 cm, leaf width 2-6 mm and thousand grain weight 0.2 g reports. Davis (1985), in *Poa trivialis* plant height 25 - 90 cm, leaf width 2 – 3.6 mm, spike length of 4 - 13 cm determined that the change. The studies conducted may differ or resemble those conducted by other researchers. This may be due to differences in genetic structure and ecological environment. As in other poa species, the values obtained in *Poa trivalis* will be healthier with long term studies.

Like many plants found in natural flora, the genetic diversity of *poa* plants is decreasing. Collection of forage crops in Turkey and studies related to the use of genotypes for breeding is not enough. In this study, some plant characteristics of *poa* genotypes collected from natural flora were determined. There were differences between *poa* genotypes in terms of some traits examined. As a result, when the data obtained for these three species are examined; those with high plant height can be used for meadow areas and those with short height can be used for turfgrass. Those with short leaf width and length can be considered for grass fields. Leaf width thick and long leaf length can be considered as grass type. So genotypes are suitable for meadow areas. Those with a large plant diameter cover the area more quickly and are more suitable for use in grass areas. In seed harvesting, those with high Spike Length and Last node Length may be suitable for machine harvest. It can also be considered as a combined yield (grass + seed) in those with high seed yield.

Table 3. Average, highest, lowest, standard deviation (Sd) and coefficient of variation (CV) of some properties examined in *Poa trivialis L. genotypes.*

	***Poa trivialis* L.**					
Properties	Number of material	Average	Highest	Lowest	Sd	CV(%)
Plant height (cm)	164	30,02	75,00	3,00	16,52	55,02
Leaf width (cm)	164	0,32	18,00	0,01	1,40	43,6
Leaf length (cm)	164	6,64	15,00	0,10	3,14	47,27
Plant diameter (cm)	148	12,67	28,00	4,00	5,30	41,83
Spike Length (cm)	102	5,74	15,00	1,00	2,99	52,11
Last node Length (cm)	102	17,31	44,00	4,00	8,07	46,60
Seed yield (g)	102	0,80	3,75	0,30	1,07	84,97

The wide variation of these differences increases the chances of selecting plants suitable for the purpose for breeding. As a result of the research, superior *poa* genotypes which can be used in future breeding studies were determined. Genotypes with good desirable properties can be used directly in breeding. Genotypes with missing aspects can be completed using breeding methods. Or a feature that is superior to itself can be complementary to another breeding program. Poa genotypes needed for a successful grass breeding program are available in our country. Collecting *poa* genotypes and other forage crops needs to be done throughout the country. Following plant collection, determination of plant characteristics, use in breeding and development of indigenous varieties is a process that must be completed in no time. It has been seen that it is necessary to continue the studies on breeding of genotypes which have superior properties than the *poa* plants studied, and developing varieties suitable for the conditions of our country and region. By increasing such studies, besides the storage of gene resources, it will be ensured to be protected by using.

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EVALUATION OF THE LANDSCAPE DESIGN OF KULU STATE HOSPITAL GARDEN ACCORDING TO USER EXPECTATIONS

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ABSTRACT

Hospitals are places used by many people during the day. It is used by people such as patients, relatives, and hospital staff. They use the interior of the hospital as well as the outer space. The hospital garden is used for many purposes such as sitting, relaxing, walking, smoking, fresh air, getting away from stress. The landscape design of hospital gardens should be taken and requests and opinions of the user should be taken. In this study, the hospital gardens; History, classification, planning and design criteria to provide information about what is intended. And the main purpose is to evaluate the landscape design of the Kulu State Hospital's garden in terms of the user and to present solutions to the deficiencies and errors that are seen. A questionnaire was conducted to the users to learn about their tastes, requests and their thoughts about the hospital garden. Within the scope of the hospital garden, the questionnaire was applied to 30 people. According to the answers given to the questions, the results of the survey were evaluated, deficiencies were determined and recommendations were made. In order to learn about the likes and desires of the users and their thoughts about the hospital garden, a survey was carried out for the users. Within the scope of the hospital garden, the survey was applied to 30 people.

Keywords: *Hospital, hospital gardens, healing gardens, landscape design*

INTRODUCTION

Hospitals are health institutions that we frequently use in our daily lives. Hospitals; It is used by different people such as medical staff, patients and visitors. Indoor and outdoor spaces in hospitals should be comfortable, clean, reliable and reliable (Sungur Ergenoğlu and Aytuğ, 2007).

Hospitals, buildings and gardens should be considered as a whole. We often use buildings as well as gardens. We meet our needs such as parking, walking, resting, getting fresh air, eating in these places. Today, as much as the construction of hospital buildings, the construction of their gardens is of great importance. Hospital gardens are thought to have positive effects on staff, patients and visitors.

Hospital gardens are light green spaces that provide physical mobility, allow us to relieve stress, get fresh air and free our minds (Elings, 2006; Sakıcı, Çelik and Kapucu, 2013). It creates therapeutic environments in the gardens of health institutions with its walkways, sitting units and green spaces (Marcus and Barnes, 1999; Sakıcı, et all. 2013).

The environments created outside the hospitals provide important psychological, physical and social contributions to the treatment of patients (Karakaya and Kiper, 2011).

According to the studies, it is observed that the presence of people in nature provides effects such as stress relief and finding peace, and it causes faster recovery in terms of health. Recently, this situation has been noticed and people are thought to relax both mentally and physically, such as hospitals, rehabilitation centers, psychiatric centers, community mental health centers, nursing homes and so on. Healing gardens have been established within the health institutions. Healing gardens have positive effects on patients' relatives and hospital staff as well as patients (Ulrich, 2002; Bulut and Göktuğ, 2006; Keçecioğlu, 2014).

The outdoor designs of hospital gardens are divided into functional and aesthetic. In functional design; user (medical staff, patients and visitors) requests and hospital uses should be analyzed to make the most accurate design. In aesthetic design, the materials used should be calming for the patient and their relatives (Gülez et all. 2001; Aksu and Demirel, 2012).

In this study, it is aimed to give information about the history, classification, planning and design criteria of hospital gardens. In addition, the landscape design of the Kulu State Hospital garden was evaluated from the aspect of the user and some suggestions were made in line with the requests of the users participating in the survey.

MATERIALS AND METHODS

The main material of the research is the current state of landscape design of Kulu State Hospital garden. This situation was examined in terms of user requests with the help of surveys and comments were made in the light of the data obtained.The method followed in the study was carried out in three stages. First, the literature is reviewed and information is given about the history, classification, planning and design criteria of hospital gardens. Secondly, the mistakes and deficiencies made by visiting the garden of Kulu State Hospital were identified and photographs were taken. Thirdly, a questionnaire was conducted to 30 people who used the hospital garden to find out the tastes, wishes and thoughts of the patients, relatives and employees of the hospital. Evaluations have been made according to the results of this survey and some suggestions have been made.Questionnaire Form, Akgün (2018), " Examination of Landscape Elements in Hospital Gardens: Case Study of Akdeniz University Hospital " and Keçecioğlu (2014), " Evaluation of Mental Health Institutions and Determination of Landscape Design Principles " based on thesis studies. .

RESEARCH FINDINGS

Kulu State Hospital; It is located in the district center, close to the main road of Ankara - Konya, in harmony with other buildings. There is a single entrance to the entrance and exit at the same time and there is a security hut in the middle. The hospital building consists of 2 buildings, old and new. These 2 buildings are interconnected from the inside.

Figure 1. Geographical location of Kulu district of Konya and front view of the hospital (Anonymous 2019).

Geographical Location: Due to its geographical location, Kulu is above the 35.5 Eastern meridian and 39.5 North parallel. In the North of the District; Bala and Haymana districts, Cihanbeyli district and Tuzgölü to the south, Şereflikoçhisar district to the east, Cihanbeyli and Haymana district to the west.

Transportation: Kulu is 110 km from Ankara and 148 km from Konya. Away. Kulu has an altitude of 1000 and has a surface area of 2880 km2. It is located on the same meridian as Ankara. Located on the Ankara-Konya asphalt, the district is in a busy location. The E-90 (E-5) Highway passes through the boundaries of the district.

Mountains: Located in the middle of the Central Anatolia Region, the district has the characteristic natural structure of Central Anatolia. It has a fairly wide and flat terrain structure. It has very little bumps. To the west is Karacadağ. The height of this mountain is 1739 meters.

Rivers and Lakes: There is no strong stream passing through Kulu district. However, in addition, in the case of closed basins, there are teas that strengthen in winter and dry in summer. The water of the creek passing through the center of the center decreases in summer and 3 km. east of Küçükgöl. There are some springs and fountain waters connected to the district center. These waters are used by the public in their own summer vineyard, garden and animal irrigation works. Tuzgölü and Küçükgöl (Acıgöl) are the lakes in the district. In addition, very small natural pond-shaped waters can be mentioned. Gökler Village and Kozanlı Town ponds are examples of these.

Flora: Our district has steppe vegetation. As a large part of the district land is uneven, it is suitable for agriculture. Beet, cumin, lentil and anise have been planted by farmers in recent years. The planting is generally carried out in the seizure mode, but upon the proliferation of the artesian wells, a double crop method is also being developed. Beet, cumin, lentil and anise, especially barley and wheat, can be added in double crop picking.

Climate: Macro air conditioning climate types of our district enters into continental climate type. For this reason, the climate in the district is harsh and cold in winters, summers and especially in July and August are dry and hot (Anonymous, 2019b).

Landscape Design of Kulu State Hospital Garden

Kulu State Hospital; in the district center, near the Ankara-Konya highway, in a position compatible with other buildings. There is a single entrance door where entrance and exit can be made at the same time and there is a security cabin in the middle part. The hospital building consists of 2 buildings, old and new. These 2 buildings are interconnected from the inside.

In the front part of the garden where people spend a lot of time, there are structures such as cafes and masjids, while in the back part of the garden, where people do not use much, there are structures such as electrical panels and warehouses. While the placement of these structures as front yard and backyard is the right decision, the way the structures are placed in the garden is not appropriate. It has caused a decrease in the amount of green space used by people.

Figure 2. Cafe, masjid (left) in the front yard of Kulu State Hospital, electrical panel in the backyard, warehouse (right)

There is not a certain parking area in the hospital garden, and vehicles are parked in all parts of the garden. This leads to the closure of walking paths. The walkways are generally useful because they provide access to all parts of the garden. Slippery materials were not used in the flooring elements and embossed, rough flooring differences were provided for disabled patients.

Seating units are only available at the front of the building, not distributed throughout the garden. There was no appropriate seating under the pergole placed on the side of the café, while the pergole on the side of the building was left idle and no seating was provided. As the seating elements were insufficient, the seating units used in the hospital building were placed in the garden.

Landscape implementation (vegetation) is generally weak. Selected planting places are wrong. Too many plant varieties have not been used, the color of the plants that attract attention, smell, form, such as features were not paid attention. The green area is generally covered with grass, resulting in a green appearance, but the passage of people to the grass surfaces is prevented. Non-aesthetic limiting elements are included. The green areas in the backyard have been left neglected.

Kulu State Hospital Garden Survey Results

Kulu State Hospital Garden Survey Results. A survey was conducted in order to find out the satisfaction, wishes and thoughts of the patients, relatives and hospital staff who use Kulu State Hospital garden which is selected as research area. The questionnaire which was applied to 30 people within the scope of the hospital garden consists of two parts. In the first part, personal information about gender, age range, education level and occupation of the respondents are given. In the second part, questions about Kulu State Hospital garden are given.

Socio-Economic Structures of the Participants: 57% of the respondents were women and 43% were men.

When the distribution of the respondents according to age groups is examined: 27% are under 25 years, 40% are between 26-35 years, 17% are between 36-45 years, 6% are between 46-55 years, 10% are 56-65 years age range. Users older than 66 did not participate in the survey.

When the respondents were asked how they provided transportation to Kulu State Hospital, which is the area of study; 40% stated that they came by private car, 7% by public transport and 53% by foot.

The participants were asked whether the parking area was adequate and if they did not have a vehicle, they were asked to switch to the other question. However, some participants found the parking area to be inadequate even without a vehicle. 65% of the parking demand was submitted. In addition, 57% of the participants found the pedestrian paths between buildings to be useful, while 43% stated that they were useless.

When the respondents were asked how long they used the hospital garden during their treatment / working period; 20% responded 15 minutes, 40% 15-30 minutes, 3% 30 minutes - 1 hour, 37% more than 1 hour. They also stated that hospital staff mostly use the garden during lunch breaks and every day. 33% of the patients stated that they used the garden every time they came to the hospital.

When the participants were asked what purpose they used the hospital garden; 29% sitting and resting, 21% sitting and chatting with colleagues, 12% walking, 17% smoking, 13% waiting, 4% not using the garden, 4% also said that they use the garden for other reasons. Hospital staff generally use the garden to sit and chat with colleagues.

When asked the participants of the survey whether they feel good in the hospital garden between treatment / work breaks; 83% stated that they felt good, 17% said they did not feel well.

The most important factor in these thoughts was asked to 25 participants who stated that they felt well in the hospital garden and they were told that they could give more than one answer. Green areas were found to be sufficient 12 times, the area was free from noise 4 times, the area away from stress environment 11 times and the other option was selected 4 times. The majority of hospital staff chose the option of removing the area from stress. The most important factor in these thoughts was asked to 5 participants who stated that they were not feeling well in the hospital yard and they were told that they could give more than one answer. Inadequate green areas are marked 4 times, inadequate resting areas 2 times, and the area noisy 5 times. The other option has not been checked.

When the participants were asked whether the structural structures in the garden (bench, trash bin, lighting element, etc.) are sufficient; 73% answered no and 27% answered yes. In addition, when asked if the landscaping in the garden is sufficient; 67% answered no and 33% answered yes.

The respondents were asked what other areas could be available in this hospital yard and they were informed that they could respond more than once. 2% of the participants stated that there could be an outdoor treatment unit, 34% more green areas, 32% children's playground, 17% cafe / restaurant, 15% more parking area.

In line with the survey results and the examinations made in the garden, in the conclusion section; After evaluating the landscape elements in the garden of Kulu State Hospital, criticism and suggestions were made for this hospital garden.

CONCLUSIONS AND RECOMMENDATIONS

Evaluation of landscape items and survey results in Kulu State Hospital yard; recommendations for ensuring deficiencies, errors and user satisfaction are as follows:

1. According to the survey results, the parking area was found to be insufficient. When the general situation of the garden is considered, people park their vehicles all over the garden and the space allocated for the parking area is insufficient. It is not possible to expand the boundaries of the garden, but a multi-storey car park can be built in the area reserved for parking.

2. The structural equipment (bench, lighting element, trash bin, etc.) found in the area was deemed insufficient by the users. Positioning of lighting elements and trash cans has been deemed appropriate. Can be increased in number. Benches are located just in front of the garden. The number of benches should be increased and distributed throughout the garden. Appropriate seating elements should be placed under the pergolas in the garden and the unused pergole should be activated. The pergolas should be covered with ivy-style plants to obtain a shade area. Under suitable trees, under-tree seating units can be placed.

3. Plantation was found to be insufficient by the users. In general, planting is poor and appropriate plants are not selected. Recombination should be done by selecting suitable plants that are pleasing to the eye. Green spaces should be increased by relocating the places made of materials that can be moved such as cafes and masjids. The backyard is idle. General cleaning should be done in the backyard, un-planted areas should be planted and supported with structural reinforcement.

4. When the users were asked what other places should be in the area, they told them that they wanted an outdoor treatment unit, children's playground, cafe-restaurant, more green area and parking area. There is not enough space in the garden to make an outdoor treatment unit. A suitable playground for the 0-6 age group can be used instead of a suitable sheltered garden. In the area there is a cafe - cafeteria style venue. They wanted to have a cafe - restaurant because it was insufficient for people. Can be expanded to appropriate sizes.

5. Limiting elements have been used to prevent the destruction of lawn areas but are aesthetic values. These elements should be replaced with aesthetic ones. And warning signs should be placed in appropriate places and increased in number.

6. It was observed that hospital staff mostly used the garden to sit down, chat with colleagues and relieve stress. There are no special seating spaces in the garden that can only be used by hospital staff. For this reason, their own seating spaces should be created where they can relieve and relieve the work stress.

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VANDALISM IN THE CHILDREN'S PLAYGROUND: THE EXAMPLE OF THE KULU DISTRICT

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ABSTRACT

Children's play areas are places that people often use throughout their lives. These places, which are used intensively, are destroyed by people unintentionally or intentionally. Destruction is called vandalism. Vandalism is, in its most general definition, acts to destroy objects belonging to public or private institutions by acting aggressively. Breaking the windows of the school, writing to queues, writing on walls, harming the phone booths, play groups in the park, camellias, trash cans etc. vandalism is carried out in many ways. The act of vandalism is a social crime. It affects people both materially and spiritually. It has been the subject of research in the world since the 60s. Turkey 'is increasing day by day the number of studies related to this issue. In this study; It was aimed to give information about vandalism, history of vandalism, reasons of vandalism, types of vandalism, areas of vandalism and the results of vandalism. And as the real goal, evaluating the potential of the children's playgrounds in Kulu district to be exposed to vandalism and developing solutions to the deficiencies and errors that are seen. A questionnaire study was applied to 30 people for the purpose of learning about users' tastes, requests and thoughts about children's play areas. According to the answers given to the questions, the results of the survey were evaluated, deficiencies were determined and recommendations were made.

Keywords: *Children, Playground, Vandalism, landscape design*

INTRODUCTION

Vandalism (destructiveness), deliberately and voluntarily, as a result of excavation, breakage, damage to all physical elements of private or public institutions, theft, breakage of windows, writing on the walls, rows, writing events, such as a riot that contains the uprising (Ceccato and Haining, 2005; Doğan, 2011). Vandalism is expressed as In english ‘‘vandalism’’, in French ‘‘vandalisme’’, in German ‘‘vandalismus’’ and in Turkish ‘‘tahripçilik’’ olarak ifade edilmektedir (Olgun and Yılmaz, 2015). Vandalism is used to mean "ravage". Although it was first seen during the French Revolution, it is known to date back to earlier years (Boz and Beyaztaş, 2001). The term M.S. In the 5th century, it was also used to express the mercilessness of the East Germanic people who looted the works of art in Rome (Avcı et all. 2016).

Destruction is the act of destroying property belonging to public or private institutions by acting aggressively (Yavuzer, 1988). It is an uncontrolled, irregular, powerful impulse, especially directed towards artworks, goods, trowel, objects, burning, washing, destroying. This impulse is a derivative of the aggressive impulse, which is the source of violence (Akyol, 2006). It is known that private property areas suffer less damage than public institutions. Therefore, the risk of destruction of a private property is less than in public areas (Underwood, 1980; Aslan, 2018).

Urban furniture is the most exposed to vandalism in public areas. Lighting elements, trash cans, benches, camellias, limiting elements, toilets, children's play elements are the most damaged urban furniture. They often suffer from vasdalism in vegetated areas. People are harming urban furniture to express their anger, earn financial income from the items they have destroyed, or just have fun. In children's playgrounds, the destruction of play elements and other urban furniture is mostly done for these purposes (Yılmaz et all. 2003).

We are witnessing vandalism in every aspect of our lives. Van Vliet (1984) grouped the areas where vandalism could be seen in six groups. These:

1. Parks and children's playgrounds,
2. Training facilities,
3. Public transport,
4. Dormitories and libraries,
5. Official institutions and organizations,
6. Urban furniture (pergola, camellia, bench, street lights, etc.) (Öğülmüş, 2000).

In this study; It is aimed to give information about vandalism, history of vandalism, reasons of vandalism, types of vandalism and the consequences of vandalism. In addition, the potential of children's playgrounds in Kulu district to be exposed to vandalism was evaluated and some suggestions were made in line with the requests and opinions of the users.

MATERIALS AND METHODS

In the study, all kinds of books, researches, thesis, articles and other sources related to Vandalism were used as auxiliary materials. The main material is the survey of the children's playgrounds in Kulu district in terms of potential exposure to vandalism and user requests. Children's playgrounds were examined on-site and the results were determined and interpreted according to the data obtained and the questionnaire evaluation.

The method followed in the study was carried out in three stages.

Firstly, literature review was conducted to give information about vandalism, history of vandalism, reasons of vandalism, types of vandalism, areas of vandalism and the consequences of vandalism.

Secondly, the children's playgrounds in Kulu district were visited on site and vandalism actions were examined and photographed.

Thirdly, a survey was conducted to find out the tastes, wishes and opinions of the users of the children's playgrounds. Evaluations were made according to the results of this survey and some suggestions were made.

P.S. The questionnaire was prepared based on the Tarakci (2003).

RESEARCH FINDINGS

Kulu district children playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park) which are selected as the study area are located within the borders of Konya.

Geographical Location: Due to its geographical location, Kulu is above the 35.5 Eastern meridian and 39.5 North parallel. In the North of the District; Bala and Haymana districts, Cihanbeyli district and Tuzgölü to the south, Şereflikoçhisar district to the east, Cihanbeyli and Haymana district to the west.

Transportation: Kulu is 110 km from Ankara and 148 km from Konya. Away. Kulu has an altitude of 1000 and has a surface area of 2880 km2. It is located on the same meridian as Ankara. Located on the Ankara-Konya asphalt, the district is in a busy location. The E-90 (E-5) Highway passes through the boundaries of the district.

Mountains: Located in the middle of the Central Anatolia Region, the district has the characteristic natural structure of Central Anatolia. It has a fairly wide and flat terrain structure. It has very little bumps. To the west is Karacadağ. The height of this mountain is 1739 meters.

Rivers and Lakes: There is no strong stream passing through Kulu district. However, in addition, in the case of closed basins, there are teas that strengthen in winter and dry in summer. The water of the creek passing through the center of the center decreases in summer and 3 km. east of Küçükgöl. There are some springs and fountain waters connected to the district center. These waters are used by the public in their own summer vineyard, garden and animal irrigation works. Tuzgölü and Küçükgöl (Acıgöl) are the lakes in the district. In addition, very small natural pond-shaped waters can be mentioned. Gökler Village and Kozanlı Town ponds are examples of these.

Flora: Our district has steppe vegetation. As a large part of the district land is uneven, it is suitable for agriculture. Beet, cumin, lentil and anise have been planted by farmers in recent years. The planting is generally carried out in the seizure mode, but upon the proliferation of the artesian wells, a double crop method is also being developed. Beet, cumin, lentil and anise, especially barley and wheat, can be added in double crop picking.

Climate: Macro air conditioning climate types of our district enters into continental climate type. For this reason, the climate in the district is harsh and cold in winters, summers and especially in July and August are dry and hot (Anonymous, 2019b).

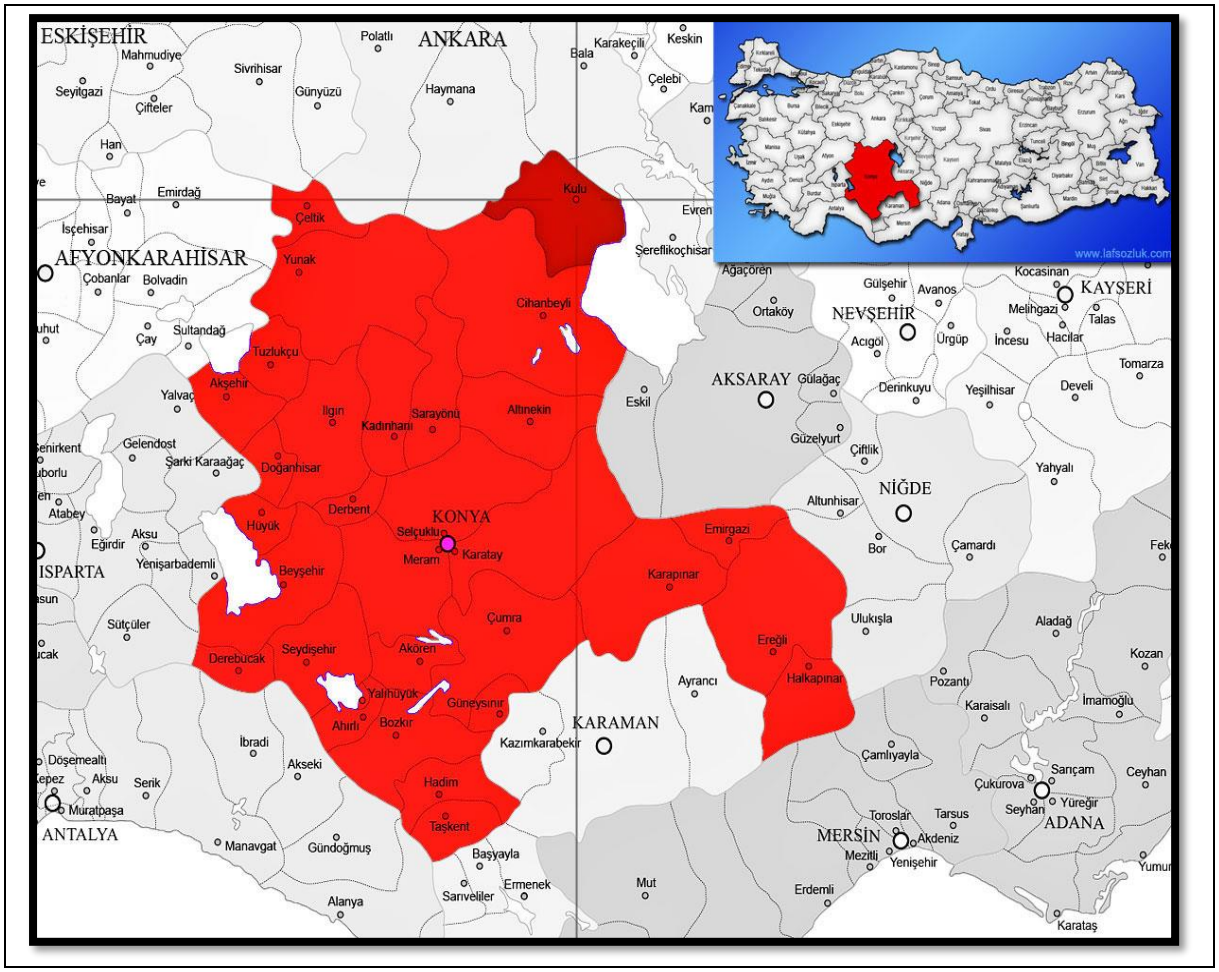

Figure 1. Geographical location of Kulu district of Konya province (Anonymous 2019).

Vandalism in Kulu District Playgrounds:

Within the scope of the research, 5 parks (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park) in Kulu district were visited and vandalism actions were examined.

The data obtained from these investigations are as follows:

Alparslan Türkeş Park: It is located in Cumhuriyet District of Kulu district. It is positioned in a large area. The park was not created according to a certain design. The usage density is higher than other parks. It is an area where people mostly use for picnics, playing games and sports. Regular maintenance and repairs are carried out, but the replacement of reinforcement elements is not sufficient.

It was not subjected to too much vandalism. The vandalism actions seen are as follows:

1. Dismantled wooden materials of trash cans,
2. Damages in untreated camellias have started to occur,
3. Picnic tables and benches have been relocated,
4. Barbecues broken,
5. With the breaking of the barbecues, people started to grill on the grass and burns on the grass surfaces.
6. When the barbecue ash is poured into the waste bins, the waste bins have started to deform,
7. Breaks have occurred in sports equipment which is not regularly maintained and is getting old,

Figure 2. The furniture that has been subjected to vandalist actions in Alparslan Türkeş Park (Orijinal 2019).

Bülent Baran Park: It is located in Fatih Sultan Mehmet Quarter of Kulu district. The park was not created according to a certain design. Intensity of use is high. It is an area where people mostly use to relax, sit, play and play sports. They have been regularly repaired and repaired, but no measures have been taken to prevent vandalism.

It has been subjected to many acts of vandalism. The vandalism actions seen are as follows:

1. The limiting elements were broken and the municipality had to remove,
2. The fence of the basketball court is torn,
3. Wooden camellias, picnic tables and benches are being dismantled and broken,
4. Picnic tables and benches have been relocated,
5. Names were dug into the camellias,
6. Fountain taps were dismantled and the fountain was inscribed with paints,
7. Garbage cans dismantled,
8. The slide in the game group was broken and dismantled,
9. Fractures started as a result of the aging of sports equipment,
10. Core shells and garbage were thrown under the picnic tables and places.

Figure 3. The furniture that has been subjected to vandalist actions in Bülent Baran Park (Orijinal 2019).

Göç Park: It is located in Camikebir Neighborhood of Kulu district. The park was not created according to a certain design. Intensity of use is moderate. It is an area where people mostly use to relax, sit, play and play sports. Regular maintenance and repairs have not been carried out.

He has been subjected to many acts of vandalism. The vandalism actions seen are as follows:

1. The wooden materials of the sitting groups and benches were dismantled,
2. Painted on playgrounds, sports equipment, sculptures and fountains,
3. The statue in the area has been destroyed,
4. Sports equipment started to be destroyed,
5. The plastic materials of the playgrounds were removed.

Figure 4. The furniture that has been subjected to vandalist actions in Göç Park (Orijinal 2019).

Huzur Park: It is located in Şırnak Quarter of Kulu district. The park was not created according to a certain design. Intensity of use is moderate. It is an area where people mostly use to relax, sit, play and play sports. They have been regularly repaired and repaired, but no measures have been taken to prevent vandalism.

He has been subjected to many acts of vandalism. The vandalism actions seen are as follows:

1. Limiting elements are destroyed,
2. The wall separating the park and buildings is broken,
3. Wooden camellias, picnic tables and benches were dismantled,
4. Written with paints on the WC building and walls,

Figure 5. The furniture that has been subjected to vandalist actions in Huzur Park (Orijinal 2019).

Kartov Park: It is located in Şırnak neighborhood of Kulu district. The park was not created according to a certain design. The usage density is low. Regular maintenance and repairs have not been carried out and no measures have been taken to prevent vandalism. The park has become a place for hooligans and alcoholics.

It has been subjected to many acts of vandalism. The vandalism actions seen are as follows:

1. The entrance door is destroyed,
2. The fence of the basketball court was dismantled, the crucibles were broken,
3. The windows of the security cabin and WC building were broken, the inside of the buildings were burned,
4. The taps of the fountain were dismantled,
5. Wooden camellias are broken, destroyed,
6. Burns on grass areas,
7. The swings of the play group have been removed.

Figure 6. The furniture that has been subjected to vandalist actions in Kartov Park (Orijinal 2019).

Kulu District Children's Playground Survey Results

Survey Results of Kulu District Playgrounds. A survey was conducted in order to find out the opinions of the users of the Kulu district children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park), which were selected as the research area, about their wishes and children's playgrounds. Before starting the survey, each participant was informed about vandalism and asked to give answers accordingly. The questionnaire applied to randomly selected groups of 30 using the park consists of two parts. In the first part, personal information about gender, age range, education level and occupation of the respondents are given. In the second part, questions related to children's playgrounds in Kulu district are given.

Socio - Economic Structure of the Participants:

67% of the respondents were female and 33% were male. When the distribution of the respondents according to age groups is examined, 20% is 25 years old and under, 50% is 26-35 years old, 10% is 36-45 years old, 13% is 46-55 years old, 7% is 56-65 years old form. There are no users aged 66 and over who participated in the survey. In order to determine the educational status of the respondents, the educational status was determined as follows. 17% of the participants were primary, 20% secondary, 10% high school, 46% university and 7% graduate.

Results Obtained from the Questions Related to the Study Area:

When the respondents were asked about their arrival to the children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park); 7% stated that they came for the first time and 93% stated that they had come before.

When the participants were asked about their frequency of use of children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park); 3% each day, 7% every two days, 34% every fifteen days, 23% once a month, 33% gave a rare answer.

When the respondents were asked when they used the children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park) at most seasons and times; 24% used it in spring, 68% in summer, 5% in autumn, 3% in winter. 56% stated that they used on weekends, 7% on weekdays and 37% on both weekdays and weekends.

Participants were asked to mark whether they liked the city furniture in the children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park) and they were able to make more than one marking. 22% liked lighting elements, 19% disliked, 27% liked sitting elements, 31% disliked, 13% liked trash cans, 17% disliked, 22% liked children playgrounds,% 21% did not like, 16% said that they liked other structural equipment, 12% said they did not.

Participants were asked about the elements they felt uncomfortable in the playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park) and they were told that they could answer more than once. 5% from traffic, 8% from noise, 10% from pollution and odor, 27% from neglect, 11% from design and planning, 32% from hooligans and strollers, 7% from alcoholics they had heard.

When the participants were asked whether they feel safe in children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park); 70% answered yes and 30% said no.

CONCLUSIONS AND RECOMMENDATIONS

Vandalism is one of the acts that threaten humanity in every aspect of our lives. It is a problem that has attracted the attention of researchers in developed countries such as USA, England and Sweden since the 60s in the world, and has very important social, psychological, economic and legal dimensions. In Turkey, causing damage to public property, destruction of park and garden, causing damage to the sculpture and works of art, articles written on the walls has become the subject of various forms of research, such as vandalism.

In this study, the evaluation of the exposure potential of the children's playgrounds (Alparslan Türkeş Park, Bülent Baran Park, Göç Park, Huzur Park, Kartov Park) in Kulu district and selected as the research area; recommendations for ensuring deficiencies, errors and user satisfaction are as follows:

1. According to the results of the survey, it was seen that the participants did not come to the children's playgrounds for the first time and the number of users using the playgrounds was variable.
2. The users stated that they use children's playgrounds more during summer and weekend. According to this result, the maintenance during summer and weekends should be more and the security should be more strict. In other seasons, the number of users has decreased, but vandalism is the most seen in these seasons. In order to prevent vandalism, security measures should be provided in all seasons.
3. Participants use children's playgrounds for walking, running, doing sports, sitting, playing games and chatting. Apart from these, it is known that people have picnics in Alparslan Türkeş Park. Many of the barbecues for barbecues have been broken and it is too late to renew them. For this reason, burns occurred on the lawn, and as a result of the barbecue ash poured into the garbage cans, destruction of the garbage cans occurred. In order to prevent these, burning barbecues should be prohibited or barbecues should be renewed as soon as possible. Destroyed lawn areas should be repaired and the burnt perception of people should be removed. The waste bins made of ash should be made of durable material and warnings should be made to prevent the non-cooling ash from spilling.
4. It is understood from the results of the survey that people spend more time between 30 minutes and 1 hour in children's playgrounds. It is known that the busiest time during the day is during school and work exits.
5. While half of the participants liked the structural equipment in the children's playgrounds, the other half did not. According to the research, the areas that do not respond to the wishes of people are more damaged. In order to prevent destructiveness, structural reinforcements should be provided in various types and materials to meet the needs of everyone.
6. Participants are most disturbed in the area by hooligans and idle wanderers or neglect. They do not feel safe. Parks in Kulu are generally maintained but it is too late to renovate the equipment. Non-renewed, aging accessories are more exposed to destructiveness. In winter, parks, hooligans, alcohol is becoming the home of the area. As a matter of fact, since Kartov Park was left unattended and security measures were not taken, it became a place for hooligans, substance users and alcohol buyers. People feel insecure in the park and do not use the park. In order to prevent this, necessary measures should be taken as soon as possible.
7. According to users, the most damaged materials in children's playgrounds; lighting elements, seating elements, trash cans, playgrounds for children, sinks and fountains, plants and lawn areas. The determinations made are correct. In order to prevent vandalism; lighting elements should be used or lamps should be protected. Benches, camellias and trash cans made of wooden material should be installed well, durable materials should be used, screws should be hidden, maintenance and repairs should be done regularly. Children's playgrounds and sports equipment should be selected from durable materials, the installation of skateboards and swings should be done well, regular maintenance and repair should be done. The faucets should be mounted securely in sinks and fountains. There is not much damage to plants. There are burns as a result of barbecue with grass fields. Apart from these, breakage and fragmentation of the fencing and crucibles of the basketball court were created. In such areas 24-hour security should be provided, camera system should be installed.
8. The participants were asked the question ‘Which of the parks do you use the servant in your opinion? Bülent Baran Park answer was taken. When asked the question «Can you prevent vandalism?», 85% answered yes. When asked about their opinions, it is a common idea that people should be made aware of vandalism.

Vandalism occurs in all parks in Kulu. In the name of preventing vandalism; maintenance of parks left uncared for, damaged materials should be renewed, places to meet the needs of people should be created, lighting should be given importance, security should be increased and people should be conscious about vandalism.

Preparation and planning are essential to the long-term success of play spaces. Careful consideration must be given to location; play spaces in hidden and inaccessible places will not be well used by children, and are most likely to be vandalised.

Planning must also consider the type of provision that is needed locally and the abilities which need to be catered for. Demographic analysis can help indicate whether children of particular age ranges are predominant locally, but in a densely built-up urban area where space is limited, play spaces which can appeal to children of a broad range of ages and abilities may be the most feasible solution.

Sometimes the novelty of newly designed spaces can attract the 'wrong' sort of attention, such as vandalism. Any damage – however minor – should be remedied as soon as possible to ensure that the message that the site is looked after and cared for is clear to the whole community.

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WASTE MANAGEMENT OF BIOMASS IN BIOECONOMY: A PERSPECTIVE

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ABSTRACT

Increasing environmental problems, population explosion, rapid urbanisation and increase in energy demand, etc. are caused gradually transforming from fossil-based economy to a sustainable bioeconomy. The bioeconomy which is expected to be a key solution to fossil fuel economy can be defined as economic activities using renewable energy and biological resources to produce clean energy and renewable materials. Enormous quantities of biomass waste are potential feedstock for sustainable production in bioeconomy, so that utilization, waste management and recycling of biomass are gained importance. In this study, based on a literature review, the importance of waste management of biomass in future bioeconomic models is highlighted.

Keywords: *Biomass, Waste management, Bioeconomy*

INTRODUCTION

The population of world is undergoing the largest wave of increase in history. According to the United Nations, the world population will stand between 8.4 and 8.7 billion in 2030, between 9.4 and 10.2 billion in 2050 (World Population Prospects, 2018). More than half of the world's population now lives in towns and cities, and it is estimated that until 2030, over 60% of the world population will live in cities (UNFPA, 2017). As a result of population explosion, environmental problems and energy demand are increasing with this dramatically growth as well. Fossil fuels as non-renewable energy sources have a serious negative effect both environment and alive. If energy requirement is supplied mainly from fossil fuels, many environmental problems such as acid rain, global warming, and toxic air emissions, which includes the release of heavy metals, come out (Finkelman et al., 2002). On the other hand, energy is the backbone of the modern world in terms of economic growth and the prices of fossil fuels are rising rapidly thereby, it become mandatory to find an alternative. The transformation of energy systems, influences economic policy agendas and all around the world policy makers are seeking strategies of diffusion of renewable energies to transform energy systems (Ketter et al., 2016). At this point, developed countries aim to transition from fossil based economy to bioeconomy with sustainable development targets by considering future generations.

The bioeconomy which is expected to be a key solution to fossil fuel economy can be defined as economic activities using renewable energy and biological resources to produce clean energy and renewable materials (Wohlfahrt et al., 2019). Bioeconomy should be based on innovative methods to substitute fossil resources with the intelligent and efficient use of bio-based materials and processes (Urmetzer et al., 2020). In addition, the European Commission defines bioeconomy as "the sustainable production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, fiber, chemicals, materials, and fuels" (European Commission, 2012). Furthermore, the U.S. federal government defines bioeconomy as "the global industrial transition of sustainably utilizing renewable aquatic and terrestrial biomass resources in energy, intermediate, and final products for economic, environmental, social, and national security benefits" (BRDB, 2016). Also, the German government claims that the bioeconomy is a tool to overcome the challenges of the future, while Finland expects their bioeconomy to reduce their "dependence on fossil natural resources, prevent biodiversity loss and create new economic growth and jobs in line with the principles of sustainable development" (Urmetzer et al., 2020). Based on these framings, it can be said that the bioeconomy is an important means to combatting global challenges such as climate change, food security, and the depletion of natural resources. The background logic is quite simple which is substituting fossil resources with renewable resources and using biological resources. Moreover, to be successful, the bioeconomy needs to have sustainability and circularity at its heart. The critical component of this success is innovative technologies. This will drive the renewal of our industries, the modernisation of our primary production systems, the protection of the environment and will enhance biodiversity. On the other hand, a sustainable bioeconomy should lead to the creation of jobs, particularly in coastal and rural areas. According to European Commission bioeconmy report, the turnover value of the bioeconmy is €2.3 trillion and accounting for 8.2% of the EU's workforce. Also, it is estimated that one million new jobs could be created by 2030 in the bio-based industries (A sustainable bioeconomy for Europe, 2018). To build a carbon neutral

future in line with the Climate objectives of the Paris Agreement is the one of the main objective of bioeconomy. For instance, studies show that when the 1 ton of engineered wood is used instead of 1 ton of concrete in the construction sector, 2.1 tons of carbon dioxide emissions could be reduced (Hurmekoski, 2017). Bioeconomy supports healthy ecosystems. Biobased and biodegradable materials are alternative to plastics. For instance, bioeconomy can contribute achieving plastic-free seas and oceans and achieving land degradation neutrality. A sustainable bioeconomy is the renewable segment of the circular economy. It can turn bio-waste, residues and discards into valuable resources. For instance, it is estimated that better recycling of high value organic residue streams in the city of Amsterdam could generate EUR 150 million in added value per year, create new 1.200 jobs in the long run and save 600.000 tonnes of carbon dioxide annually (Circle Economy, 2016).

Enormous quantities of biomass waste are potential feedstock for sustainable production in bioeconomy, so that utilization, waste management and recycling of biomass are gained importance. In this study, based on a literature review, the importance of waste management of biomass in future bioeconomic models is highlighted.

WASTE MANAGEMENT

Biodegradable waste (or biowaste) are an important source of biomass and it has historically been utilised for thousands of years (O'Callaghan, 2016). On the other hand, the biowaste which has potential economic value is starting to be recognized by several sectors (e.g. the agricultural, forest-based, chemical and energy sectors). In the present scenario of deteriorating environment and diminishing resources, waste is one resource that will never diminish. Enormous quanties biogenic waste can be considered as potential feedstock for structuring the bio-based economy. In this perspective waste management is necessity for the sustainable economic development (Mohan, 2018). The demand for these biowaste is likely to increase with the development of the bioeconomy and with the changing the economic conditions of production, as well. It is estimated that residual biomass of the six most important crops (barley, maize, rice, soybean, sugar cane and wheat) are generated more than 3300 megatonnes annually (Bentsen et al., 2014). In the Europe alone, every year the production of waste paper, food, and plant material are 900 megatonnes. Nearly 40 megatonnes of fish could be discarded each year during commercial fishing or the waste of the waste produced in fisheries and aquaculture could be as high as 130 megatonnes (Ghosh et al., 2016). It is estimated that the account for forestry, woody biomass residues, such as branches and tree tops are 5100 megatonnes per year globally. On the other hand, these residues account for 87 megatonnes in EU-28 (Camia et al., 2018). In addition, it has been estimated that by 2030 the U.S. could produce 1.3 billion dry tons of biomass for bioenergy and bioproducts without compromising food, feed and export demands. This biomass capacity includes 368 million tons of forest debris, 87 million tons of grains, 428 million tons of crop residues, 106 million tons of animal manure and food processing waste and 377 million tons of dedicated energy crop biomass (Guo and Song, 2019). From these results, it is easily to say that waste of biomass takes an important part in biomass production.

The amount of household and industrial wastes produced are almost 300 megatonnes every year in the EU and these wastes remain largely unexploited. Among this waste, 140 megatonnes (90 megatonnes in dry matter) are municipal waste. About 82% of municipal solid waste is generated by households, the rest coming from commerce and trade, small businesses, yard and garden waste etc. (A sustainable bioeconomy for Europe, 2018). Moreover, food residue is the potential input for producing energy through biogas production or in dedicated combined heat and power plants. Food waste has huge potential among the biomass waste. According to the State of Food and Agriculture report of FAO, it is estimated that around 14 percent of food produced for human consumption is wasted or lost, which amounts to about 1300 megatonnes per year, and adds 3300 megatonnes of CO_2 equivalent GHGs emitted to the planet atmosphere (FAO, 2019). On the other hand, there is considerable uncertainty about estimates related to food waste because the entire food system should be considered. Due to current limitation in food wastes quantification, limited data on its quality and level of homogeneity, and to differences in national implementations of the waste legislation, the use of food products and conversion of food waste is still limited. Furthermore, the recovery of human waste through wastewater treatment, is also a potentially very valuable and large-scale source of energy, fertilizers and chemicals.

In fact, waste treatment operations encompass disposal, recovery and recycling. The lack of proper source segregation of waste is the key factor within the waste management which hinders the potential of waste recycling so waste management is gained important in the circular bioeconomy. More efficient and sustainable waste management practices need to be developed to recover valuable resources from waste and

simultaneously addressing its remediation issues. Land filling, composting, incineration, digestion, pre-treatment and fermentation are solid waste practices. Disposal, landfills and incineration are least favourable option for reducing greenhouse gas emissions with little or no energy recovery; conversely, waste prevention, reuse and recycling have the highest potential to reduce greenhouse gas emissions (A sustainable bioeconomy for Europe, 2018). Where waste-to-energy processes are opted for, there is a need to ensure that the most efficient techniques are used: this maximizes contribution of waste management to the climate and energy objectives.

CONCLUSION

Bioeconomy is a comprehensive, dynamically developing sector in today's economy. It aims at relieving some of the global wicked problems connected with the excessive use of non-renewable resources, including climate change and the irreversible depletion of the Earth's natural resources. However, transition to and expansion of the bioeconomy has some major barriers such as inability to produce sufficient biomass feedstocks with desirable cost-effectiveness and minimal environmental impacts, inefficiency of current biomass refinery technologies, a lack of counterpart bioproducts as compared to petro-derived products in cost and performance, uncertainty of the bioenergy and bioproducts market, inadequate social preparation for biofuels and bioproducts, inconsistency of bioeconomy policies, and involvement of large, risky capital investment in bioeconomy infrastructure and facilities, yet in a risk averse financial environment. On the other hand, the waste hierarchy is the cornerstone of bioeconomy. One industry's waste becomes the starting material for another. One of the main idea in bioeconomy is to add value to biological waste and residues. Enormous quantities of biomass waste are potential feedstock for sustainable production in bioeconomy, so that utilization, waste management and recycling of biomass are gained importance.

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THE IMPORTANCE OF NUTS IN HUMAN HEALTH

SEYIT MEHMET ŞEN

Retired, Emeretius Prof.,

Abstract

Walnuts, which have come to the fore front since healthy nutrition gained importance.

I can say that it is the most emphasized fruit of today.

Walnut is rich in antioxidant substances and fiber as well as the highly unsaturated fat and protein icontains.

It is also a very rich source of B vitamin complexes and mineral substances.

Walnuts are a very rich source of vitamin E.

Vitamin E is also a very important antioxidant.

Walnuts are also very rich source of Melatonin hormone.

The hormone melatonin is anti-aging, regulates sleep and very important antioxidant.

Antioxidants bind healthy cells to themselves, destroying cancer-causing free radicals.

Walnuts, in terms of antioxidant studies of thousands foods, has been a very rich food.

As it is known, walnut is very rich in triple unsaturated fat which has been emphasized in recent years and especially introduced as brain food Omega 3 (alpha linolenic acid).

Although salmon and flaxseed are also very rich in Omega 3 oil, walnut is easy to consume and is eaten with pleasure and it has a wide usage area which makes it more prominent among the other two foods.

Walnuts are also very rich in Omega 6 as well as Omega 3.

As it is known, Omega 3 and Omega 6 are essential fatty acids and must be taken from outside.

Walnuts are also a good source of olive oil (Omega 9).

About 10% of walnut oil is olive oil.

Walnuts are rich in unsaturated fats, very important for cardiovascular health.

Regularly eating 30 g of walnuts a day, certainly do not catch parkinson and alzeymır.

Walnut glycemic index is one of the lowest.

Because half of the carbohydrates in walnuts is fiber.

In this respect, walnuts should be among the daily dietary regimens of diabetics.

Walnuts are very rich in protein.

Walnut in this form is defined as protein tree in some sources.

Half of the walnut proteins are essential amino acids and must be taken during nutrition.

Walnuts are among the richest nutrients in fiber.

As it is known, fiber is one of the sine qua non of health nutrition..

Keywords: Antioxidant, Omega 3, Glycemic, Melatonin, Fiber

CEVİZİN İNSAN SAĞLIĞINDAKİ ÖNEMİ

Özet

Sağlıklı beslenme önem kazanalı beri öne çıkmaya başlayan ceviz, diyebilirim ki günümüzün üzerinde en çok durulan meyvesi konumundadır.

İçerdiği yüksek oranda doymamış yağ ve protein yanında, antioksidan maddelerce ve lifçe zengin olan ceviz, özellikle B vitamin komplekslerinin ve mineral maddelerin de çok zengin bir kaynağıdır.

Ceviz çok zengin bir Evitamini kaynağıdır.

E Vitamini aynı zamanda çok önemli bir antioksidandır.

Ceviz Melatonin hormonu bakımndan da çok zengindir.

Melatonin hormonu hem yaşlanmaya karşıdır, hem uykuyu düzene sokar, hemde çok önemli bir antioksidandır.

Antioksidanlar sağlıklı hücreleri kendilerine bağlayarak kansere sebep olan serbest radikallerin yok edicileridir.

Ceviz binlerce gıda arasında yapılan incelemelerde antioksidan bakımından çok zengin birkaç gıda arasında yer almıştır.

Bilindiği gibi ceviz son yıllarda üzerinde çok durulan ve bilhassa beyin gıdası olarak takdim edilen Omega 3 (alfa linolenik asit) üçlü doymamış yağ bakımından da çok zengindir.

Somon balığı ve keten tohumu da Omega 3 yağı bakımından çok zenginse de, cevizin tüketim kolaylığı ve zevkle yenilir olması yanında çok geniş bir kullanım alanı bulunması onu diğer iki gıdanın yanında daha çok öne çıkarmaktadır. Ceviz Omega 3 yanında Omega 6 bakımından da çok zengindir.

Bilindiği gibi Omega 3 ve Omega 6 esansiyal yağ asitlerinden olup, mutlaka dışarıdan alınmaları gerekir.

Ceviz aynı zamanda iyi bir zeytinyağı (Omega 9) kaynağıdır.

Ceviz yağının yaklaşık %10'u zeytinyağıdır.

Cevizin doymamış yağlar bakımından zengin olması, kalp ve damar sağlığı bakımından çok önemlidir.

Düzenli olarak günde 30 g ceviz yiyenler, kesinlikle parkinson ve alzeymıra yakalanmazlar.

Ceviz glisemik indeksi en düşük gıdalardan birisidir.

Çünkü cevizdeki karbonhidratların yarısını lif oluşturur.

Bu bakımdan ceviz özellikle şeker hastalarının günlük beslenme rejimleri arasına mutlaka girmelidir.

Ceviz protein bakımından çok zengindir.

Bu haliyle ceviz bazı kaynaklarda protein ağacı olarak tanımlanır.

Ceviz proteinlerinin yarısı esansiyal amino asitlerden olup, mutlaka beslenme sırasında alınmalıdırlar.

Ceviz lif bakımından en zengin birkaç besin maddesi arasındadır.

Bilindiği gibi lif, sağlıklı beslenmenin olmazsa olmazlarından biridir.

Anahtar kelimeler: Omega 3, Glisemik, Antioksidan, Melatonin, lif

GİRİŞ

Yediğimiz gıdaları değerli kılan içlerinde yeterince bulunan besin maddeleridir.

Ceviz en sağlıklı sert kabuklu meyve olarak bilinir.

Antik Roma'da cevizin ismi Jovis Glans yani Jüpiter'in Meyvesidir.

Ceviz batı kaynaklarında aynı zamanda Royal nut olarak da bilinir.

Bu büyük ceviz, muhteşem ceviz, şahane ceviz ya da krallara yaraşır ceviz anlamına gelir.

Cevizin besin değeri tablosu şöyledir.

Bu tablo, çeşide, bölgeye, yetişme şartlarına göre az veya çok mutlaka farklılık gösterir.

Cevizleri sağlığa yararı olan birçok besin maddesi yönünden zenginleştirilmiş gıdalar olarak dikkate almak durumundayız.

GLİSEMİK İNDEKS

Ceviz Glisemik indeksi en düşük gıdalardan biridir.

Glisemik indeks, gıdaların kan şekerini yükseltme hızıdır.

Karbonhidratların en küçük birimi olan glikoz, kan şekerini oluşturur. Vücuttaki bütün hücreler sadece glikozu kullanırlar.

Bazı besinlerin Glisemik indeks değerleri düşük, bazılarının yüksektir.

Glisemik indeksi düşük yiyecekler, kan şekerini daha yavaş yükseltirler.

Bu nedenle benzer gıdalar arasında bir seçim yaparken Glisemik indeksi düşük olanlar tercih edilmelidir.

Kanda şekerin çok artması, zehir etkisi yapar ve vücudun tüm hücrelerini tahrip eder.

Kandaki şekeri kullanılır hale getiren insülindir.

İnsülin yeterince olmadığı zaman şeker enerji üretiminde kullanılamaz.

Bütün sert kabuklu meyveler Glisemik indeksi çok düşük gıdalardır.

Kestane, Kaju ve Antepfıstığı dışında kalan sert kabuklu meyvelerin Glisemik indeksi 10'un altındadır.

Bu nedenle bu meyveleri yediğimizde kan şekerimiz yükselmez.

Ceviz Glisemik indeksi 10 olarak kabul edilen gıdalardan olup; bu çok mükemmel bir özelliktir.

ENERJİ

İnsanlar gıdaları iki nedenle tüketirler:

Organlarının sağlıklı yaşamalarını sürdürebilmek için…

Vücudun enerji ihtiyacını giderebilmek amacıyla…

Bilindiği gibi gıdaların enerji değerleri bünyelerinde bulundurdukları temel gıda maddelerinin (Karbonhidrat, Protein, Yağ) miktarına göre hesaplanır.

Karbonhidrat ve Proteinin bir gramının enerji değeri kabaca 4 kkal, yağın bir gramının enerji değeri 9 kkal kabul edilir.

Vücudun bu üç temel besin maddesinden yeterince faydalanabilmesi için, onların kendilerini oluşturan küçük parçacıklara ayrılması gerekir.

Bu ayrışma ve sindirim sırasında bir enerji harcanır.

Harcanan bu enerji alınan temel gıdaya göre değişir.

Proteinin parçalanması ve sindirimi sırasında harcanan enerji yenen gıdadan oluşan kalorinin %30'unu…

Yağın parçalanması ve sindirimi sırasında harcanan enerji yenen gıdanın %12'sini…

Karbonhidratın parçalanması ve sindirimi sırasında harcanan enerji yenen gıdadan oluşan kalorinin %7'si kadardır...

Yenen gıdalardan alınan enerji gerek sindirim, gerek günlük aktivite sırasında tüketilmeyecek olursa vücudumuzun değişik yerlerinde depo edileceklerdir

Ceviz enerji değeri çok yüksek olan bir meyvedir.

Cevizin 100 gramının enerji değeri 650-700 kilo kalori olarak verilmiştir.

YAĞLAR

Cevizin enerji değerinin çok yüksek oluşu bünyesindeki yağ oranının çok fazla oluşundandır.

Tabloda görüldüğü gibi, genel ortalama olarak cevizin yağ oranı %65-70 olarak kaydedilmiştir.

Bu yağ oranı kimi ceviz çeşitlerinde %70'in üzerine çıkar.

Bu durumda cevizin kalori değerinin çok daha yukarılara, 750 kilo kalorinin üzerine çıkacağı açıktır.

Sağlıklı yağlar günlük diyetteki kalorinin yaklaşık %30'unu sağlamalıdır.

Cevizdeki yağların:

%6.1'i doymuş yağ (palmitik asit, stearik asit)

%8.9'u tekli doymamış yağ(oleik asit/ Omega 9)

%47.2'si çoklu doymamış yağ

_%38.1'i ikili doymamış yağ (linoleik asit/ Omega 6) (esansiyal)

_%9.1'i üçlü doymamış yağ (linolenik asit/ Omega 3) (esansiyal)

Vücudun ihtiyacı olan esansiyal yağların besinlerle dışarıdan alınması gerekir.

Ceviz esansiyal yağlar (Omega 3 ve Omega 6) bakımından çok zengindir.

Ceviz özellikle Omega 3 yağının en zengin bitkisel kaynaklarındandır.

Cevizi son yıllarda öne çıkaran en önemli etmenlerden birisi bu Omega 3 yağıdır.

Sağlıklı olmamız için, her gün diyetimizde en az zengin bir Omega 3 kaynağını almayı amaçlamalıyız.

Cevizde Omega 6'nın Omega 3'e oranı, diğer sert kabuklulara göre çok daha düşüktür ve bu iyi bir özelliktir.

Yapılan çalışmalara dayanarak ceviz yağının zeytinyağından daha yararlı olduğu belirtilmiştir.

100 g ceviz yağının dağılımı ise şöyledir:

Ceviz yağı:

%49–63 oranında Linoleik, %8–15,5 oranında Linolenik, %13.8–26,1 oranında Oleik, %6.7–8,7 oranında Palmitik, %1.4–2,5 oranında Stearik Asit içerir.

Trans yağ asidi, karbon atomları arasında trans çift bağ olan bir doymamış yağ asididir ve sağlıksız yağlardır. Cevizlerde trans yağ yoktur.

KARBONHİDRATLAR

Vücut fonksiyonlarının uygun bir şekilde yerine getirilebilmesi için, belli ölçüde karbonhidrata mutlaka ihtiyaç duyacaktır. Vücudun karbonhidrat alımı yeterli değilse, yorgunluk, kramplar ve zayıf zihinsel fonksiyonlar ortaya çıkar.

Ceviz 100 gramında %13,7 oranında karbonhidrat içerir.

Cevizde şeker olarak ifade edilen karbon hidrat oranı %7 civarındadır.

Cevizdeki karbonhidratın %6,7'si liftir.

Bu cevizin besin değerini artıran bir özelliktir.

İnsan vücudu lifi(selüloz) sindiremez.

Vücutta sindirilmeyen bu lif barsaklarda taşıyıcı olarak görev yapar ve cevizin laksatif etkisini artırır.

Sağlığımızı koruyabilmemiz için yediğimiz gıdalarla yeterli miktarda lifi/ posayı almak zorundayız.

Cevizdeki lif çoğunluk olarak erimeyen liftir.

İz miktarda eriyebilen lif de vardır.

Lif kişiye tokluk hissi verir, aşırı yemeyi ve kilo almayı önler.

Cevizdeki eriyebilen lif çoklu ve tekli doymamış yağlarla uyum içinde çalışarak kolesterol seviyesini düşürür ve kalp-damar hastalıklarının önlenmesinde yardımcı olur.

Yetişkinler için cinsiyete bağlı olarak günlük 21–38 g lif tavsiye edilir.

Çocuklarda her yaş için günlük 1 g lif gerekir.

Birçok meyve ve sebzede ceviz kadar lif yoktur.

Elmada lif oranı %2,4; marulda %1,1; aysbergde %0,7'dir.

PROTEİNLER

Diğer temel gıdalardan farklı olarak günlük düzenli bir şekilde protein almak ve harcadığımız proteini yerine koymak durumundayız.

Çünkü protein vücutta çok az depolanır.

Cevizin 100 gramında %16-20 oranında protein vardır.

Cevizler zengin protein kaynaklarıdır.

Cevizde bulunan protein etin yerine geçecek özelliklere sahiptir.

Ceviz bu haliyle bir protein ağacıdır…

Nitekim kimi batılı bilim adamları cevizi protein ağacı olarak nitelemekte ve kimi kıtlık zamanlarında insanların beslenmesindeki protein eksikliğinin cevizle giderilebileceğini ileri sürmektedirler.

Ceviz, proteinlerin temelini oluşturan esansiyal aminoasitler bakımından çok zengindir.

Ceviz proteininin yarıya yakınını (%7) esansiyal amino asitler oluşturur.

VİTAMİNLER

Cevizde A, B1, B2, B3, B5, B6, B9, C, E, K bulunur.

Cevizler B1, B6, B9 yönünden zengindir.

Cevizler E vitamini bakımından ise çok zengindir.

Vitamin E ceviz yağında Alpha-Tocopherol ve Gama-Tocopherol olmak üzere iki şekilde bulunur.

100 gram cevizde 26,8- 43,6 mg Tokoferol vardır.

Bunun:

%90'ı Gama-Tocopherol, %6'sı Alfa-Tocopherol, %4'ü Beta ve Delta-Tocopherol

Bu miktar E vitamini günlük ihtiyacın %139'unu karşılar.

Vitamin E yağda eriyebilen çok güçlü bir antioksidandır.

Bir Antioksidan olarak Vitamin E'nin vücudu hastalıklara karşı koruma gücü çok iyidir.

MİNERALLER

Mineraller inorganik maddelerdir; makro ve mikro elementler olarak sınıflandırılırlar.

Makro elementlere vücut günde 100 mg veya daha fazla ihtiyaç duyar.

Mikro elementlere günde 100 mg'dan daha az ihtiyaç duyulur.

Mineraller insan beslenmesinde önemli olup; vücudun değişik fonksiyonlarına yardım ederler.

Vücut mineralleri yapamaz; bu nedenle insan beslenmeyle bitkisel ve hayvansal gıdalardan mineralleri almak zorundadır.

Mineraller binlerce enzimin vücudumuzdaki karşılıklı etkileşmelerinde ateşleyici olarak aktif rol oynarlar.

Mineraller vitaminlerden daha önemlidirler.

Cevizlerde gerekli minerallerin hepsi az veya çok vardır.

Bunlar Kalsiyum, Demir, Mangan, Magnezyum, Bakır, Çinko, Fosfor, Potasyum, Sodyum, Selenyum, Gümüş…

Cevizler Demir, Magnezyum, Çinko, Fosfor yönünden zengindir.

Cevizler Mangan, Bakır yönünden çok zengindir.

Ceviz beyin sağlığı için gerekli olan gümüş iyonlarını içerir.

Gümüş elementi beyin dokusu tarafından kullanılır.

Cevizdeki gümüş ve selenyum çocukların zekâ gelişimleri için yarar sağlar.

CEVİZDE ÖNE ÇIKAN BAZI MİKRO BESİNLER

Antioksidanlar

Antioksidanlar, serbest radikaller olarak bilinen zararlı moleküllerin sebep olduğu zararlanmalara karşı hücreleri korur; iltihaplanmaları azaltır.

Ceviz Antioksidan bakımından en zengin sert kabuklu meyvedir.

Cevizde diğer sert kabukluların iki katı kadar Antioksidan madde vardır.

30 g cevizde bulunan antioksidan, ortalama irilikte bir kişinin gün boyu yediği bütün meyve ve sebzelerden aldığı antioksidanlardan daha fazladır.

Günde sadece 6-7 ceviz yemek yüksek seviyede Antioksidan için yeterlidir.

Bir gram ceviz bir Antioksidan olan fenollerin 70 birimini içerir.

Polifenoller bitkilerde oluşur ve çok güçlü antioksidandırlar.

Polifenoller iltihap önleyici özelliklere sahiptirler.

Polifenoller, vitamin E benzeri Antioksidanların 15 katı daha fazla Antioksidan gücüne sahiptir.

Vücudunun Antioksidan ihtiyacının giderilmesi için kişi günlük yemeğine mutlaka bir kaç ceviz eklemelidir.

Ceviz birçok Antioksidan madde içerir (13 126 mmol/g).

Yapılan bir çalışmada 1113 gıda maddesi incelendi ve ceviz

3.721 mmol/28 g ile böğürtlenden sonra ikinci sırayı aldı.

Bir başka çalışmada ise ceviz kuşburnudan sonra yine ikinci sırayı aldı.

Değişik gıdalarda yapılan diğer bir çalışmada ise cevizlerde en az 10 farklı Antioksidan olduğu belirlendi.

Buna göre bulunan toplam fenoller şöyle bulundu:

Bir avuç cevizde(28 g) 802 mg

Bir bardak elma suyunda 117 mg

Bir paket çikolatada 205 mg

Bir bardak kırmızı üzüm şurubunda 372 mg

Cevizin yağsız kısmı Antioksidan kapasitenin çoğunluğunu temin etmektedir (tahminen yaklaşık 332 qmol trolox/g dm).

Bunun büyük kısmı erimeyen tanenden çıkarılmaktadır.

Cevizin Antioksidan kapasitesinin ancak %5'den daha azı yağından gelmektedir.

Antioksidan kaynağı olarak cevizin seçilmesinin avantajı, cevizin kavrulmadan ham olarak yenmesidir.

Kavrulma ısısı genel olarak Antioksidanların etkisini azaltmaktadır.

Halk cevizi kavrulmamış olarak yer, böylece Antioksidanların etkisini tam olarak alır.

Melatonin

Melatonin beyin epifizi tarafından üretilen bir hormon olup; uykuyu tetikler ve düzene sokar.

Bu hormon çok güçlü bir Antioksidan olup cevizde bol miktarda vardır.

Dolayısıyla Melatonin hormonu, doğal bir gece uykusu için cevizi mükemmel bir akşam gıdası yapar.

Melatonin, vardiyalı çalışan işçilerin ve saat dilimi değişiminden fazlaca rahatsızlık duyan kişilerin uykusunu düzene sokmaya yarar.

Melatoninden beklenen yararın sağlanabilmesi için bünyede yeterli seviyede olması gerekir.

Kişiler özellikle kırk yaşlarına yaklaştıklarında, fazlaca ceviz yemelidirler. Çünkü kırk yaşlarına ulaştığımızda, Melatonin üretimimiz azalmaya başlar.

Melatonin noksanlığından dolayı Antioksidan korumasında ortaya çıkan bu azalma, hayatın daha sonraki safhalarında hastalık yapıcı serbest radikallerin gelişimine yol açabilir.

İnsan vücudunda kullanıma hazır formunu içeren nadir besinlerden biri olan ceviz, 2,5–4,5 ng/g Melatonin içerir.

Cevizin yaşlanmayı önleme özelliği vardır.

Ceviz Melatonin içerdiği için, antiagin bakımından zengin olan on gıda arasında yer alır.

Melatonin insanı okumaya karşı istekli yapar.

Melatonin ayrıca çok güçlü bir Antioksidan olup, serbest radikallerin neden olduğu oksidatif strese karşı vücudumuzun mukavemetini artırır.

İyi bir gece uykusu için yapılacak şey yatmadan önce ceviz yemektir.

Bitki kimyasalları

Ceviz sağlığı destekleyen bitki kimyasalları yönünden zengindir.

Antioksidan etkiye sahip olan bu maddeler fitosteroller, Ellagic Asit, Karatoneidler ve Polifenolik bileşiklerdir.

Bu bileşikler yaşlanmaya, kanserlere, iltihaplanmaya ve nörolojik hastalıklara karşı potansiyel olarak sağlık etkisine sahiptirler.

Ceviz yağı Ellagic asit ile birlikte Gallic asit ve Malik asit içerir.

Bunların hepsi güçlü Antioksidan, anti-bakteriyel, anti-inflammatory, anti-viral, anti-septik özelliklere sahiptirler.

Ellagic asit ve Gallic asit Polifenolik bileşiklerce çok zengindirler.

Bu iki bitki kimyasalı bakteriyel ve viral ataklara karşı vücudumuzun bağışıklık sistemine ekstra bir savunma hattı sağlayıcı olarak bilinirler.

Araştırmaların gösterdiğine göre Ellagic ve Gallic asit birçok anti kanser özelliklere sahip olup; keza serbest radikallerin LDL oksidasyonunu önlerler.

Gallic asit ve malik asidin her ikisi de Antioksidan olup, az miktarda da olsa cevizde vardır; her ikisi de Ellagic asit benzeri etkiye sahiptirler.

Bu bileşikler bağışıklık sistemini destekler ve bazı kanserlere karşı koruyucu etkiye sahiptir.

Cevizde bolca bulunan polifenoller antioksidan özellikte olup, bağışıklık sistemini destekler.

Resveratrol doğal bir Polifenolik bileşik olup, değişik biyotik ve abiotik streslere, streslerin ortaya çıkardığı zararlara, UV-radyasyonuna, bakterial ve mantari bulaşmalara engel olur.

Resveratrol, cevizde bulunan bir bitki kimyasalı olup Sırt 1 enzimini aktif hale getirir.

Sırt 1 hücre düzeninden sorumlu enzim olarak göreve yapan bir proteindir.

Sırt 1 enzimi daha fazla kalori yakmamızı sağlayarak vücudumuzun metabolik oranını artırır.

Cevizin Resveratrol içeriği, onun kilo vermedeki faydasının anahtarıdır.

Resveratrol, aynı zamanda anti kanser potansiyele sahiptir.

C*eviz Serotoninin en önemli kaynağı olup;* beynin Serotonin seviyesini yükseltir.

Serotonin beyinde mesaj taşıyan en önemli kimyasal olup, ruh halimizi ve isteklerimizi kontrol eder.

Bu hormon mutluluk hormonu olarak bilinir; noksanlığı depresyona neden olabilir.

Ceviz Beta-karotene, Lutein ve Zeaxanthin içerir.

Ceviz yağındaki diğer bitkisel kimyasallar caffeic asit, ellagitanin, kaempferol 'dür.

Ceviz sağlıklı beslenmeye yetecek miktarda Phytik Asit içerir.

Phytik asit iyi bir antioksidandır.

CEVİZDEKİ ESANSİYAL YAĞLARIN FAYDALARI

Bu yağlar mutlaka gıdalarla alınması gereken yağlardır.

Cevizlerde bulunan esansiyal yağlar Omega 3 ve Omega 6'dır.

Omega 3(Alfa Linolenik Asit)

Omega 3 yağları HDL kolesterolü yükseltir, LDL kolesterolü düşürür, anormal kalp atışlarını önler, kalp hastalıkları riskini düşürür, kan pıhtısı gelişimini engeller; düşünmeyi, öğrenmeyi ve hafızayı iyileştirir.

Omega 3 beyin sağlığını destekler; beyin hücrelerinin daha dıştaki zarları için hayati önemi olan bir bileşiktir.

Sağlıklı bir yaşam için günde 1,3–2,7 g; haftada 7–11 g Omega 3 alınması tavsiye edilmektedir.

Omega 3 kardiyovasküler sağlığın korunmasında…

Daha iyi zihinsel fonksiyon sağlanmasında…

Astım, romatoid artirit, diyabet 2, yüksek tansiyon, egzama, sedef hastalığı gibi sorunların giderilmesinde faydalıdır.

Omega 3'ün Akdeniz tipi diyette kalp sağlığına olumlu etki yapmada zeytinyağından daha önemli bir yere sahip olduğu belirtilmektedir.

Beyin hücreleri görevlerini gereği gibi yapabilmeleri için Omega 3 yağlarına ihtiyaç duyarlar.

Depresyon oranlarının artışı ile Omega 3 tüketiminin azalması arasında ilişki bulundu.

Düşük Omega 3 tüketimleri:

Çocuklarda hiper aktiviteye, çğrenme zorluğuna, davranış bozukluğuna

Yetişkinlerde huysuzluğa, uyku problemlerine neden olmaktadır.

Düzenli ceviz yemenin 45 gün içinde trigliseridi %19–33 arasında düşürdüğü belirlendi.

Omega 3 kanın damarlarda pıhtılaşmasını azaltır.

Omega 3 kalbimizin düzensiz çalışmasını önler.

Kan pıhtısının dolaşımı/ amboli, kalp krizinin en yaygın nedenidir.

ALA (Omega 3) kolayca EPA ve DHA' ya çevrilir.

EPA (Eicosapentaenoic asit) ve DHA(Docosahexaenoic asit), prostaglandinlerin üretimine yardımcı olur.

Prostaglandin kan akışını ve bütün vücuda oksijen dağıtımını düzene sokar.

Prostaglandin kan damarlarını genişleterek kan basıncını düşürür, kalp fonksiyonlarını iyileştirir.

Araştırıcılar kolesterol seviyesinin düşmesi ile kandaki Alfa Linolenik Asit (ALA) seviyesinin artması arasında bir ilişki buldular.

Omega 3 vücudun kalsiyum seviyesini artırır; kemik erimesini engeller.

Omega 6 (Linoleik Asit)

Omega 6 yağ asidi (n–6 yağ asidi olarak da bilinir) çoklu doymamış yağ asidi olup, esansiyaldır.

Omega 6 kötü kolesterolü (LDL) düşürür, iltihaplanmayı azaltır, kalp hastalıklarına karşı koruyucudur.

Ceviz çok zengin bir Omega 6 kaynağıdır.

Öyle ki ceviz yağının yaklaşık %60'ını Omega 6 oluşturur.

CEVİZİN FAYDALI OLDUĞU BAZI HASTALIKLAR

KALP HASTALIKLARI

Haftada 4–5 kez ceviz tüketenlerde kalp krizi riskinin %50 oranında azaldığı bulunmuştur.

Yüksek kolesterollü kişiler ceviz içeren yemek yedikten sonra:

Atar damarlarda kan akışı %24 oranında artarken…

Zeytinyağı içeren öğünde kan akışı %36 oranında azalmıştır…

E-selektin, hücrelerin yapışmasında rol oynayan bir molekül olup, kolesterolü plaklar oluşturarak kan damarlarının duvarlarına yapıştırır, bu plaklar ceviz yedikten sonra azalır.

Cevizden gelen koruyucu yağ, yüksek doymuş yağlı diyetlerin bazı zararlı etkilerini yok eder.

Doymuş yağlar bakımından zengin olan her öğünden sonra yapılan testler gösterdi ki, ceviz tehlikeli iltihapların oluşmasını ve öğünlerden sonra atar damarlardaki oksidasyonu azaltıyordu.

Ceviz yağı Endothelin seviyesinin düşmesine yardımcı olmaktadır. Endothelin damarların iltihaplanmasına neden olur.

Endothelin seviyesinin düşmesi nedeniyle kan damarlarında plaklar etkili olacak şekilde birikemez.

Ceviz yağının tüketilmesi kalp hastalıklarının gelişmesini önleyici bir etkiye sahiptirler.

KANSER

Ceviz yağı gırtlak, kolon ve prostat kanser riskini azaltmaktadır.

Ellagic asit iyi bir antioksidan olup, hücreleri serbest radikallerin zararlarına karşı korur; kansere sebep olan maddeleri vücuttan atar, kanser hücrelerinin kopyalanmasını kontrol altında tutar; kansere giden metabolik kalıbı bloke eder.

Ellagic asit bağışıklık sistemini güçlendirir.

Etkili bir Antioksidan olan Ellagic asit belli kanserleri geliştiren bazı maddelerin bünyeden atılmasını da sağlar.

Cevizdeki fitosteroller göğüs, prostat ve kalın bağırsak kanserlerine karşı koruma sağlarlar; bağışıklık sistemini desteklerler; kan kolesterolünü ve bazı kanser formlarının olası riskini azaltırlar.

100 g ceviz yağı yaklaşık 180 mg Phytosterol içerir.

%85 Beta-Sitosterol, %7,3 -5-Avenasterol, %4.6 Campesterol, %1,1 Kolesterol

KİLO ALMA VE OBEZİTE

Sert kabuklulardan alınan kaloriler kiloya neden olmazlar.

Ceviz yiyenlere tokluk hissi verir ve onların aşırı yemelerini önler.

8 865 Yetişkin kadın ve erkek üzerinde 28 ay süreyle yapılan çalışmada; haftada en az iki kez ceviz yiyenlerin, hiç ceviz yemeyenlere veya hiç denecek kadar az ceviz yiyenlere göre %31 daha az kilo aldıkları görüldü.

Sık ceviz tüketimi kilo alma riskini azaltır; bu azalış 5 kg veya daha fazla olabilir.

Özellikle kilo almaktan endişe edenler için çok aşırı olmamak kaydıyla cevizin yemeğimizin bir parçası yapılması sağlığımızı ve IQ'müzü desteklememizin en iyi yoludur.

STRES

Ceviz yağının yüksek oranda bulunduğu bir diyette vücut strese daha iyi cevap vermekte ve kan basıncı düşmektedir.

CİLT SAĞLIĞI

Ceviz yağı vücudun değişik organlarına yapılan masajlarda uzun zamandır kullanılmaktadır.

Cevizin doymamış yağları fazla olduğu için deriyi nemlendirmede ve kırışıkları gidermede çok faydalıdır.

Ceviz yağı deriye uygulandığında, şifa verici özellikleri nedeniyle cilt kanserine karşı ilaç olarak da etkisini gösterir.

Ceviz yağının mantari bulaşmalara, siğillere, egzamaya ve sedef hastalığına etkili olduğu ispatlanmıştır.

Sert kabuklulara karşı alerjisi olanlar masajlarda ceviz yağını kullanmaktan sakınmalı ya da ceviz yağı kullanımında biraz daha dikkatli olmalıdırlar.

Ceviz yağı tüketilmesi cilt sağlığını korur.

Ceviz yağının iltihaplanmaya karşı etkisi güneş yanığı, kafa kaşıntıları, deri ülseri, kepekleri ve kabarcıkları gibi belirli cilt belirtilerini hafifletir.

Omega 3 sedef hastalığının belirtilerini hafifletebilir.

TANSİYON

Ceviz yüksek seviyede bir amino asit olan Arginin içerir(2,1 g/100).

Bu amino asit vücuda girdiğinde vücut onu nitrik okside çevirir.

Nitrik Oksit kan damarlarındaki düz kasların üzerinde etkilidir; kan damarlarını genişletir ve böylece kan akışını artırır.

Nitrik oksit, kan damarlarının iç duvarlarını düzleştirerek ve onları esnek ve gevşek hale getirerek hipertansiyonun önlenmesinde hayati rol oynar.

Ailede hiper tansiyon varsa, ceviz yemek kan damarlarının ihtiyacı olan nitrik oksidi sağlamanın en kolay ve etkili bir yoludur.

Yapılan araştırmalarda Argininin damarların elastikiyetini %64 oranında artırdığı belirlenmiştir.

Nitrik Oksit seviyesinin korunması, hiper tansiyon hastaları için önemlidir.

Nitrik Oksit diyabet ve kalp hastalıklarında da önemlidir.

Ceviz bu tip hastaların diyetlerine katılacak olursa büyük katkı sağlar.

DİYABET

Diyabetik diyetteki nihai amaç kan şekerini sabitleştirebilmektir.

Kandaki aşırı glikozun varlığı, uzun sürede kalp krizi, felç, körlük ve böbrek hastalıkları gibi ciddi diyabetik karışıklıklara yol açar.

Kandaki glikoz seviyesinin devamlı yüksek oluşu kalbi besleyen kan damarlarına zarar verir.

Bu da kalp hastalıklarına, kalp krizine, kalp iltihabına ve kalp damar hastalıklarına yol açar.

Hipertansiyonun etkilediği şeker hastaları ve kalp hastaları için de ceviz gereklidir.

Çok sayıda diyabetik inceleme göstermektedir ki, yüksel tansiyon dâhil diyabet ile sayısız risk faktörü bir araya gelmektedir.

Bu nedenle diyabetik diyet mutlaka yüksek tansiyona hitap etmelidir.

Cevizlerdeki Omega 3 diyabetiklerdeki yüksek tansiyonun düşürülmesine yardımcı olmaktadır.

Yapılan bir çalışmaya göre 12 hafta süre ile Omega 3 kullanan kişilerde kan basıncı dikkat çekecek şekilde düştü.

ZİHİNSEL FONKSİYON

Araştırıcılar Alzeymir hastalıklarına bir çözüm bulamamışlarsa da, zihni gerilemenin önlenebilir olduğunu düşünmektedirler.

Ceviz Parkinson ve Alzeymir gibi hastalıkların önlenmesinde yardımcı olur.

Cevizlerde bulunan Omega 3 hem Motor hem de Kognitif fonksiyonlara etki eder.

Kognitif fonksiyonlar:

Anlama, düşünme, muhakeme ve hatırlama durumlarını içine alır.

Motor fonksiyonlar:

Kasları, hareketleri kullanma ve kontrol kabiliyetidir.

SAFRA KESESİ TAŞI

Özellikle doğurgan, şişman ve kırk yaşlarındaki kadınlar cevizlerin sağlığa etkilerinden fazlaca yararlanmalıdırlar.

Bu tip kadınlar safra kesesi taşı üretmeye meyyaldirler.

Bir araştırma raporuna göre günde en az 30 g ceviz yiyen kadınlarda safra kesesi taşına yakalanma riski daha az görüldü.

Yirmi yıl süre ile 80 000 kadın üzerinde yapılan bir çalışmada haftada bir kez 28–30 g ceviz yiyenlerde safra kesesi taşı oluşma riski %25 oranında daha az oldu.

CEVİZİ NASIL YEMELİYİZ?

Cevizi en iyi yemenin yolu ham olarak yemektir.

Cevizi bu şekilde yemekle onun Antioksidan özelliğinden en iyi şekilde yararlanabiliriz.

Ceviz yağı salatalarda sağlıklı yağ olarak kullanılabilir.

Ceviz yağı yüksek ısıda pişirilen yemeklerde tavsiye edilmez.

Yüksek ısıda pişirme ceviz yağının tadını acılaştırır ve lezzetini bozar.

Hoş koku, lezzet ve besin değeri kazandırmak için pişirilmiş yemeklerin üzerine ceviz yağı dökülebilir.

Çoğu kişi ceviz yağını pastaların üzerine dökmekte kullanır.

Eğer yağ taze ise yüksek ısıda pişirme ile Omega 3 bozulmaz.

Cevizde karbonhidrat miktarı az olduğu için, açlığa engel olabilirler ve diyetteki kilo kaybının dengelenmesinde önemli rol oynayabilirler.

Sindirim zorluğu çekenler yemeden bir gece önce cevizleri ıslatırlarsa enzimler etkisizleşir ve cevizleri sindirmek daha kolay hale gelir.

Günlük olarak yenilmesi önerilen toplam ceviz miktarı 30 gramdır.

Özellikle uyku problemi olan…

Zihinsel dağınıklık yaşayan…

Aile içinde ve sosyal çevresinde uyumsuzluk gösteren kişiler için, bu miktar 50–60 grama kadar çıkartılabilir.

CEVİZ YERKEN NELERE DİKKAT EDİLMELİDİR?

Ceviz sağlıklı beslenme için mutlak gerekli bir gıdadır.

Ceviz düzenli olarak yenildiğinde çok önemli bazı hastalıkların gelişmesini önleme özelliğine sahiptir.

Fakat cevizin bir gıda maddesi olduğu unutulmamalı ve ceviz kesinlikle bir ilaç olarak düşünülmemelidir.

1.Bazı kişiler ceviz yağına karşı alerjik reaksiyona sahiptirler.

Cevize alerjisi olanlar, ceviz yerken ölçüyü kaçırmamalıdır…

2.Ceviz yağı demir emilimi ile çatışır.

Günlük olarak çok fazla ceviz yenecek olursa, demir emilimindeki engelleme dolayısıyla kansızlık görülebilir.

Bu durum dikkate alınmalıdır.

3.Bütün yağlarda olduğu gibi, gramında 9 kalori içerdiği için ceviz ve yağları tedbirli kullanılmalı ve aşırıya kaçılmamalıdır.

Amerikan Besin ve İlaç Dairesi 30 gramlık ceviz paketlerinin üzerine:

"Kalp sağlığını korumaya yardımcı olur"

Notunun konulmasına izin vermiştir.

Sağlıklı olmak ve sağlığı korumak için:

Ceviz olduğu gibi, ham haliyle her gün mutlaka yenmelidir…

Cevizi mutlaka kabuklu almalı ve kendimiz kırmalıyız…

Ceviz doymamış yağlar bakımından çok zengin olduğu için, hava ile temasında çok çabuk bozulur…

Bir şey daha:

Ceviz yiyenler hem çalışma arkadaşlarıyla…

Hem de evde eşleri ve çocuklarıyla çok iyi uyum içinde olurlar…

Çünkü ceviz beyin gıdasıdır ve insanı geçimli yapar.

Ceviz gerçek anlamıyla tam bir stratejik üründür.

Bu günümüzde istenildiği ölçüde bilinemese de, gelecekte bilinecektir…

Dünya nüfusu çoğaldıkça…

İnsanlar zenginleştikçe…

Bilinç düzeyi yükseldikçe…

Sağlıklı beslenmeye verilen önem daha da artacak…

Bu da cevize olan talebin artmasını sağlayacaktır.

RICE PRODUCTION COSTS ANALYSIS AND RICE PRODUCTIVITY RISKS ON SANDY AND PADDY FIELDS IN CILACAP REGENCY, INDONESIA

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ABSTRACT

As an agrarian country, the role of rice in Indonesia is very important as a provider of staple food which has an impact on Indonesia's food security and as a source of economic activity for most people. Land extensification is one of the main programs to support Indonesia's food self-sufficiency plan. Paddy fields are most suitable for rice cultivation, whereas sandy fields are marginal land. As marginal fields, sandy fields are potential land for extensification of rice cultivation. The purpose of this study is to compare production costs and productivity risks in rice farming in two different types of land. Purposive sampling was used to determine the sample area. Primary data were collected using a questionnaire. Totally 60 rice farmers were interviewed (30 from sandy fields and 30 from the paddy fields) in the study area used simple random sampling. Production costs and coefficient of variation values are used for data analysis. Cost analysis per hectare shows that sandy fields (IDR19.262.132,31) had a higher production cost compared to the paddy fields (IDR14.267.568,51). Comparative analysis of production costs with the T-test also showed significantly different results. The productivity risk of sandy fields are higher with lower productivity values (7,424.69 kg ha^{-1}) compared to paddy fields (9,859.74 kg ha^{-1}). The solutions for reducing production risk are irrigation, crop diversification, and farm insurance.

Keywords: *Comparative study, Marginal land, Production costs, Rice farming, Risks*

INTRODUCTION

Indonesia is an agricultural country. In 2015 the value for Agricultural land in Indonesia was 570,000 km^2. Based on agricultural land, Indonesia ranks 17th as an agrarian country (Index Mundi, 2015). Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures.

As an agrarian country, a development planned by the Indonesian government is more concerned with agricultural development. The government of Indonesia's 2015–2019 National Medium-Term Development Plan (RPJMN) highlights two distinct roles of the agriculture sector which are to increase rice production for food security and develop higher value cropping to improve rural livelihoods. To increase the number of food crops, four main businesses are implemented, namely intensification, extensification, rehabilitation, and food diversification (Quincieu, 2015).

Rice (*Oryza sativa*) is one of the most important staples consumed by the people of Indonesia. The role of rice is also very important as a provider of staple foods that impact on Indonesia's food security and as a source of economic activity for most people. According to data from the annual report of the Directorate General of Food Crops, the annual average rice needed for population consumption between 2012-2015 was 38,243,000 tons (Indonesian Ministry of Agriculture, 2016).

To meet national rice needs, it is necessary to utilize factors of production effectively and efficiently for agricultural production. Simple production theory describes the relationship between factors of production and the level of production produced. There is one basic assumption regarding the nature of the production function, namely "the law of diminishing return" (Sukirno, 2011). Production factors are divided into variable factors (variable costs) and fixed factors. These two factors are combined in different proportions to produce various levels of production (Sudarman, 2004).

Total costs are the total production costs incurred. Fixed costs are costs incurred and opportunity costs of all input factors of production (Pindyck and Rubinfeld, 2007). Variable costs are costs that can change according to the output produced. Costs incurred consist of explicit costs and implicit costs (Cramer and Jensen, 1966).

The land is one of the most important factors in rice production. In the soils, there are substances and microbes needed by plants. Besides, the land will also affect the entry of other factors of production. For example the use of agricultural machinery, suitable types of seeds, fertilizer application, irrigation, and the amount of labour needed in the production process.

Based on rice production data in Central Java Province, Cilacap Regency produced the highest production for 6 consecutive years with total rice production in Cilacap Regency in 2014 reaching 813,431 tons (Indonesia Central Bureau of Statistics, 2015). The types of rice planted in Cilacap are lowland rice and upland rice (Cilacap Regency Central Bureau of Statistics, 2015). Cilacap Regency is located close to the Indian Ocean so there is a lot of sandy lands.

Rice that requires sufficient water in its vegetative growth process shows the importance of its ability to retain water. Paddy fields which are generally soil types are vertisol which has a fairly good ability in holding water are very different from sandy fields which are very easy to lose water. The numbers of paddy fields are decreased because of land-use changes. Sandy land is a very strategic area for the development of a specific location agricultural sector (Setyono and Suradal, 2007).

The production process in agriculture certainly has risks. Risk measures can also be influenced by factors of production involved in agriculture. Different land uses in agricultural activities can increase or reduce the risk of agriculture.

Risk is more widely used in the context of decision making because the risk is interpreted as an opportunity for a bad event to occur due to an action. The higher the level of uncertainty of an event, the higher the risk caused by the decision making (Barish, 1962). Thus, identification of sources of risk is very important in the decision-making process.

According to Elton and Gruber (1995), there are several risk measures including variance, standard deviation, and coefficient of variation. The coefficient of variation is obtained from the ratio of the standard deviation to the expected return of an asset. The coefficient of variation shows income variability which is generally indicated by percentages (Pappas and Hirschey, 1995).

The difference in the amount of input of production factors will affect production costs and risks in rice farming. Based on the description, the aims of the study are :

1. To compare production costs of rice farming in paddy fields and sandy fields
2. To compare the productivity risks of rice farming in paddy fields and sandy fields

METHODOLOGY

Study Area

The study was conducted in Cilacap Regency. Geographically Cilacap Regency is located between $108^0$4'30 "- $109^0$30'30" East Longitude line and $7^0$30 "- $7^0$45 '20" South Latitude. Cilacap Regency is bordered by Banyumas Regency in the north, Kebumen Regency in the east, West Java Province in the west and the Indian Ocean in the south.

The area of Cilacap Regency in 2014 was 2253.61 km^2 which was divided into 24 districts. The area is divided into several sections, namely paddy fields area of 30.17%; moor/garden area of 21.26%; field / Huma area of 0.04%; plantation area of 5.76%; community forest area of 0.90%; ponds are 20.80%; non-agricultural land area of 21.06% (Cilacap Regency Central Bureau of Statistics, 2015).

Based on data from the Meteorology and Geophysics Agency of Cilacap Regency, the highest amount of rainfall in 2014 occurred in July (659.0 mm) and the lowest occurred in September (4 mm). The highest maximum temperature recorded at 34.4^0 C occurred in April, while the lowest maximum temperature of 21.8^0 C occurred in August and September.

Sampling Procedure

Determination of the location of research carried out by purposive sampling method. The research was conducted in three districts namely Nusawungu District, Binangun District, and Adipala District located in Cilacap Regency. The three districts had paddy fields and sandy land with almost the same rice farming productivity.

The data used in this study are primary data using questionnaires. The number of samples studied was 60 farmers. The number of sandy fields samples are 30 farmers and paddy field samples are 30 farmers. Determination of the sample used the simple random sampling method.

Analythical Technique

Data collected were analyzed using descriptive statistics analysis. Descriptive statistics were used to analyze the socio-economic characteristics of the farmers and constraints associated with rice production.

The formula for calculating production costs according to Suratiyah (2011) is TC = TVC + TFC. A comparative test of the cost of rice farming production, Two-Sample Test for Equal Means is used. Test using Microsoft Excel, with the criteria if t arithmetic > t table, or probability > 0, the cost of production does not significantly different. On the contrary, if t arithmetic < t table, or probability < 0 then the cost of production between the two types of land is significantly different.

The productivity risk of paddy fields farming and sandy fileds can be identified by the analysis of the coefficient of variation. The coefficient of variation formula according to Snedecor and Cochran (1973) is :

$$CV = \frac{\sigma}{\bar{Y}}, \sigma = \sqrt{\frac{\sum(Xn - X1)^2}{n-1}}$$

which,
CV : Coefficient variation
σ : Standard deviation
$\bar{Y}$: The average value of a factor
n : Number of samples

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

Based on table 1 it is shown that farmers who work on rice both paddy fields and sandy fields are males. In addition, only 3.33% of farmers are not in productive age. While 96.67% are farmers of productive ages with an age range of 15-64 years. The number of farmers who are more in the productive age allows farmers to be more optimal in conducting farming activities so that the production of rice farming is expected to be more optimal.

Based on table 1 it can be seen that most farmers take formal elementary school education. The number of sandy fields farmers who received an education equal to elementary school was 83.87%, while there were fewer rice farmers who were only 76.67%. While the highest education taken by farmers is equal to the level of senior high school. The number of paddy farmers at the senior high school level of education is higher, which 10% compared to sandy fields farmers who are only 3.23%. Education of the farmer gives influence on farmers' decision to adopt new information and technology (Mwangi and Kariuki, 2015).

Table 1. Socio-economic characteristics of the respondents

	Sandy Fields		**Paddy Fields**	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**
Sex				
Male	30	100,00	30	100,00
Female	0	0,00	0	0,00
Total	30	100,00	30	100,00
Age				
16-64	29	96,67	29	96,67
>64	1	3,33	1	3,33
Total	30	100,00	30	100,00
Land Tenure (ha)				
Ownself	0,1822	87,72	0,2421	92,08
Rent	0,0118	5,70	0,0208	7,92
Profit sharing	0,0077	3,73	0,0000	0,00
Army land	0,0059	2,85	0,0000	0,00
Total	0,2076	100,00	0,2629	100,00
Educational Level				
Primary school	25	83,87	23	76,67
Junior high school	4	12,90	4	13,33
Senior high school	1	3,23	3	10,00
University	0	0,00	0	0,00
Total	30	100,00	30	100,00

Source : Field survey, 2016

Land ownership status affects production costs because farmers with land ownership status did not own themselves will incur land rental costs. In the study sample area, there were 4 types of land ownership, namely owning, renting, profit sharing, and Army land. Based on table 1 data, the majority of farmers own their own land with a percentage of 87.72% in the sandy fields and 92.08% in the paddy fields. The type of land is also

very influential on the success of rice farming. The average of paddy lands ownership is higher that is 0.2629 ha compared to the average ownership of sandy fields which is 0.2076 ha. In the area of the sandy field there is a land of the Army which is rented cheaply to the community so that it can be managed to improve food security in Cilacap Regency.

Production Costs Analysis

Production is the result obtained from the farming process, while productivity is the result obtained by each unit of land area. Sandy fields farmers generally cultivate rice in the rainy season and dry season, but if there is a long dry season, farmers only plant rice in the rainy season. Whereas in paddy fields can cultivate rice until the dry season 2 if the water supply is still sufficient. However, in 2015, paddy farmers in sandy fields and paddy fields planted paddy during the rainy and dry seasons 1.

Table 2. Average Production and Productivity of Rice in Cilacap Regency in 2015

No.	Land Types	Land Area (ha)	Production (kg)	Productivity (kg/ha)
1	Sandy Fields	0,2077	1.541,83	7.424,69
2	Paddy Fields	0,2630	2.592,67	9.859,74
Total		**0,4747**	**4.134,50**	**17.141,01**

Source : Field Survey, 2016

Table 2 shows that rice production per paddy fields area is higher than sandy land. Rice productivity in paddy fields is higher at 9,859.74 kg/ha compared to sandy land 7,424.69 kg/ha. Paddy fields that have smaller soil pores make nutrients and water in the soil not easy to leave so that the soil is more fertile and increases rice production. Whereas in sandy fields areas, soil pores are wider which makes water and nutrients easily leave.

Production costs are all costs used to procure factors of production in farming activities. Production costs affect farm income. Costs can be divided into variable costs and fixed costs.

Table 3. Average Production Costs of Rice Farming in Cilacap Regency in 2015

No	Explanations	Sandy Fields		Paddy Fields	
		Per Rice Farming (IDR)	Per hectare (IDR)	Per Rice Farming (IDR)	Per hectare (IDR)
1	**Variable Costs**				
	a. Labours	2.222.097,50	10.700.652,51	2.223.570,13	8.456.086,15
	b. Production Facilities	1.204.203,33	5.798.918,10	1.275.888,33	4.852.116,65
	c.Irrigations	264.133,87	1.271.953,53	46.935,48	178.492,46
Total Variable Costs		**3.690.434,70**	**17.771.524,15**	**3.5463.93,95**	**13.486.695,25**
2	**Fixed Costs**				
	a. Cost of Depreciation	202.677,83	202.677,83	325.592,78	325.592,78
	b. Land rent costs	245.000,00	1.179.813,16	85.185,05	310.572,78
	c. Land tax costs	22.451,61	108.117,18	38.051,61	144.707,70
Total Fixed Costs		**470.129,44**	**1.490.608,16**	**448.829,44**	**780.873,26**
Total Costs		**4.160.564,15**	**19.262.132,31**	**3.995.223,39**	**14.267.568,51**

Source : Field survey, 2016

Costs are inversely proportional to income, the higher costs, the smaller the income will be. This makes farmers want to always minimize the cost of farming production. The method used to calculate depreciation costs is the straight-line method.

According to research by Wagan et. al. the biggest cost component is variable cost, which is more than 70.09% of the total production cost. Whereas in the research sample the variable cost per hectare incurred was 92.26% of the total production cost on the sandy lands and 94.53% of the total production cost on the paddy field. Although the percentage of the variable cost of paddy fields is higher, the total value of the variable cost of sandy fields per hectare is much higher at IDR17,771,524.15 while in paddy fields IDR13,486,695.25.

High depreciation costs on sandy fields because the processing of sandy fields is more difficult which causes the agricultural equipment used to be damaged more quickly. In addition, sandy fields farmers generally have a water pumping machine to irrigate land if there is a lack of water. Comparative analysis of production costs of rice farming in sandy fields and paddy fields using statistical tests (t-test) in Microsoft Excel.

Table 4. The Results of Analysis of Different Tests of Production Costs Per Hectare of Rice Farming in Cilacap Regency in 2015

No	Land Types	Average Production Costs (IDR)	t-stat	Prob.
1	Sandy Fields	19.262.132,31	3,7400025	0,0002855
2	Paddy Fields	14.267.568,51		

Source : Primary Data Analysis, 2016

Based on table 4 it is shown that the probability value of 0.0002855 is smaller than alpha so that the cost of rice production between sandy fields and paddy fields per hectare is significantly different. The average cost of rice production for coastal sand per hectare is IDR19,262,132.31. Whereas on paddy fields, the average production cost of rice per hectare is IDR14,267,568.51.

Productivity Risks Analysis

Risk analysis of rice farming was comparing the coefficient values of production variation and productivity of each type of land. The characteristics of the two very different types of land are expected to have different risks.

Table 5. The Results of Rice Productivity Risk Analysis in Cilacap Regency in 2015

No	Land Types	Average Productivity (kg/ha)	Standard deviation	Coefficient of Variation
1	Sandy Fields	7.424,69	2.680,25	0,3610
2	Paddy Fields	9.859,74	3.016,94	0,3060

Source : Primary Data Analysis, 2016

Table 5 shows that the risk of sandy fields rice productivity is higher at 0.3610 compared to paddy lands at 0.3060. Kustiwati's research (2011) says that in the dry land, the risk of productivity of rice farming reaches 48%. High productivity indicates that the average productivity variability is smaller so the risk is lower.

The risk of rice farming in sandy fields is higher because the type of sandy fields has large pores which makes it more difficult for nutrients to be retained in the soil resulting in less fertile land. In addition, the existing rainfed irrigation system on sandy fields is very vulnerable to water shortages, especially during the long dry season. On the other hand, during the rainy season, the amount of water found in excess land so that newly planted plants cannot grow optimally because many plants are rotten.

CONCLUSION AND RECOMMENDATIONS

This research are to compare production costs of rice farming in paddy fields and sandy fields and compare the productivity risks of rice farming in paddy fields and sandy fields. From the finding, cost analysis per hectare shows that sandy fields (IDR19.262.132,31) had a higher production cost compared to the paddy fields (IDR14.267.568,51) and both of the are significantly different. The productivity risk of sandy fields are higher with lower productivity values (7,424.69 kg ha^{-1}) compared to paddy fields (9,859.74 kg ha^{-1}). Providing an agricultural extension of proper agricultural management will minimize the cost of rice production. Also the solutions for reducing production risk are irrigation, crop diversification, and farm insurance.

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THE WATERS OF BOUKOURDANE AND KEDDARA (ALGERIA): WHEN TWO DAMS RESERVOIRS OF A HIGHLY SOLIDITY ENVIRONMENT BY AGRICULTURE?

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SUMMARY

In Algeria, siltation, combined with the discharge of wastewater into rivers, poses enormous problems for dam managers. In addition to the dam's diminishing capacity due to sedimentary deposits, the water quality of the dam will be seriously threatened. In this article, we examine the evolution of the water quality of the lakes of the two large dams in the Algiers watershed, namely the Boukourdane and Keddara dams. With a total capacity of 250 million m^3Both dams are over exploited by the population of the capital and neighboring Wilayas. In addition, their watersheds are highly dependent on agriculture, which can affect the water quality of the reservoirs.Our study was based on investigations carried out on the dam sites and collecting physicochemical and biotic data obtained by ANRH over the past five years. The results obtained determine the temporal evolution of each parameter, the types of correlation and the degree of drinkability of the water. Phosphorus is the main factor of this study because it is the nutrient essential for the proliferation of algae. This parameter tells us about the trophic status of the lakes of the two dams.

Keywords: *Physicochemical analyzes- dam-Keddara-Boukourdane- Eutrophication - water quality.*

GENERAL INTRODUCTION

The Algeria has an annual average rainfall contribution of close to 100 billion m^3, on which surface water represent only 12.5 billion m^3, the rest is divided between evaporation, infiltration and discharge towards the sea of the 12.5 billion m^3, the country has tried to mobilize nearly half by building 67 dams with a total storage capacity of 6.4 billion m3 after she was the about 1 billion m^3 independence [1].

Water quality is an important parameter that affects all aspects of ecosystem and human well-being, such as the health of a community, the foodstuffs to be produced, economic activities and the health of ecosystems and biodiversity. In this work, we explore the water quality of two dams primarily for irrigation which are north of Algeria namely Keddara and Boukourdene.

PRESENTATION OF THE STUDY AREA

Dam Boukourdene (Figure 1) is located in the province of Tipaza was in northern Algeria. It is part of the Littoral-Littoral Atlas and covers an area of about 156 km² for a perimeter of 63 km. Geographically, this dam is located between longitude 2 7'40 "and 2 20'21" East and latitudes 36 32'60 "and 36 24'43" North. It is fed by the wadi El Hachem. The latter comes into being after the confluence of the four main tributaries: the wadi Boukadir from the west, the wadi Tegdza from the south and the wadis Nachef and Fedjena from the east.

The keddara dam (Figure 1) is located in the northern part of the Tell Atlas, at the western end of the metamorphic massif that extends the Kabyle massif, it is located on the territory of the wilaya of Boumerdes, 8 km south of Boudouaou, and 35 km to the east of Alger. The Keddara reservoir with a capacity of 142,391Hm^3 is fed by the contributions of wadis Keddara and El Haad gravitarily by the transfer gallery (3.2km long), resulting in the end by pumping from the reservoir. Bani Amrane (through a pipe and a gallery, the length is 31.0km) [1].

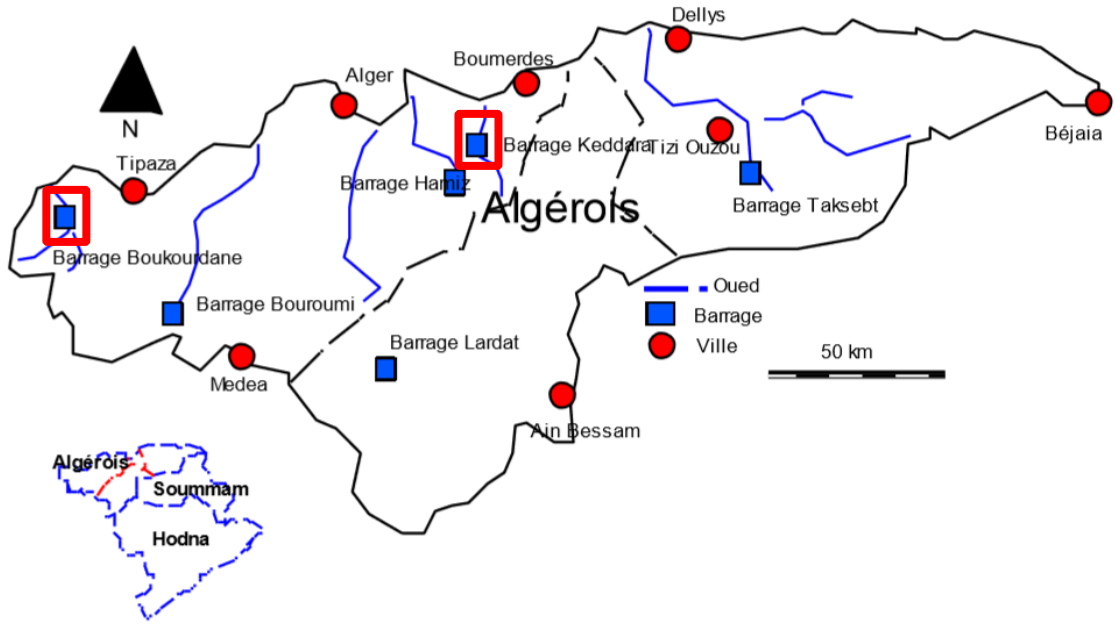

Figure 1: Location of the two dams keddara and Boukerdene at the great basin Hydrographic Algérois- Soummam- Hodna

MATERIALS AND METHODS

The assessment of surface water quality is based on the notion of alterations, which include physicochemical parameters of the same nature or the same effect that make it possible to describe the major types of degradation of water quality: organic and oxydables, crude protein, phosphorus and, mineralization ect... It is on these bases that were set by the alteration thresholds grids. The alterations defined by the ANRH are acidity, PES (suspended particles), temperature, mineral, MOOX (organic and oxidizable materials), nitrogenous materials, phosphorus materials and EPV (plant proliferation effect). Each quality parameter is described by 5 classes, from very good (Class 1) to very bad (Class 5).

For each parameter, it is the percentile 90 (value not exceeded by 90% of the results during the year that serves as reference). This value is also defined as the "value reached for 90% of the time". It is the most unfavorable value that is retained. In the case where it has 10 steps and under; the class of the parameter is determined by the worst value. On the other hand, the alteration is classified according to the class of the parameter retained [2].

Operating mode

In order to study the eutrophication of dam water and its general quality, it is essential to use a boat or a tire that must be anchored to the deepest part of the water body. Some measurements are made in situ. Other analyzes are carried out at the level of ANRH's analytical laboratory. A specific sampler for the deep sampling (device allowing to open the sampler at a determined level and thus to collect at a given point) is used.

In situ measurements

The measurements of the samples taken were made based on the study of Jean RODIER and Bernard LEGUBE [3]. The methods for measuring each of the parameters are explained in the following paragraphs.

Measures of water transparency

The water transparency measurement was measured with a Secchi disk, averaging two readings.

Measurements of temperature and oxygen

A profile of the dissolved oxygen and the temperature is made from 0.5 meter of the surface up to 0.5 m of the bottom with intervals between 3 and 5 meters.

The purpose of the classification of water is to classify dams by physical, mineral, organic, nitrogen and phosphorus in one of the following four classes represented by colors:

- **Class 1**: water of good quality, used without any particular requirement, it is represented graphically by the blue color.
- **Class 2**: Medium quality water, used after a single treatment. It is represented in green.
- **Classe 3**: e to poor quality, can only be used after a very thorough treatment. It is represented in yellow.
- **CLASS 4**: excessive pollution, can only be used after special treatment and expensive. It is represented in red.

Classification used for the different parameters analyzed, at each two dam of the study area, is shown respectively in Table 1, Table 2 and Table 3 below [2]:

Table 1: General Quality Grid

Class / parameters	C1	C2	C3	C4
a-**Physical quality**				
pH	6.5-8.5	6.5-8.5	5.5-6.5 or 8.5-9	<5.5 or> 9
MES mg / l	0-30	30-75	75-100	>100
Temperature C	25	25-30	30-35	>35
Smell, Taste	Without	Without	Without	
b-**Mineral quality**				
Dry residue	300-1000	1000-1200	1200-1600	>1600
Ca^{2+} mg / l	40-100	100-200	200-300	>300
Mg^{2+} mg / l	<30	30-100	100-150	>150
Na^{+} mg / l	10-100	100-200	200-500	>500
Cl^{-} mg / l	10-150	150-300	300-500	>500
SO_4^{2-} mg / l	50-200	200-300	300-400	>400
c-**Organic quality**				
Dissolved Oxygen% St	90-100	50-90	30-50	<30
BOD_5 mg O_2/ l	<5	5-10	10-15	>15
O_2mg/lCOD	<20	20-40	40-50	>50
M.Org mg / l	<5	5-10	10-15	>15

Table 2: Grid nitrogenous matter

Forms of nitrogen	N1	N2	N3	N4
NH_4^{+} mg / l	≤0.01	0.01-0.1	0.1-3	>3
NO_2^{-} mg / l	≤0.01	0.01-0.1	0.1-3	>3
NO_3^{-} mg / l	≤10	10-20	20-40	>40

Table 3: Grid phosphorus.

Phosphorus forms	P1	P2	P3	P4
PO_4^{-}mg / l	≤0.01	0.01-0.1	0.1-3	>3

Samples for analysis

Water samples are taken from plastic bottles for various analyzes and in brown glass bottles for pH and chlorophyll "a" and stored in a cooler for analysis the next day in the laboratory. The conservation of most of the samples can not exceed 24 hours [3]. Our experimental study focuses on the processing of ANRH data obtained between 2013 and 2017.

RESULTS AND DISCUSSIONS

The results presented below after (Table 4 and Table 5) are processed from grids that bedridden at our disposal.

Table 4: Classification grid of the monthly average values of the physicochemical parameters of the waters of the Boukourdene dam during the period (2013/2017)

moy mensuelle [2013 2017	JAN	FEV	MARS	AVRI	MAI	JUIN	JUILLET	AOUT	SEPT	OCT	NOV	DEC
pH	8	8	8,2	7,6	8,3	8,2	8,2	8,2	8,3	8,3	8,2	7,7
M.E.S à 105°C mg/L						21	147	26	1	6		19
Transparence (cm)	150	150	180	200	250	180	100	140	200	100	120	250
T°C Eau	13,0	11,0	16,0	20,0	22,0	28,0	29,5	28,5	26,0	23,8	19,5	14,0
Résidu Sec mg/L	597	572	554	552	515	488	522	510	532	644	758	561
Calcium mg/L	70	66	72	60	61	63	51	34	58	55	62	39
Magnésium mg/L	44	41	32	36	36	38	48	56	37	18	39	39
Sodium mg/L	52	43	43	60	44	33	15	39	45	24	20	48
Chlorures mg/L	89	87	73	80	73	89	75	92	99	86	135	75
Sulfates mg/L	139	111	121	146	141	128	133	131	127	155	150	128
O2 %	118,3	83,6	99,1	107,8	71,6	108,0	113,3	107,1	83,1	77,5	76,2	77,5
O2 mg/L	12,5	9,2	9,8	9,7	6,1	8,4	7,9	7,7	6,4	6,4	6,9	8,0
D.C.O mg/L de O2	9	9	13	11	9	22	19	9	9	5	35	8
D.B.O5 mg/L de O2												2,5
M.Org mg/L de O2	2,0	3,5	3,2	3,4	3,3	5,0	2,9	4,5	2,0	2,0	4,0	3,2
Ammonium NH4 mg/L	0,079	0,116	0,000	0,003	0,000	0,071	0,072	0,143	0,032	0,277	0,151	0,316
Nitrites NO2 mg/L	0,230	0,226	0,168	0,000	0,027	0,038	0,000	0,000	0,000	0,000	0,000	0,233
Nitrates NO3 mg/L	0,0	0,1	0,8	1,1	1,2	0,3	2,0	1,5	0,0	0,6	0,0	0,8
Phosphates PO4 mg/L	0,113	0,028	0,205	0,086	0,055	0,067	0,077	0,046	0,242	0,673	0,000	0,034
P/T mg/L	0,048	0,019	0,078	0,039	0,028	0,032	0,036	0,025	0,091	0,234	0,010	0,021
Chlorophylle a + µg/L	2,58	2,59	5	7,25	4,35	18,74	12,57	10,1	4,89	10,56	6,32	0,63
Taux de saturation %	118,3	83,6	99,1	107,8	71,6	101,5	113,3	107,1	83,1	77,5	76,2	77,5
pH	8	8	8,2	7,6	8,3	8,2	8,2	8,2	8,3	8,3	8,2	7,7

Table 5: Classification Grid for avereage monthly physicochemical parameter values of the waters ofu dam e Keddara during the period (2013/2017)

moy mensuelle [2013/2017]	JAN	FEV	MARS	AVR	MAI	JUIN	JUILLET	AOUT	SEPT	OCT	NOV	DEC
T°C Eau	12,1	12,8	18,4	20,3	22,2	27,8	20,0	29,0	26,3	24,6	19,1	13,5
Résidu Sec mg/L	556	525	521	540	485	534	433	486	468	502	441	532
Calcium mg/L	65	57	53	46	47	40	37	39	40	43	45	47
Magnésium mg/L	32	24	27	28	30	31	29	30	25	32	30	29
Sodium mg/L	74	68	71	58	63	78	54	69	66	68	62	47
Chlorures mg/L	98	68	62	58	64	67	69	70	80	80	73	71
Sulfates mg/L	118	107	104	107	113	114	121	99	93	90	81	71
O2 %	78,0	107,7	127,3	148,4	105,0	133,1	99,6	132,8	104,9	89,0	97,5	70,1
O2 mg/L	8,4	11,4	11,9	13,3	9,0	9,8	9,0	9,4	8,0	7,2	9,0	7,3
D.C.O mg/L de O2	18	29	27	32	30	14	14	9	15	9	15	5
D.B.O5 mg/L de O2		2,0	3,0	1,0	3,0	3,0	3,0	4,0	1,0	1,0	7,0	1,0
M.Org mg/L de O2	3,8	4,5	3,2	5,5	6,0	3,5	7,0	6,4	3,0	4,9	3,0	4,0
Ammonium NH4 mg/L	0,050	0,064	0,038	0,040	0,060	0,080	0,160	0,180	0,080	0,002	0,070	0,400
Nitrites NO2 mg/L	0,240	0,240	0,206	0,240	0,274	0,240	0,000	0,069	0,034	0,069	0,034	0,172
Nitrates NO3 mg/L	0,2	1,8	0,7	1,1	0,9	0,3	0,0	0,1	0,0	0,0	0,0	0,0
Phosphates PO4 mg/L	0,015	0,291	0,401	0,000	0,000	0,000	0,000	0,031	0,245	0,012	0,034	0,073
P/T mg/L	0,016	0,108	0,145	0,150	0,280	0,310	0,011	0,021	0,093	0,015	0,022	0,035
Chlorophylle a + µg/L		1,28	2,5	5,54	13,86	13,01	10,28	5,75	4,86	2,71	3	1,2
Taux de saturation %	78,0	107,7	127,3	148,4	105,0	133,1	99,6	132,8	104,9	89,0	97,5	70,1
pH	8	8,3	8,3	8	8,3	8,1	8	8,2	8,1	8,2	8,3	8,3

After the analysis of the samples collected during the period (2013/2017), the collection and the data processing within the ANRH, we can conclude that the water stored in the two dams of our study, is free of

urban and agricultural and even industrial waste (Table 6). This is affirmed by the classification of our water in class C1 defined as being of good quality which predominates almost all the parameters (PO_4 and P_{tot}).

Table 6: Comparison of the trophic status of Boukourdene/Keddara waters according to the water classification grid during the period (2013/2017)

parametres	ph	Mes a105°C	Trans (cm)	T°C eau	Resses	Ca	Mg	Na	chlorures	sulfates	O2%	O2	DCO (o2)	DBO5 (o2)	Morg (o2)	NH4	NO2	NO3	PO4	PTOT	Chl a+yg/l	taux de sat
boukourdene	bonne	mediocre	mediocre	bonne	moyenne	moyenne	moyenne	bonne	bonne	moyenne	bonne	moyenne	bonne	moyenne	moyenne	bonne	bonne	bonne	bonne	bonne	bonne	bonne
keddara	moyenne	moyenne	mediocre	bonne	moyenne	bonne	moyenne	moyenne	bonne	moyenne	bonne	bonne	bonne	bonne	moyenne	bonne	moyenne	bonne	bonne	bonne	bonne	bonne

The evaluation of the application in oxygen (O_2) and total oxygen (O_{2tot}) by the biological oxygen demand (BOD_5), the chemical oxygen demand (COD), organic matter (M_{org}), the temperature of the water (T C degree) and the rate of saturation (in %) classified in class (good) behind the lack of production algal and cyanobacteria affirmed by the lack of nutrients (NH4, NO2, NO3) in small quantities which gives the water of the dams the membership in class C1: this eliminates the production of the phenomenon of eutrophication.

The parameters such as turbidity, MES, Transparency classify the two waters in class C3 (bad) interpreted by the physical deterioration of water shown by the presence of fine particles, mineral, organic biodegradable or not. More than 50mg/ l was detected by a depth of 150 cm. The relatively neutral pH (between 6 and 9) strongly influences biological diversity. The effects of plant proliferation (EPV) show the absence of the phytoplankton asserted by the chlorophyll a + values and the saturation rate, which gives our water the good quality (class C1).

CONCLUSION

During periods of maximum summer thermal stratification, oxygen is undoubtedly one of the most important indicators of the degree of eutrophication of a body of water. The decrease in dissolved oxygen concentrations at the bottom of bodies of water is related, for the most part, to the consumption of this dissolved gas by aerobic bacteria that break down the organic matter accumulating at the bottom of a body of water. When establishing a thermal stratification in the two levels of water, there may be release of phosphorus in sediments if the anoxic bottom waters. The oxygen was present with concentration often greater than 4 mg /l to the bottom of the dam Boukourdene and Keddara during the period 2013 to 2017. However, during the year 2017 we recorded oxygen levels between 2.9 and 3.2 mg /l respectively. Although both phosphorus and nitrogen are classified in C2 (middle class) as part of their respective alteration, it does not preclude that they are essential nutrients for the growth of algae, responsible for the eutrophication of body of water. The most unfavorable of the three criteria (total phosphorus, oxygen and NH4 +) defines the trophic degree of the dam.

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IDENTIFICATION OF THE SOURCE OF SEDIMENT PRODUCTION AT THE UPPER AND MIDDLE CHELIFF BASIN USING GEOGRAPHIC INFORMATION SYSTEMS (G.I.S.)

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ABSTRACT

The objective of this study is to identify the source of sediment production in the upper and middle Cheliff basin. The latter is exposed to a serious problem of soil degradation. This results in a significant increase in the siltation rate of the majority of the dams spread over this basin. Indeed, four classes of erosion vulnerability have been distinguished (low, medium, high and very high), where the most vulnerable areas occupy most of the basin. These areas are identified mainly at subwatershed level: wadi Fodda, wadi Cheliff Ghrib and wadi Ebda. These areas are responsible for significant sediment production. The produced map provides an excellent decision-making tool for managers to better target their preventive intervention strategies to protect the soil and the environment.

Keywords: *Erosion, Cheliff, Vulnerability, GIS, Model Builder.*

Presentation of the study area

The upper and middle Cheliff watershed is part of the greater Cheliff basin northwest of Algeria (Fig.1). Its area is about 10701 Km² [1]. Geographically, it is located between longitudes 1° and 3° 90' to the East and latitudes, 35° and 36°50’ North. It includes altogether eleven sub-watersheds [2].

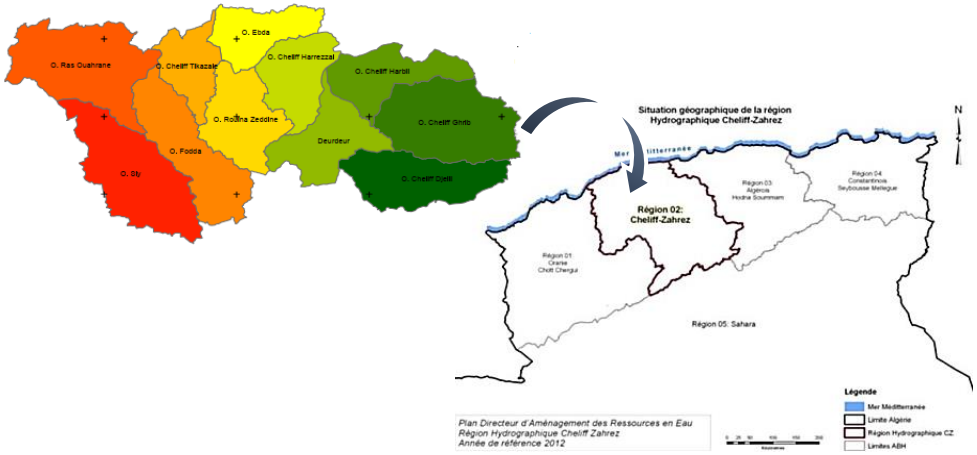

Figure 1: Geographic location of the upper and middle Cheliff watershed

This basin is traversed by the Cheliff wadi over a length of 349 km and has a very dense hydrographic havel (Fig. 2). It is characterized by a very diversified relief [3]. In the South and the East, mountains are marked by high altitudes that can reach 1946.9 m, with steep slopes. From the northeast to the center of the watershed it is valleys, characterized by low altitudes and gentle slopes [2].

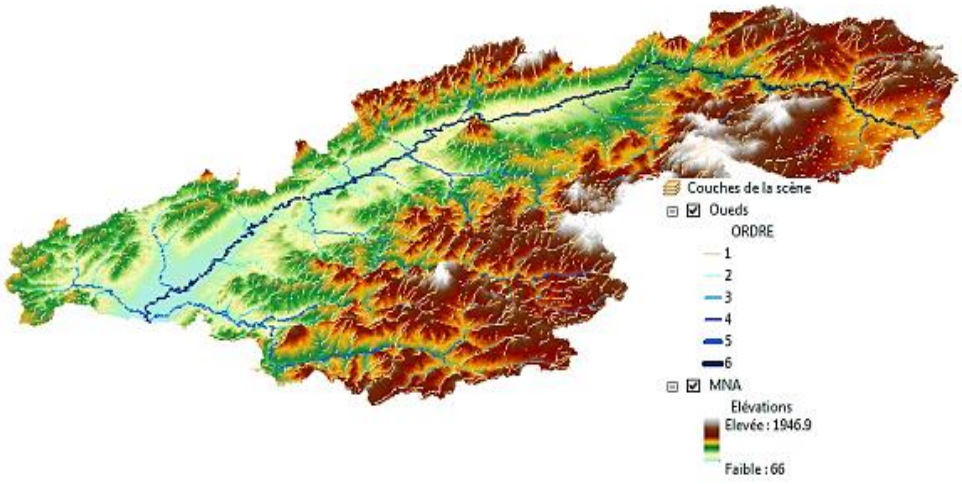

Figure 2: Numeric Altitude Model of the upper and middle Cheliff basin

METHODOLOGY

The approach used initially aims at exploiting satellite, topographic, geological and climatic data, after integrating and analyzing them in a GIS environment. This method allowed us to create five thematic maps (Fig. 3) and reclassify them using ArcGis™ software. Subsequently, we prioritized the role of each factor by assigning a weight index, relative to the erosion sensitivity degree for each of the classes obtained: weak role = 1, average = 2, strong = 3 and very strong = 4. To obtain the final erosion soil vulnerability map for our basin, we used a model builder weighted overlay method on ArcMap™ (Fig. 4).

The degree of vulnerability to erosion is then expressed by [1]:

Degree of Erosion Sensitivity=Slope index+Lithological index+Land Use index+Precipitation index+Wind Exposure index.

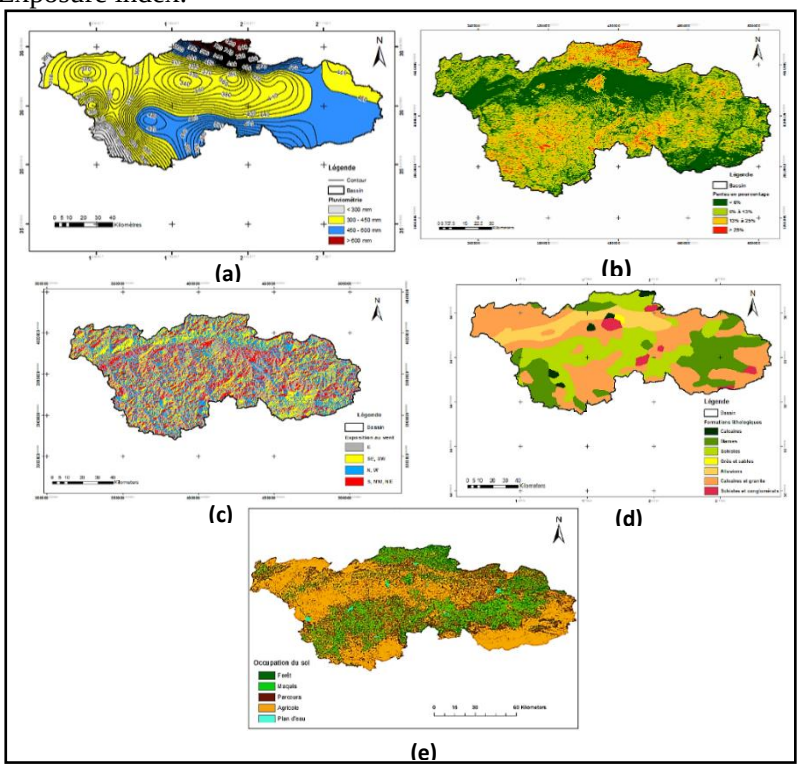

Figure 3: Thematic maps developed: (a)Isohyets map, (b)Slopes map, (c)Wind exposure map, (d)Lithological formation map, (e)Land Use map

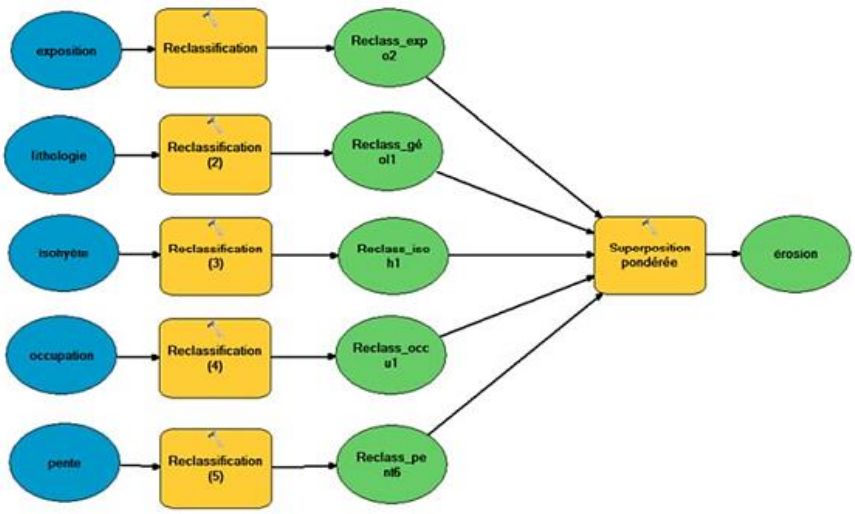

Figure 4: Map overlay diagram of the model builder application on ArcMap.

Most of the work was done according to the methodological flowchart presented in Figure 5:

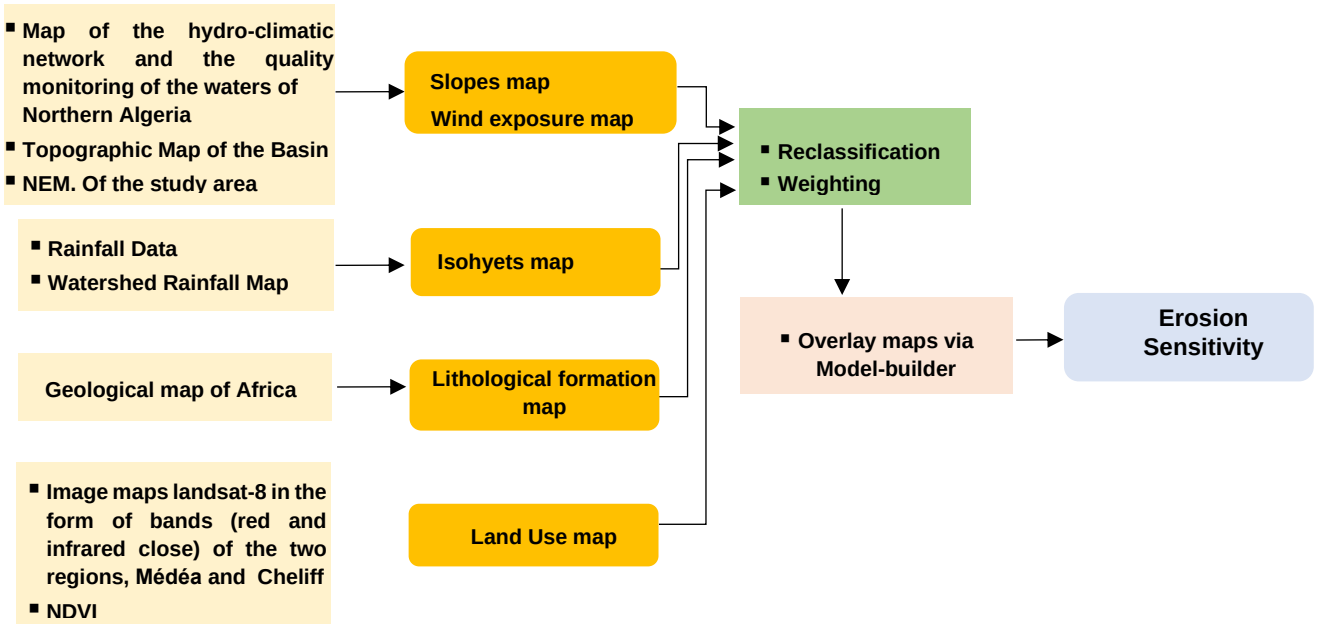

Figure 5: Methodological diagram for the production of the Erosion Sensitivity Map

Editing the soil erosion sensitivity map of the upper and middle Cheliff basin

The erosion sensitivity map (Fig. 6) is obtained, taking into account the physical characteristics (relief, geological nature of the soil, and vegetation cover) and the hydrological characteristics related to climatic factors (precipitation and wind), by the crossing of the five thematic maps produced. From this map, it appears that highly vulnerable areas occupy most of the basin (about 68,021%). This vulnerability is caused mainly by a very high precipitation intensity, very steep slopes as well, and soft facies. Gully erosion has been identified particularly at the level of the three sub-watersheds: wadi Fodda, wadi Cheliff Ghrib and wadi Ebda. These identified areas are responsible for significant sediment production.

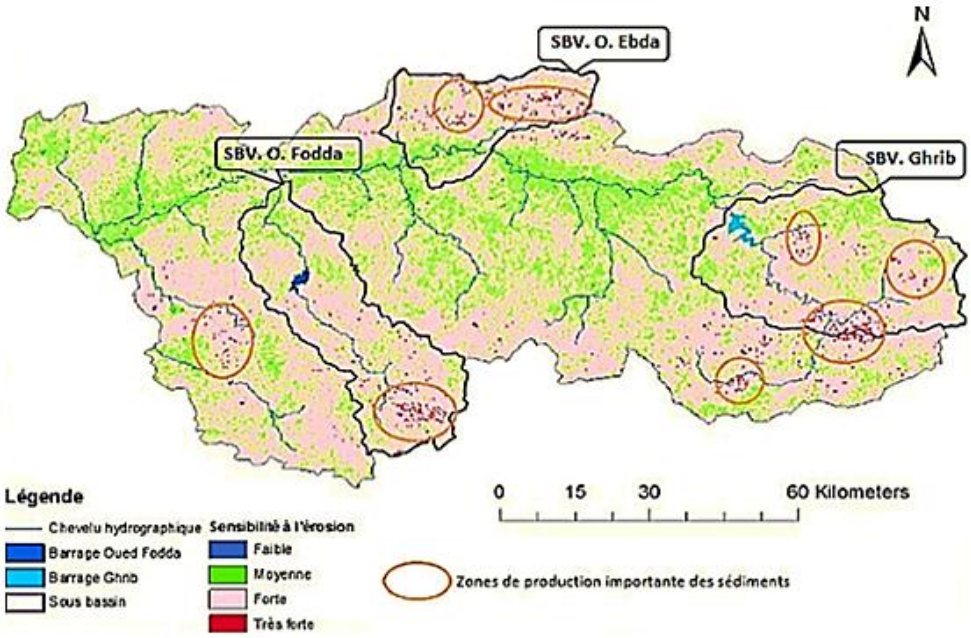

Figure 6: Soil erosion sensitivity map of the upper and middle Cheliff basin.

CONCLUSION

We have seen in this study that the areas of sediment production were identified mainly upstream of the three sub-watershed: Wadi Ebda, Wadi Cheliff Ghrib and Wadi Fodda, based on the map of soil sensitivity levels at erosion developed for our study area. At the level of the latter two sub-basins, the Oued-Fodda dam and the Ghrib dam, respectively, represent about one-third of the total siltation of Algerian dams, according to the National Agency for dams and transfers (ANBT) of Algiers. Indeed, the Boughzoul dam was built upstream of the Cheliff Ghrib dam in order to limit the floods and thus reduce the quantity of sediments transported. This map can be used as a decision-making tool for the design engineer, as it provides an overview of the endangered areas and can be used as a visual and explanatory support, referring to the database.

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HYDROPONIC BARLEY IN SUBSTITUTION TO OAT HAY IN SHEEP DIET: EFFECT ON INTAKE DIGESTIBILITY AND NITROGEN BALANCE

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ABSTRACT

Currently, given the soaring price of concentrate and the low quality of basic rations most commonly adopted by farmers in Tunisia, an urgent appeal was launched to alternative resources to improve the nutritive value of ruminant diets. The hydroponic barley (HB) is one of these alternatives which its use in animal feed date from the 18th century. In this context, we tried to study in this work, the effect of the partial replacement of hay by hydroponics barley on intake and digestion in sheep.

Sixteen Barbarine rams were used in this experiment. Animals were divided into two equal groups and housed in individual 1.5 x 1 m boxes placed in a well-ventilated covered barn with a cement floor. The first group received oaten hay ad libitum and 500 g barley grain. For the second group, 20% of hay intake was replaced by hydroponic barley in term of dry matter. Rams were acclimated for 21 days to diets before starting six days measurement period. Results showed that HB is rich in water and protein. Hay intake and dry matter digestibility decreased significantly with the replacement of hay by HB. However, HB did not affect organic matter and crude protein digestibility. The nitrogen balance showed a different trend.

The retained nitrogen was higher in sheep given HB. This trend is related mainly to the urinary nitrogen which was too low. Basis on these results, we can conclude that HB improve specially nitrogen retention which is closely related to animal weight gain. Thus, to make sure of this virtue, we have to study HB effect on sheep growth.

INTRODUCTION

The use of sprouted grains in the human diet dates back to the 17th century (Leitch, 1939). Its introduction into animal feed is more recent and dates back to the middle of the 19th century with early experiments conducted on hydroponic barley on dairy cows (Leitch, 1939, Myers, 1974). The hydroponic production of green feed is made from feed grains, with a high germination rate and cultivated for a short period of time of a few days in a chamber with more or less controlled conditions (Sneath and McIntosh, 2003). In general, seeds are germinated and grown for about a week until a fodder carpet consisting of sprouted grains, with their intertwined white rootlets surmounted by green shoots (Cuddeford, 1989). The product is given entirely to the animals and the empty space of the culture chamber is reused to germinate a new series of seeds (Al-Karaki and Al-Hashimi, 2012). The interest of using green feed from hydroponics in animal feed is linked to its high nutritional value. It is characterized by its richness in amino acids, vitamins enzymes and soluble carbohydrates which, come from the transformation of the starch, proteins and lipids of the grain into simpler forms thanks to the enzymes activated by the process of germination (Lorenz and D'appalonia 1980, Chavan and Kadam 1989). It has been argued in earlier research (Koehler, 1934, Leitch, 1939) and confirmed by more recent work (Finney, 1982) that sprouted grians are distinguished from dry grain by a grass juice factor responsible of improving animal performance. Work on the ruminant performance is sparse and has shown controversial results (Myers, 1974, Peer and Leeson, 1985) that depend on the animal category and the composition of the diet. Fayed (2011) showed that the addition of hydroponic barley to the lamb diet improves growth performance. Eshtayeh (2004) showed better milk performance for the Awessi dairy breed in Jordan when hydroponic barley is added to an olive cake based diet. Leitch (1939) and more recently Tudor et al. (2003) observed a growth gain in feeder bulls with the addition of sprouted barley. However, the work of Farlin et al. (1971) and those of Fazelli et al. (2011) showed no growth advantage in beef cattle when hydroponic barley is added to the diet. It is most commonly reported a decrease in dry matter intake with the incorporation of hydroponic barley into the diet (Hillier et al., 1969, Myers, 1974, Fazelli, 2011) and attributed to its high content in water and fiber compared to barley grain. . Eshtayek (2004) reports an improvement in ingestion in the Awassi dairy ewe. Regarding digestibility, most of the work on sheep showed a marked improvement in this parameter, with the addition of hydroponic barley to the diet. This is mainly attributed to the presence of bioactive catalysts and enzymes that can improve food digestion and retentions (Peer and Leeson 1985, Morgan et al., Fazelli 2011, Fayed 2011). Howerver, Dung et al. (2010) did not observe any significant effect

of the presence of hydroponic barley on digestibility. Similarly, Sneath and Mcintoch (2003) and Hillier and Perry (1969) observed the same and attributed it primarily to the increase in fiber content. In Tunisia, the first research at INRAT on hydroponic barley dates back to the 1970s (Ben Salem, 2014, Comm Pers). Since then, it was abandoned because of lack of interest for this resource. Some sporadic research has been conducted on its use in rabbit feeding (Kriaa et al., 2001) or on growing conditions (Trabelsi, 1995). But recently and in view of the increase in the price of food, an urgent media call was launched by private to revive this technology and a number of promoters have started to produce and market barley hydroponics. The Ministry of Agriculture was challenged by the magnitude of the subject, seized research organizations to initiate scientific research on the true value of this fodder and the desirability of its introduction and adoption large scale. It is indeed a question of reflecting on the sustainability and viability of hydroponic barley production projects once launched because it is the organization of the sector as a whole. In this context, our work proposes to study the nutritional value of hydroponic barley and the effect of the partial replacement of hay by hydroponics barley on intake and digestion in sheep.

MATERIAL AND METHODS

Animals and diets

Sixteen Barbarine rams were used in this experiment. Animals were divided into two equal groups and housed in individual 1.5 x 1 m boxes placed in a well-ventilated covered barn with a cement floor. The first group received oaten hay ad libitum and 500 g barley grain. For the second group, 20% of hay intake was replaced by hydroponic barley in term of dry matter.

Rams were acclimated for 21 days to diets before starting six days measurement period.

The hydroponic barley used (from the kounouz variety) was supplied by a newly established promoter in the Ras Djebal region. To produce it, the grain barley is cleaned with tap water, cleared of coarse debris and then soaked for 30 minutes in a solution of 20% bleach. The barley is then rinsed with tap water and then left to soak in tap water overnight (at least 16 hours). The barley is then decanted for 3 to 4 hours, then put on plastic trays of 35 cm x 61 cm at the rate of a seeding dose of 7 kg m-2. It is germinated in an isolated chamber in the basement to have a more or less constant temperature of 23 ° C. The culture lasts between 8 to 10 days during which the trays are regularly irrigated with a system of automated drippers delivering 4.5 l m-2 day-1. The trays are superimposed on shelves and are arranged in inclined planes of 5% to ensure the drainage of the irrigation water. Before their distribution, the hydroponic barley were cuted into 2x2 cm dice to facilitate their consumption by animals

Measurements and sampling

Feed intake was recorded daily during the 7 days of the measurement period. Along with the total collection period, feed intake was determined daily by weighing the amounts of individual distributed feeds and corresponding refusals. Feces and urine were collected daily weighed, and a 10% aliquot was collected from each sample. Fecal and urine aliquots were composited by lamb within the 7-day collection period, and a subsample of feces and urine were frozen for later analyses.

Laboratory analyses

Ground samples of offered feeds, refusals and feces were analyzed for dry matter (DM), ash (550 °C for 8 h) and N (Kjeldahl-N) according to AOAC (1990) and for neutral detergent fiber (NDF) according to Van Soest et al. (1991)..Urine was analyzed for Kjeldahl-N (AOAC, 1990)

Statistical analyses

Data were analyzed using the general linear model procedure SAS (1991) according to the model:$Yijk= \mu+R_i + e_i$,

Where Y is the dependent variable, μ is the overall mean, R_i is the effect of grazing forage (i = 1− 2), ei is the residual error.

RESULTS

Feed chemical composition (Table 1) shows that hydroponic barley has a low DM content compared to grain (11.5% vs. 91.3%). However, barley germination increased crude protein and NDF levels by 14.42% and 58.3%, respectively. The OM content was not affected by the germination process.

Table 1. Nutrient contents of feeds

	Oat hay	Barely	HB
DM	88.6	91.3	11.5
OM	90.87	96	96.1
CP	8.64	10.2	14.4
NDF	62.8	27.6	58.3

Diet intake and digestibility are presented in table 2. Hay intake has significantly decreased with replacement rate of 20%. It decreased significantly from 42.4 g DM kg W0.75. Consequently, diet intake decreased significantly (P< 0.05). Digestibility of DM and fiber decreased significantly following the consumption of OH while those of the MO and MAT were not affected

Table 2. Effect of hydroponic barely on feed intakes and diet digestibility in sheep

	Diet 1	Diet2	ES	Pr
Intake, (g DM/kg $W^{0.75}$)				
Hay	42.37	32.01	0.88	0.0001
HB	0	3.65	0.62	0.0001
Diet	72.55	66.32	1.44	0.0087
Digestibility (%)				
MS	67.39	63.79	1.18	0.0484
MO	68.9	65.8	1.17	0.0787
MAT	58.07	53.59	1.85	0.1084
NDF	53.59	46.71	1.56	0.0075

Nitrogen balance is reported in table 3. Ingested and urinary nitrogen levels were higher with the first group. Fecal loss were similar which explains the lack of effect of hydroponic barely on nitrogen retention.

Table 3. Effect of hydroponic barely on nitrogen balance

	Diet 1	**Diet 2**	**ES**	**Pr**
Ni	16.43	15.40	0.16	0.0005
Nu	3.94	1.87	0.46	0.0069
Nf	6.9	7.16	0.29	0.5452
Nr	5.62	6.36	0.55	0.3596

DISCUSSION

According to the literature (Morgan et al., 1992, Sneath and McIntosh, 2003), hydroponic barley is a particularly nutritious feed for ruminants. This corroborates our results which revealed that this feed is rich in crude protein (CP, 14.4 % DM) and fiber in comparison to barley grain. The germination of barley without the use of a nutrient solution proves that the accumulation of the CP content is only induced by the germination process. In contrast, Morgan et al. (1992) link this increase in protein content to the absorption of nitrogen contained in the nutrient solution applied with irrigation water.

The replacement of hay by hydroponic barley is accompanied by a decrease in the intake of hay. In the same context, Fazaeli et al. (2011) observed a decrease in intake following hydroponic barely consumption while Restle et al. (2002, 2003) and Berry et al. (2004) did not observe any effect on intake. These controversial results can be explained by the cumbersome effect of hydroponic barely, which is closely related to its chemical composition including its content in DM or also by the palatability of hydroponic barely which is closely related to its organoleptic properties (odor and taste).

Digestibility of DM and fiber decreased significantly following the consumption of hydroponic barely while those of the OM and crude protein were not affected. These results differ from those advanced by Fayed (2011) and Sharif et al. (2013) who have got an increase in digestibility related to the presence enzymes (especially phytase) and vitamins in the juice of the hydroponic barely. In the same trend, Abidi et al. (2014) reported a significant increase in DM, OM and CP digestibilities when they replaced barely grain by hydroponic barely.

The analysis of the nitrogen balance shows that the regimes applied were not iso-nitrogenous. Nitrogen intake was lower in animals assigned to hydroponic barely consumption. Nitrogen losses in urine decrease

with the consumption of hydroponic barely. Fecal losses were similar which explains the lack of effect on nitrogen retention. These results corroborate those of Dung et al. (2010) who did not observe a significant effect of hydroponic barely on retained nitrogen.

Basis on these results, hydroponic barely may improve specially animal weight gain which is closely related to nitrogen retention.

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VETCH SUMMER GRAZING (VSG) UNDER CONSERVATIVE AGRICULTURE (CA)*:* PROMISING ALTERNATIVE TO CEREAL RESIDUE GRAZING FOR BETTER BARBARIN LAMBS RESPONSE

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ABSTRACT

Nowadays, there is an urgent need to reverse soil degradation and to improve crop and livestock productivity at farm level. Conservation Agriculture (CA) can be helpful in enhancing crop productivity, resource use efficiency, and soil health. However, the demand for crop residues as animal feed are among the major constraints for the adoption of CA technologies. Thus, the objective of this trial was to test the value of summer grazed vetch as an alternative to wheat residues and to compare lamb response on dried common vetch (cultivar Mghila) and wheat stubble. 20 Barbarine lambs aged in average seven months with an average weight of 22.5 kg were divided into two groups; each group received one of the following treatments: T1: Vetch grazing during the morning (3 h) and evening (2h), T2: Wheat stubble grazing during the morning (3 h) and evening (2h) + 400 g barely

A stocking rate of 20 lambs ha-1 was used and calculated on the basis of initial biomass yield and a average daily intake of 1.5 kg DM day lamb-1.

Animals were allowed to graze dried vetch (whole plant) and wheat stubble for 60 days. Two weeks after the beginning of the trial, lambs on stubble were supplemented by barely grain (400 g/day) to compensate body weight loss.

Vetch and residue biomass and nutritive value and animal growth was assessed through every two weeks. Animal behaviour were studied once during the grazing period.

The assessment of the animal behaviour showed that animals grazing vetch spent more time in feeding than those on residue (75% vs 47%) and less time in walking (22% vs 47%). However, lambs on stubble spent practically the same time in feeding and walking throughout the morning grazing period.

Initial vetch biomass was about 4,5 T DM ha^{-1} and then dropped to 2,5 T DM ha^{-1} in an asymptotic way as grazing goes on through the grazing period. Similarly, seed content dropped significantly which explain the CP content decrease. DG average of lambs on vetch was higher than that of animals on cereal residues (81 and 48.1 g day^{-} respectively).

It can be concluded that during summer period, dried vetch biomass provided a valuable alternative to cereal stubble and complementation which is rich in energy and protein and should sustain moderate growth performances of growing lambs.

Keywords: *AC, summer vetch grazing, stubble, commercial diet, lamb, behaviour, growth*

INTRODUCTION

In Tunisia, agriculture is undergoing an important pressure to cover the increasing populations demands of water resources and soil use generally degraded. Climate change impact aggravates further challenges faced by the agriculture. It increases temperatures and rainfall variation enhancing soil degradation, water scarcity and pollution. Thus, climate change present a negative effect on crop and livestock production systems in all regions.

Therefore, there is an urgent need to reverse soil degradation and to improve crop and livestock productivity at farm level, as well as to maintain food security in Tunisia. Conservative agriculture (CA) technologies based on the principle of reducing tillage, retaining crop residue, and crop diversification through efficient rotations and crop and forage alternatives can be helpful in enhancing crop productivity, resource use efficiency, and soil health (Farooq et al., 2015). It is an innovative alternate paradigm of regenerative, ecological and sustainable agriculture that is replacing the degrading conventional tillage based agriculture worldwide. The adoption of CA is spread in all land-based systems including annual and perennial cropping systems, including plantation systems, agro-forestry systems, crop-livestock systems...etc.

Many of the current achievements attributed to CA can be traced to farmers and farmer organizations in Tunisia. CA technology has been promoted in Tunisia by many development agencies, such as CIMMYT, FAO and IFAD. Recent research has shown results on the impact of CA on crop productivity, farm profitability and system sustainability (Sommer et al., 2014). However, the lack of farm implements suitable for zero-tillage seeding and the demand for crop residues as animal feed are among the major constraints for the adoption of CA technologies (Angar et al., 2012; Ben Cheikh et al., 2016). Under semi-arid region of Tunisia, conventional livestock production systems face a number of severe constraints from which the most important is the limited natural resources and the lack of forage crop integration and diversification. Farmers should monitor the performance of their flocks throughout summer and autumn to provide feeding strategies that will prevent unwanted losses of bodyweight and rely mainly on cereal straw and stubble which are of poor quality. Under CA, livestock nutrition and productivity could be increased with new forage legumes particularly vetch which is native from Tunisia , and would make possible the option to retain a minimum-required amount of residue on the soil. Vetch is mainly used as a hay or grazed during spring seasons (Haddad, 2006). However, the entire dried plant summer grazing is a rare practice. Thus, the aim of the present study was to test the hypothesis that grazing dried vetch is the appropriate low cost alternative to wheat stubble providing high quality forage for animals during summer season and essentially, to maintain sufficient soil cover under CA system.

MATERIAL AND METHODS

Animals and diets

The grazing experiment was carried out at Bourabia experimental station during summer months after wheat harvesting (2015). The grazing experience started in late June at vetch seeds physiological maturity stage.

The common vetch (cultivar Mghila) have been used in this experiment. 20 Barbarine lambs aged in average seven months with an average weight of 22.5 kg were divided into two groups. Each group received one of the following treatments: T1: Vetch grazing during the morning (3 h) and evening (3h), T2: Wheat stubble grazing during the morning (3 h) and evening (3h) + 400 g barely

A stocking rate of 20 lambs ha-1 was used and calculated on the basis of initial biomass yield and a average daily intake of 1.5 kg DM day lamb-1.

Animals were allowed to graze dried vetch (whole plant) and wheat stubble for 60 days. Two weeks after the beginning of the trial, lambs on stubble were supplemented by barely grain (400 g/day) to compensate body weight loss.

Measurements and sampling

Along with the grazing period, vetch and wheat residue biomass and nutritive value were assessed every two weeks. Biomass yield were estimated through harvesting 6 square meter randomly distributed at each corresponding plot and subsamples were dried in a ventilated oven at 70 °C for 48 h to determine their dry matter contents and other subsamples were dried at 50 °C then ground to pass through a 1 mm screen and stored for further chemical analysis.

Animal growth was assessed biweekly. Animal behaviour was recorded in the morning and the afternoon at mid of the grazing period.

Rumen fluid was collected before the distribution of morning meal (0 h) and at 3 h post feeding over period 1 and 2 using a flexible stomach tube and a syringe. pH was immediately measured. Samples of 5 ml filtered rumen fluid were acidified with three drops of sulphuric acid and stored in the freezer until analyzed for ammonia nitrogen (NH3-N). Unfiltered samples were mixed with a solution composed of 10 ml, 90 ml distilled water and 60 mg green of bromocresol for protozoa counting.

Laboratory analyses

Ground samples were analyzed for dry matter (DM), ash (550 °C for 8 h) and N (Kjeldahl-N) according to AOAC (1984) and for neutral detergent fiber (NDF) according to Van Soest et al. (1991). Rumen fluid samples were analyzed for NH3-N according to Weatherburn (1967).

Calculation and statistical analyses

The average daily gain was calculated for each lamb using regression analysis of body weight against time from day 1 to day 60.

Data were analyzed using the general linear model procedure SAS (1991) according to the model:$Yijk= \mu+R_i + e_i$,

Where Y is the dependent variable, μ is the overall mean, R_i is the effect of grazing forage ($i = 1- 2$), ei is the residual error.

RESULTS

Biomass yield and CP content evolution across grazing period

Initial vetch biomass was about 4,5 T DM ha^{-1} at seed maturity and then dropped to 2,5 T DM ha^{-1}. Similarly, CP and Seed content dropped significantly (figure 1). The local vetch variety used in this trial still maintaining no shattered pods till one week before the end of grazing period.. In the beginning, CP vetch content were 2.2 time higher than that of stubble (16.8 and 7.8 % DM). By the end, both of them dropped significantly

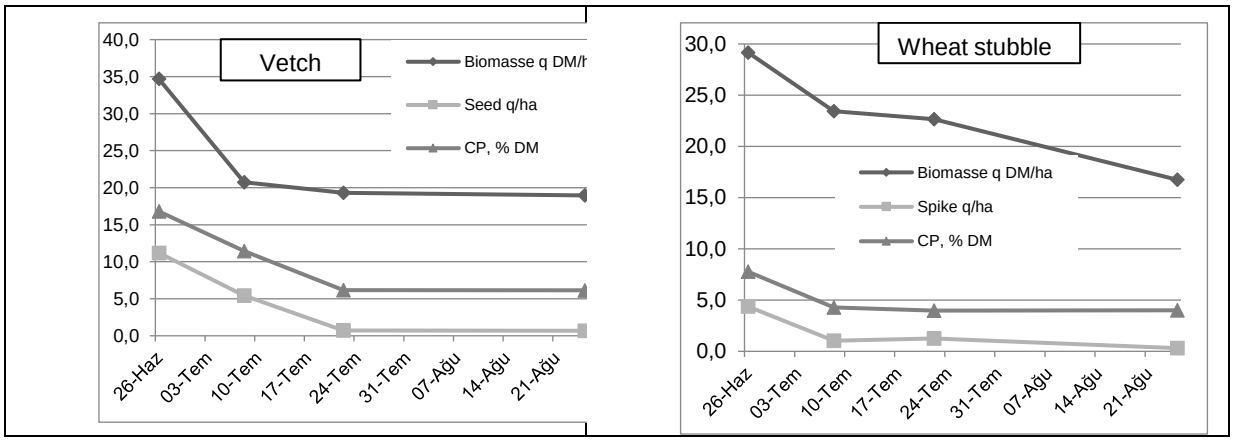
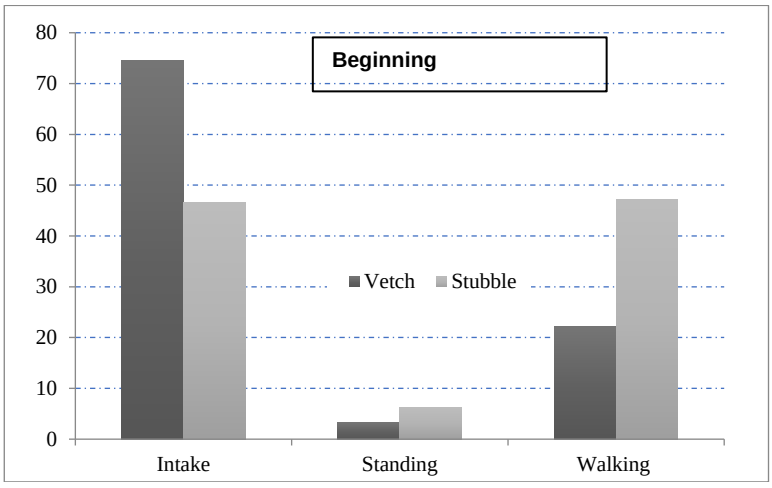


Fig. 1. Variation of vetch biomass and proportion of grain and seed and CP content of vetch and wheat stubble through grazing period

Animal behaviour

Results showed a significant difference in lamb behaviour (figure 2). Animal behaviour showed that animals grazing vetch spent more time in feeding than those on residue (75 % vs 47 %) and less time in walking (22 % vs 47 %).The observation of lamb on vetch during the morning grazing period showed that lambs spent 75 % in feeding in two-thirds of the period. By the end of the period, lambs spent almost the same time in feeding and walking (50 % and 47.5 %).Concerning lambs on stubble, the behaviour showed that animals spent practically the same time in feeding and walking throughout the morning grazing period.



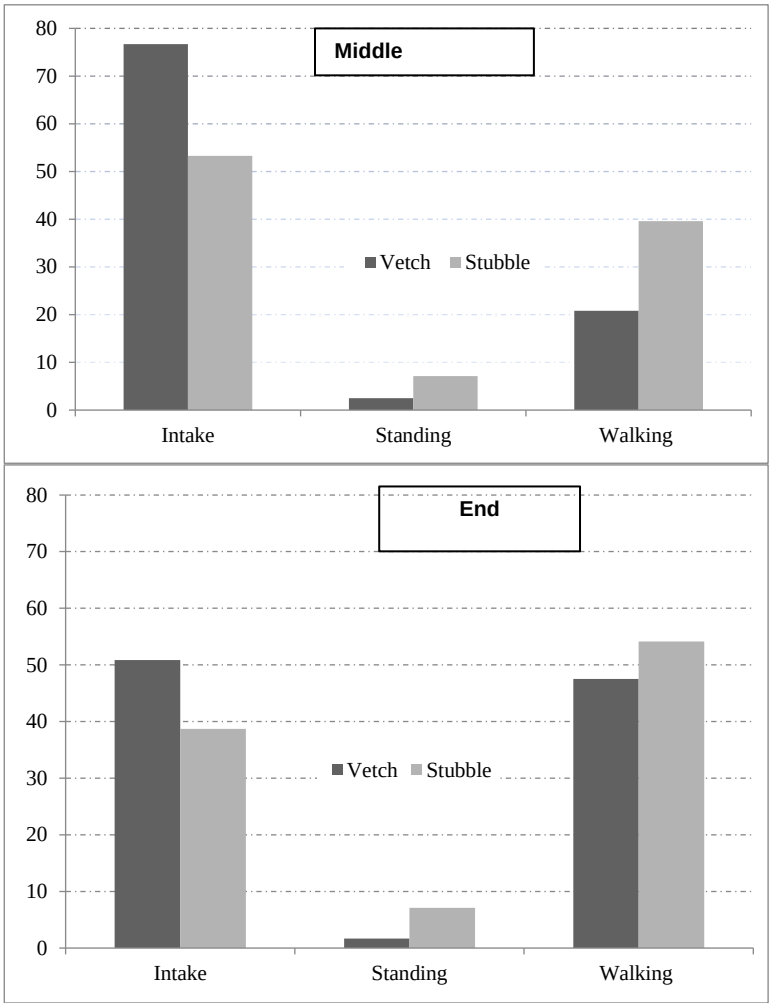


Fig 2. Lamb behaviour on vetch and stubble in the beginning, the middle and the end of morning grazing period.

Fermentation parameters

Rumen fluid pH and NH_3-N level, and protozoa count were not sensitive to grazing system (Table 1, *Pr > 0.05*).

Table 1. Effect of diets on pH, Ammonia level and Protozoa after 0 and 3 h of feed consumption

	Vetch Diet	Wheat Stubble Diet	SEM	Significance Pr
pH 0h	7.1	6.9	0.06	0.4545
pH 3h	6.7a	6.6	0.08	0.5611
Ammonia 0h	19.5	19.1	1.57	0.8793
Ammonia 3h	22.0	22.1	1.78	0.9452
Protozoa 0h	1.70	1.71	0.14	0.9657
Protozoa 3h, (10^5)	2.66	2.67	0.08	0.8877

Live weight variation (LW) and average daily gain (ADG)

Animal live weights evolution showed the same trend (figure 3). ADG was higher in lambs on vetch grazing (81 and 48.1 g day^{-}for vetch and stubble, respectively).

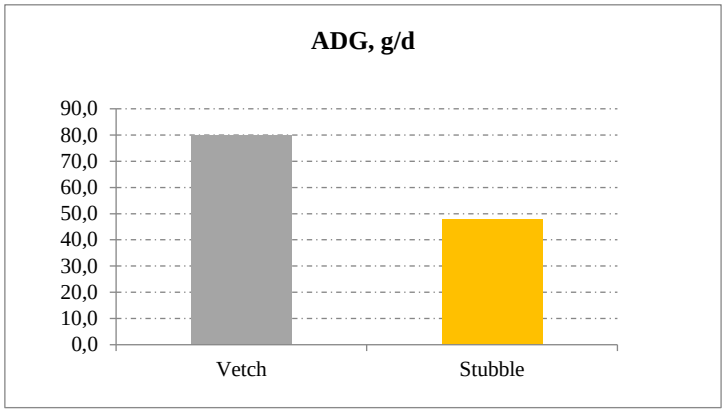


Fig. 3. Average daily gain (ADG) of Barbarin lambs

DISCUSSION

The objective of this trial is to prove the importance of summer grazing of vetch as an alternative to wheat stubble for better integration livestock / forage under conservative agriculture and also to keep a sufficient vegetal cover to ensure a sustainable agricultural production system. The choice of vetch comes from the fact that the use of this legume has become a tradition in the countries of North Africa. Its high nutritional value as well as its impressive ability to withstand the climatic change in these areas, which are generally characterized by a dry climate and low rainfall (Ates al. 2013).

Monitoring changes in vetch and wheat stubble biomass showed a significant effect of grazing system on the amount of plant cover at the end of the experiment. Comparison of the final biomasses of two plots confirms the value of vetch grazing. In fact, this pasture allowed to a final biomass of vetch of 2 T DM / ha compared to that of stubble (1.6 T DM / ha). These residual amounts are less than those of barley and wheat reported by Mrabet (2001) and Ben Said et al. (2011) which is related to the initial low biomass induced by low rainfall.

The CP content of the vetch (16% DM) confirms the interest of this forage alternative. This content dropped in a remarkable way throughout the grazing period. This decrease is explained by the gradual disappearance of seeds. This finding corroborates that of Rebolé et al. (2004). Even in the absence of seeds, the CP content of the straw of the vetch exceeds 6 % MS. Such a value corresponds to that of the hay of the vetch reported by Caballero et al. (1996) and Biondi et al (2008). In contrast to vetch, stubble had a low CP value that was virtually stable over the grazing period even in the presence of the spike. These results are consistent with those reported by Ben Said et al. (2011) and Nayarko et al. (1994).

The follow-up of the behavior of the lambs showed a time allotted to the intake of the vetch more than that of stubble. This is explained by the quality of the vetch. This behavior highlights the preference of the lambs of the vetch and therefore a better palatability of the vetch. Such observation is similar to that described by Dumont et al. (2001).

In this experiment, the study of mean values values of ruminal fermentation parameters did not reveal a significant effect of forages. These values are similar to results reported in the literature (Focant, 1984, Jouany, 1994). All rumen ammonia-N concentrations obtained in this study were within the adequate range for an efficient microbial protein synthesis (Jouany, 1994). Even Protozoa were not sensitive to forage.

The quality of the common vetch could explain the effect on animal performances. Indeed, vetch with its CP level above the required optimum microbial synthesis (Ibrahim and Tibin, 2003) improved daily weight gain by more 168% compared to that of animals on wheat stubble. These results corroborate with those obtained by Rihaoui et *al*. (2010) who observed an improvement in the growth of lambs grazing vetch during the spring. In the same vein, Haddad and Hussein (2001) reported significantly higher ewe weight gain with vetch straw compared to wheat straw.

CONCLUSION

It is concluded that during summer period, dried vetch biomass provided a valuable alternative to cereal stubble and complementation which is rich in energy and protein and should sustain moderate growth performances of growing lambs. These relevant results could convince farmers to adopt this feeding alternative under CA. It allows to alleviate the pressure on stubble through its grazing only one time per day and to replace the stubble afternoon grazing time by vetch.

ACKNOWLEDGEMENTS

This study was partially funded by the IFAD-ICARDA-CLCA project (Phase 1) and CRP wheat.

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MONTHLY RAINFALL VARIABILITY SIMULATED BY MED-CORDEX REGIONAL CLIMATE MODELS ON ALGIERS COASTAL BASIN IN PAST AND FUTURE CLIMATE CONDITIONS

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ABSTRACT:

This work aims to evaluate the ability of two high-resolution (12km) regional climate models (RCMs) from the MED-CORDEX initiative to reproduce monthly rainfall in Northern Algeria, which is located in the southern part of the Mediterranean basin. To do this study, 10 rainfall stations over the basin have been selected. Simulations of two models (RegCM4 - ICTP and Aladin5.2 - CNRM) have been evaluated against observed data over the period 1981-2010. Generally, the two models underestimate rainfall from October to February and overestimate rainfall from March to September. The average bias (absolute value) calculated between simulated data from the ICTP model and observations, oscillates between 13% and 24% over the period October-May. From the same period, the average bias calculated between simulated data of the CNRM model and observed data is between 21% and 39%. During the dry season (June, July, August) the model bias reach up to 100%. This is due to the very low rainfall amounts during this season. Climate change scenarios simulated by the two RCMs have been analyzed for the period 2070-2099 under the RCP4.5 and RCP8.5 emission scenarios. Generally, the result indicates that a large drying is expected in future projections by comparison with the historical period during wet season.

Keywords: *climate change, Algeria, rainfall, Med-Cordex, Regional Climate Models*

INTRODUCTION

Today, there are a multitude of climate models, based on different scenarios of greenhouse gas emissions that can simulate past and future climate variability. For several years now, great interest has been given to the variability of rainfall and its evolution in climate change scenarios. In fact, the analysis of the variability of future precipitations makes it possible to elaborate socio-economic and environmental impact studies from the perspective of integrated management of water resources, agriculture and the environment. Water is a source of life, and its availability is becoming increasingly scarce because of the drought observed during the last decades.

Algeria has experienced a severe drought period that is persistent for more than 25 years, which has affected the availability of surface and groundwater resources as well as agricultural production [1]. Hence the interest of studying model-simulated climate projections up to 2100, in order to anticipate adaptation measures to cope with the impacts of climate change. In this work, the aim is to assess the capacity of the high-resolution Med-Cordex regional climate models (RCMs) to simulate rainfall in the Algiers coastal basin and analyze future projections.

DATA AND METHODS

To assess impact of climate change on rainfall variability, ten rainfall stations have been selected over the Algiers coastal basin (table1). Monthly data was obtained from the National Agency of Water Resources (ANRH) over the reference period 1981-2010.

Table1. Geographic characteristic of rainfall stations (decimal degrees)

Id stations	Stations name	Longitude	Latitude	Altitude (m)
20315	GOURAYA	36,57	1,90	34
20406	FOUKA VILLE	36,65	2,75	160
20509	BIRMANDREIS ANRH	36,75	3,05	140
20607	PEPINIERE D ALGER	36,65	3,33	87
21017	BOUMEDFAA MF	36,37	2,48	270
21115	EL HAMDANIA	36,36	2,77	650
21209	BOUFARIK PEPINIERE	36,57	2,91	60
21403	LARBAA	36,57	3,16	100
21601	AGHRIBS	36,81	4,32	680
22002	BAGHLIA VILLAGE	36,82	3,86	30

For this study, two regional climate models are evaluated; the RegCM4 - ICTP and the Aladin5.2 - CNRM. These models provide high-resolution data of simulated rainfall for 12x12 km square areas for the reference period (1981-2010) and projected period (2070-2099) under the RCP4.5 and RCP8.5 emission scenarios. The simulated monthly rainfall data of each model was then ($\bar{R}_{sim}$) compared to observed data ($\bar{R}_{Obs}$)from the study area using the bias method.

$$Bias = \frac{\bar{R}_{sim} - \bar{R}_{Obs}}{\bar{R}_{Obs}} \quad (1)$$

RESULTS

Overall, comparison between observed and simulated rainfall data over the reference period 1981-2010 at the ten stations shows that RCMs underestimate rainfall during wet season (October to May) and overestimate rainfall during dry season (June to September).

The bias calculated over the dry season oscillates between 100% and 400%, and not exceeds 300% for CNRM model (Fig.1). However, this overestimation is mainly due to low rainfall amounts during this season. Results show that ECTP model reproduce rainfall of wet season better than CNRM during the reference period. The average bias (absolute value) calculated between simulated data from the ICTP model and observations, oscillates between 13% and 24% over the period October-May. From the same period, the average bias calculated between simulated data of the CNRM model and observed data is between 21% and 39%.

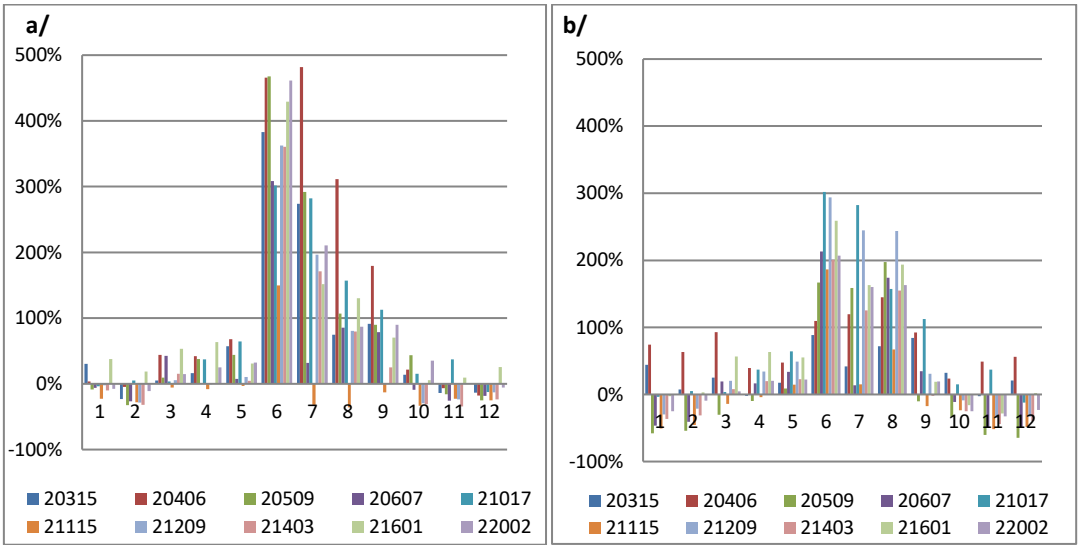

Fig1. Bias calculated between observed and simulated data of ICTP (a) and CNRM (b) over the reference period 1981-2010.

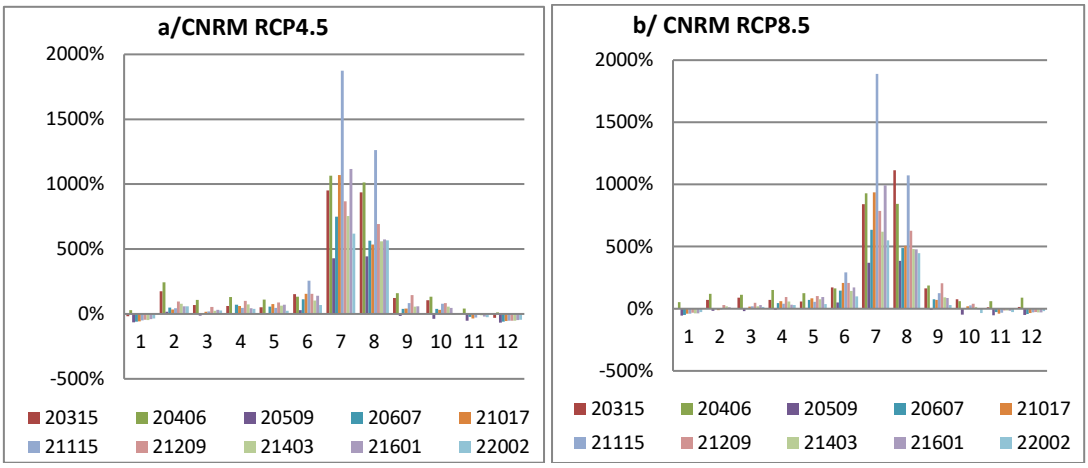

Fig2. Difference of rainfall between projected and reference period under RCP 4.5 and RCP 8.5 scenarios

Climate change scenarios simulated by the two RCMs have been analyzed for the period 2036-2065 under the RCP4.5 and RCP8.5 emission scenarios. Results show a large decrease of rainfall during the wet season and increase of rainfall during the dry season (Fig.2). Simulation data under RCP 4.5 are not available for ICTP model.

DISCUSSION

The assessment of two Med-Cordex regional climate models to reproduce rainfall variability of Algiers coastal basin show that models underestimate rainfall in wet period and overestimate rainfall in dry period as highlighted in some other studies of [1], [4] and [5].

The Bias calculated between observed and simulated data varies from stations to another and the mean bias calculated for all stations, show that ICTP reproduce monthly rainfall of study area better than CNRM model. However more models should be investigated to have better simulations.

Generally, the two models give the same results for the projected period 2036-2065. They predict an increase of rainfall during dry season and more decrease during wet season, which corresponds with studies conducted by [2], [3], [4] and [5].

CONCLUSIONS

This study aimed to assess regional climate models to reproduce rainfall of Algerian Coastal basin in order to use projected rainfall data on environmental impact assessments. In fact, the use of climate model outputs allows us to project on the availability of future water resources and on agricultural production, which are a source of life for man. However, it is very important to have good simulations of rainfall variability, before establishing environmental impact studies .That is why more models should be investigated. Better simulations will help us to suggest some measures of adaptation to address climate change for an integrated management of environment.

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TOTAL HEAVY METAL STATUS OF THE SOILS IN THREE DIFFERENT LAND USE TYPES

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ABSTRACT

This study was conducted in Çıplak village in Çanakkale, NW Turkey. The soil samples were collected from three different land use types. The first of these three different land use types is the land which has been cultivated for 15 years in maize, the second is the land which has been cultivated for seven years in maize, and the third is a land which has been in (Sunflower-wheat-sunflower-maize-wheat-sunflower-maize-sunflower-sunflower-maize) crop rotation system. Total heavy metal content of soils was determined in the study and total content of Cd, Cr, Cu and Zn contents were investigated. Soil samples were collected from three different soil depth (0-10 cm), (10-20 cm) and (20-30 cm). Total Cd contents of soil samples were found to be approximately in limit values. Total Cr contents of the soils were determined to be within the limit values. However, total Cu and Zn contents of the soils were found over the limit values. The data showed that total Cu and Zn content were over the limits and all soil samples were enriched by Cu and Zn. It was determined that total Cd content has the highest value in the first land use type at (20-30 cm). Total Cr content has the highest value in the third land use type (10-20 cm) and the first land use type (0-10 cm). Total Cu content has the highest value in (0-10 cm) of second land use type. Total Zn content has the highest value in (10-20 cm) of first land use type.

Keywords: *Maize, heavy metal, land degradation, land use, Çanakkale.*

ACKNOWLEDGMENTS

We thank Council of Scientific Research Projects of Çanakkale Onsekiz Mart University for providing financial support for this study (Project No. FBA-2018-2576).

CO-PRODUCTION OF PECTINASE, CELLULASE AND XYLANASE BY THERMOPHYLIC ASPERGILLUS SP. 55SZ FOR CLARIFICATION OF FRUIT JUICES

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ABSTRACT

Pectinases, cellulases and xylanases are of great importance in fruit juice industry. They are used to improve the efficiency of extraction and clarification processes. They also enhance the concentration of reducing sugar, total soluble solid and phenol concentration in juice. Interest in thermostable enzyme has been increased in recent years. Commercial preparation of these enzymes, produced industrially by filamentous fungi especially Aspergillus species, are not stable for a long time at high temperature. Therefore, researches on isolation of thermophilic microorganisms for thermostable enzyme production have generated great interest. In present study, thermophilic flamentous fungal strain, which ability to grown on citrus wastes, isolated from soil in Samsun. The strain was identified as Aspergillus fumigatus 55SZ using a molecular approach. Co-production of pectinase, xylanase and cellulose was performed by solid state fermentation. It was found that the best substrate for enzyme production was wet orange peel. The effect of different fermentation medium (FM1, FM2, FM3 and FM4) on enzyme production was investigated. Results show that the maximum enzyme production was achieved when 10 mL FM1 containing 1.4 g/L $(NH_4)_2$ SO_4, 0.3 g/L $MgSO_4.7H_2O$, 2 g/L KH_2PO_4, 0.3 g/L $CaCl_2$, 5 g/L $NaNO_3$, and 200 µL/L tween 20 was added 10 g substrate. It was concluded that crude extract obtained from newly isolated and thermophilic Aspergillus sp. 55SZ can be used as pectinase, cellulase and xylanase source for fruit juice industry.

Keywords: *Pectinase, Cellulase, Xylanase, Solid state fermentation, Aspergillus fumigatus*

INTRODUCTION

Fruit juice is a non-fermented, but fermentable beverage obtained from fruit. Fruit juices can be divided into two groups; raw fruit juices and clarified fruit juices. The clarified fruit juices are more preferred by both manufacturer and consumers in many cases. The key stages of clarified fruit juice manufacturing are selection and preparation of raw material, juice extraction, clarification, batch preparation, pasteurization, filling and bottling. Although mechanical methods such as filtration, sedimentation and centrifugation can also be used for clarification, enzymatic treatments are more preferred because of low cost and high yield. Enzymatic treatment also increases reducing sugar concentration in juice [1]. Enzymatic clarification mainly carried out by pectinase, cellulose and xylanase. These enzymes act on pectin, cellulose and xylan polysaccharides, which release from plant cell wall to juice during extraction process.

Pectinases break down pectic substances which are complex polysaccharides mainly composed of galacturonic acid units [2]. Cellulases catalyze the hydrolysis of glycosidic β-1-4 linkages in cellulose composed of glucose monomers [3]. Xylanases degrade xylan into the xylooligosaccharides and xylose monomers [4]. Treatment of the fruit juice with these enzymes after extraction resulted in reduction of viscosity and regulation of homogeneity in addition to clarification.

Enzymes, used in fruit juice industry, are produced by some microorganisms especially filamentous fungi, separately. It has been reported that the *Aspergillus* sp. [5], *Penicillium* sp. [6], and Mucor sp. [7] are the excellent producers of pectinase, cellulose and xylanase. However, there are limited reports on co-production of these enzymes.

In the present study, thermophilic flamentous fungal strain, which ability to grown on citrus wastes, isolated from soil in Samsun. The strain was identified using a molecular approach. Furthermore, effects of the inducers and type of the fermentation medium on co-production of pectinase, xylanase and cellulose by isolated strain studied using solid state fermentation.

MATERIAL and METHOD

Isolation of fungi

The *Aspergillus fumigatus 55SZ* strain used in this study was isolated from soil in Samsun. Equal

amount of soil and mandarin peel were mixed and then moisten using liquid medium to provide the fungal growth. Mixture was incubated at 50 °C under static condition. After hyphae formation, fungi was isolated and then cultured using MEA medium containing 30 g/L malt extract, 3 g/L pepton from soy meal, 15 g/L agar.

Molecular identification of fungal isolate

The strain was incubated on MEA medium for 48 hours and 50℃. SDS-CTAB method was used for DNA isolation. The desired gene region was amplified with PCR using primers ITS1 and ITS4. The size of DNA was scanned by gel electrophoresis. PCR samples sent to BM Lab for DNA sequence. Sequence similarity was investigated using BLAST in NCBI.

Solid State Fermentation and Extraction of Extracellular Enzymes

Ten grams of the substrate was transferred in 250 mL flask and autoclaved at 121 °C and 1 atm pressure for 15 min. Substrate was moistened with fresh fermentation medium containing 1 X 10^6 bacterial cells recovered from 24 h old culture. After the all ingredient were mixed by sterile strip, flasks were incubated at 50 °C under static conditions. At the end of the incubation, 50 mL of citrate buffer was added to flask. Flask was incubated at room temperature for 30 min under 120 rpm shaking condition. Homogenized culture was filtrated through muslin clot and centrifuged at 10.000 *g* for 5 min. Supernatant were used as crude enzyme.

Determination of total protein concentration and pectinase assay

Protein concentration of the crude enzyme solution was determined according to Bradford [8]. Pectinase activity was assayed measuring the amount of reducing sugars liberated from citrus pectin according to the method described by Miller [9]. Equal volume of enzyme and citrate buffer containing 1 % (w/v) citrus pectin were incubated at 30 °C for 10 min. The reaction was ended by the addition of the DNS solution. The mixture was incubated at 100 °C for 5 min and then diluted by distilled water. Absorbance of the chilled mixture at 540 nm was detected. Galacturonic acid, glucose and xylose standard curves were used to calculate the liberated reducing sugars by pectinase, cellulose and xylanase, respectively. One unit pectinase, cellulose and xylanase activities are defined as the amount of enzyme that releases 1 µmol galactronic acid, glucose and xylose per 1 min at 50°C under the same assay condition, respectively.

Selection of substrate for co-production of pectinase, cellulase and xylanase

Different carbon sources (orange, mandarin, apple, banana peel, banana pseudostem, wheat straw) were tested to detect their effects on co-production of pectinase, cellulose and xylanase by solid state fermentation.

Selection of fermentation medium for co-production of pectinase, cellulase and xylanase

Effect of FM1 (1.4 g/L $(NH_4)_2SO_4$, 0,3g/L $MgSO_4.7H_2O$, 2g/L KH_2PO_4, 0,3 g/L $CaCl_2$, 5g/L $NaNO_3$, 200µl Tween20, 1mL Trace element solution), FM2 (0.5g/L KCl, 0,5g/L $MgSO_4.7H_2O$, 0,01g/L $FeSO_4.7H_2O$, 2g/L $NaNO_3$, 4,5g/L KH_2PO_4, 0,5g/L Pepton, 0,3 g/L Meat extract), FM3 (10 g/L Glucose, 3,33 g/L $(NH_4)_2SO_4$, 1g/L KH_2PO_4, , 0,05 g/L $MgSO_4.7H_2O$, 0,05g/L KCl, 0,1 g/L $FeSO_4.7H_2O$) and FM4 (10 g/L glucose, 6 g/L yeast extract, 2g/L $(NH_4)_2SO_4$, 4g/L KH_2PO_4, 6g/L NaH_2PO_4, 0,2g/L $FeSO_4.7H_2O$, 0,5g/L $CaCl_2$) on co-production of pectinase, cellulose and xylanase by solid state fermentation were studied. Incubation was carried out at 50 °C under static condition.

RESULTS and DISCUSSION

Identification of isolate

The pairwise sequence similarity analysis based on the ITS1-ITS4 region indicated that the isolated fungal strain shared 96.79 %sequence identity with the type strain *Aspergillus fumigatus ATCC 1022*. Therefore, isolated strain was called *Aspergillus* sp. 55SZ .

Selection of substrate for co-production of pectinase, cellulase and xylanase

The effects of different substrate adding the medium as inducer on co-production of pectinase, cellulase and xylanase were assessed under static condition, whose results are shown in Table 1. Results showed that the co-production of enzymes by solid state fermentation was regulated by the substrate. Enzyme production was not detected when the apple peel, combination of apple and banana peels, and banana pseudostem were used as substrate. On the other hand, the relatively high enzyme production was observed with orange peel, mandarin peel, combination of orange and banana peel, combination of orange and banana pseudostem, combination of mandarin and banana peel, combination of apple and banana pseudostem, combination of apple and banana pseudostem, combination of orange and wheat straw. Highest pectinase, and xylanase production was detected when the orange peel was used as substrate. However, highest cellulose activity was measured in culture grown on mandarin peel.

Table 1. Effect of various substrates on co-production of pectinase, xellulase and xylanase by solid state fermentation

Substrate	Enzyme Activity (U/g substrate)		
	Pectinase	**Cellulase**	**Xylanase**
Orange peel	33.55 ± 0,16	13.99 ± 0,411	18.82 ± 0,43
Mandarin peel	32.34 ± 8,08	30.32 ± 6,64	18.73 ± 10,45
Apple peel	ND	ND	ND
Orange + Banana Peel	22.57 ± 2.15	3.26 ± 0.45	2.86 ± 0.39
Orange + Banana pseudostem	24.33 ± 0.93	5.54 ± 0.61	9.0 ± 0.56
Orange + Wheat straw	20.10 ± 2.02	6.42 ± 1.01	6.56 ± 0.84
Mandarin + banana peel	25.44 ± 3.42	4.26 ± 0.79	4.59 ± 0.52
Mandarin + Banana pseudostem	11.95 ± 2.17	4.05 ± 0.41	3.62 ± 1.04
Mandarin + Wheat straw	10.53 ± 0.51	2.69 ± 0.51	2.18 ± 0.26
Apple + Banana Peel	ND	ND	ND
Apple + Banana pseudostem	21.57 ± 1.82	7.59 ± 1.73	7.09 ± 0.70
Apple + Wheat straw	13.49 ± 5.27	5.14 ± 1.09	4.11 ± 1.26
Banana Peel	3.21 ± 0.32	2.12 ± 0.2	1.85 ± 0.42
Banana pseudostem	ND	ND	ND
Straw	8.11 ± 2.33	8.01 ±2.14	24.28 ± 1.52

Calculated specific activities were given in Table 2. Highest specific activities were measured for all tested enzymes when the production was carried out with orange peel. In presence of the other substrate, it was detected that the specific activities of pectinase, cellulose and xylanase significantly decreased. Furthermore, highest fungal biomass was obtained when the mandarin peel was used in fermentation. However, specific activity was lower. These results indicate that the production of extracellular pectinase was not growth-associated in cultures of *Aspergillus sp. 55SZ*. Considering the specific activity, we decided to evaluate orange peel as inducer for co-production of pectinase, cellulose and xylanase.

Table 2. Effect of various substrates on specific activity of pectinase, cellulase and xylanase by solid state fermentation

Substrate	Specific activity (U/mg protein)		
	Pektinase	**Cellulases**	**Xylanase**
Orange peel	148.87 ± 0.73	62.09 ± 1.82	83.54 ± 1.92
Mandarin peel	58.06 ± 14.51	54.45 ± 11.92	33.63 ± 18.77
Apple peel	ND	ND	ND
Orange + Banana Peel	9.44 ± 1.09	1.36 ± 0.12	1.19 ± 0.10
Orange + Banana pseudostem	15.50 ± 0.59	3.52 ± 0.39	5.73 ± 0.35
Orange + Wheat straw	9.35 ± 0.94	2.98 ± 0.47	3.05 ± 0.39
Mandarin + banana peel	9.35 ± 1.09	1.56 ± 0.23	2.02 ± 0.43
Mandarin + Banana pseudostem	3.91 ± 1.03	1.42 ± 0.28	1.18 ± 0.65
Mandarin + Wheat straw	2.80 ± 0.13	0.71 ± 0.61	0.5 ± 0.03
Apple + Banana Peel	ND	ND	ND
Apple + Banana pseudostem	14.28 ± 1.21	5.05 ± 1.15	4.71 ± 0.46
Apple + Wheat straw	8.44 ± 2.18	2.34 ± 0.48	1.87 ± 0.47
Banana Peel	2.79 ± 0.18	1.84 ± 0.1	1.60 ± 0.06
Banana pseudostem	ND	ND	ND
Straw	3.39 ± 0.71	2.46 ± 0.66	7.47 ± 0.7

Selection of fermentation medium for co-production of pectinase, cellulase and xylanase

To determine the best fermentation medium for co-production of pectinase, cellulose and xylanase by solid state fermentation using *Aspergillus sp. 55SZ*, four fermentation medium (FM1, FM2, FM3, and FM4) were tested. Results were illustrated in Figure 1. Highest pectinase production was obtained with FM1 while highest cellulase and xylanase production were observed in culture prepared with FM2. However, highest specific activity for pectinase and xylanase was detected when the FM2 was used in cultivation.

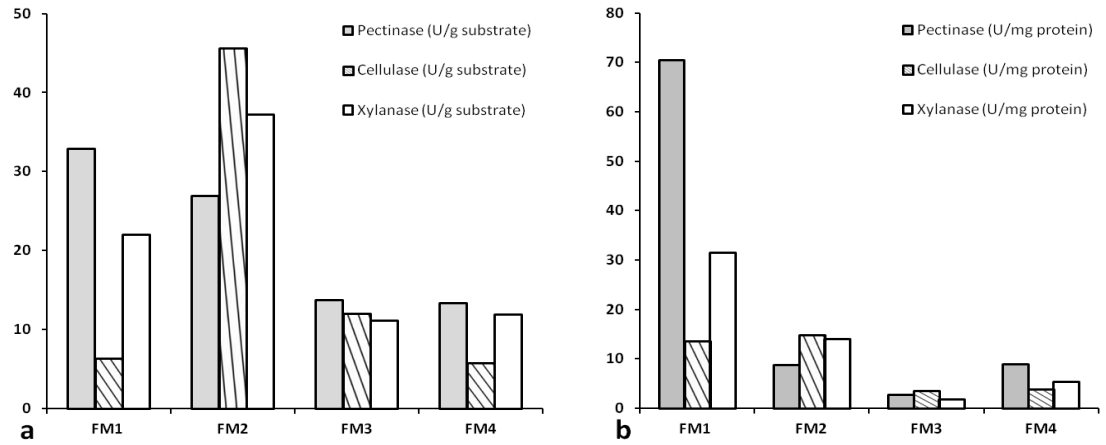

Figure 1. Effect of various fermentation medium on **(a)** co-production and **(b)** specific activities of pectinase, cellulase and xylanase by solid state fermentation.

CONCLUSION

Results show that the maximum enzyme production was achieved when the cultivation of *Aspergillus* sp. 55SZ was performed with 10 mL of FM1 containing 1.4 g/L $(NH_4)_2$ SO_4, 0.3 g/L $MgSO_4.7H_2O$, 2 g/L KH_2PO_4, 0.3 g/L $CaCl_2$, 5 g/L $NaNO_3$, and 200 µL/L tween 20, 1 mL trace element solution and 10 g substrate. It was concluded that newly isolated thermophilic *Aspergillus* sp. 55SZ can be used to co-production of pectinase, cellulase and xylanase. Furthermore, produced crude enzyme can be also used for clarification in fruit juice industry.

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THE DISTRIBUTION OF SOIL NUTRIENTS UNDER NO TILL SYSTEM (REGION OF RABAT)

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ABSTRACT

The conversion of conventional till (CT) to no till (NT) is often accompanied by multiple changes of physico-chemical parameters including soil nutrients.

Through this work that has been developed on two experimental study of NT system and CT localized at Merchouch and Ain Sbit, we found changes in the distribution of primary nutrient elements of soils on different depths mostly noted on the site of Merchouch having applied more years of conversion to NT system. Indeed, under NT, phosphorus is distributed in descending gradient from the surface. A trend towards stratification is also observed for potassium but stillstatistically insignificant. However for total nitrogen, we noted an effect of NT at 15-20 cm depth at the vertic soil of Merchouch site. Concerning the trace nutrients, the soil of Merchouch revealed deficiencies in zinc. Copper content is good in both sites without recording a significant effect of NT on their contents.

Keywords: *No till, nutrients, soil fertility, Trace elements, sustainable agriculture.*

INTRODUCTION

No- till system has shown interesting advantages over traditional tillage techniques at the international and national levels. In fact, it makes it possible to reconcile economic gain and preservation of the environment. However, conversion to NT causes changes in the distribution of nutrients (Macro and micronutrients) in the soil (Thomas et al., 2007). It is therefore crucial to continue scientific researchs to fully understand this system as a whole and to provide measures for adjusting and adapting fertilization to be adequate for any changes in the distribution and / or availability of the elements under no-till system.

This study aims to characterize and evaluate the effect of NT on the distribution of the main nutrients in the soil profile of two types of soil, stating that comparison is made between NT and CT and not between the two types of soil.

MATERIALS AND METHODS

Presentation of the experimental sites

We conducted this work on two sites: the Merchouch site, where the experiment of the comparative study between No till and conventional tillage extends to 10 years on a vertisol. The second site is that of Ain Sbit, the test is installed for 6 years on isohumic soil. In both trials a bi-annual rotation cereals-legume is applied (soft wheat-lentil).

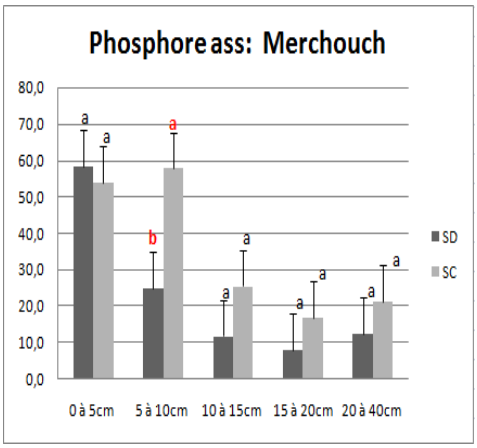
Observations and measures

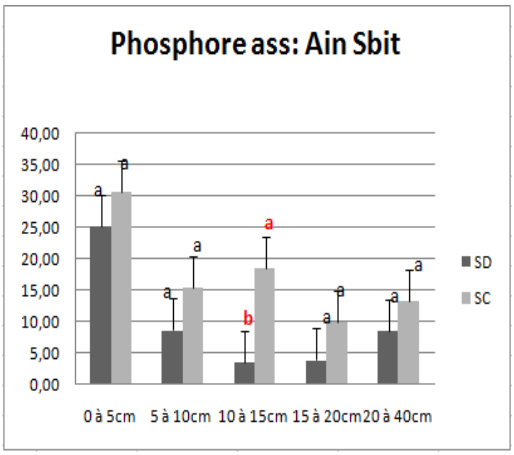
Soil samples were collected at five depths (0-5, 5-10, 10-15, 15-20, 20-40 cm) with three replicates at both sites for a total of 120 samples collected. Subsequent laboratory analyzes of the 120 soil samples (pH, organic matter, total nitrogen, available phosphorus, exchangeable potassium, determination of micronutrients (zinc [Zn], copper [Cu], manganese [Mn]; iron [Fe]).

RESULTS AND DISCUSSIONS

In what follows we will present the results of the evaluation of the effect of NT conversion on the distribution of macro and micro nutrients at different depths of two types of soil .

Effect of no-till on total nitrogen





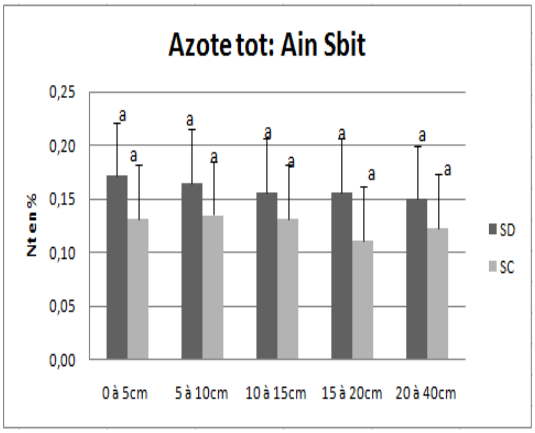
Figures 1 and 2: Variation of the total nitrogen content of the soil under NT and under CT.

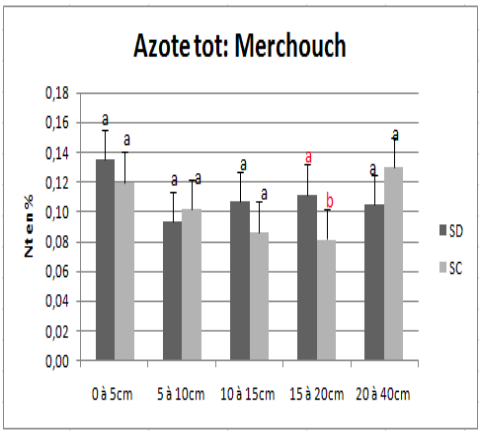
Soil tillage did not affect the total nitrogen content at the AinSbit isohumid soil (Figure 1). However, in the 15-20 cm horizon of Merchouch Vertisol (Figure 2), after 10 years, no-till was able to significantly improve total nitrogen, which also includes the organic nitrogen form. The latter represents about 5% of the OM of the soil. As a result, it could be assumed that the accumulation of OM on the same horizon could induce an increase in total nitrogen. Indeed, Maltas (2007) confirms the positive effect of SD on total soil nitrogen. due to the accumulation of organic nitrogen.

Effect of no-till on assimilable phosphorus

The levels of available phosphorus are high in the surface horizon under NTand CT at both sites (Figures 3 and 4).

This is due to the fact that the phosphorus has low mobility and remains concentrated in the first cm after application of phosphate fertilization. However, under CT this difference between surface and depth is attenuated because of tillage which





Figures 3 and 4: Variation of the assimilable phosphorus content of soil under NT and CT

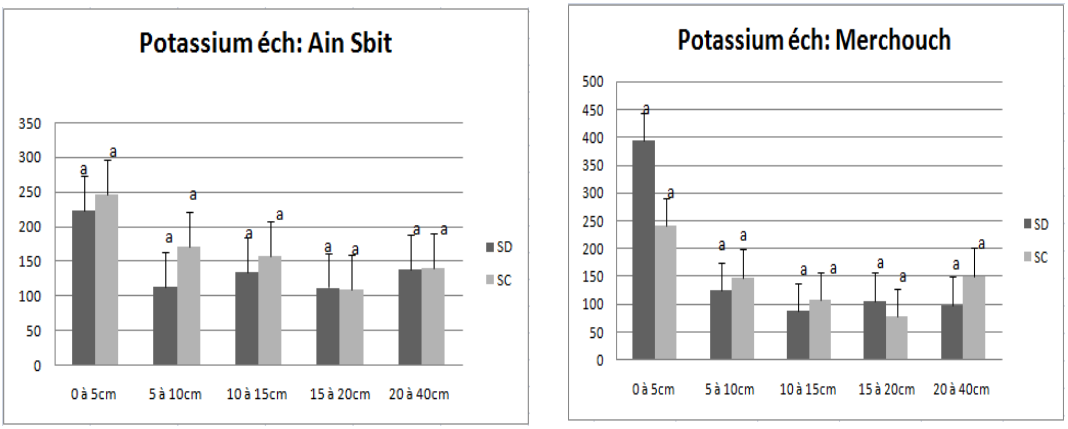
homogenizes the profile of the soil in phosphorus. While under NT, we are witnessing the creation of a decreasing gradient of phosphorus levels from the surface to the depth. Other studies suggest this stratification of phosphorus under NT system (Ferreras et al., 2000, Sharpley, 2003). From a practical point of view, phosphate fertilization under direct seeding should be rethought and the tendency of phosphorus to accumulate on the surface to be taken into account.

Effect of no-till on exchangeable potassium

Like phosphorus, at the Merchouch site (Figure 6), potassium also tends to be accumulated under NT on the surface and to create a gradient of concentration decreasing towards the depth.

This stratification of potassium is less noticeable at the AinSbit site (Figure 5) and this is probably because of the the duration of application of NT that is 10 years in Merchouch and 6 years in Ain sbit.

Also , because of the richness of the clay soil that releases the inter-leaflet potassium in depth. In fact, we are talking about the transition phase and stabilization phase of direct NT. The durations of these two phases vary according to the type of soil, the climatic conditions and especially the duration of application of NT system (Moussadek et al, 2011). In our case, the soil of the Ain Sbit site is probably in a transition phase. However, it will be necessary to think to reconsider the potassium fertilization under NT system especially for the case of heavy soils.

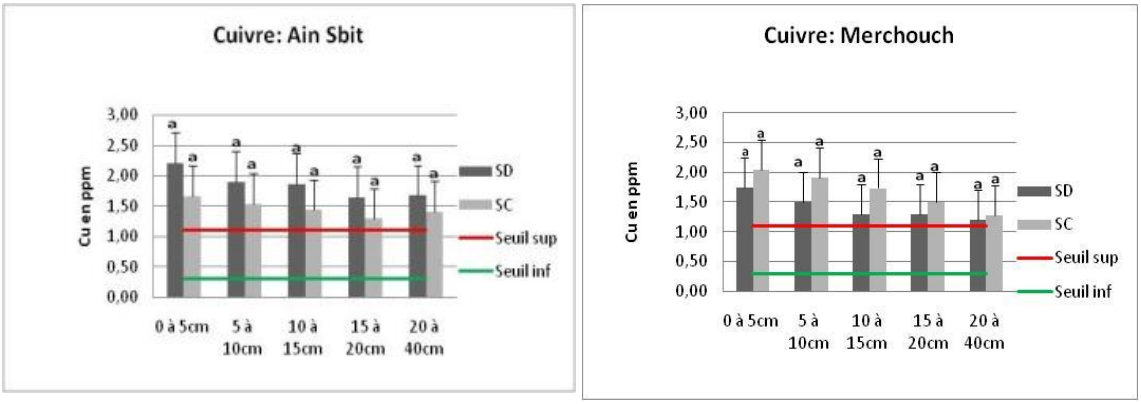


Figures 5 and 6: Variation of exchangeable potassium content of soil under SD and SC.

In the figures below, we sought to represent the variations of each trace element by also showing the lower threshold of its deficiency and the upper threshold of its richness in the soil.

Effect of no-till on soil zinc content

According to figures 7 and 8, it is found that the soil of AinSbit is rich in zinc, while the vertisol of Merchouch site is deficient in zinc along the soil profile, and is below the lower threshold of deficiency (lower horizontal line). Zinc accumulates on the surface of the soil. However, no significant effects were reported.

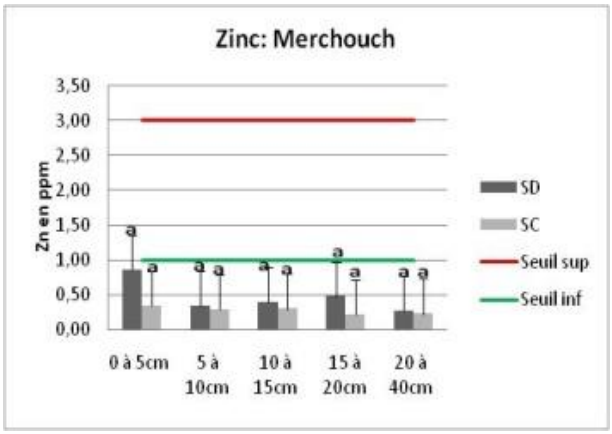


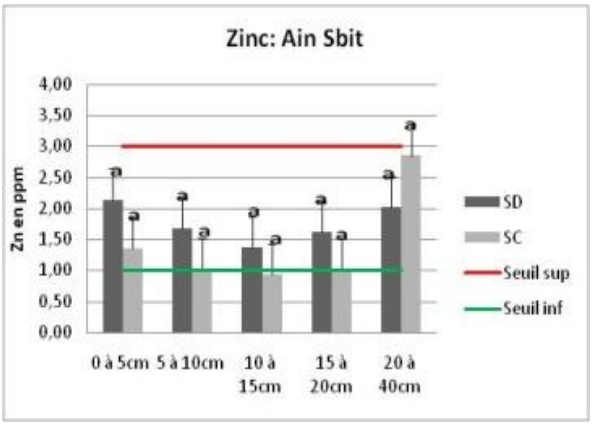
Figures 7 and 8: Variation of the zinc content under NT and CT.

5. Effect of direct seeding on the soil content of copper

Figures 9 and 10 show that the soils of both sites are sufficiently filled with copper. In fact, the contents present exceed the appropriate thresholds of richness and can approach the toxicity. However, the toxicity is relative and depends largely on the values of cation exchange capacity (CEC) and organic matter (OM) in addition to pH. Moreover, the observation of these same figures (9 and 10) also allows us to note the existence of a decreasing gradient of the copper contents from the surface to the depth both under NT and under CT. Statistically, it can be deduced that currently the tillage method has not shown any effect on zinc and copper contents in the soil. It would probably take longer to check for such

changes. Indeed, according to Tarkalson et al. (2006) and Santiago et al (2008), the effect of no-till was only observed after 14 and 21 years of experimentation.





Figures 9 and 10: Variation of copper content under NT and CT

CONCLUSIONS

The study of the effect of NT system on the distribution of soil nutrients in the Zaer region has shown that there are indeed changes in the distribution of nutrients in the soil under direct seeding more pronounced at the siteof Merchouch having undergone more years of conversion to this conservation system. Indeed, under NT the phosphorus is distributed according to a decreasing gradient from the surface to the depth. A tendency to stratification is also observed for potassium but statistically insignificant. However, for total nitrogen a direct seeding effect was only observed at the depth of 15-20 cm at Merchouch Vertisol. With regard to trace elements, Merchouch's vertical soil revealed zinc deficiency and copper richness in both sites, but did not show a significant effect of NT on their levels.

The first results of this work have allowed us to contribute to better understand and better manage fertilization under NT system.

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CARDIAC SAFETY OF MACROLIDE ANTIBIOTICS

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ABSTRACT

Macrolide antibiotics show bacteriostatic effect by inhibiting protein synthesis in bacteria. They are used extensively in respiratory diseases because of their high density in the respiratory system. In general, their activity against gram positive microorganisms is more pronounced. Although macrolides are safe antibiotics, these antibiotics have significant life-threatening side effects. The use of macrolide antibiotics has been reported to prolong the QT interval, resulting in severe cardiac arrhythmias, and therefore limited use in some species. Studies have shown that the use of these antibiotics may cause torsade de pointes due to inhibition of the human ether a-go-go related gene channel. In order to determine the main cause of the cardiotoxic effect of macrolides in animals, detailed molecular studies should be performed. It has been reported that changes in the macrolides, especially in the ion channels, vary depending on the dose, and it is recommended that this dose should be well adjusted during treatment and pharmacokinetic studies specific to each animal species are required to determine the appropriate dosage regimen.

Keywords: *Macrolide, cardiac arrhythmia, human a-go-go related gen, QT interval*

GENERAL PROPERTIES OF MACROLIDE ANTIBIOTICS

Macrolide antibiotics are a class of large polypeptide molecules in which one or more sugar forms have binding 14, 15 and 16 membered lactone rings (Hernando-Sastre 2010).

Macrolide antibiotics can be classified into 4 groups according to their clinical use and the number of carbons in the lactone ring (Araújo ve Demoly 2008, Baggott ve ark 2011, Villarino ve ark 2013, Dik ve ark 2017, Zhou ve ark 2017).

- 12-membered groups: Methymycin, Neomethymycin, Picromycin
- 14-membered groups: Erythromycin, Clarithromycin, Roxithromycin, Dirithromycin, Erythromycylamine, Flurithromycin, Oleandomycin, Sporeamycin A, Troleandomycin.
- 15- membered groups: Azithromycin, Gamithromycin, Tulathromycin
- 16-membered groups: Tildipirosin, Josamycin, Spiramycin, Kitasamycin (Leucomycin), Midecamycin, Rocitamycin, Rosaramycin, Miokamycin (Midecamycin acetate), Tylosin, Tilmicosin.

Macrolide antibiotics bind reversibly to the 23S ribosomal RNA in the 50S subunit of bacteria, inhibit mRNA- directing protein synthesis and inhibiting bacterial growth (Abu-Gharbieh ve ark 2004).

These antibiotics are well dispersed into cells, tissues and organs. They have the ability to accumulate in some tissues and have a long half-life. Especially used in respiratory system infections. Macrolides, may show bactericidal effects when they reach high concentrations in respiratory system infections. Macrolides are generally more efficacious against gram-positive microorganisms, although in the veterinary field they find use in anaerobic infections such as pasteurellosis, mycoplasmosis and some foot infection. Narrow-spectrum antibiotics (Yazar ve ark 2018).

Although macrolides are generally well tolerated, these drugs have many important side effects. The most important of these side effects is observed in the digestive system because it over-stimulates the intestinal motility and there are widespread side effects in the digestive system (Rubinstein 2001). It may occur frequently after oral and intravenous administration of macrolides with nonspecific symptoms such as vomiting, diarrhea, abdominal pain. In addition to these side effects, it also has side effects such as hepatotoxicity, ototoxicity and cardiotoxicity that poses a vital risk (Salimi ve ark 2016).

Macrolide antibiotics cause prolongation of the QT interval, resulting in severe ventricular arrhythmias and sudden cardiac death. Studies have reported that the use of these antibiotics may cause torsade de pointes (TdP) due to inhibition of the channel encoded by the human ether -a-go-go related gene (hERG) (Salimi ve ark 2016).

HERG STRUCTURE AND PHARMACEUTICAL BLOCKAGE

The hERG (KCNH2) gene encodes the Kv11.1 protein that forms the α subunit of the fast potassium channel, which forms a specific binding site for various cardiac and noncardiac drugs (Skibsbye ve Ravens 2016). hERG belongs to the family of voltage-dependent potassium channels and defines the subunit of the rectifier (delayed potassium flow regulator) I_{Kr} that forms the pore structure (Raschi ve ark 2008). The hERG gene is highly expressed in the heart, but it is expressed in different tissues such as nerve, tumor, pancreatic β and chromaffin cell (Raschi ve ark 2008, Skibsbye ve Ravens 2016).

hERG is a homotetramer consisting of four identical α-subunits (1159 amino acids) and 6 transmembrane domains (S1-S6) (Perrin et al 2008, Ponte et al 2010). S1 and S4 segments form the voltage sensor that senses the transmembrane potential, while S5 and S6 form the selective pores of potassium (Sanguinetti and Tristani-Firouzi 2006). In the S6 segment, there are two amino acids Tyrosine (Tyr) and Phenylalanine (Phe) to which drugs that cause QT prolongation bind (Ponte et al 2010).

Direct blocking of this channel can be observed as a result of decreased drug-induced hERG potassium channel flow. hERG potassium channels can be blocked by various classes of therapeutic drugs such as antiarrhythmics, psychotherapeutics, antimicrobials, antihistamines. The interaction of the hERG channel with the drug has its own specific binding sites (Sanguinetti and Tristani-Firouzi 2006). Although the reason why hERG channels are highly sensitive to various drugs is not fully explained, two mechanisms are emphasized (Recanatini et al. 2005).

1. Unlike other potassium channels, hERG channels do not normally have two proline residues that limit the volume of the internal cavity of the channel. Therefore, drugs with large molecules fill the hERG channel and inhibit potassium conduction (Recanatini et al 2005).
2. İnstead of the aliphatic isoleucine or valine residues found in the inner helix of other potassium channels, two aromatic residues Tyrosine652 (Tyr652) and Phenylalanine656 (Phe656) are found in the inner helix of the hERG channel (Recanatini et al 2005)

Macrolides cause I_{Kr} inhibition and block the hERG channel due to their dose and affinity. Thus, by inhibiting the outflow of potassium, the intracellular potassium concentration increases due to electrical heterogeneity along the ventricular wall. This was reported to cause prolongation of repolarization (QT prolongation), leading to a delay in the action potential process (Ponte et al. 2010, Cornett et al. 2017).

THE EFFECTS OF MACROLIDE ANTIBIOTICS ON THE HEART

1. Erythromycin

The cardiotoxic potential of erythromycin is low, but it has rarely been reported to be serious cases. Erythromycin disrupts the repolarization of the heart when given at high doses and as a result may prolong the QT interval in the ECG, resulting in polymorphic ventricular tachycardia. It has also been reported that the risk of death may increase in patients taking erythromycin due to drug-drug interactions (Ray ve ark 2004, Guo ve ark 2010).

Erythromycin prolonged the action potential at high doses both in vitro and in vivo in canine. The effects of erythromycin on action potential were more much in Purkinje fibers than in papillary muscle. It is reported that this antibiotic moderately inhibits sodium flow and stimulates sodium-calcium exchange. However, the effect of erythromycin on the action potential has been reported to be mostly due to the blockage of potassium channels (Rubart ve ark 1993).

2. Clarithromycin

Clarithromycin has a broad antimicrobial spectrum and side effect profile compared with erythromycin. Erythromycin has a higher risk of TdP formation, but this is less more in clarithromycin. Since the structure of clarithromycin is similar to erythromycin, its arrhythmic potentials have been reported to be similar (Guo ve ark 2010).

3. Azithromycin

The azithromycin azalide group is an antibiotic and is widely used in pneumonia, bronchitis, H. pylori and other infections. Reports on the prolongation of the action potential due to azithromycin are limited. In animal studies, azithromycin prolonged the QT interval at high doses; but it has been reported to have less proarrhythmic potential than erythromycin and clarithromycin (Milberg ve ark 2002, Russo ve ark 2006).

Azithromycin (15 mg / kg and 30 mg / kg) was administered orally to rats for 14 days. According to the results, was increased lactate dehydrogenase (LDH) levels, heart rate was decreased, PR and QT interval were prolonged, change in duration and amplitude of QRS complex, increase in amplitude of T wave were reported. Histopathological examination of the heart tissue revealed edema, hypertrophy and necrosis of the cardiac muscle cells. Histological sections of the heart tissue were revealed interstitial edema, hypertrophy and necrosis of cardiac muscle cells. Catalase, superoxide dismutase, glutathione levels decreased; malondialdehyde levels increased, therefore it was reported that oxidative stress is induced due to imbalance. It has been reported that prolongation of the QT interval may be due to inhibition of the hERG potassium channel, but azithromycin has a weak effect on potassium channels. In QRS, expansion and slows down of depolarization were reported to be caused by inhibition of rapid sodium channels and also influenced potassium efflux and calcium influx (Atli ve ark 2015).

In rabbit heart cells treated with erythromycin, clarithromycin and azithromycin, the amount of intracellular calcium increases as a result of I_{Kr} blocking depending on the dose. Therefore, it is determined that the tendency of TdP will increase with prolonged repolarization. Erythromycin and clarithromycin triangular extended the action potential on ECG in phase 3, while azithromycin showed a quadrangular extension in phase 2. The reason for this difference was that erythromycin and clarithromycin inhibited I_{Kr} and prevented calcium entry into the cell. Azithromycin has been reported to interact with different potassium channels (Milberg ve ark 2002).

4. Roxithromycin

Roxithromycin has a lower risk of prolonging the action potential compared to other macrolide antibiotics. QT interval was prolonged when used with different cardiotoxic drugs or in patients with atrioventricular blockade (Simko ve Lőrincz 2013).

In rats treated with roxithromycin, it was reported to have less than erythromycin and clarithromycin, but more arrhythmic effects than azithromycin, depending on drug concentrations in plasma. (Ohtani ve ark 2000).

Due to the limited number of studies with roxithromycin, information on cardiotoxic safety is limited. Although previous and recent studies are contradictory, long-term studies on the safety of macrolides are needed (Gorelik ve ark 2018).

5. Tilmicosin

Tilmicosin is used to treat Pasteurella multocida and Pasteurella haemolytica infections in cattle, sheep, pigs and poultry (Christodoulopoulos 2009, Lust ve ark 2011).

Tilmicosin, has been reported to more potent cardiac side effects than other macrolide antibiotics (Er ve ark 2014). Use of tilmicosin is particularly risky in goats (EMEA 2005). In acute toxicity studies, intravenous and intramuscular administration of 7.5-30 mg / kg of tilmicosin in various animal species has been determined to be fatal (EMEA 1996). It has been reported to cause an increase in heart rate and a change in muscle contraction in animals poisoned with tilmicosin (Kaya 2002). In goats, reported that intramuscular or subcutaneous injections at doses greater than 10 mg / kg causes toxicity. In horses, 10 mg / kg intramuscular or subcutaneous injections has been reported to cause damage at the site of administration (Papich 2015).

Shortly after subcutaneous injection of tilmicosin to a 15-day-old lamb at a dose of 15 mg / kg, an increase in heart rate and a systolic murmur was detected on auscultation of the heart. It was reported that lamb died in a short period of time and there was enlargement of the heart in the necropsy, multiple muscle septal defects in the left ventricle of the heart and mild pulmonary edema (Christodoulopoulos 2009).

Although tilmicosin is known to be toxic to goats, there is no experimental study, but a case report has been reported. The goat was injected subcutaneously with 10 mg / kg body weight of tilmicosin and

caused death in young goats within one hour, with no founded deaths in older goats. As a result, it was determined that this dose may be age-related toxic or lethal dose (Coşkun ve ark 2012).

Tilmicosin shows a variety of toxic efficacy according to the application site and species (Yazar ve ark 2001). In studies, it was reported that intravenous administration of 5 mg / kg dose in cattle caused death, 10 mg / kg intramuscular application in pigs caused convulsion and monkeys died in 30 mg / kg dose (Christodoulopoulos 2009). In a study conducted on donkeys, subcutaneous administration of 10 mg / kg of tilmicosin resulted decreased myocardial contraction, impaired left ventricular systolic function, decreased blood volume, tachypnea and tachycardia (Youssef ve ark 2016). Yazar et al. (2001) reported a significant increase in creatine kinase activity as a result of damage of heart muscle the day after 25 mg / kg subcutaneous tilmicosin injection in mice.

It has been reported that subcutaneous administration of 75 mg / kg subcutaneous tilmicosin in mice may induce lipid peroxidation and oxidative stress by overproduction of reactive oxygen species. İn tilmicosin applied mice was reported serum and cardiac markers [creatine kinase, LDH, creatine kinase myocardial-B (CK-MB)] increased (Ibrahim ve Abdel-Daim 2015). Although it has been reported that this effect of tilmicosin may cause negative inotropic effect due to depletion of intracellular calcium due to inhibition of calcium channels in sarcolemma (Ibrahim ve Abdel-Daim 2015).

Accidental high doses of tilmicosin have been shown to cause positive chronotropy and negative inotropy in the treated animal and veterinarian (Christodoulopoulos 2009, Er ve ark 2011). Although the cardiotoxic mechanism of tilmicosin is not known, it has been shown that a decrease in the amount of myocardial calcium may cause negative inotropy (Ibrahim ve Abdel-Daim 2015). Tilmicosin may also directly affect the heart cells and increase the burden of the cardiovascular system by increasing adrenaline release in the body (Christodoulopoulos 2009).

6. Tulathromycin

In rabbits treated with tulathromycin, inflammatory mediators have been reported to be triggered by increased oxidative stress and nitric oxide levels. It was reported that direct cardiac marker troponin I and CK-MB concentrations increased and LDH and aspartat aminotransferase concentrations did not change. In addition, a decrease in ionized calcium and potassium levels has been reported. As a result, it was reported that tulathromycin-induced oxidative stress and inflammation may be cardiotoxic by causing cardiac cell damage and may have cardiac side effects due to the blockage of potassium ions, similar to other macrolides (Er ve ark 2011).

Troponin I and CK-MB, the specific markers of heart damage, were reported to be highest on 1. day after subcutaneous administration of 2.5 mg / kg to tulathromycin (Corum ve ark 2015). It was reported that subcutaneous administration of tulathromycin to 12.5 mg / kg and 15 mg / kg for 6 months caused myocardial damage. In other studies, it was reported that the administration of 7.5 mg / kg subcutaneously to 4 or 6 weeks of calves and 12.5 mg / kg subcutaneously to 8 months of calves had no adverse effects on the heart (EMEA 2004). It is known that these results may create differences according to dose, species difference, route of administration, duration and when single dose is administered. This antibiotic may be safe in terms of heart and hematological values in sheep (Corum ve ark 2015).

7. Gamithromycin

In a study of gamithromycin in sheep, 6 mg / kg dose of subcutaneous gamithromycin administration after 1 day showed a non-statistical increase in the level of troponin I (marker of cardiac damage), no specific change in CK-MB was reported. In conclusion, it was reported that this antibiotic had no significant side effects on the heart, liver and kidney (Corum ve ark 2016).

8. Tildipirosin

It has been reported that after 1 day following administration of tildipirosin at a dose of 4-8 mg / kg subcutaneously in sheep, it may cause arrhythmias due to increased CK-MB and troponin I values due to increased mitochondrial permeability in myocardial cells. In conclusion, tildipirosin may be cardiotoxic due to dose increase (Dik ve ark 2017).

9. Josamycin ve Oleandomycin

Although no adverse cardiac effects have been reported in humans, josamycin and oleandomycin can reversibly inhibit cardiac calcium influx and cause changes in action potential. However, it was

emphasized that clinical use may be safer than other macrolides (Tamargo ve ark 1982, Volberg ve ark 2002).

It has been reported that josamycin and erythromycin can reduce the dose of transmembrane calcium in isolated rat atria and cause negative inotropic effect and decrease in blood pressure (Tamargo ve ark 1982).

10. Tylosin

Tylosin has been reported to be an extremely safe antibiotic for acute toxicity. It is safe to use this drug intramuscularly by adding 4-10 mg / kg to cattle, 6 mg / kg to sheep and goats, 2-4 mg / kg (1-2 times a day) to dogs and cats, and 500 mg / L to drinking water in poultry. Animals affected by individual sensitivity have been reported to have major symptoms such as fluttering, muscle weakness, and ataxia (Kaya 2002). However, in the study of zebrafish embryos, azithromycin, clarithromycin, tilmicosin and tylosin administration bradycardia occurs in high doses of antibiotics, in low-dose tachycardia occurs. While slow heart rate leads to prolongation of QT interval, it has been reported that the cause of low dose tachycardia is unknown (Yan ve ark 2019).

11. Telithromycin

Telithromycin is a macrolide antibiotic of the ketolide class (Guo ve ark 2010). It has been reported that telithromycin does not cause prolongation of the QT interval or change in heart rate when administered to healthy people at different doses (Démolis ve ark 2003). However, studies have shown that isolated dog purkinje cells cause prolongation of the action potential due to hERG inhibition in close to 25 percent (Martin ve ark 2004). Telithromycin has been reported to cause bradycardia via hERG / IKr block in isolated rabbit purkinje cells at very high concentrations and to delay repolarization (Lu ve ark 2007). Although the arrhythmias are generally known to be due to the inclusion of hERG, it is also thought to be the result of changes in the amount of intracellular calcium (Wisialowski ve ark 2006).

PREVENTION OF CARDIOTOXIC EFFECTS OF MACROLIDE ANTIBIOTICS

There is no known antidote to macrolide-induced cardiotoxicity (Er ve ark 2014). However, studies in mice and rats have reported that amiodarone (Er ve ark 2014), spirulina platensis (Ibrahim ve Abdel-Daim 2015), lycopene (Abdel-Daim ve ark 2018), mirazide and ascorbic acid (Abdel-Daim ve ark 2014), S-methyl cysteine (Elazab ve ark 2014), carvedilol (El-Shitany ve El-Desoky 2016) and l-carnitine (Kart ve ark 2007) may reduce cardiotoxicity (Er ve ark 2014).

As a result of these studies it has been reported increased lipid peroxidation, removes the free radicals formed, inhibits the formation of apoptosis, protective effects against oxidative stress and reduce heart damage and reduce the cardiotoxic effect of macrolides (Abdel-Daim ve ark 2014, Elazab ve ark 2014, Ibrahim ve Abdel-Daim 2015, Abdel-Daim ve ark 2018).

CONCLUSIONS AND RECOMMENDATIONS

Although studies on cardiotoxicity of macrolides in veterinary medicine have been reported to be due to increased oxidative stress, apoptosis, and mitochondrial permeability, gene structures such as hERG and ion channels may also be involved in this mechanism. The changes in ion channels depends on dosage of macrolides and the dosage have to be adjusted during treatment. In order to determine the dosage regimen, pharmacokinetic studies specific to each animal species are recommended. Although studies on cardiotoxicity of macrolides in veterinary medicine have been reported to be due to increased oxidative stress, apoptosis, and mitochondrial permeability, gene structures such as hERG and ion channels may also be involved in this mechanism. The changes in ion channels depends on dosage of macrolides and the dosage have to be adjusted during treatment. In order to determine the dosage regimen, pharmacokinetic studies specific to each animal species are recommended.

Macrolide sensitivity should be investigated in detail especially in goats. Detailed molecular studies are needed to determine the main cause of heart attack or to expand the QT interval mediated by macrolides. Determination of the main cause of cardiotoxicity in animals treated with macrolide-induced cardiotoxicity is thought to increase treatment success.

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TRACKING MAJOR PLANT PATHOGENIC BACTERIA USING MICROSATELLITES DERIVED FROM FULL GENOME SEQUENCE ANALYSIS

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ABSTRACT

Bacterial gram negative/ positive pathogen, infecting different cultivars leads to economic loses and fruit quality. However discrimination of them using molecular tehniques such as only specific PCR by primers designing of flanked regions conferring virulence are not sufficient, lacks of informative and not useful alone for detection of the pathogen exactly and for tracking of dissemination. Many pathogenic island of the pathogens genomes shows complexity due to their genomic shape and variance. Tracking of the pathogen prevalence by molecular tools are important for diminishing crop losses cause of bacterial pathogen in production fields and to follow contamination sources. We have designed specific microsatellites using full genome sequence of each bacteria using international database by means of bioinformatic tools on major bacterial pathogens (Xanthomonas vesicatoria, Clavibacter michiganensis, Acidovorax citruli and Erwinia amylovora) that these markers have suggested to follow and discrimination of contamination sources resulting from propagation material and seeds besides other molecular tools. We believe that these selected microsatellites are beneficial molecular markers to follow pathogens and to get precaution for controlling bacterial diseases. Furthers studies will be continued on this aspect on effectivelly designing of RT- PCR primers by these specific microsatellites considering rapidly diagnosis diversity of them and effective detection.

Keywords: *Bacterial pathogens, full genome analysis, microsatellites, RT-PCR probe, tracking*

INTRODUCTION

Several molecular markers such as Restriction Fragment Length Polymorphism (RFLP), Amplified Fragment Length Polymorphism (AFLP), microsatellites and rDNA sequences were tested for genetically discrimination of different macro- microorganisms (Akopyanz et al. 1992; Dutweiler et al 2008; Patel et al. 2018). On the other hand, RFLP, microsatellites and Inter-Simple Sequence Repeat (ISSR) were used to geographically cluster isolates of pathogens. Inter-retrotransposon amplified polymorphism (IRAP) and retrotransposon-microsatellite amplified polymorphism (REMAP) methodologies were initially designed to identify different pathogens (Guo et al. 2018). Such PCR-based techniques target retrotransposons long terminal repeat (LTR) sequences relevant in genome evolution and speciation due to their mobile nature (Serrato- Capuchina and Matute, 2018) microsatellites loci that are preferentially associated with retrotransposons (Sotero Caio et al. 2017) . Microsatellite markers provide relevant information for identifying conservation units and for investigating the genetic processes that take place in populations such as patterns of gene flow, generation of genetic neighborhoods and the incidence of genetic drift. Currently, microsatellite markers are commonly employed for the analysis of population genetic structures because of their co-dominant nature and high informativeness (Cheraghi et al. 2018).

In this work, we have prepared available **new markers** list of microsatellites considering their tandem repetivite regions using sequence data and advanced selection methodologies.

MATERIAL AND METHODS AND RESULTS

To assess of molecular markers, we have used full genome sequence of each pathogen available in NCBI database and, designed our selective molecular markers considering their genomic repetitive

ratio and base length. All these information has been provided by bioinformatics tools. These are given below in Table 1. (Asterics in sequences are to protect its originality before publishing in SCI journal)

Erwinia amylovora	**Forward Primer**	**Reverse Primer**	**Base Length**
(GCAGCTTCCACCGCCGGG)2	Primer 1 -> 5'-CAG**********CCG-3'	Primer 2 -> 5'-GTG**********CCG-3'	64
(ATTGTT)9	Primer 1 -> 5'-ACG**********TCA-3'	Primer 2 -> 5'-TTC**********CTT-3'	249
(TGGCAA)7	Primer 1 -> 5'-TGC**********GTT-3'	Primer 2 -> 5'-ATG**********GAT-3'	237
(CGGCAGTT)3	Primer 1 -> 5'-AAA**********GCG-3'	Primer 2 -> 5'-AGC**********ATT-3'	230
(GCGTGATAT)7	Primer 1 -> 5'-GGT**********CAA-3'	Primer 2 -> 5'-CAA**********GCC-3'	218
(GCTGTAATG)5	Primer 1 -> 5'-CAA**********GCC-3'	Primer 2 -> 5'-CAT**********AGC-3'	198
Xanthomanas vesicatoria			
(CGATTCC)4	Primer 1 -> 5'-GCC**********CTC-3'	Primer 2 -> 5'-CCT**********ATC-3'	191
(AAAGCAGC)8	Primer 1 -> 5'-AGC**********TCT-3'	Primer 2 -> 5'-TCG**********CAG-3'	191
(AGCAAC)9	Primer 1 -> 5'-GCT**********AGT-3'	Primer 2 -> 5'-CAG**********TGA-3'	237
(GGCAGT)6	Primer 1 -> 5'-TCA**********GAT-3'	Primer 2 -> 5'-CAC**********TGA-3'	219
(TGGGAAG)9	Primer 1 -> 5'- CGG**********AGA-3'	Primer 2 -> 5'- TTC**********CCG-3'	109
(CTGTCG)8	Primer 1 -> 5'-ATT**********TGG-3'	Primer 2 -> 5'-CAA**********CAC-3'	150
(TCGGGAA)5	Primer 1 -> 5'-TCA**********GAC-3'	Primer 2 -> 5'-GAC**********CGA-3'	150
Clavibacter michiganensis subsp. michiganensis			
(GACGCTGCTGGCACTGACGCGACG)9	Primer 1 -> 5'-ACC**********ATG-3'	Primer 2 -> 5'-GTC**********CAT-3'	198
(CCGACGCAT)3	Primer 1 -> 5'-CGG**********CAG-3'	Primer 2 -> 5'-CAG**********ATG-3'	249
(GCTTCCGCGACGCGG)4	Primer 1 -> 5'-ACT**********TCC-3'	Primer 2 -> 5'-TCG**********AAT-3'	243
(CGCCGA)6	Primer 1 -> 5'-AGG**********AGC-3'	Primer 2 -> 5'-TCC**********GTC-3'	240
(GCCGGGT)6	Primer 1 -> 5'-ACG**********GGG-3'	Primer 2 -> 5'-AGC**********CCC-3'	189
CAACGGCGGCGGCTACGGCGGCGGCTACGGCGGCGG	Primer 1 -> 5'-AGA**********TCC-3'	Primer 2 -> 5'-TCA**********GCG-3'	174
(CGGCGACGCGCGGTC)4	Primer 1 -> 5'-CGT**********GCT-3'	Primer 2 -> 5'-ACG**********AGG-3'	201
(TCG)9	Primer 1 -> 5'-TAG**********GAG-3'	Primer 2 -> 5'-ACT**********AGC-3'	229

RESULTS AND CONCLUSION

We believe that these markers will be a good tool to determine of genetic diversity and tracking of the pathogen dissemination besides other molecular markers. Further studies will be continued on testing these primers on different pathogens. These selected microsatellites are beneficial molecular markers to follow pathogens and to get precaution for controlling bacterial diseases. Furthers studies will be continued on this aspect on effectivelly designing of new RT- PCR primers by these specific microsatellites considering rapidly diagnosis diversity of them based on intra specific level for detection.

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GROWTH AND PRODUCTION OF MUSTARD (*BRASSICA CHINENSIS* L.) WITH ORGANIC PLANT SUPPLEMENTS APPLICATION

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ABSTRACT

*Mustard (*Brassica chinensis *L.) has a high economic value and sold at a more expensive price than other mustard types. The study aims to evaluate the effect of organic plant supplements (OPS) application on growth and production of mustard and to obtain the most proper concentration of OPS for effectively mustard production. The experiment was arranged in Randomized Complete Block Design (RCBD) with a single factor i.e. concentration of OPS and five replications. Five levels of OPS concentration applied consisted of 0 (control), 1, 2, 3, and 4 mm^{-3} m^{-3}. The results show that OPS significantly affected the vegetative growth (plant height, leaf length, and radicle number) and production of mustard. The significant effect of OPS on vegetative growth was obtained at 2 and 3 weeks after planting. The concentration of 3 mm^{-3} m^{-3} could be applied to obtain the high vegetative growth and production of mustard.*

Keywords: *Brassica chinensis L., concentration, eco-friendly farming, organic fertilizer, yield,*

INTRODUCTION

Mustard (*Brassica chinensis* L.) has a high economic value and sold at a more expensive price than other mustard types. This condition according to Driyani (2015) is caused by this commodity is rarely planted, although can be harvested in 40-50 days after planting. The urban farming community can cultivate mustard use the compost of organic wastes as the medium cultivation in the polybags. Currently, the demand for this commodity increase continuously, and very potential to be widely developed. Mustard contains high vitamin A, C and D, folate, and potassium. Potassium is one of the most important minerals in the body, it regulates fluid balance, muscle contractions, nerve signals, and heart. Crispy and soft texture make this commodity very popular for consumption.

Generally, farmers use chemical fertilizer in their farming practice for more effective and efficient with higher production, instantly. The use of organic fertilizer is considered as old and ineffective ways, so this way began to be abandoned. The use of chemical fertilizers continuously could decrease soil fertility and productivity as a residue effect. In these conditions, the use of chemical fertilizers in high dose should be reduced by using the organic fertilizers. Lingga and Marsono (2003) reported that the use of organic fertilizers can also increase the quality of vegetables and fruit crops.

The 4.0th Industrial revolution has changed the perspective for agricultural practices to be more efficient, technological, and eco-friendly. Recently, the massive land-use change from agricultural to non-agricultural activity i.e. settlement, offices, factories, and industries result in the fragmentation and loss of productive agricultural land. One of the efficient agricultural practices can be done by the utilization of a house yard for vegetable cultivation using polybags. Eco-friendly farming practices in the house yard result in free pests, pesticides in the product (Saparinto, 2013), and less chemical fertilizer (Winarni et al., 2015).

Chemical input in agricultural practices by farmers had been reported to be one of the high factors of production cost, whereas the fertilizer subsidies policy by the government increasingly limited and tight. All this time, farmers can decrease production cost according to Suwahyono (2017) through the use of chemical fertilizer which was subsidized by government policy. The use of organic fertilizer needs to be applied in our agricultural practices, especially for horticulture crops like mustard in our house yard. One of the organic fertilizer types that can be applied is Organic Plant Supplements (OPS).

This fertilizer had reported by Azkaini (2018) could increase root and stems cell turgor, increase the flower and fruit set, and prevent the flower and fruit drop. A bottle of OPS 12.98 % nitrogen (N),

5.12 % phosphate (P_2O_5), 14.20% potash (K_2O), 3.17% sulphate (S_2O_4), 0.03% magnesium (Mg), 5.97% organic carbon, 42.02 ppm Fe, 0.61 ppm Cu, 27.80 ppm Zn, and 0.40% C/N ratio. The research aims to evaluate the effect of OPS application on growth and production of mustard, and to obtain the most proper concentration for effectively mustard cultivation.

MATERIALS AND METHODS

Time and site

The study was carried out from March to April 2019 in Lebak Bulus Seedlings Garden, Lebak Bulus Seed Development Center and Plant Protection, Department of Maritime Agriculture and Food Security. The study site was located in 6° 18' 1" S and 106° 46' 1" E, ± 25 meters above sea level (MASL), and with latosol soil type.

Design

The experiment was arranged in Randomized Complete Block Design (RCBD) with a single factor i.e. concentration of organic plant supplement (OPS) and five replications. Five levels of OPS concentrations applied consisted of: 0 (control), 1, 2, 3, and 4 mm^{-3} m^{-3}.

Planting

This study used 25 experimental units, and each unit consisted of 3 polybags. The polybag was filled with 5 kg growth medium; the mixture of topsoil, goat manure, and husk charcoal, then the soil covered by silver black plastic mulch to decrease the growth of the weeds. In 14 days after sowing, mustard seedlings (Nauly F1 Variety) were transplanted into each polybag (20 cm x 25 cm) with one seedling for one polybag, and the maintenance was conducted daily until the harvest time. A 200 ml organic plant supplement was applied to each polybag every 10 days.

Plant growth and yield observation

The observation was done on plant growth and yield characteristics, i.e. plant height (cm), leaf length (cm), root length (cm), number of leaves, number of roots, fresh weight (g), and consumption weight (g). The observation of growth characteristics was performed every week until harvest time at 30 days after transplanting, while the yield characteristics were performed 30 days after transplanting

Data analysis

Statistical analysis was conducted on the analysis of variance for the main effects and the means of the values were compared with the Tuckey test ($p = 0.05$).

Results and Discussion

The climate conditions are important to agriculture, plant production, and food security. Considerable economic losses result from sub-optimal climate conditions are the undermining of plant production and food security. Plant growth and production are strongly influenced by the environmental stresses experienced by the plants in the field. Sub-optimal climate conditions will further exacerbate economic losses and decrease the predictability of yield and quality for the farmer. The climate conditions of the site of this study were shown in Table 1.

Table 1. Climate conditions on research site

Month	Average		Total monthly rainfall (mm)
	Temperature (^{0}C)	Humidity (%)	
March	27.6	82.8	145.3
April	28.1	82.7	304.0

Source: BMKG Wilayah II Ciputat

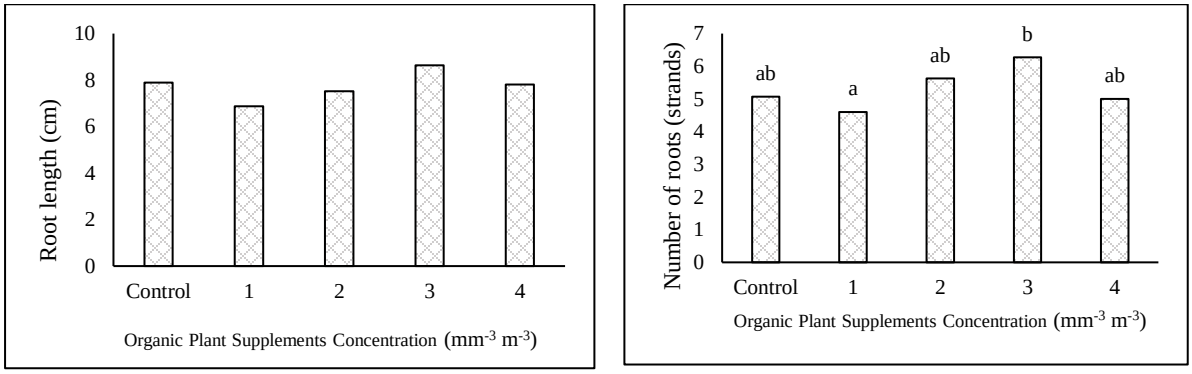
These data were collected from the Meteorological, Climatological, and Geophysical Agency for Ciputat Region. The average of temperature and humidity during the research are suitable for the plant

growth and production in the tropics, (27.6-28.1 ^{o}C) and (82.7-82.8%), respectively. These climate conditions are appropriate for mustard growth and production, Sukmawati (2012) had reported that the appropriate climate conditions for mustard cultivation are the temperature of 15-30 ^{o}C, and total rainfall >200 mm month^{-1}. There is an increase the rainfall intensity from March to April which was showed by total rainfall of 145.3 to 304.0 mm month^{-1}. The low rainfall intensity in March did not affect the mustard growth and production.

Vegetative growth of mustard plants

Fertilizer is one of the most vital inputs contributing to crop production, and fertilization increases productivity and improves yield quantity and quality (Olaniyi et al., 2010). Roots are important organs that supply water, nutrients, hormones, and mechanical support (anchorage) to crop plants and consequently affect economic yields. In addition, roots improve soil organic matter by contributing to soil pools of organic carbon (C), nitrogen (N), and microbial biomass. Organic plant supplements showed did not significantly affect root length (Figure 1a) but significantly affect the number of roots (Figure 1b).

Seedlings transplanting causes the root needs time to develop, and transplanting condition leads to support the root formation. Root development will decrease the water and nutrient absorption, so that root formation is a strategy to increase the root absorption in transplanting phase. The highest roots number was obtained at OPS concentration of 3 mm^{-3} m^{-3}, nevertheless didn't significantly different from other concentrations. The higher roots number will expand the water absorption range, and according to Herumia et al. (2017) and Amir (2016) will increase the water volume and nutrient uptake. The increase in water uptake will increase nutrient uptake. Furthermore, OPS contains nitrogen and phosphor. Nitrogen was reported by Wahyudi (2010) increased vegetative growth (roots, stems, and leaves), and Purwati (2013) reported P plays a role to stimulate the root growth.



a b

Figure 1. Root length (**a**), and number of roots (**b**) of mustard in different concentration of organic plant supplements; Each bar chart followed by same letters in same week shows not significantly difference at Tuckey test (p = 0.05).

The root growth is very important to deliver the nutrient from soil to plant organs. OPS application on mustard showed a significant effect on plant height at 3week after planting (WAP) but did not significantly affect at 1, 2, and 4 WAP (Figure 2a). At 1 until 2 WAP, mustard seedlings still in the acclimatization phase from germination seedling to the field, so this condition caused organic plant supplements uptake by roots was un-optimal.

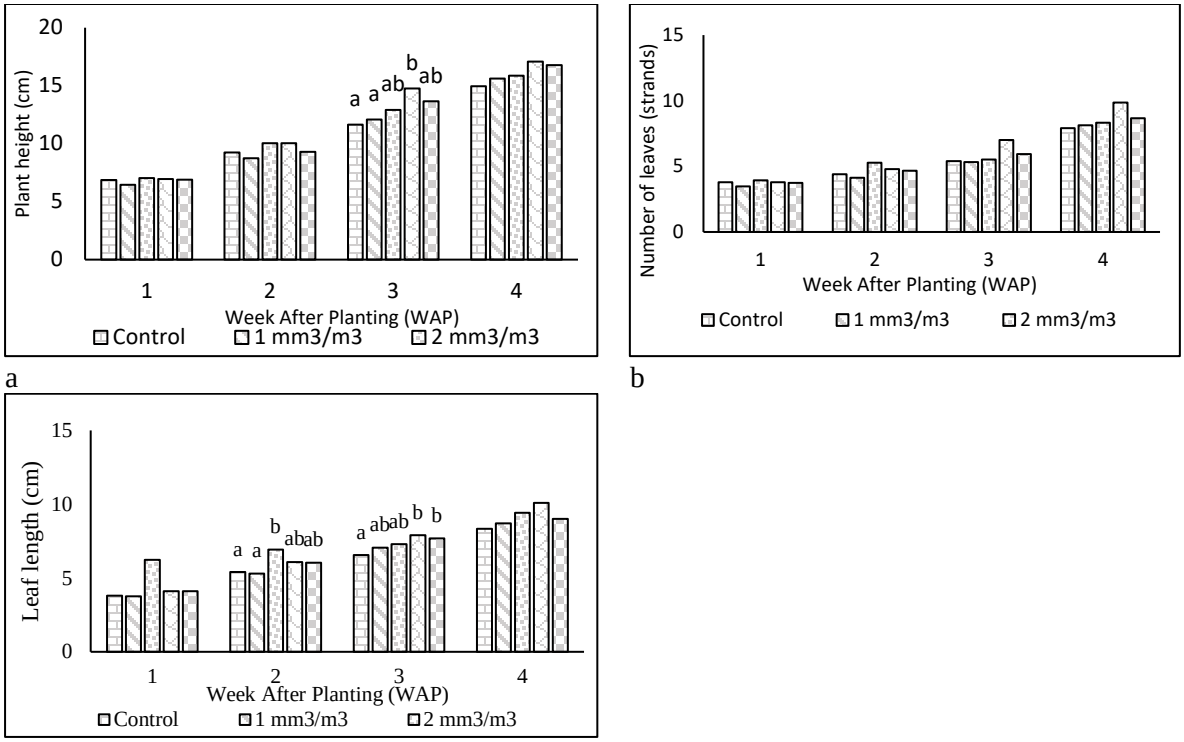


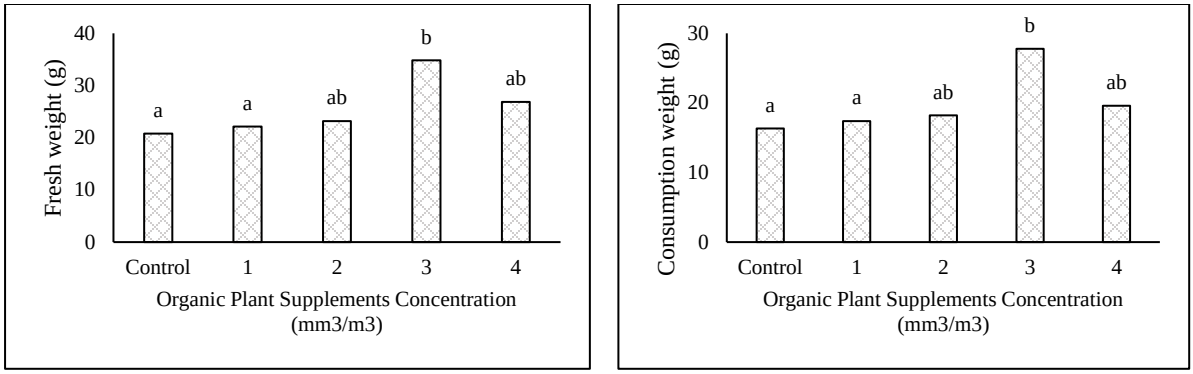
Figure 2. Plant height (**a**), number of leaves (**b**), and leaf length (**c**) of mustard in different concentration of organic plant supplements; Each bar chart followed by same letters in same week shows not significantly difference at Tuckey test (p= 0.05)

At 3 WAP, the highest plant was obtained in the concentration of 3 mm^{-3} m^{-3}, nevertheless did not significantly different from the concentration of 2 and 4 mm^{-3} m^{-3}. OPS contains high nitrogen to support mustard vegetative growth, especially plant height. According to Duaja et al. (2012a), the plant needs high nitrogen for plant height growth. Wibowo (2017) also reported that nitrogen was needed by the plant to increase the plant height. OPS was required by mustard to increase the nitrogen uptake reported by Syafruddin et al. (2012) as an essential nutrient for vegetative growth. Thus the finding was in agreement with that of Ojeniyi et al. (2007) who reported that the application of N, P, K, and animal manure increased the plant height of tomato as compared to control. Nitrogen deficiency also had reported by Sutedjo (2010) decrease growth of plant height, and this condition was shown by mustard on control.

OPS was late to support the plant height and caused a low effect on the number of leaves. Sritopia (2017) reported that the leaves grow in a segment at stem, so lower plant height will decrease the segment at the stem to leaves grow. The lower number of leaves leads to the use of photosynthesis assimilate will be translocated to leaf development and result in the increase of leaf length. Lakitan (2012) also reported the increase of leaf length resulted from photosynthesis assimilate translocation. The highest leaf length was obtained at the concentration of 2 mm^{-3} m^{-3} at 2 WAP, and 3 mm^{-3} m^{-3} at 3 WAP. At 2 WAP, the concentration of 2 mm^{-3} m^{-3} was significantly different to lower concentrations, nevertheless were not significantly different to higher concentrations. The concentration of 3 mm^{-3} m^{-3} resulted in the highest leaf length and was significantly different from lower concentrations, nevertheless not significantly different from higher concentration.

Yield components and production

Fresh weight is one of the characters used to measure plant growth. This character describes the photosynthesis product (Salisbury and Ross, 1995), and the fresh weight of horticulture products was affected by leaves number dan leaf length (Roidi, 2016; Darwin, 2012). OPS showed a significant effect on fresh weight (Figure 3a) and consumption weight (Figure 3b).



a b

Figure 3. Fresh weight (a), and consumption weight (b) of mustard in different concentration of organic plant supplements; Each bar chart followed by same letters in same week shows not significantly difference at Tuckey test ($p = 0.05$)

Organic fertilizer was reported by Syekfani (2002) are more quickly available for being *uptaken* by plant *roots, promotes higher leaf length, and according to Mahdianor (2012) will increase the photosynthesis capacity. Photosynthesis product will translocate to stem, roots, and leaves, so that increase the fresh weight. Tatik et al. (2014) also reported that the higher number of leaves will increase the fresh weight and dry weight. The concentration of 3* mm^{-3} m^{-3} *resulted in the higher fresh and consumption weight, and showed a significant difference to control and 1* mm^{-3} m^{-3}*, nevertheless did not show a significant difference to 2 and 4* mm^{-3} m^{-3}*. Fe and Mg contained in OPS play a role in the photosynthesis process and leaves formation. Duaja et al. (2012b) reported that Fe and Mg increase the accumulation of carbohydrates and proteins.*

Table 2. The effect of organic plant supplements on mustard yield

Organic Plant Supplements Concentration	Yield (ton ha^{-1})	
	20 cm x 20 cm	15 cm x 15 cm
Control (0 mm^{-3} m^{-3})	5.2	9.24
1 mm^{-3} m^{-3}	5.53	9.84
2 mm^{-3} m^{-3}	5.8	10.32
3 mm^{-3} m^{-3}	8.71	15.49
4 mm^{-3} m^{-3}	6.7	11.93

Yield is the right character to measure the plant production, and plant spacing highly affects the population, will further effect yield. The effect of OPS on mustard yield was showed in Table 2. Concentration of 3 mm^{-3} m^{-3} resulted the highest yield both in 20 cm x 20 cm and 15 x 15 cm spacing i.e. 8.71 and 15.49 ton ha^{-1}, respectively. Generally, mustard was planted in the spacing of 20 cm x 20 cm. The spacing of 15 x 15 cm could be applied to increase the yield of mustard in house yard cultivation.

CONCLUSIONS

1. Organic plant supplements significantly affect vegetative growth (i.e. plant height, leaf length, and root length), and yield of mustard.
2. The concentration of 3 mm^{-3} m^{-3} could be applied to obtain the high vegetative growth and yield in mustard cultivation.

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ANIMAL WELFARE IN ANIMAL HEALTH

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ABSTRACT

Animal Welfare (Hayvan Refahı, Tierschütz, Gönenç)

The science of animal welfare was defined as a new field that began to develop scientifically in the 1960s. Today, it is concerned with many disciplines such as physiology, zoology, ethics and ethology. Firstly, the Danish Animal Protection Law was legislated in 1950. Following that, the report of the Brambell committee convened in England was published in 1965. In 1966, the Ministries of Agriculture of the EU Countries concluded the treaty of animal welfare during transport. During the reigns of Kanuni Sultan Süleyman and Yavuz Sultan Selim in the Ottoman Empire, the edicts were enacted to ensure that animals, especially horses, are not starved and to provide comfortable conditions for them. Due to its importance, animal transports have been the first studied topic of animal welfare. Following that, the topics of welfare of farm animals and animal welfare in slaughtering were considered. The welfare of the animals used for experimental and scientific purposes and the welfare of the animals in the wild have been the later studied topics.

In this study, the topics of animal welfare in animal transports, welfare of farm animals and animal welfare in slaughtering are explained. The extent to which animals adapt to the environment, that is, their capabilities to cope with stress, is important to determine animal welfare.

Transports that are not carried out under appropriate conditions cause deaths, injuries and decrease in meat quality resulting in economic losses in animals. Animal transports are important for animal welfare, animal-human health and livestock economy.

Legal regulations made on this topic are "The Regulation on the Welfare and Protection of Animals during Transport" published in the official gazette dated 24 December 2011 and numbered 28152 and "The Regulations on Welfare of Farm Animals" published in the official gazette dated 23 December 2011 and numbered 28151.

The aforementioned regulations are compatible with;

The Council Directive 98/58/EC of the European Union Concerning the Protection of Animals Kept for Farming Purposes

The Council Directive 1999/74/EC of the European Union Laying Down Minimum Standards for the Protection of Laying Hens

The Council Directive 2008/119/EC of the European Union Laying Down Minimum Standards for the Protection of Calves

The Council Directive 2007/43/EC of the European Union Laying Down Minimum Rules for the Protection of Chickens Kept for Meat Production.

The purpose of this study is to determine the minimum standards of the conditions in which the husbandry and care of farm animals whose products and services are utilized is carried out by considering their developments, adaptations, domestication situations, physiological and ethological needs and behaviors, and to ensure the animal welfare by putting these standards into practice.

HAYVAN SAĞLIĞINDA HAYVAN REFAHI

GİRİŞ

Hayvan refahı bilimi 1960'lı yıllarda bilimsel olarak gelişmeye başlayan yeni bir alan olarak tanımlanmaktaydı. Bugün ise, fizyoloji, zooloji, hayvan besleme, etik, etoloji gibi birçok bilim dalını ilgilendirmektedir. İlk olarak,1950 yılında Danimarka'da Hayvanları Koruma Yasası yayınlandı. Bunu 1965 yılında İngiltere'de toplanan Brambell komitesi raporu takip etti.1966 yılında AB Ülkeleri Tarım Bakanlıkları ulaşım sırasında hayvan refahı antlaşması imzaladı Önemi dolayısıyla hayvan nakilleri hayvan refahın da ilk çalışılan konu olmuştur. Daha sonra çiftlik hayvanlarının refahı ve kesimde hayvan refahı konuları işlenmiştir. Deneysel ve bilimsel amaçlar için kullanılan hayvanların refahı ve yabani hayattaki hayvanların refahı ise daha sonra çalışılan konular olmuştur.(Bakanlık Hizmet İçi Sunuları)

Çalışmamızda, refah konusunun çok kapsamlı olması sebebiyle (Taşımada refah, çiftlikte refah, mezbahada refah, deney hayvanlarının refahı, yabani hayatta refah) ilk çalışılan konu olan taşımada refahı (ruminantlarda) özellikle ulusal ve uluslar arası mevzuatlar çerçevesinde incelenmiştir.

MATERYAL VE YÖNTEM

1965 yılında İngiltere'de toplanan Brambell komitesi raporuna göre

Beş Özgürlük

1-Aç ve susuz kalmama

2-Acı, veya hastalık oluşturucu etkenlere maruz kalmama

3- Normal davranışlarını sergileyebilme

4-Korku ve endişeden uzak olma

5- Rahatsız olmama

Beş Sorumluluk

1- Yeterli miktarda uygun gıda ve su verilmeli ve dinlenmeleri için imkan sağlanmalı

2- Araçlar ve tesisler hayvan sayısı ve türüne uygun olarak tasarlanıp inşa edilmeli

3- Nakil için uygun durumda olmayan hayvanlar hızlı bir şekilde tespit edilerek tedavi edilmeleri sağlanmalı

4- Grup halindeki hayvanlar kavgaları önleyecek şekilde barındırılmalı sosyal etkileşim için yeterli alan sunulmalı

5- 'Güvenli' bir çevre sağlanmalı

Hayvan sağlığı Açısından Stres önemlidir.

Stres faktörleri: kötü muamele, sıkışma, yenilik, açlık, susuzluk, soğuk, sıcak, ses, hareketsizlik

Stresle başa çıkma kapasitesi: Yaş, cinsiyet, tür, sağlık durumu ve daha önceki deneyimler

Hayvan Davranışları: Hayvan davranışları her zaman hayvanların hayatta kalmasını temin etmek üzere şekillenmiştir.

Sürülere hakim olmak, taşımada indirme ve bindirmede ve hayvan refahını sağlama açısından, hayvanların doğal davranışları hakkında bilgi sahibi olmak çok yararlı olmaktadır. Hayvan sağlığı açısından hayvan bakıcılarının ve nakliyecilerin, çobanların hayvan davranışlarını bilmeleri hayvanların taşımada ve çiftlikte strese girmelerini önlemektedir.

Örneğin Lider hayvan, su, gölgelik, otlanma alanı veya başka bir kaynak arayışına çıktıklarında gruptaki diğer hayvanların takip ettiği hayvandır.

Koyunlar ender de olsa sesle iletişim kurarlar. Sürüden ayrılan koyun sürünün geri kalanını bulmak için ses teması kurar.

Yapılan araştırmalar koyunların özellikle mekansal hafızalarının çok kuvvetli olduğunu ortaya koymuştur. Otlatılmaktan gelen koyunlar köy içerisinde kendi ağılına yönelerek bu hafızayı ispatlamaktadır**.** Merada yetiştirilen hayvanlar serbest kalınca yaşadığı ağıla dönüş yolunu bulabilir**.** Bu gibi bilgiler ve lider hayvanın tespit edilmesi özellikte sürü gütmede ve nakillerde çok önemlidir. *Hayvanların çevreye ne derece uyum sağladığı yani stresle başa çıkma kapasitesi hayvan refahını belirlemesi açısından önemlidir.*

Uygun şartlarda yapılmayan nakiller hayvanlarda ölümlere, yaralanmalara, et kalitesinin düşmesine sebep olarak ekonomik kayıplara yol açmaktadır. Hayvan nakilleri; hayvan refahı, hayvan-insan sağlığı ve hayvancılık ekonomisi açısından önemlidir.

Bu konuda yapılan yasal düzenlemeler ise;

5996 sayılı Kanun dayanak olarak gösterilerek

1 "Hayvanların Nakilleri Sırasında Refahı ve Korunması Yönetmeliği (24) Aralık 2011 Tarih ve 28152 Sayılı Resmi Gazete de yayınlanarak yürürlüğe girmiştir.

2-Canlı Hayvan Ticareti Yapan Satıcıların Çalışma ve Denetlenmesi ile İlgili Yönetmelik 18 Ocak 2012 Tarih ve 28177 sayılı Resmi Gazete de yayınlanarak yürürlüğe girmiştir.

3-Hayvan Nakillerinde Kontrol ve Dinlendirme İstasyon Yönetmeliği 30 Mayıs 2015 tarih ve 29371 sayılı Resmi Gazete'de yayınlanarak yürürlüğe girmiştir.

Hayvanların Nakliyeye Hazırlanması

1-Sağlıklı hayvanlardan bir grup oluşturulmalı,

2-Grup içerisindeki öncü hayvan belirlenmeli,

3-Nakilden en az 6 saat önce yemleme kesilmeli,(İhtiyaç duyulursa su verilebilir)

4-Özellikle ekstansif hayvan yetiştiriciliğinde hayvanlar nakil öncesi tesis ortamına ve bakıcıların varlığına alıştırılmalı,

Yüklemede

1-Eğitimli bakıcılar tarafından yapılmalı,

2-Bayrak vs. yardımcı aletler kullanılmalı,

3-Hayvanlar rampa adı verilen donanımlar vasıtasıyla yüklenmeli,

4-İşletmelerde sabit veya portatif rampalar olmalı,

5-Sulama sisteminden kaynaklanabilecek rutubeti engelleyebilmeli,

Yükleme Esnasında Stresin Azaltılması Amacıyla

1-Nakliyenin önceden planlanması,

2-Yüklemeden önce hayvan gruplarını ayırmak (yaş-ırk-ağırlık),

3-Hayvanlar arasındaki kavgayı önlemek için birbirlerine alışkın olmayan hayvanların karışık olarak yüklenmemesi,

4-Muamele zamanının minimumda tutulması,

5-Hayvanların dondurucu yağmur ve kardan korunması,

6-Hayvanlara minimum heyecan verecek şekilde hareket ettirilmesi, önemlidir. (Bakanlık Hizmet-İçi eğitim ve sunuları)

Yığılmalara neden olan Faktörler

1-Su birikintilerinden gelen yansımalar

2-Metal yansımaları (Sığırlar diskromattır. Sığır, koyun ve keçilerin retinası sarımsı yeşil ve mavimtırak mor renklere daha hassastır. Bu durum, hayvanların ışığın veya gölgeler gibi karanlığın keskin kontraslarına ve muamele ekipmanlarındaki parıldamalarından korkmalarına sebep olur.)

3-Sallanan zincirler

4-Metal çınlamaları ve çarpma sesleri

5-Yüksek frekanslı sesler (Çok yüksek sesler hayvanlar için en büyük stres yapıcı etkendir.) İnsan kulağı 1000-3000 hz- sığır ve atlar ise 8000 ve üstü hz/ koyunlar 10000 hz. frekansındaki seslere duyarlıdır. Bakıcıların, hayvanların kulak hareketlerine dikkat etmeleri gerekmektedir. Hayvanlar kulaklarını, dikkatlerini çeken noktaya doğru çevirirler.)

6-Hava tıslaması/ üfleme sesi- Susturucu ya da boruların dışarıda yapılması ile önlenmelidir.

7-Yaklaşan hayvanlara doğru hava akımı

8-Çitlere/ yükleme-boşaltma yoluna asılmış giysiler (Hayvan yol boyunca asılı şekilde duran herhangi bir nesne gördüğünde geri gitme eğilimindedir. Bu yüzden hayvanları koridora sürmeden önce yol boyunca asılan herhangi bir nesnenin olup olmadığı kontrol edilmelidir.)

9-Hareket eden plastik parçaları

10-İleriye doğru hareket eden insanların görüntüsü

11-Yerde küçük objeler- bardak gibi

12-Döşeme ve yapıdaki değişiklikler

13-Döşemede bulunan boşaltma ızgarası

14-Ekipman rengindeki ani değişiklikler

15-Hayvanın gireceği yerin karanlık olması- Hayvanlar karanlık yerden ışıklı yere doğru hareket etme eğilimlidirler.

16-Parlak ışık. - Hayvanlar karanlık yerden ışıklı yere doğru hareket etme eğilimlidirler, fakat parlak bir ışığa doğru hareket etmeye çekinirler.

17-Gölgeler; Sığırlar zayıf derinlik algısına sahiptir, bu yüzden gölgeli olan yerlere girmekten çekinirler ve bu da yığılmalara neden olur.Bakanlık Hizmet-içi eğitim sunuları)

Hayvan Satıcıları

1-Çalışma izni için başvuran satıcıların iş ile bağlantılı kullandıkları işletmeleri, Yönetmeliğin 18 inci maddesinde belirtilen teknik ve sağlık şartlarını taşımalıdır. (18 Ocak2012)

2-Doğrudan ya da dolaylı olarak sığır cinsi hayvanlar, koyun ve keçi türü hayvanlar ile domuz türü hayvanların alım ve satımını yapan satıcılar, işletmelerinin bağlı bulunduğu il/ilçe müdürlüğünden **çalışma izni** almak zorundadır.

Hayvan satıcılarının İl/ilçe Müdürlüklerinden çalışma izni almak için

1- Hayvan satıcılarının il/ilçe müdürlükleri tarafından verilecek eğitimlere katılmış olması gerekmektedir.

2-İşletmelerin Yönetmelik şartlarını taşımaması ve söz konusu eğitimlere katılım sağlanmaması halinde satıcılara çalışma izni verilmemektedir.

Ayrıca hayvan alım satımı yapmalarına müsaade edilmemektedir.

Yaptırımlar:

Satıcı ***çalışma izin belgesi olmayan*** *hayvan sahipleri* satın aldıkları hayvanları satın almalarından itibaren ilgili yönetmelik gereği

1-Koyun ve keçi türü hayvanlar için en fazla *yirmi dokuz* gün,

2-Sığır cinsi ve domuz türü hayvanlar için ise en *fazla otuz* gün içerisinde

3-Bu hayvanlar için il/ilçe müdürlüğü tarafından *veteriner sağlık raporu* düzenlenmez. veteriner sağlık raporu düzenlenmeyen hayvanlar bir ilden farklı ile nakledilemez.

Nakliye esnasında hayvanlar özel donanımlı (İçinde otomatik su tertibatı ve otomatik soğutma bulunan) kamyonlar ile taşınmıyorsa uzun mesafeli taşımalarda mutlaka 8 saatte bir araç durdurulup, dinlendirilmeli ve su ve yem verilmelidir.

Nakliye Sonrası

1-Nakliye sonrasında hayvanlara (sığır) iyi kalitede saman,

2-Nakliyeden hemen sonra hayvanlara su vermemek,

3-Buzağılara verilebilir. Yetişkinlerde bu süre2 veya3 saati geçmemelidir.

4-İndirilen hayvanların bulunduğu ahırların aydınlatılması, gereklidir.

Birlikte Naklin Mümkün olmadığı durumlar

1-Cinsiyet farkı, tür farkı, boynuz farkı, düşmanlık farklı cüsse

2-Yalnız hareket edemeyen, yaralılar, ileri gebe, yeni doğum yapanlar, yeni doğmuş buzağılar, kuzular, göbekleri iyileşmemiş yeni doğanlar

3- (7) günden küçük kuzular ile (10) günden küçük buzağılar nakledilemez

Yalnız buzağılar 100km. den uzak olmamak şartıyla yakın çiftliklere nakledilebilirler.

Hayvan satıcılarının sorumlulukları

1-Karantina bölgesinden hayvan alamaz.

2-Tanımlanmamış (küpesiz) hayvan alım satımı yapamaz.

3-Gezdiği her işletme için tek kullanımlık tulum ve galoş giyer.

4-Hayvanlarıyla ilgili gerekli bildirimleri zamanında yapar.

5-Farklı türdeki hayvanlar bir arada bulundurmaz.

6-Hayvan refahı kurallarına uyar ve uyulmasını sağlar.

7-Kurban Bayramında Bakanlıkça belirlenen kurallar doğrultusunda alım, satım ve nakil yapar.

Yaptırımlar (1)

1-Yönetmelik hükümlerini yerine getirmeyen satıcılar süre verilerek uyarılır, bu sürede eksikliklerin giderilmemesi halinde çalışma izni iptal edilir.

2-İşletmelerde 5996 sayılı Kanuna aykırı uygulamalar tespit edilmesi durumunda idari yaptırım uygulanır. Yanlış uygulamanın ikinci defa tespiti halinde satıcının çalışma izni iptal edilir.

Yaptırımlar (2)

Satıcı **çalışma izin belgesi olmayan** hayvan sahipleri satın aldıkları hayvanları satin almalarından itibaren;

1-Koyun ve keçi türü hayvanlar için en fazla yirmi dokuz gün,

2-Sığır cinsi ve domuz türü hayvanlar için ise en fazla otuz gün içerisinde tekrar satamaz.

3-Bu hayvanlar için il/ilçe müdürlüğü tarafından veteriner sağlık raporu düzenlenmez.

Çalışma izni için başvuran satıcıların iş ile bağlantılı kullandıkları işletmeleri, Yönetmeliğin 18 inci maddesinde belirtilen teknik ve sağlık şartlarını taşımalıdır.

Yükleme Yoğunluğu

Kategori	Canlı Ağırlık (kg)	metrekare alan / Hayvan
Küçük danalar	50	0.30-0.40
Orta boy danalar	110	0.40-0.70
Ağır danalar	200	0.70-0.95
Orta boy sığır	325	0.95-1.30
Ağır sığır	550	0.95-1.30
Çok ağır sığır	>700	1.30-1.60

Yükleme Rampaları

Yükleme rampalarının zemini kaymaz olmalı, gün ışığında yapılan yüklemelerde, rampalar kuzey ya da güneye çevrilmeli, araca giriş yeri ile rampa arasında boşluk kalmamalı, yükleme rampaları mümkün olduğunca kısa olmalı, yükleme koridoru yan duvarların hayvanların insanları görmeyecek şekilde dayanıklı malzemeden yapılması gerekmektedir.

İşletme içi Düzenlemeler

1-Çiftlik hayvanları, refahlarının sağlanması için, günde en az bir kere ahırda, ağılda veya merada kontrol edilir,

2-Gerekli olması durumunda, hasta ya da yaralı hayvanlar kuru, rahat altlığı olan uygun bir ayrı bölmede izole edilir.

3-Yeni doğan buzağıların doğumdan hemen sonra ve/veya en geç ilk altı saat içerisinde kolostrum almaları gerekir.

4-Tüm buzağılar günde en az iki kere beslenmelidir.

5-Sekiz haftalıktan büyük olan buzağılar, sağlığı ya da davranışları nedeniyle tedavi görmesinin gerekli olduğu bir veteriner hekim tarafından onaylanmadıkça, bireysel bölmelerde barındırılmaz.

Bulgular ve Tartışma

Hayvanların çevreye ne derece uyum sağladığı yani stresle başa çıkma kapasitesi hayvan refahını belirlemesi açısından önemlidir.

Uygun şartlarda yapılmayan nakiller hayvanlarda ölümlere, yaralanmalara, et kalitesinin düşmesine sebep olarak ekonomik kayıplara yol açmaktadır. Hayvan nakilleri; hayvan refahı, hayvan-insan sağlığı ve hayvancılık ekonomisi açısından önemlidir.

Amacımız; Ürün ve hizmetinden yararlanılan çiftlik hayvanlarının, gelişmesi, uyumu ve evcilleşme durumları ile fizyolojik, etolojik ihtiyaçları ve davranışları dikkate alınarak bakıldıkları ve yetiştirildikleri koşulların asgari standartları ve bunların uygulamaya konulması ile hayvan refahının sağlanmasıdır.

Sonuç ve Öneriler Hayvan refahı insan ve hayvan sağlığı açısından çok önemlidir. Ayrıca düzenli ve kontrollü bir hayvansal üretim özellikle zoonoz hastalıkları önlenmesi çevre ve doğanın korunmasını etkilemektedir. Bu amaçla ilgili AB Direktiflerinde belirtildiği gibi ahır, ağıl ve mera ile hayvanlar ve yem depoları günde bir kez mutlaka kontrol edilmelidir. Eksiklikler giderilmeli ve hayvanların genel sağlık durumları gözden geçirilmelidir.

Kaynakça

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EFFECTS OF SOME PLANT EXTRACTS AGAINST *ERWINIA AMYLOVORA* BY THE INDUCED RESISTANCE ON APPLE *IN VITRO* AND *IN VIVO* CONDITIONS

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ABSTRACT

Erwinia amylovora is the causal agent of fire blight, a devastating plant disease affecting a wide range of host species within Rosaceae and a major global threat to commercial apple and pear production. Management of fire blight is complicated by limitations on use of antibiotics in agriculture, antibiotic resistance development, and limited efficacy of alternative control agents. Even though successful in control, preventive antibiotic sprays also affect non-target bacteria, aiding the selection for resistance which could ultimately be transferred to the pathogen Erwinia amylovora. Promising plant extracts for the management of plant diseases are environmentally safe, long-lasting. In this study, the air-dried 32 plant material was ground into fine powder and extraction was performed at room temperature by maceration with 80% (v/v) methanol/distilled water. Antimicrobial activity was evaluated by measuring the inhibition zones in reference to the test organisms. Among the tested plants, Thymus vulgaris showed a good antibacterial activity and they inhibited the growth of the pathogens with inhibition zone diameter ranging from 3 to 25 mm at 1-20% (w/v) in absolute methanol in vitro conditions. In vivo, the highest efficacy was determined by Thymus extracts as 61.72% on reducing shoot blight of E. amylovora on apple cv. Royal Gala seedlings. Obtaining data indicated that some plant extracts may be used against the bacterial diseases on pome fruits within sustainable and organic management programs.

Keywords: *ecofriendly management, organic, apple, plant extract, fire blight*

INTRODUCTION

Apples are valuable fruits that have been widely used around the world and savored for their delicious flavor since ancient times. Apple trees are cultivated worldwide and are the most widely grown species in the genus *Malus*. The tree originated in Central Asia, where its wild ancestor, *Malus sieversii*, is still found today (Amandine et al., 2012).

There are a number of diseases that commonly occur year after year in both commercial and home plantings of apples. These diseases do not infect at the same time but appear in a fairly regular sequence depending up on the weather and the development or phenology of the apples, beginning at dormancy and continuing until fruit are harvested. The diseases which are common in apple include fire blight and apple scab (Douglas, 2018).

Fire blight caused by *Erwinia amylovora*, is the most serious bacterial disease of apple, pear, hawthorn, cotoneaster and other plant species in the family Rosaceae (Vanneste, 2000). The pathogen is included among quarantine organisms in many countries around the world and very strict quarantine measures are enforced (Smith et al., 1997). Since sanitation methods could not stop the spreading of the disease, fire blight management using appropriate chemicals and bio-control agents is the focus of ongoing efforts. Effective control can be achieved through streptomycin treatments (Johnson and Stockwell, 1998). However, its use has been prohibited in many countries due to the risk of resistance development in the population of the fire blight agent and non-target bacteria (Iacobellis et al., 2005).

The development of *E. amylovora* resistance to the antibiotic streptomycin, the greater desire of the society on safe production in agriculture and the prohibition of antibiotics for use in fruit growing in most countries of the European community and other states. Thus, several of these aspects have promoted the need for alternative control strategies (Zeller and Laux 2001, 2002). In the following, the main activities within biocontrol of fire blight on the basis of microbial antagonists, natural compounds and resistance elicitors will be presented.

The objective of this study was determine the efficacy of plant extracts on apple cv. Royal Gala as alternative bactericides against fire blight disease causal agent *E. amylovora* under *in vitro* and *in vivo* conditions.

MATERIAL AND METHODS

Plant Samples

In order to obtain plant extracts, the leaves of **ivy** (*Hedera helix*), **lavender** (*Lavandula officinalis*), **eucalyptus** (*Eucalyptus globulus*), **oregano** (*Origanum vulgare*), **rosemary** (*Rosmarinus officinalis*), leaves of **thyme** (*Thymus vulgaris*) **sage** (*Salvia officinalis*), **thyme** (*Satureja hortensis*) seeds of **nigella** (*Nigella sativa*), **cumin** (*Cuminum cyminum*); fruits of **sumac** (*Rhus coriaria*), **basil** (*Ocimum basilicum*) were collected between May and August, 2017 from Konya province and they were identified by Selcuk University Faculty of Science, Dept. of Botany.

These were placed in glass jars with grain alcohol 40%. Dishes were kept at 28º C and dark for two weeks. After 14 days, the plant extracts obtained were stored at 4º C and darkness. Chemical control was performed using streptomycin sulphate.

Apple cultivar Royal Gala which is susceptible cultivar to fire blight disease, and its seedlings in three year-old was used in the experiments.

Erwinia amylovora Strain Used in the Experiments

Phenotypically and molecularly diagnosed, Eakb29 coded and high virulent (92%) *Erwinia amylovora* isolate obtained from Selçuk University Department of Plant Protection Molecular Bacteriology Laboratory Culture Collection were used in the study. This isolate was isolated from pear tree in 2015 in Aksehir district of Konya.

Inoculation of the Pathogen

A dilution series was prepared from the suspension prepared from *E. amylovora* isolate which was developed for 48 hours at King B medium in the spectrophotometer at a measurement value of 0.15 at 660 nm wavelength. 100 µl was taken from each series and spreaded with glass baguette instead of King B medium in three replicates, developed for 48 hours at 25 °C and colony counted and pathogen population was adjusted to 4×10^8 CFU/ml.

Apple cv. Royal Gala shoots were inoculated by transversally bisecting the two youngest actively growing leaves with scissors and dipped in a suspension of Eakb29 strain of *E. amylovora* suspension. The bacterium was introduced to fill the wound and leave visible drops at both ends of the wound. The treated shoots were labeled with flagging tape for evaluation purposes.

Antibacterial Activity of Plant Extracts against *E. amylovora in vitro*

The antibacterial assay was performed using the agar disc diffusion method (Bauer et al., 1966). The suspension of Eakb29 isolate (10^8 CFU/ml) were poured into 9 cm diameter Petri dishes on King's B agar medium. After solidification, the treated paper discs were placed in the center of plates, with three replications for each treatment. Sterilized distilled water discs were served as control. The plates were kept at room temperature for 1h to allow diffusion of extract into the agar. The plates were incubated at 25±1 °C for 48 hrs and the inhibition zone diameter was measured to the nearest mm (Ruddock et al., 2005). The antimicrobial efficacy index (IAE) was calculated with the formula:

IAE (%) = (-1x [(C-T)/(C+T)])x100 where C is the average inhibitory zone (cm) on the standard dish (streptomycin 0.02%) and T is the average inhibitory zone on the treated dish. The IAE (%) indicated whether the efficacy of plant extracts is lower and/or higher than the streptomycin standard (Kokoskova and Pavela, 2007).

Antibacterial Activity of Plant Extracts against *E. amylovora* on Apple

Three-year-old apple cv Royal Gala seedlings were grown in a greenhouse in 45-cm-diameter pots containing a sterilized mix of soil–sand–peat (2:1:1 by volume) and watered daily by drip-irrigation. A mineral solution (NPK 20–20–20) at 2 g l-1 was distributed weekly into the pots to maintain optimum

nutritional conditions. Heating and drip-irrigation data were recorded by logger at 60-min intervals. In the greenhouse, 2 h before and 2 h after bacterial inoculation, the relative humidity was maintained at 90% to favor stomata opening.

Seedlings were sprayed with suspensions of *E. amylovora* (10^8 ml^{-1}) until runoff and placed in a moist chamber consisting of a plastic tray enclosed by a transparent plastic top. After two days of incubation at 25˚C with light, the tops were removed from the trays and seedlings were further incubated for five days at 85% RH, 25˚C and with 16 hrs. light per day. Thereafter, *E. amylovora* inoculated seedlings were sprayed with plant extracts and bactericides or water as controls. Two seedlings of apples were used for each replicate of each treatment. Six seedlings of apples with clear symptoms of fire blight after the application of *E. amylovora* were sprayed with copper hydroxide and streptomycin (each one three plants) until runoff and seedlings were incubated for five days at 85% RH, 25˚C and given 16 hrs. of light per day. The seedlings sprayed by water were used as control.

The length of visible fire blight lesions and of the current season's shoot growth was recorded after all lesions had ceased to extend, as indicated by the formation of a determinate margin between diseased and healthy tissues. Disease severity was calculated using the following formula:

Disease severity (%) = (a / b) x 100 where a is the length of the blighted part of the shoot (cm), and b is the whole length of the shoot (cm) (Zeller and Zeller, 2009). Percent effectiveness of the applications (**A**) was calculated according to the following formula:

A = (B - C) / B x100 where **B** is the percent disease severity in the controls, and **C** is the percent disease severity in treated shoots.

Statistical Analysis

MINITAB (State College, PA, USA) was the statistical program used. The means (expressed as percent disease) were used to determine significant treatment differences. Data were analyzed using MSTAT software (Michigan State University, MI, USA) and the differences between treatments were determined by Least Significant Difference (LSD) Test at $P < 0.05$. (Duzgunes et al., 1987).

Re-isolation of *E. amylovora* from diseased plants

To isolate *E. amylovora* strain from diseased parts of plants was plated on King's B medium with the stroke method. Biochemical tests were made to determine phenotypic properties of strain Eakb29 of fire blight. DNA isolation and agarose gel electrophoresis were carried out according to standard protocols. Amplification of *E. amylovora* plasmid pEA29 was performed with primers A (5'CGGTTTTTAACGCTGGG3') and B (5'GGGCAAATACTC GGATT3') (Bereswill et al., 1995).

RESULTS AND DISCUSSION

Antibacterial efficacy of different medicinal and aromatic plant extracts on *E. amylovora* strain Eakb29 was evaluated using the disc diffusion method to measure the surrounding inhibition zones at 5 doses *in vitro* conditions (Table 1). The mean values of the inhibition zones caused by extract to the bacterial agent ranged from 0 to 22 mm. The inhibition zone increased in a dose-dependent manner for all extracts.

The maximum inhibition zone for the pathogen was obtained for the 20% concentration of *Thymus vulgaris* extract (25 mm for *Erwinia amylovora*) comparison with streptomycin (for each bacterium 34, 31 and 32 mm, respectively) *in vitro*. The lowest inhibition zones of 5, 6 and 9 mm were obtained from *Lavandula officinalis* and *Nigella sativa* at the same concentration dose of extracts, respectively.

Table 1. Zones of growth inhibition* (mm) showing antibacterial activity of plant extracts against *Erwinia amylovora* on paper disc diameter of 5.0 mm

PLANTS	Extract Concentration (%)*				
	20	10	5	2,5	1
Cuminum cyminum	12.0±2.34 ef	5.0±1.18	1.0±1.19	-	-
Eucalyptus globulus	16.0±2.01 f	11.0±2,17	7.0±1.17	1.0±0.72	-
Hedera helix	10.0±2.69 dg	4.0±1.45	0.5±2.10	-	-
Lavandula officinalis	5.0±1.12 j	1.0±0.18	-	-	-
Nigella sativa	6.0±1.91 hj	1.0±0.84	0.3±0.79	-	-
Origanum vulgare	9.0±2.87 g	2.0±0.13	0.6.0±0.90	-	-
Ocimum basilicum	10.0±1.06 fg	4.0±0.13	1.5±0.92	-	-
Rhus coriaria	19.0±1.54 c	14.0±1.97	6.0±0.61	1.0±1.75	-
Rosmarinus officinalis	13.0±1.84 e	8.0±0.16	5.0±0.79	1.0±0.15	-
Salvia officinalis	9.0±1.73 fg	5.0±1.78	1.0±1.06	-	-
Satureja hortensis	13.0±1.59 e	7.0±0.96	4.0±0.89	1.0±0.91	
Thymus vulgaris	25.0±1.46 b	16.0±1.97	9.0±0.61	3.0±1.75	-
Streptomycin (control)	31.0±1.7 a	22.0±2.00	17.0±4.24	10.0±3.10	6.0±3.64

Disease severity (%) and the efficacy (%) of plant extracts to fire blight disease on apple cv. Royal Gala seedlings were determined in greenhouse conditions. The highest efficiency was obtained by *Thymus vulgaris* extract with 61.72% ratio (Table 2).

Table 2. Disease severity and the efficacy of plant extracts to fire blight disease on apple seedlings

Applications	Disease severity (%)	Efficacy(%)
Control (negative control)	91.4 ± 2.40	-
Eucalyptus globulus	51.7 ± 3.20	29.94 d*
Rhus coriaria	32.8 ± 1.11	46.52 c
Thymus vulgaris	29.2 ± 3.52	61.72 b
Streptomycin (positive control)	0.9±1.73	91.29 a

*The values shown are the mean averages of five replications for each *Erwinia amylovora*. The average values in a row followed by different letters are significantly different at $p < 0.05$ according to the Duncan's Multiple Range Test.

Control of fire blight disease remains difficult due to the limited availability of bactericides. Preparations based on copper compounds, which are applied most frequently, are not sufficiently effective in disease management for apple and stone fruit orchards and could have unfavourable effects either on the environment or on human and animal health (Iacobellis et al., 2005; Vanneste et al., 2005). Search of an environmentally friendly biological alternative is a permanent task of present research (Chen et al., 2009). In plant protection, the use of herb essential oils looks promising against plant bacterial pathogens because some of them have a strong antimicrobial activity.

Herbal sensitivity test has paved the way the viable introduction of plants for the treatment of disease causing microorganism in cheaper cost and eco-friendly way. Therefore, it will be more beneficial to put emphasis on biological control of *E. amylovora* through plant extracts instead of antibiotics. Moreover, further researches are necessary to find more plant species and purify the antimicrobial substances present in the crude plant extracts effective against *E. amylovora*.

Extracts of some plant have been shown to be effective against *E. amylovora* and some important bacterial pathogens, thus suggesting their potential use in agriculture as alternatives to or in combination with a reduced amount of copper compounds.

Three plant extracts tested in this study proved useful for effective biocontrol of *E. amylovora* on apple plants. No negative (phytotoxic) effects were recorded on the apple seedlings tested.

In our studies, we obtained moderate antibacterial efficiency from rosemary treatments as a similar result. In further researches, it should be investigated differences of Gram negative and positive

both thyme, sumac and eucalptus treatments and, interactions between host and peroxidase and total protein in the extract treatments.

Thymus plant extracts possess several pharmacological properties, such asspasmolytic, antiseptic, expectorant, antispasmodic, and anti-inflammatory effects. The antimicrobial activities of thyme essential oilare mostly attributed to the active monoterpenephenolic components. These terpene phenolsinteract with the amine and hydroxylamine groupsof the proteins on bacterial membrane altering their permeability and resulting in bacterial death.

Many organic solvents such as benzene, chloroform, ethyl acetate or methanole can be used for extraction of medicinal and aromatic plants.

Comparing with water experiments, methanol extractions of these plants are highly successful (pre-experiments in this study) for this reason we used these method. However, advantages of water extraction are their easily preparation, eco-friendly method and low cost.

In conclusion, the study suggests that medicinal plant, especially sumac, eucalyptus and thyme, extracts could be used as seed treatment to reduce disease incidence and severity. Further investigations are being carried out to understand more thoroughly their role in antibacterial efficacy against different bacterial plant pathogens, as well as their large scale use in disease management. The activity of these plant extract might provide new opportunities to improve control of different bacterial tomato diseases, including bacterial speck, spot, canker and pith necrosis. Preservation of environmental quality and slowing the rate of development of pesticide-resistant strains are some of the benefits that the use of plant extracts can have on IPM and on sustainable agriculture.

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DETERMINATION OF ROOT ROT BACTERIAL PATHOGENS ON SUGAR BEETS IN CENTRAL ANATOLIA AND SUSCEPTIBILITIES OF COMMONLY CULTIVATED SUGAR BEET CULTIVARS TO PECTOBACTERIA

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ABSTRACT

Sugar beet (Beta vulgaris) is considered as one of the most important crops among the other major industrial crops. Bacterial soft rot diseases are very destructive and causing significant losses in sugar beet crop. In this study, soft rot bacteria were obtained from diseased sugar beet during 2016-2017 growing seasons from Konya and Karaman Provinces in Turkey. Biochemical, physiological, morphological and PCR-based molecular assays were performed for identification and characterization of the isolates. The tested isolates grew on nutrient agar at 37°C as well on media with 5% NaCl and CVP selective medium. They gave a positive reaction in hypersensitivity test (HR) on tobacco leaves, similarly in pectolytic activity and pathogenicity test. Catalase test was positive while negative for oxidase and potassium oxidase. Indole and amylase production tests were negative while positive for phosphatase. In addition, the strains demonstrated positivity for acid production from glucose, fructose, lactose and mannitol. PCR assays were conducted by using specific oligonucleotide primers Y1 / Y2, EXPCCR / EXPCCF, ECA1F/ECA2R and L1/G1. According to results, Pectobacterium caratovorum subsp. caratovorum and Pectobacterium betavasculorum were identified as causal agents of soft rot disease on sugar beet plants and the pathogenic Pectobacterium spp. classified according to traditional and molecular tests. In addition, it was determined the reactions of widely cultivated sugar beet cultivars against Pectobacteria. Understanding host - pathogen interactions depended on well characterized pathogens will help to manage the bacterial diseases on sugar beet.

Keywords: *sugar beet, Pectobacterium, soft rot, PCR, characterization*

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is regarded to be an outstanding product of breeding studies among food crops in global use. It also became a model for genetics and breeding techniques to improve plant efficiency and productivity. At that moment, growing sugar beets in Europe altered the prior monoculture of tiny grains and brought the notion of crop rotation. This developed the fertilization scheme, likewise improved soil fertility and reduced weed problems, while providing livestock with a source of food from beet tops, crowns and pulp (Harveson, 2015). In 2017, Russian Federation was the first sugar beet producer on the world by 51,933,913 tons as part from the global production (301.015.696 tons), followed respectively by France, Germany, USA and Turkey as top 5 sugar beet producers (Anonymous, 2019).

Sugar beet can be threatened also by a number of various pathogenic bacteria such as *Pseudomonas syringae* pv.*aptata* (Bacterial leaf spot), *Pantoea agglomerans* pv. *betae* (Bacterial pocket), *Pectobacterium betavasculorum* (Bacterial vascular necrosis and rot) and *Pectobacterium carotovorum* subsp. *Carotovorum* (Bacterial soft rot) (Draycott, 2006).

The soft rot disease is regarded as one of the most significant and important among sugar beet diseases, transmitted by seeds, causing significant losses on seed quality, yield and epidemics under favorable conditions. In Turkey, sugar beet crop is considered important due to its contribution to the development of plant and animal production sectors, maximizing industrial inputs exploitation, the improvement of physical structures and the ecological balance of soils and increasing the yield of the products to be planted. It creates 25-30 million tons of business volume per year for the transportation sector. The total economic contribution to the national Turkish economy is approximately 1.2 billion dollars (Anonymous, 2018).

In this study, the purpose is to characterize the pathogen by biochemical and molecular methods and also to execute its importance for Konya and Karaman province in Turkey. Till now, causal agents couldn't be determined by basing on symptomatological methods, because these latter are ineffective. Until molecular assays are more easily accessible depending on the full genome sequence of individual taxons, Soft rot bacteria identification will continue to depend whenever possible on multiple supplementary probes and methods being used simultaneously The development of appropriate control strategies with the disease primarily depends on the accurate identification. Development of control methods and improvement programs will facilitate, through accurate and in short time identification of bacterial soft rot disease caused by Pectobacteria. In addition, this study serves the reactions of widely cultivated sugar beet cultivars against Pectobacteria.

MATERIAL and METHODS

Konya which met 35.5% of the sugar beet production in Turkey and some counties (Aksehir, Altinekin, Beysehir, Cihanbeyli, Celtik, Cumra, Eregli, Kadinhani, Kulu, Ilgin, Konya Central, Seydisehir, Yunak districts of Konya province), and Karaman province including 4 in acreage root rot has been conducted to identify bacterial pathogens. In the pre-harvest period in 2015 (in September and October); Root samples were taken in 124 fields in order to determine bacterial factors in plants showing signs of discoloration and soft rotting in the form of blackening of the roots in sugar beets showing wilted places and in places where there were dead areas. In 2016, 105 sugar beet seedling samples were collected in order to determine the root causes of blight by carrying out surveys in the same region sowing areas of the same factories during the seedling period (in May). In the surveys conducted on various dates in August, September and October; Disease plant samples were collected in 102 fields to determine bacterial agents. During the month of May 2017 and in the first week of June; a total of 345 fields were investigated. A total of 312 root samples were collected from these fields, in places where there were dead areas and wilted sugar beets.

The isolations were made of leaves, stems and tubers showing signs of rot or wilt. For this purpose, the infected parts were washed thoroughly in tap water to remove soil and dust residues and subjected to surface sterilization in 70% ethanol for 1 minute. After rinsing 3 times with sterile distilled water (SDS), the pieces which were cut with the help of a sterile scalpel and the patient and healthy tissue were incubated for 30-45 minutes in a 150 rpm mixer in 5 ml SDS. The resulting suspensions were diluted 10^1–10^5 times and spread nutrient agar (NA) and King's B (KB) media. These media containing the first isolations were developed for 48 hours at 28 ºC and then the bacteria were purified by line planting from these colonies to different selective media.

Selective or semi-selective media were tested for growth. The obtained morphological characteristics of the bacterial isolates were eosin methylene blue (EMB), yeast peptone glucose agar (YPGA), crystal violet Pectate (CVP), modified Miller-Schroth's medium, nutrient glycerol manganese chlorite (NGM) medium was determined. 25% glycerin stock cultures of all bacterial isolates were prepared and stored in deep freezer (-80) until used for all tests.

In biochemical and physiological tests, Gram reaction, mobility, tolerance to NaCl at different concentrations (1-7%), catalase production, phosphatase activity, oxidase production, growth at 37 ^{0}C, nitrate reduction, fluorescent pigment production in KB medium, fermentative reaction, eesculin hydrolysis, arginine dihydrolase test, pigment production, production of H_2S from thiosulphate and cystein, pectolytic activity in potato, liquefaction of the gelatine, litmus milk test, coagulation test, acetoin production, gas production from glucose, saccharose reduced compounds test, indole production, erythromycin sensitivity, urease production, acid production from ribose, xylose, glucose, lactose, sucrose, maltose, metil-methyl glucoside, melibioose, cellobiose, trehalose and sorbitol, and use of citrate and malonate tests (Schaad et al., 2001; Fassihiani and Nedaeinia, 2008). Positive control bacterial isolates of domestic and foreign origin were used in all tests.

In DNA isolation and PCR, Qiagen isolation kit was used for genomic DNA isolation of the bacterial isolates. In PCR tests, specific oligonucleotide primers and universal primer sets for different bacterial factors were identified. With the aim of soft rot bacterial identification, Y1 / Y2 (Darrass et al., 1994), EXPCCR / EXPCCF (Kang et al., 2003), ECA1F / ECA2R (De Boer and Ward, 1995), L1 / G1

(Toth et al., 2001), ECH1 / ECH1 and ADE1 / ADE2 (Nassar et al., 1996), VirD2 (Haas et al., 1995) specific primers were used in PCR assays.

In pathogenicity tests of isolated the bacteria, bacterial suspensions of 10^8 CFU/ml prepared with a total of 35 isolates randomly selected from each bacterial genus were made by inoculating the first two true leaves of Aranka beets to the petiols with a hypodermic syringe. After inoculation, the plants were kept in the greenhouse for 3 weeks under 28ºC temperature, 75-80% humidity and 16 hours light-8 hours dark conditions. A scale of 0-5 was used for symptom evaluation (Zidack and Jacobsen, 2001).

In determination of susceptibility to beet cultivars widely cultivated against bacterial factors causing root rot, Aranka, Bernace, Cigogne, Eldorado, Mohican, Rodeo, Serenada and 4K 515 beet varieties were grown in pots in the climate room of the Sugar Institute for susceptibility testing of beet varieties against bacterial root rot agents. According to the experiment, randomized block design, 4 replicates were established for each variety and each bacterial isolate. Eight weeks after sowing, the healthiest plants were tested. In the experiment, *Pectobacterium betavasculorum* isolates, Pb146, Pb165, Pb178, Pb179 and Pb195, and *Pectobacterium caratovorum* subsp. *caratovorum* isolates, Pc11, Pc14, Pc58 and Pc389 were used. Bacterial inoculations were performed with the aid of a hypodermic syringe, inoculating bacterial suspensions of 10^8 CFU/ml in the first two true leaf petioles. After inoculation, the plants were kept in the greenhouse at 28ºC temperature, 75-80% humidity and 16 hours light-8 hours dark conditions for 5 weeks. According to Zidack and Jacobsen (2001), susceptibilities were evaluated and classified by 0-5 resistance levels.

RESULTS and DISCUSSION

The project was carried out in order to determine the fungal and bacterial factors causing significant damage to sugar beet tubers. The gaps caused by the disease in the sampled fields ranged between 5-30% and macroscopic symptoms were evaluated as fungal, bacterial, viral and different physiological problems. The most typical symptoms observed in beet specimens suspected of bacterial disease were; blackening in the form of soft rot, color change in the transmission bundles and dead areas in the field. During the survey, isolation studies were carried out from 159 out of 226 field samples which were thought to be contaminated with bacterial agents.

Biochemical, Morphological and Physiological Tests for Bacterial Identification

In the study, according to Schaad et al. (2001); Dimic (2006); Fassihiani and Nedaeinia (2008), biochemical, morphological and physiological diagnoses were made. Obtaining to the findings;

* *Xanthomonas* spp. in 4 samples (1st Term, 2015 survey) and (2nd Term, 2016 survey)

* *Pectobacterium betavascolorum* and *Pectobacterium caratovorum* subsp. *caratovorum* in 86 samples, (1st Term, 2015 survey) and (2nd Term, 2016 survey)

* *Dickeya chrysanthemi* in 2 samples (1st Term, 2015 survey)

* *Pseudomonas* spp. in 61 samples, (1st Term, 2015 survey) and (2nd Term, 2016 survey)

* *Rhizobium radiobacter* in 2 samples (1st Term, 2015 survey)

* *Streptomyces* spp. in 1 sample (1st Term, 2015 survey) were determined. Results of biochemical, morphological and physiological tests of the isolated bacteria were shown Table 1.

Table 1. Biochemical, morphological, physiological and molecular diagnostic tests results of sugar beet root rot causing bacterial agents in Konya and Karaman Provinces

Tests	Bacterial Pathogens Isolated from Sugar Beets									
	Pa (R)	Pcc (R)	Pcc (%)	Pb (R)	Pb (%)	Dc (R)	Dc (%)	Ps (%)	Rr (%)	Xt. (%)
Gram reaction	-	-	100	-	100	-	100	100	100	100
Fluorescent pigment product. on KB	-	-	100	-	100	-	100	69	-	-
Cavity on CVP	+	+	96	+	92	+	93	7	-	-
Growth at 37 ºC	–	+	99	+	100	+	100	38	+	+ / -
Growth at 5% NaCl	+	+	100	+	100	-	92	29	-	-
Fermentative growth	+	+	100	+	100	+	100	0	0	0
Pectolitic activity	+	+	94	+	89	+	100	11	0	0
Oxidase production	-	-	2	-	0	-	0	73	0	+ / -

Sensitivity to erythromycin	-	-	100	-	100	+	100	82	+	+ / -
Compounds reducing from sucrose	+	-	92	-	94	-	100	36	NT	NT
Indol production	−	-	87	-	93	+	100	68	NT	NT
Phospatase production	−	-	100	-	95	+	50	46	NT	NT
Malonate using	−	-	87	-	92	+	100	48	NT	NT
Acid production from lactose	+	+	93	+	87	+	100	46	NT	NT
Acid production from maltose	+	-	100	+	100	-	100	0	NT	NT
Acid production from α-methyl glucoside	+	-	100	+	100	-	100	36	50	0
Acid production from sorbitol	−	-	100	-	100	-	100	36	NT	NT
Acid production from trehaloze	+	+	88	+	91	-	100	NT	NT	NT
HR on tobacco cv. Benthemiana	+	+	84	+	76	+	50	62	0	40
PCR; Y1 / Y2 primer seti	+	+	96	-	100	-	100	NT	NT	NT
PCR; EXPCCR / EXPCCF primer seti	-	+	100	-	100	-	100	NT	NT	NT
PCR; L1/G1 primer seti	-	+	100	+	92	-	100	NT	NT	NT
PCR; ECH1 / ECH1' primer seti	-	-	100	-	100	+	100	NT	NT	NT
PCR; virD2 spesifik primerleri	NT	NT	NT	NT	NT	NT	NT	NT	100	NT

Pa: *Pectobacterium atrosepticum*, Pcc: *Pectobacterium caratovorum* subsp. *caratovorum*, Pb: *Pectobacterium betavasculorum*, Dc: *Dickeya chrysanthemi*, R: Referance culture,

Pcc, Pb, Dc, Ps, Rr, Xt; Bacterial isolates obtained in experiments,

(%):The ratio of the reactions of the obtained bacterial isolates to the tests (based on the reference culture), NT: not tested

Reactions of Sugar Beet Cultivars Widely Cultivated against *Pectobacteria* spp.

Sugar beet cultivars Aranka, Bernace, Cigogne, Eldorado, Mohican, Rodeo, Serenada and 4K 515 were grown in pots in the climate room of the Sugar Institute for susceptibility testing of beet varieties against bacterial root rot agents. The experiment was established according to randomized block design and the number of replicates was 4 for each bacterial isolate. Eight weeks after sowing, the healthiest plants were tested. The reactions of the sugar beet cultivars against soft rot *Pectobacteria* spp. are presented in Table 2.

Table 2. Reactions of Different Sugar Beet Cultivars against Bacterial Root Rot Agents

Sugar Beet Cultivar	Bacterium	Susceptibility Class	Sugar Beet Cultivar	Bacterium	Susceptibility Class
Aranka	Pb146	**OD**	Mohican	Pb146	**OH**
Aranka	Pb165	**OH**	Mohican	Pb165	**H**
Aranka	Pb178	**OH**	Mohican	Pb178	**OH**
Aranka	Pb179	**OH**	Mohican	Pb179	**H**
Aranka	Pb195	**OH**	Mohican	Pb195	**H**
Aranka	Pc11	**OH**	Mohican	Pc11	**H**
Aranka	Pc14	**OH**	Mohican	Pc14	**H**
Aranka	Pc58	**OD**	Mohican	Pc58	**OH**
Aranka	Pc389	**OH**	Mohican	Pc389	**OH**
Aranka	Control	**-**	Mohican	Control	**-**
Bernace	Pb146	**OD**	Rodeo	Pb146	**OD**
Bernace	Pb165	**OH**	Rodeo	Pb165	**OD**
Bernace	Pb178	**OH**	Rodeo	Pb178	**D**
Bernace	Pb179	**OD**	Rodeo	Pb179	**D**
Bernace	Pb195	**OD**	Rodeo	Pb195	**OH**
Bernace	Pc11	**OH**	Rodeo	Pc11	**OD**
Bernace	Pc14	**OD**	Rodeo	Pc14	**OH**
Bernace	Pc58	**OD**	Rodeo	Pc58	**OH**
Bernace	Pc389	**OD**	Rodeo	Pc389	**OD**
Bernace	Control	**-**	Rodeo	Control	**-**

Cigogne	Pb146	**OH**	Serenada	Pb146	**OH**
Cigogne	Pb165	**H**	Serenada	Pb165	**OH**
Cigogne	Pb178	**OH**	Serenada	Pb178	**OH**
Cigogne	Pb179	**OH**	Serenada	Pb179	**OH**
Cigogne	Pb195	**OH**	Serenada	Pb195	**OH**
Cigogne	Pc11	**H**	Serenada	Pc11	**OH**
Cigogne	Pc14	**H**	Serenada	Pc14	**OH**
Cigogne	Pc58	**H**	Serenada	Pc58	**OH**
Cigogne	Pc389	**OH**	Serenada	Pc389	**OH**
Cigogne	Control	-	Serenada	Control	-
Eldorado	Pb146	**OH**	4K 515	Pb146	**H**
Eldorado	Pb165	**OH**	4K 515	Pb165	**H**
Eldorado	Pb178	**OH**	4K 515	Pb178	**H**
Eldorado	Pb179	**OH**	4K 515	Pb179	**OH**
Eldorado	Pb195	**OH**	4K 515	Pb195	**H**
Eldorado	Pc11	**OH**	4K 515	Pc11	**H**
Eldorado	Pc14	**OH**	4K 515	Pc14	**H**
Eldorado	Pc58	**OH**	4K 515	Pc58	**H**
Eldorado	Pc389	**OH**	4K 515	Pc389	**H**
Eldorado	Control	-	4K 515	Control	-

Middle resistant (OD), Middle susceptible (OH), Susceptible (H)

Pc: *Pectobacterium caratovorum* subsp. *caratovorum*, Pb: *Pectobacterium betavasculorum*

Bacterial root rot agents in sugar beet are usually *Pectobacterium carotovorum* subsp. *carotovorum, P. atrosepticum, P. betavasculorum*, (Thomson et al., 1977). Cracks occur due to overgrowth, especially at the beginning of plants that receive more nitrogen fertilizer. Bacteria from these cracks lead to plant deaths, especially by introducing *P. carotovorum* and creating soft rot (Schroth et al., 1979). In addition, other bacterial agents causing damage to sugar beet tubers; *Xanthomonas beticola*, *Dickeya chrysanthemi, Rhizobium radiobacter, Curtobacterium flaccumfaciens* pv. *betae* (Thomson et al., 1981; Fassihiani and Nedaeinia, 2008).

In the survey studies, only fungal agents were detected in 6% of the sugar beet tubers with rottenness, while only 68-71% of the bacteria or bacteria-fungus mixture infections were detected (Strausbaugh and Gillen, 2009). In recent years, especially in Konya cultivation areas, beet tuber rots have been detected and this situation has been observed to increase gradually. Especially *Pectobacterium* spp. obtained from the survey studies in the project, which cause soft rot in different vegetables, ornamental plants and fruits, cause important economic losses during land and storage conditions and during transportation (Perombelon and Kelman, 1980; Pitman et al., 2008). In sugar beet, *P. carotovorum* subsp. *carotovorum, P. betavasculorum* and *P. atrosepticum* molecular, biochemical and host-level differences have been demonstrated in various studies (Perombelon and Kelman, 1980; Gardan et al., 2003; Ma et al., 2007). High temperature, humidity, unsuitable storage conditions and poor transport conditions promote factors of soft rot. Losses due to this disease are reported to be between 15-30% with the most optimistic estimate (Agrios, 2006). Among these agents, sugar beet-specific *Pectobacterium betavasculorum* can cause product losses of over 40% (Thomson et al., 1981). The disease can cause severe symptoms at warm temperatures of 24ºC and slightly above. An effective chemical in disease control is not known, but biological control possibilities are being studied (Thomson et al., 1977).

During our survey, isolation studies were carried out from samples taken from 159 samples of 226 fields thought to be contaminated with bacterial factors. Within the scope of the project, the identification of bacterial pathogens that may cause losses in sugar beet in the region is important in terms of determining the pathogen caused by the observed symptoms as well as planning the combat possibilities considering the characteristics of the pathogen.

In this study, the reactions of the varieties against the important bacterial pathogens were evaluated. 8 different beet varieties (Aranka, Bernace, Cigogne, Eldorado, Mohican, Rodeo, Serenada and 4K 515) which were included in the experiment showed moderate sensitivity to different isolates of beet bacterial rot agents (*Pectobacterium caratovorum* subsp. *caratovorum* and *Pectobacterium betavasculorum*). Bernace and Rodeo sugar beet cultivars showed higher resistance to bacterial rot agents, while Cigogne, Mohican and 4K 515 cultivars had higher susceptibility to disease. With this project, while presenting the current state of the sugar beet bacterial diseases, which is one of our most important economic products for our country, it formed the basis for the studies of sugar beet - bacterial pathogen interactions planned in the future.

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SALINITY AND ALKALINITY OF SURFACE AND GROUND WATER RESOURCES IN TURKEY

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ABSTRACT

Alkalinity and salinity present in surface and ground water resources causes agricultural and environmental degradation on both regional and global scales. Numerous studies assess surface and ground water quality in Turkey on the local scale; none of these existing studies, however, evaluate quality of surface and ground water resources throughout Turkey. The present study evaluates surface and ground water quality throughout Turkey by the systematic analysis of excess alkalinity and its effect on salinization chemistry. This study searched all existing data published under keywords "water quality", "water salinity", "water alkalinity", and "water physico-chemical properties" (published in both English and Turkish). A subset of over 230 analyses contains sufficient major ion results for sodicity-risk and alkalinity analysis of Tigris and Kizilirmak rivers, the Bafra delta, Lake Tuz, and Turkish Lakes Region. A quarter of the samples are saline (electrical conductivity exceeds 4 dS m^{-1}). Excess calcite alkalinity is a concern because a third of the surface and groundwater samples have an alkalinity content that exceeds the dissolved calcium content. This means irrigation using these waters will lead to alkalinity salinization with a heightened potential for sodicity.

Keywords: *water salinity, water alkalinity, surface waters, ground water, waters of Turkey*

INTRODUCTION

The World Resource Institute and other similar organizations use a variety of parameters to assess the withdrawal of fresh water from renewable surface and ground sources. One of these is the *water stress index WSI*, which is the ratio of annual water withdrawal to renewable resources, regardless of whether the renewable source arises the country in question. The World Resources Institute rates Turkey as high stress ($WSI \approx 40\%$).

The *water stress index WSI*, however, does not account for water quality, specifically salinity and sodicity. If the renewable water resource has a high salinity, then ineffective salinity management may require increased withdrawal to reverse and maintain salinization. This paper evaluates water analyses for a range of freshwater resources in Turkey to provide a preliminary water quality assessment for the nation.

Of particular interest is the alkalinity of the various water resources because this determines whether salinization in irrigated soils will lead to increased soil alkalinity and the development of sodicity which can compromise salinity management. If the source water leads to increased soil alkalinity it will lead to higher exchangeable sodium levels in the irrigated soil when has a high probability of reducing water infiltration at the soil surface and hydraulic conductivity within the soil profile, both of which make salinity management much more difficult.

METHODS

This study searched all existing data published under keywords "water quality", "water salinity", "water alkalinity", and "water physico-chemical properties" (published in both English and Turkish). This study assessed 740 water analyses published in peer-reviewed papers. After appropriate statistical analysis and reviewing data quality and completeness this number was reduced to 380 water analysis. These papers were selected because they reported the concentration of all major ions (sodium, potassium, magnesium, calcium, alkalinity, chloride and sulfate) and electrical conductivity. Many other papers were reviewed and rejected for our purposes because the data were incomplete.

A common sodicity risk parameter is the *sodium adsorption ratio SAR* (expression (1) of the water source. As we will see, the *SAR* of the source water is insufficient to predict its change under salinization.

$$SAR = c_{Na}/\sqrt{c_{Mg} + c_{Ca}}\ [units: mmol \cdot dm^{-3}] \quad (1)$$

Evaporation through soil water loss will lead to the precipitation of the calcite $CaCO_3(s)$ in the soil. The removal of calcium and alkalinity from solution during calcite precipitation may cause the evolving *SAR* (1) to increase rapidly of the source water alkalinity is relatively high or much less rapidly if the source water alkalinity is relatively low (Hardie and Eugster, 1970).

This paper uses the relative *calcite alkalinity* (3) adapted from Hardie and Eugster (1970) to predict whether salinization results in increasing or decreasing soil alkalinity under soil water loss.

$$Calcite\ Alklainity = log_{10}(c_{Alk}/c_{Ca})\ [units: mmol_c \cdot dm^{-3}] \quad (2)$$

If *calcite alkalinity* is greater than unity (1) then salinization will lead to increasing alkalinity and a rapid increase in the *SAR* of moisture in the soil profile. If, on the other hand, *calcite alkalinity* is less than unity (1) then salinization will lead to decreasing alkalinity and a much slower increase in the *SAR* of moisture in the soil profile. We associate excess *calcite alkalinity* with elevated sodicity risk if the water source is used for agricultural irrigation.

Consider the effect of evaporation on water with excess calcite alkalinity, as calcite precipitation removes calcium and alkalinity in a fixed stoichiometric ratio the Alk/Ca moles-of-charge ratio will increase as calcium is removed at a disproportionately higher rate than alkalinity. In the limit $c_{Ca} \ll c_{Mg}$ the solution *SAR* approaches (3). Because this is the result of evaporative concentration, the final salinity EC_f is greater than the initial salinity EC_i leading to a limiting sodium adsorption ratio $LSAR(EC_f)$ defined by (4).

$$\lim_{c_{Ca} \to 0} SAR = c_{Na}/\sqrt{c_{Mg}}\ [units: mmol \cdot dm^{-3}] \quad (3)$$

$$LSAR(EC_f) = \sqrt{EC_f/EC_i} \cdot c_{Na}/\sqrt{c_{Mg}}\ [units: mmol \cdot dm^{-3}] \quad (4)$$

The *limiting sodium adsorption ratio* $LSAR(EC_f)$ is defined only if there is excess calcite alkalinity (2), otherwise calcite precipitation disproportionately removes alkalinity.

A multiple linear discriminant analysis was used to determine whether there existed systematic variation in water samples from different regions by using JMP package. The differences between each group (i.e., region) are based upon multivariate normal for each group. The analysis was performed using the DISCRIM procedure in SAS/STAT, assuming the data is normally distributed. The classification criterion is examined by a measure of generalized squared distance based on the pooled covariance matrix yielding a linear function.

Pearson's correlation analysis was used to evaluate relationships between water quality indicators and chemistry of each regions surface and ground water supplies by using JMP package of SAS 9.3 (SAS, 2014).

RESULTS

Figure 1 plots the locations where water samples meeting the standard defined earlier for our irrigation water quality assessment.

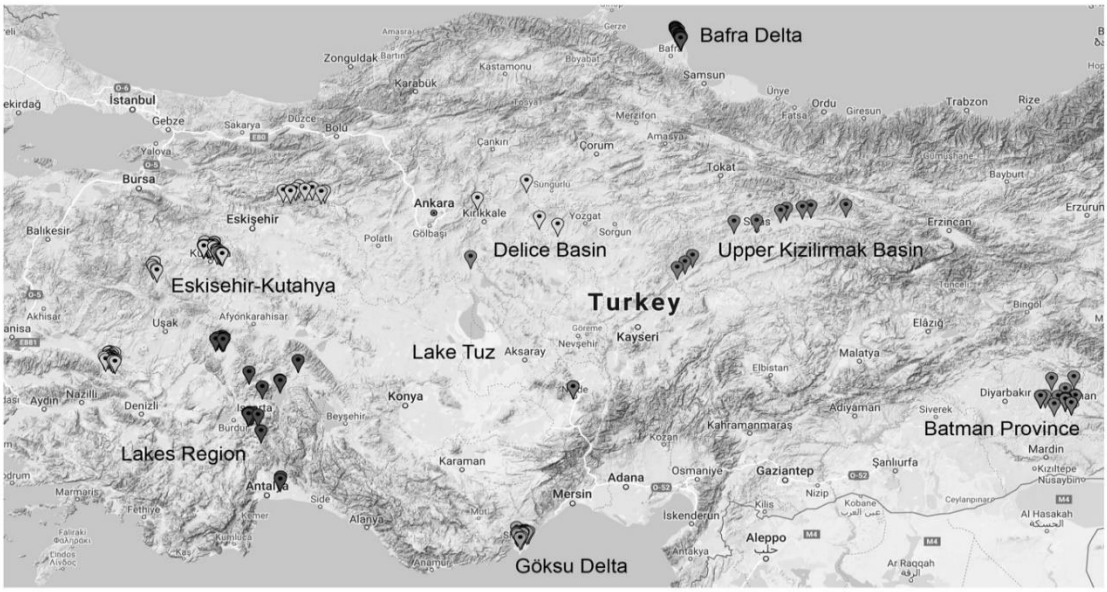

Figure 1. A map of Turkey plotting the location of the water samples evaluated in this report.

Figure 2 plots the *calcite alkalinity* (2) of all water samples included in this report. The alkalinity-to-calcium ratio ranges from 0.1 to greater than 10, a range of two orders of magnitude. Roughly half of the water samples (plotting to the left of the graph) have low initial alkalinity while half (plotting to the right of the graph) have high initial alkalinity.

The data show a trend toward decreasing calcium solubility as the alkalinity-to-calcium ratio increases; this is merely the effect of the ratio on calcite solubility. We can clearly see that as water becomes more alkaline calcium solubility decreases which will cause the *SAR* (2) to increase, thereby increasing sodicity risk.

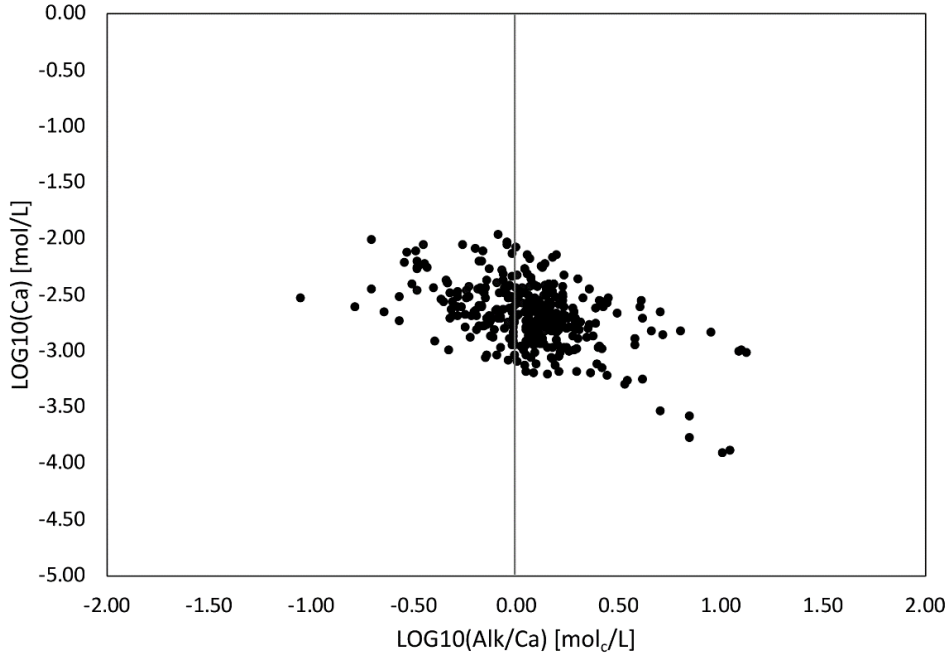

Figure 2. The alkalinity-to-calcium ratio (base-10 logarithmic scale) for all samples is plotted on the horizontal axis and the dissolved calcium concentration (base-10 logarithmic scale) is plotted in the vertical axis. The red line represents an alkalinity-to-calcium ratio of unity.

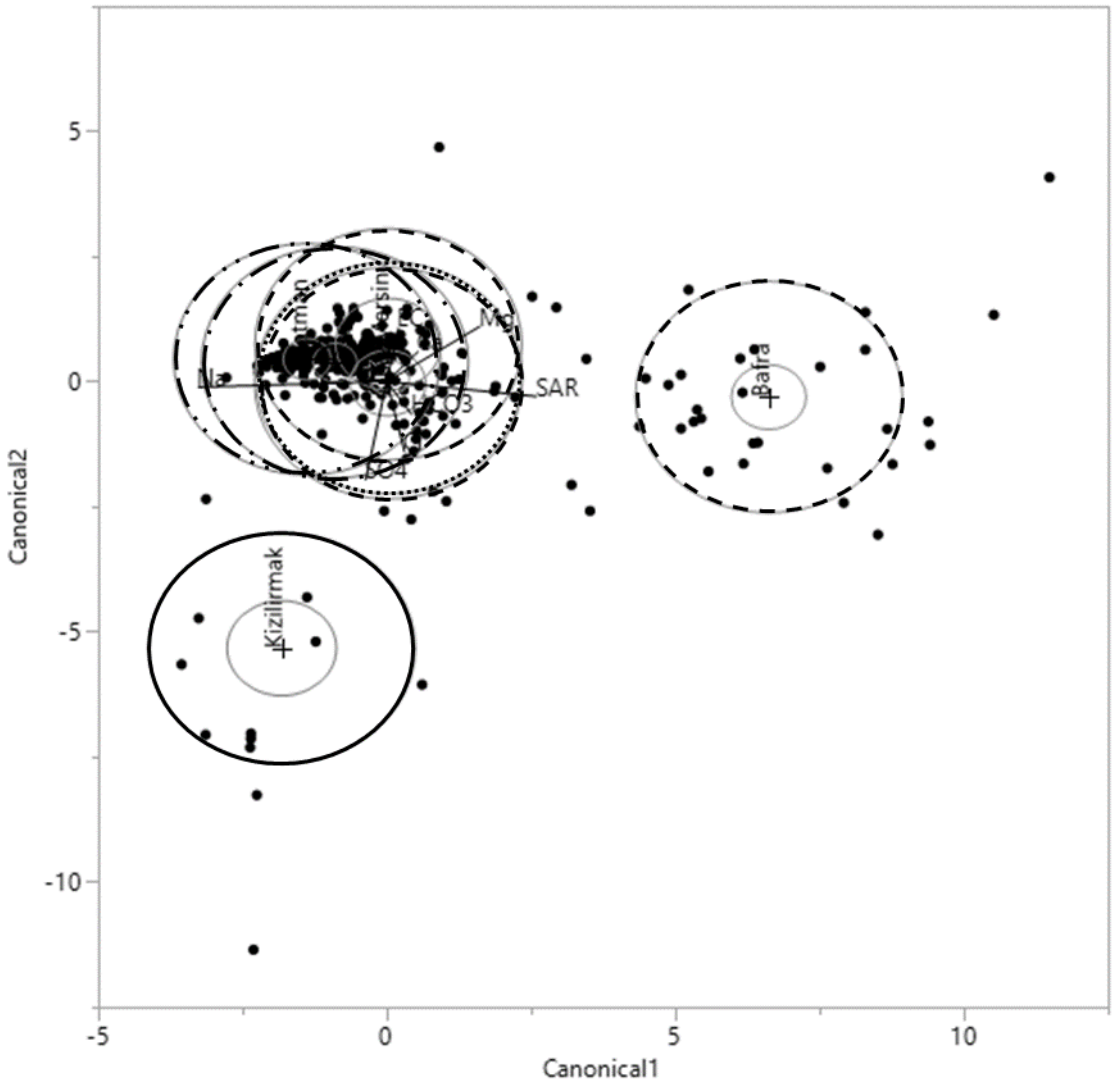

Figure 3. Multi-linear discriminant analysis of all water data (major ion concentrations, electrical conductivity and SAR) included in this report p<0.05. The circles indicate each group (region) where parameters represented by lines. Length of each line indicate weight of each parameter.

Multi-linear discriminant analysis of all solution data (Figure 3) reveals three distinct groups: groundwater samples from the Bafra delta on the Black Sea coast, surface water samples collected from the Delice river basin, and all other sources.

Figure 3 should be considered a purely statistical assessment of water data and unable to reveal the underlying chemical basis for the unique characteristics of the various water-source groupings. The distinct characteristics of groundwater from the Bafra delta is easily explained as the result of saltwater intrusion along the eastern coast of the delta (insert references). We will take up the chemical basis for the distinct properties of surface water from the Delice river basin below.

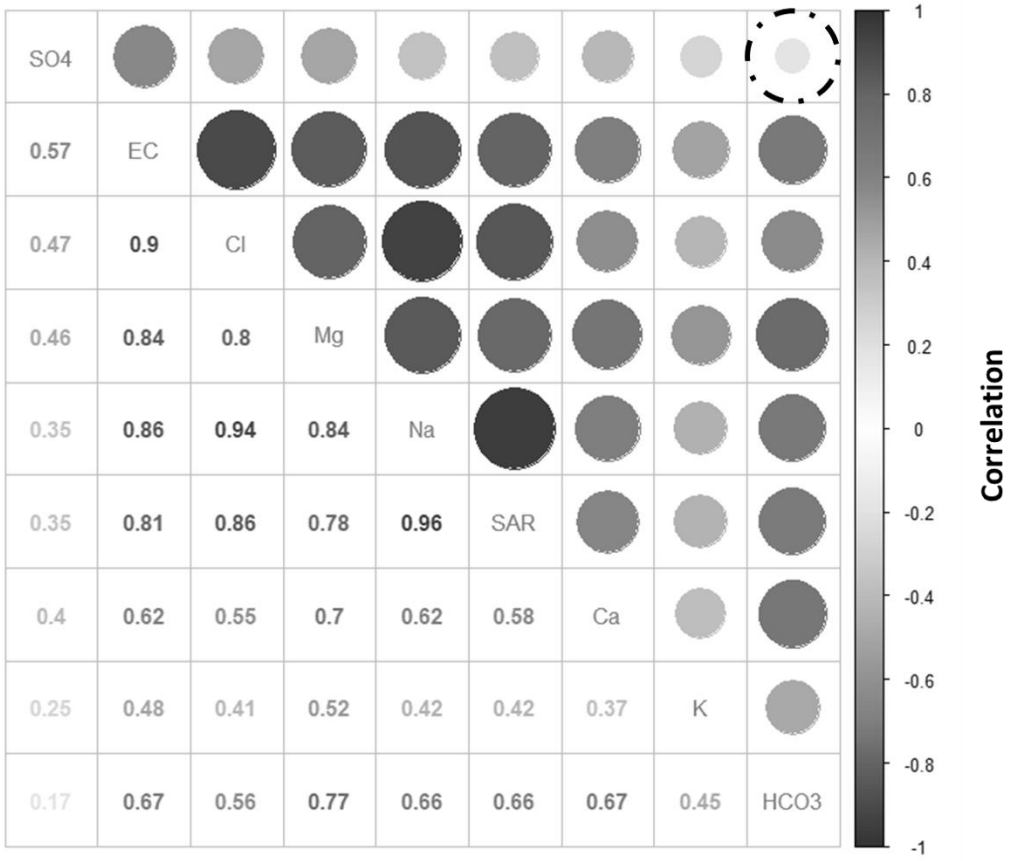

*Figure 4. Pearson's correlation analysis diagram based on the solution data listed in the figure *p<0.05; **p<0.01; ***p<0.001. The numbers on diagram indicate whether the correlation between parameters is positive (no sign) or negative ("-") and the magnitude of the correlation coefficient. The shading intensity and size of the circles in the upper right denotes the magnitude, while the numerical values in the lower left lists the magnitude and sign of the correlation. EC, electrical conductivity and SAR, sodium absorption ratio.*

Figure 4 plots the Pearson's correlation diagram for the entire data set. The reader should note the correlation between dissolved sulfate and bicarbonate (or alkalinity) is quite small (cf. red circle).

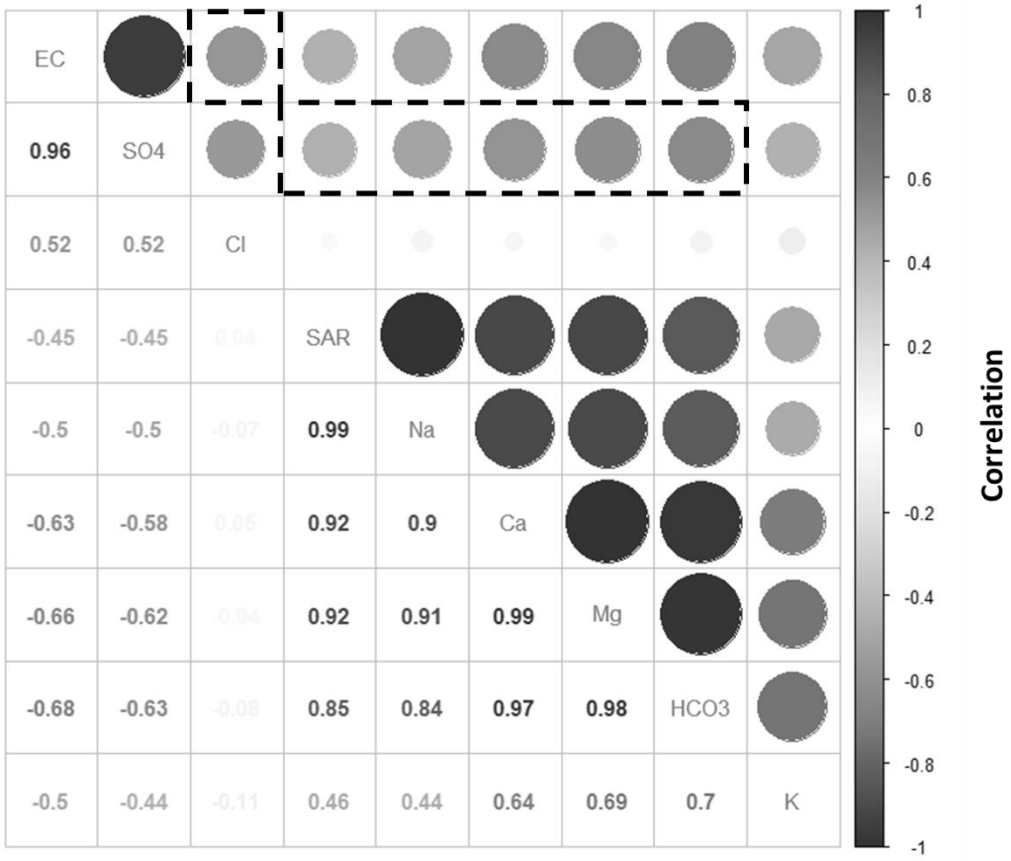

*Figure 5. Pearson's correlation analysis diagram for the Delice river basin, based on the solution data listed in the figure *p<0.05; **p<0.01; ***p<0.001. The numbers on diagram indicate whether the correlation between parameters is positive (no sign) or negative ("-") and the magnitude of the correlation coefficient. The intensity of color and size of the circles chart denotes the magnitude and direction of the relationship. EC, electrical conductivity and SAR, sodium absorption ratio.*

The Pearson's correlation diagram in Figure 5 is quite different from the correlation diagram for all sites (Figure 4). The chemistry of the Delice basin shows significant negative correlations between sulfate and all major cations and alkalinity not found elsewhere (cf. Figure 4).

The statistical assessment found in figures 3-5 point to a distinct chemistry for the surface water in the Delice river basin (Figure 6). The the Delice basin sample sites include a site on the Kizilirmak river near Hacibali Turkey at the upper end of a reservoir created by a hydroelectric dam near Yalimköy, Turkey.

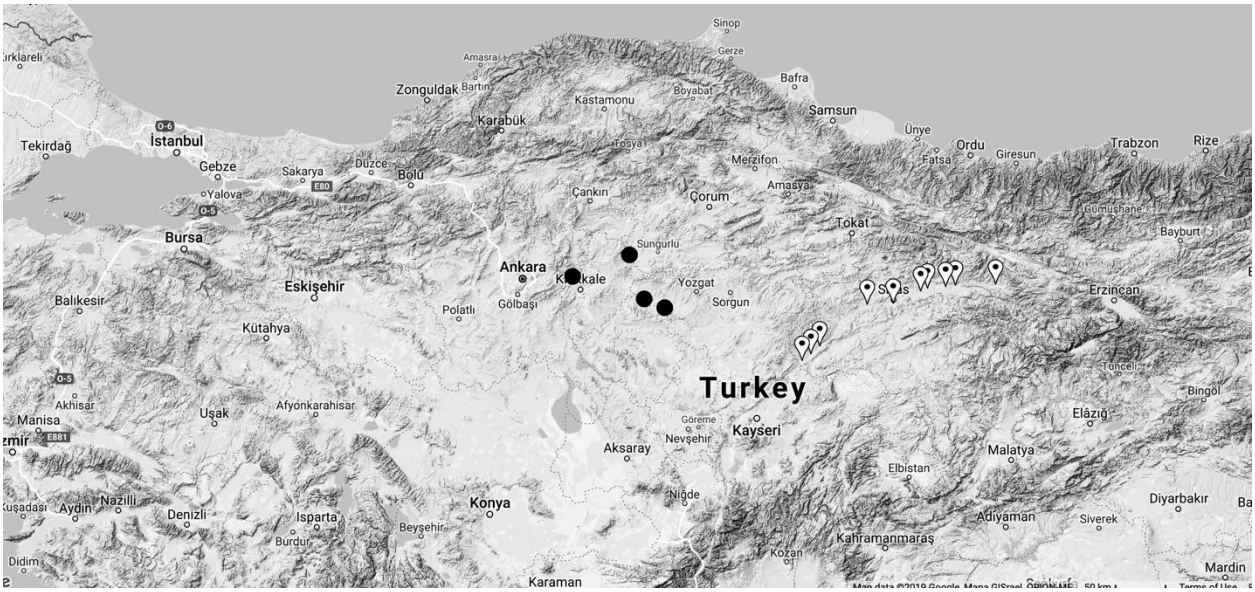

Figure 6. Sample sites along the Upper Kizilirmak river from Zara to Egerci (white pins) and in the Delice river basin (black dots). The western site (black dot) located at 39.95033333 N, 33.41958333 E in the vicinity of Hacibali is on the Kizilirmak river below the Delice-Kazilirmak confluence near Kula, Turkey.

Figure 6. Sample sites along the Upper Kizilirmak river from Zara to Egerci and in the Delice river basin. The site located at 39.9503 N, 33.4196 E (in the vicinity of Irmak and Hacibali, Turkey) is on the Kizilirmak river below the Delice-Kazilirmak confluence.

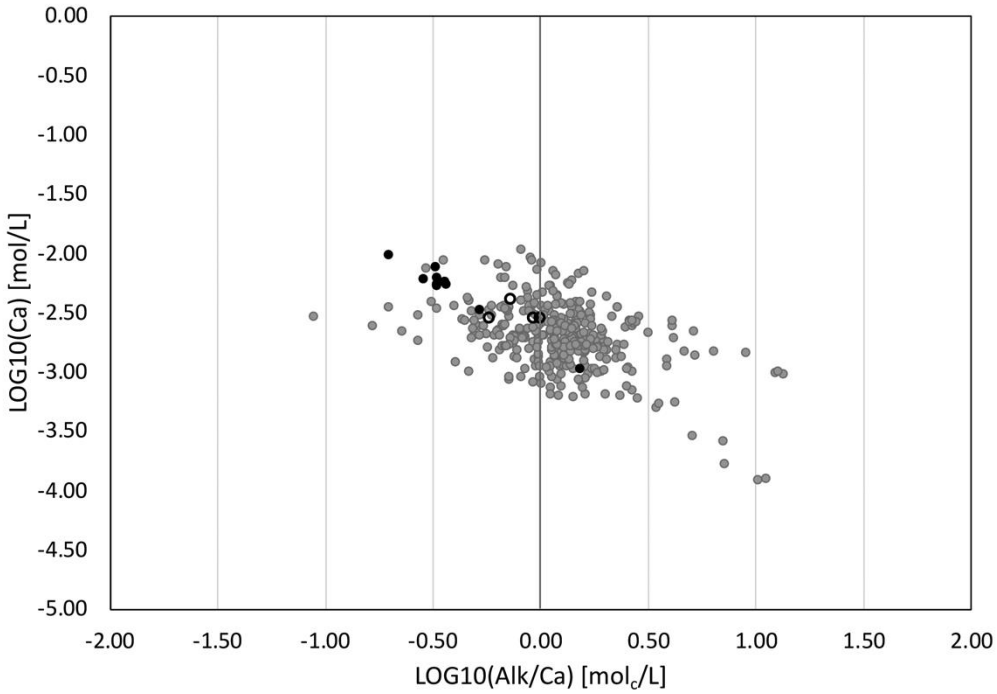

Figure 7. The alkalinity-to-calcium ratio (base-10 logarithmic scale) is plotted on the horizontal axis and the dissolved calcium concentration (base-10 logarithmic scale) is plotted in the vertical axis. All samples are plotted as filled grey circles, samples from the Upper Kizilirimak basin as filled black circles and samples from the Delice basin as open circles. The vertical line through zero represents an alkalinity-to-calcium ratio of unity.

Figure 7 plots the calcite alkalinity data of all sites (filled grey circles), the Upper Kilizirmak river basin from Zara to Eğerci (filled black circles) and the Delice basin (open black circles). Clearly, the Kizliirmak and Delice rivers have low relative calcite alkalinity. This, by itself, suggests a diminished potential to develop high SAR under salinization.

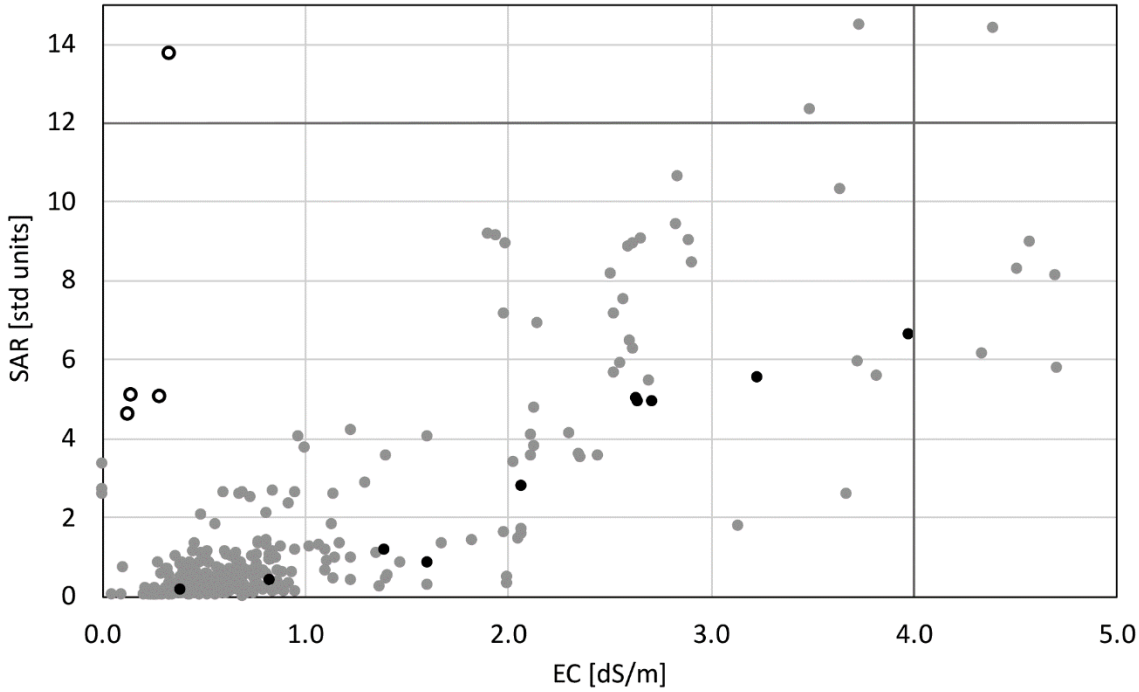

Figure 8. The (EC, SAR) coordinates of source water samples from the Upper Kizilirmak basin are plotted as filled black circles, coordinates for water samples from the Delice basin are plotted as open circles and coordinates from all other regions are plotted as filled grey circles. The vertical line through 4 dS/m is the salinity threshold while the horizontal line through SAR = 12 is the sodicity threshold.

Figure 8 plots the source SAR for water samples from the Upper Kizilirmak basin (filled black circles) and the Delice basin (open black circles), data from all other sites are plotted as filled grey circles to provide context. Lines in Figure 8 delineate the salinity threshold of 4 dS/m and the *SAR* = 12 sodicity threshold. The reader can see water from the Upper Kizilirmak basin is quite saline with several samples in the range from 2-4 dS/m. This clearly indicates a salinization risk if these locations are used for irrigation. The sodicity risk of the Upper Kizilirmak river basin is well below the SAR = 12 sodicity threshold and, given low calcite alkalinity of this water (Figure 7) we can conclude the potential for sodicity developing under irrigation is low.

The chemistry of the Delice basin (including the aforementioned site on the lower Kizilirmak river near Hacibali, Turkey) hint at a significantly higher sodicity risk (cf. open circles, Figure 8). The Delice basin results in Figure 8 likely offer the chemical basis for the statistical discriminant separation appearing in Figure 3.

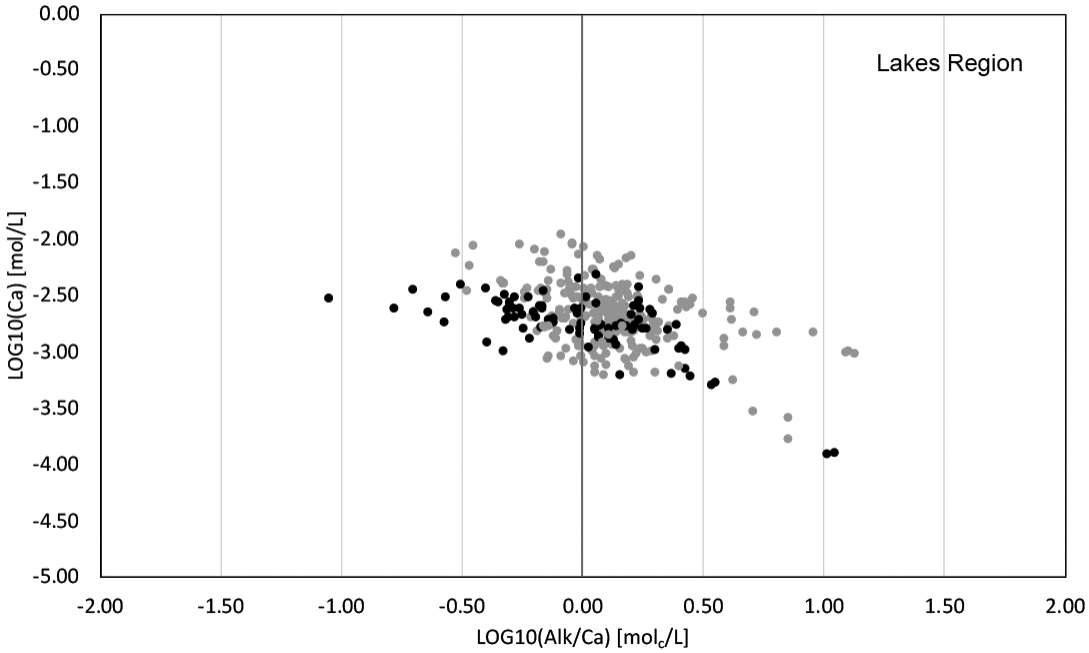

Figure 9. The alkalinity-to-calcium ratio (base-10 logarithmic scale) is plotted on the horizontal axis and the dissolved calcium concentration (base-10 logarithmic scale) is plotted in the vertical axis. All samples are plotted as filled grey circles and samples from the Turkish Lakes Region as filled black circles. The vertical line through zero represents an alkalinity-to-calcium ratio of unity.

Figure 9 plots the relative calcite alkalinity for the Lakes Region west of Konya, Turkey. The Alk/Ca moles of charge ratio varies by two orders of magnitude from 0.1 to 10. As mentioned above, ratios that plot the left of the vertical line through zero are relatively deficient in alkalinity compared to what which derives all its alkalinity and calcium form calcite. The alkalinity deficient waters have a low sodicity risk under salinization.

About half of the samples plot to the right of the vertical line through zero, marking them as waters with excess alkalinity with a higher potential sodicity risk under salinization. Figure 10 plots the *SAR* of the source water whose salinity is EC_i as open circles and it plots the $LSAR(EC_f)$ at the limit where $EC_f = 4\ dS/m$ as filled circles (i.e., $LSAR(4)$). The salinity plotted on the horizontal axis is the original salinity EC_i for both $SAR(EC_i)$ and $LSAR(EC_f)$.

Salinization to $EC_f = 4\ dS/m$ for those samples that plot to the right of the vertical line in Figure 9 leads to significant increases in *SAR* but none of the waters approach the sodicity threshold of $LSAR(4) = 12$. In other words, the sodicity risk of salinization to $EC_f = 4\ dS/m$ is negligible. The water sources representative of the Turkish Lakes Region have a higher salinization risk than sodicity risk.

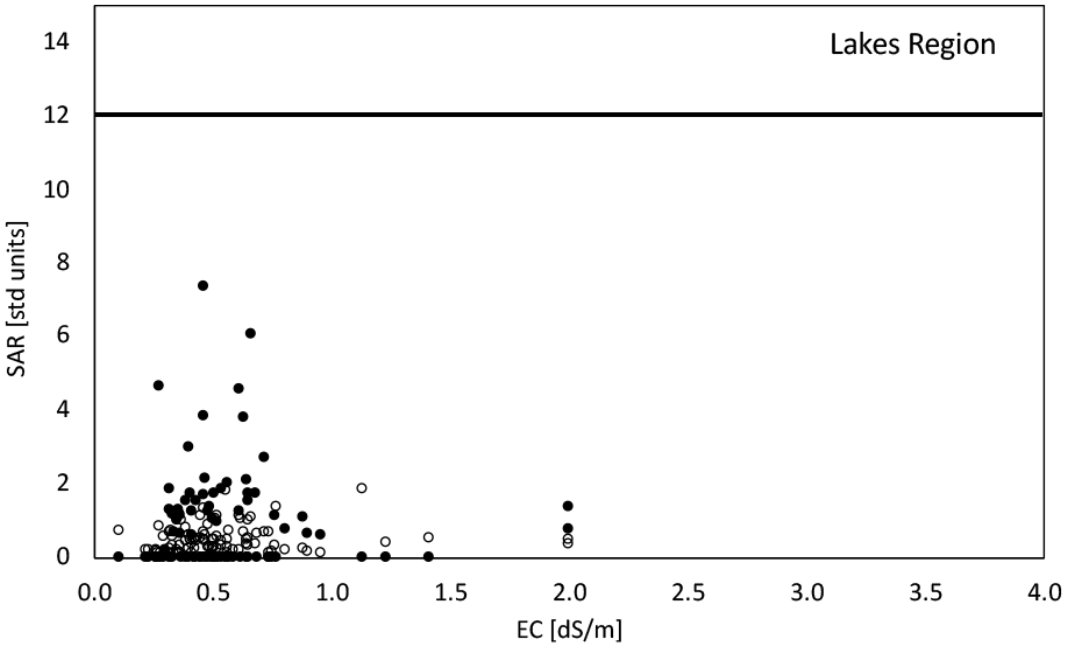

Figure 10. The (EC, SAR) coordinates of source water samples from the Turkish Lakes Region are plotted as open circles.

The LSAR (4) values of water samples after evaporative concentration to 4 dS/m are plotted as filled circles, the EC values are those of the original samples. The vertical displacement shows the potential increase in SAR as salinization increases and dissolved calcium is depleted by calcite precipitation; this for only those samples with excess calcite alkalinity (cf. Figure 9).

Results for the remaining regions (the tiny Göksu delta in the Mediterranean Sea, the vicinity of Lake Tuz, groundwater from the Batman province, and the Eskişehir-Kütahya region) are fundamentally the same as the Turkish Lakes Region appearing in Figures 9 and 10.

DISCUSSION

The 360+ surface and ground water analyses from throughout Turkey (Figure 1) cover a 100-fold range in the Alk/Ca moles-of-charge ratio (Figure 2) which suggests some of these waters have a potential sodicity risk. Multi-linear discriminant analysis (Figure 3) finds three groups whose compositions differ significantly from one another. One of these groups are groundwater from the Bafra delta on the Black Sea coast which derives its distinct chemistry from seawater intrusion.

The second distinct group is composed of water samples from the Delice basin (including a site below the Delice-Kaiilirmak confluence near Kula, Turkey. The Delice basin samples have low relative calcite alkalinity (Figure 7) but a notably high SAR. Samples from the Upper Kizilirmak basin have notably high salinity but low SAR values coupled with low relative calcite alkalinity.

The highest potential sodicity risk are found in the Delice basin and, potentially, the Lower Kizilirmak below the Delice-Kizilirmak confluence. This conclusion is very tentative because it is based on four samples.

In general, the salinity and sodicity risk of the remaining Turkish water sources evaluated in this report are low. Which means the salinization risk for irrigation with these water sources is relatively low.

The results of this analysis suggest a few recommendations for future study. First, the major ion composition and salinity of the Kizilirmak river below Eğerci, Turkey to well below the Delice-Kizilirmak confluence. Second, the salinity of irrigation drainage water from all important irrigation districts in Turkey would reveal whether landowners are effectively managing soil salinity.

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SORGHUM CROP HEIGHT MONITORING USING MULTISPECTRAL UNMANNED AIR VEHICLE IMAGES

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ABSTRACT

Crop height is one of the most important indicator of vegetation status which is result of agricultural applications such as irrigation, fertilization etc. Conventional methods for determining crop height are depends on labor-intensive and time-consuming field measurements. Moreover, these type data cannot represent spatial changes of crop height information over field. The objective of this study was monitoring of crop height of Sorghum (Sorghum bicolor) using multispectral images acquired by an Unmanned Air Vehicle (UAV) system throughout the 2019 growing period. UAV images were acquisitioned in nine different date in 2019. For each fly, at least 300 images were taken by using multispectral camera with more than %85 overlap at an altitude of 50 m above ground level. Ortho-mosaic images and dense point clouds were generated by using Structure from Motion algorithm. Digital Surface Models (DSM) were generated from dense point cloud of each data set, and crop height maps were generated by subtracting ground level height from DSM's. Estimated crop height values were compared with manual crop height measurements. Results indicated that crop height information obtain from UAV images were compatible with manual measurements. As a conclusion, data collected from UAV with multispectral sensors have an important potential for crop height estimation.

Keywords: *Crop height, UAV, multispectral, dense point cloud, Structure from Motion*

INTRODUCTION

Crop height is defined as vertical distance between land surface and top leaf that can perform photosynthesis (Holman et al. 2016). Crop height is one of the most important indicator of vegetation status (Díaz-Varela et al. 2015). This feature has been used successfully in yield estimation (Freeman et al. 2007; Geipel et al. 2014; Li et al. 2016; Schirrmann et al. 2016), detection of crop growing rate, vegetation health status (Holman et al. 2016), crop type mapping (Wu et al. 2017) and weed detection (Piron et al. 2011). Besides, there is significant correlation between biomass and crop height of forage crops such as sorghum and maize (Díaz-Varela et al. 2015). Traditionally crop height measurements are performed manually in the field. However, this method is time-consuming and labor intensive and some errors may occur during reading, writing or saving of measurements (Madec et al. 2017). In addition to these deficiencies of manual measurement, it is very difficult to determine spatial and temporal variability of crop height of big scale agricultural lands at an acceptable precision level by using these point base data. Therefore, new crop height measurement methods are required for efficient, economic and rapid results.

Until now, some devices such as field scananalyzer (Virlet et al. 2017) and sensor mounted on the tractor (Andrade-Sanchez et al. 2014) were developed, as an alternative way to conventional measurement, for monitoring phenological properties of crops. These methods consist of multiple sensors mounted to platforms to provide high spatial and temporal resolution data. However, these systems are not suitable for big scale agricultural land (Holman et al. 2016).

Digital elevation models (DEM) derived from remotely sensed data become very crucial for monitoring crop height. Some satellite systems, some sensors suitable for manned or un manned aerial vehicles can provide data for generating DEM. Spatial and temporal resolution and cost of these systems are crucial for their preference for determination of crop height data.

Satellite and manned air vehicle systems have some disadvantages for detection of crop height precisionally due to their low spatial resolution. Recent years, the size and weight of the sensors have decreased with technological advances and un-manned air vehicles (UAV) are being used effectively in

agriculture (Tunca et al. 2018). Córcoles et al. (2013) was performed successfully of leaf area index estimation from UAV images. Change in the level of vegetation has been demonstrated temporally and spatially in sunflower by using UAV images (Vega et al. 2015).

As it is known, high spatial and temporal resolution images can be obtained from UAV systems. In recent years, researchers have developed new methods based on high resolution UAV images to characterize the three-dimensional structure of crops and provide an alternative to traditional crop height measurements. Many of these methods use passive sensors that can generate 3D properties of crops using reflections in visible and infrared regions of the electromagnetic spectrum. In this context, some studies were carried out on estimating crop height from UAV images in wheat (Comar et al. 2012), barley (Bareth et al. 2016) and corn (Varela et al. 2017).

Although there are a number of studies on crop height estimation in wheat, barley, corn and various fruit trees, studies on grain sorghum are quite limited. Therefore, the aim of this study is to investigate the possibility of prediction of the temporal and spatial changes in sorghum crop height using multispectral camera images mounted on a UAV.

MATERIAL AND METHOD

Study Area and Climatic Condition

The study was carried out at the Black Sea Agricultural Research Institute Trial Station in Bafra, Samsun in 2019 (Figure 1). The altitude of the research area from the sea is 15 m, latitude and longitude values are 41.6017, 35.9189 respectively. The study area has a semi-humid climate. According to long term climatic data, the maximum average temperature was 28.5ºC in August and the lowest minimum temperature was 1.6ºC in February. The average annual relative humidity is 75.4% and the average annual rainfall was 717.5 mm (MGM 2018). The study was carried out in an agricultural area of 0.1 ha. Soil structure of the study area is clay and clay silt. Digestive was used as a crop variety in the study. The length of the growing period of this sorghum variety is 150 days and potential yield is approximately 35.0 tons ha^{-1}. Drip irrigation system was used for applied irrigation water. Crop height was measured with a 1 cm precision steel ruler.

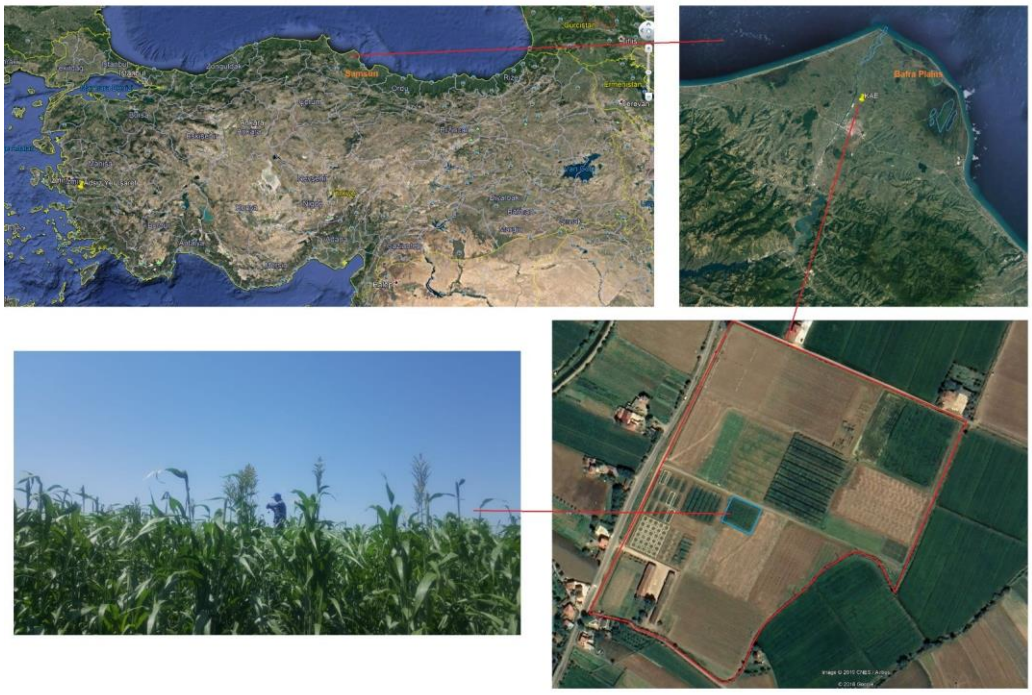

Fig 1. Location of the research field at the Black Sea Agricultural Research Institute Trial Station in Bafra, Samsun, Turkey

Unmanned Aerial Vehicle and Multispectral Camera

DJI Phantom 4 Pro model UAV was used in the research. The device weight is 1.3 kg and has 4 propellers. The flight time of this device is approximately 28 min. The device can be operated by a user with the remote control and can also be operated autonomously. In this study, UAV flights were carried out autonomously. MicaSense Altum (MicaSense, Seattle, WA, USA) multispectral camera was used to visualize the study area and estimate crop height. This camera has 5 multispectral (Red, Green, Blue, Red Edge and NIR) and 1 Thermal imaging sensors. Field of view of the multispectral and thermal sensors are 48° x 37° and 57° x 44° respectively. This camera can be acquired multispectral and thermal images with an interval of max 1 second. In addition, the system has a Calibrated Reflectance Panel and a sunshine sensor which can measure the energy that come from the sun instantaneous. Geotagged images can be saved using GPS system which is embedded the irradiance sensor.

Software Used in Study

In this study, Pix4D Capture IOS was used for autonomous UAV flights. Python 3.6 and Numpy, OpenCV, exiftool and pysolar Python modules was used to convert raw images to reflectance. Agisoft Metashape 1.5.3 was used to obtain orthomosaic images and Digital Elevation Model (DEM) maps from reflectance images. QGIS 3.4.0 software was used to create vectors belonging to the experimental plots and to obtain data for the plots. SPSS 23 was used for comparison of the data and statistical analysis.

METHODS

Agricultural Practices

Sorghum seeds (28 seeds m^{-2}) were sown on 15 May 2019 manually. Before sowing, 92 kg ha^{-1} P_2O_5 and 36 kg ha^{-1} N fertilizer were applied. No disease was detected in the study area during the plant growing season. Irrigation water was applied by using drip irrigation system. There are 4 different irrigation treatments in the study. These were full irrigation (S1), 70% (S2), 40% (S3) of the S1 treatment and rainfed agricultural production (S4). Irrigation duration and amount was calculated according to given methods in Koksal et al. (2017). Crop height measurements were carried out on days after sowing (DAS) 54, 64, 75, 86 and 106 using ruler.

UAV Flights

UAV flights were carried out autonomously at an altitude of 50 meter above the ground level and at a speed of 2 m sec^{-1}. UAV flight missions were programmed by considering at least 85% lateral and forward overlap rate of multispectral camera acquisition. In order to take canopy images from different angles and obtain the crop surface model successfully, UAV flights were performed by using grid scanning method.

Image Acquisition and Image Processing

Multispectral camera was mounted on UAV and this system was used for acquisition of multispectral images of research site. Image acquisitions were performed on DAS 52, 64, 72, 86 and 103. All UAV measurements were performed between 13.00 and 14.00. In order to calibrate the irradiance data of each image taken by using individual bands, the calibrated reflectance panel image was acquired before each flight. The irradiance calibration coefficients obtained from these images were applied separately to all related images of each band. This camera performed multispectral and thermal imaging of the trial area at 1 second intervals. The captured images were saved to the USB memory stick mounted on the MicaSense Altum body. Images taken during UAV take-off and landing of and images with blur effect were excluded while operation of image processing.

As a first step, all of the raw images were converted to reflectance images. After this process, a number of distortion corrections (lens vignette and polynomial) were performed for each image. These procedures were carried out according to the methods given by the manufacturer (Anonymous 2019).

The methods given in Torres-Sánchez et al. (2015) were used for the creation of orthomosaic and DEM maps based on reflectance images. Plant height maps were obtained by removing the height values representing the soil surface from the obtained DEM maps. QGIS 3.4.0 software was used to generate vectors for each experimental plot. Mean, highest, lowest and standard deviation values of crop height were obtained by using the zonal statistical method in QGIS 3.4.0 for the area covered by each vector polygons.

RESULT AND DISCUSSION

Estimated Sorghum Crop Height

In this study, crop height estimations were carried out for DAS 52, 64, 72, 86 and 103 and related crop height maps were given in Figure 2. As mentioned above, different amounts of irrigation water were applied to the plots. Although, number of rainfall events and received amount of rainfall that occurred during 2019 sorghum growing season were reduced the expected impact of different irrigation treatments in sorghum, at a certain level, difference in vegetation level was observed.

While experimental plots belong to S1 irrigation treatment had the highest crop height values for image acquisition dates, the lowest plant height values were estimated for S4 plots where rainfed production was performed. The highest crop height value was estimated as 4.07 m on DAS 103 in the plot 1 (S1) while the lowest plant height value was estimated as 0.04 m on DAS 44 in plot 8 (S4). The highest standard deviation value was predicted in plot 2 on DAS 103 as 0.39 m. The highest and lowest plant height was measured as 3.21 m and 0.80 m on DAS 103 and DAS 44 in the field from plot 1 and plot 2, respectively. In all of the plots, there was an increase in plant height after DAS 53. The maximum increase occurred in plot 1 between DAS 54 and 75 with 1.40 m. Similar increase were observed for other S1 plots.

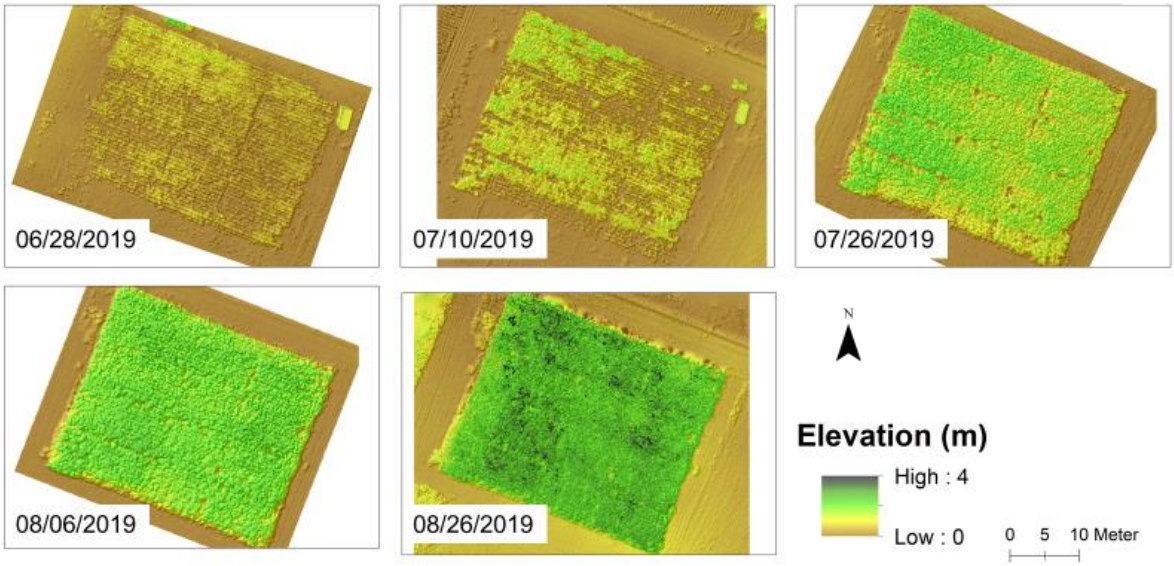

Fig 2. Sorghum Crop Height Estimation from Multispectral Images during the growing period.

Comparison of Estimated Plant Height and Ground Measured Plant Height

Crop height values estimated from high resolution UAV images and crop height values measured with ruler on the ground were statistically compared. Comparison results showed a good agreement between estimated and measured crop height values.

Statistically a significant correlation ($p < 0.01$) between the estimated and measured crop height values were determined. The coefficient of determination (R^2) of the linear relationship was calculated as 0.89 (Figure 3). Although there is a high level of correlation between crop height values estimated from UAV images and plant height values measured in the field, generally estimated crop height values are higher than those measured in the field. Accordingly, estimated sorghum crop height values can be calibrated by using the linear regression equation given in Fig. 3.

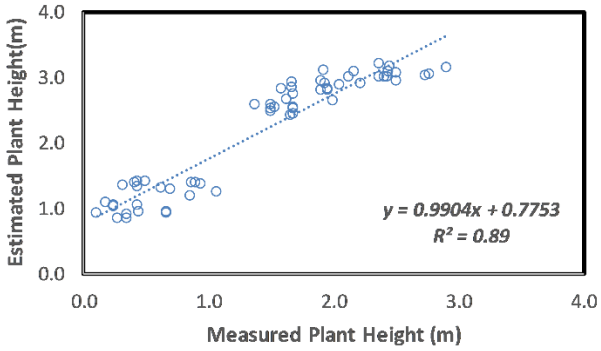

Fig 3. Comparison of Estimated Plant Height and Ground Measured Plant Height

Results related to statistical analysis of this study was concordant with previous studies. Watanabe et al. (2017) found significant correlation between crop height values estimated from UAV images and crop height values measured on the ground (r = 0.842). Varela et al. (2017) was found R^2 value of 0.80 a relationship between estimated (UAV) and measured crop height of maize. Similar results related to relationship between these two parameter were found by Holman et al. (2016) (R^2 =0.97; for wheat) and Bareth et al. (2016) (R^2=0.91; for barley) were found. In general, the R^2 value obtained as a result of this study shows great compatibility with the previous studies taken place in the literature.

CONCLUSION

In this study, crop height estimation for sorghum was made from DEM maps that calculated from high resolution raw multispectral images obtained from MicaSense Altum multispectral camera. According to results obtain from this study, there is a high correlation between estimated crop height from UAV images and measured crop height in the field. Crop height maps are one of the most important indicators of crop development. These maps can contribute to the effective use of agricultural inputs by implementing field-specific agricultural practices. Further studies are needed to estimate crop height with UAV flights using different sensors, different flight heights and with ground control point in the future.

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TOMATO SPOTTED WILT VIRUS AND RESISTANCE TO THE VIRUS ON TOMATO

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ABSTRACT

Tomato spotted wilt virus (TSWV), which is one of the 10 most destructive viruses among plant viruses, is known to cause commercial losses in all tomato growing countries. The most important reason for this the virus can be transmitted by the vector thrips species quite effectively. The lack of an effective pesticide that can be used in chemical control against plant viruses increases the importance of other methods to control. For example, as in TSWV, controlling of the vectors is one of the most common methods. However, due to some problems such as the development of resistance to insecticides in vectors and some mistakes (time, dose, quantity…) in application of insecticides, may cause failure for controlling of vectors. Therefore, the epidemics of TSWV are inevitable. Another method that is the most effective and easiest to control the virus is to develop a virus resistant variety and use it in the field. For example, TSWV resistance in tomato was provided by the detection of the Sw-5 gene found in wild tomato species. Many companies around the world developed the TSWV-resistant varieties containing the Sw-5 gene. However, in these resistant varieties, resistance may be broken due to mutation in the virus genome. As a result of this, infections can be seen on plants. Again, due to mutations occurring in the genome of the virus, it has been found that differentiation occurs in virus transmission and replication within the vector. In different parts of the world, it has been reported that the Sw-5 resistance on tomato is broken. Therefore, researches are being conducted to find different resistance sources. As a result of a study carried out for this purpose, it was reported that the gene called Sw-7 provides resistance to the resistance-breaking isolate. In this review, breaking of TSWV resistance on tomato, detection of new resistance genes, usability of these genes and the effects of mutations on vector-virus interaction are summarized.

Keywords: *TSWV, resistance breaking, Sw-5, Sw-7, thrips, tomato, vector*

INTRODUCTION

Plants are susceptible to infection by many disease-causing agents resulting in significant reduction in quality, yield and lifespan. Globally, plant diseases cause billions of dollars' worth of losses in agricultural production annually (Agrios, 2005). There have been complete crop failures due to disease outbreaks, resulting in famines.

Plant pathogenic viruses are capable of causing serious losses in crop production worldwide. Globally, losses due to plant viral diseases are estimated at US$60 billion annually (Wei et al., 2010). The losses are particularly severe in developing countries due to several reasons. Firstly, pesticide use for virus disease control is less extensive and less effective. Secondly, farmers often grow unimproved varieties that are low-yielding and not disease-resistant. Such varieties are more likely to be severely affected by disease outbreaks than improved varieties (Rybicki & Pietersen, 1999). Thirdly, disease surveillance is poor. Many virus diseases continue to cause severe yield losses and yet are unreported and so, not controlled. This greatly affects most countries' national economic growth as they depend on agriculture for export earnings, employment opportunities and food security.

Tomato production is under threat from viral diseases causing significant yield and quality loss all over the world (Pappu et al., 2009). One of the most common viral diseases occurs with *Tomato spotted wilt virus* (TSWV) on tomato.

It's hard to effectively control of TSWV. Generally, classical control methods are used for controlling TSWV such as, eradication of infected plants, preventing of vector thrips species get in to cultivation areas, spraying insecticides for vector thrips, and controlling of reservoir weeds. Although, these control methods are used for controlling TSWV, sufficient success in controlling is not obtained.

One of the most effective control methods for virus diseases is use of resistant varieties. As, against to other virus diseases, several resistant tomato varieties have been developed against to TSWV. For this purpose, *Sw-5* gene was the most commonly used. But, in recent years, several reports have been published about resistance-breaking TSWV isolates. Therefore, different resistance sources have been researched. *Sw-7* is the one of the hopeful gene against to TSWV. Recently, for developing TSWV resistant varieties, *Sw-7* gene is most studied on.

Discovery and Significance of TSWV

Tomato spotted wilt virus (TSWV) was first reported in 1915 in Victoria, in south-eastern Australia, by Brittlebank (1919), who named the disease caused by this pathogen "Spotted Wilt". However several earlier reports of unknown diseases with similar symptoms in tomato in Ohio, USA, 1895, and tobacco in Eastern Cape, South Africa, 1905, combined with a very wide host range, suggest that TSWV has been around for much longer, and makes its origin unclear (Peters, 1998). Within a short space of time following the first official reports, disease symptoms were found across mainland Australia and overseas (Best, 1968). That the disease arose from a thrips-vectored virus was confirmed in the 1920s, and named *Tomato spotted wilt virus* by Samuel (Samuel et al., 1930).

TSWV is the second most destructive viral pathogen in the list of economic damage causing plant viruses (Scholthof et al., 2011). Its worldwide distribution throughout tropical, subtropical, and temperate zones combined with its broad host range increases the difficulty of controlling the spread of this plant virus.

According to the Food and Agriculture Organization (FAO), tomato is the 9th most grown agricultural product with 159 million tons per year. (Ghatak et al., 2017). A case study where the effect of TSWV on tomato yield was studied from May to November in Samsun province of Turkey, showed that the TSWV caused 42.1 and 95.5% reduction in yield and marketable value of tomato, respectively (Sevik & Arli-Sokmen, 2012). From 1996 to 2006, in Georgia alone, spotted wilt disease caused an average annual loss of US$12.3 million (Riley, Joseph, Srinivasan, et al., 2011). Kenya were affected by a disease suggestive of TSWV infection during the November 1999 to March 2000 tomato-growing season. Farmers reported up to 80% losses of their potential yields (Wangai et al., 2001). TSWV is known for its large rates of economic loss in its other hosts, such as peanuts, peppers, as well as tomatoes.

Classification, Hosts and Symptoms of TSWV

Tomato spotted wilt virus belongs to the genus *Orthotospovirus*, of the family Tospoviridae in the order Bunyavirales (ICTV, 2018). *Orthotospovirus* is the only genus in the Bunyavirales order that can infect plants. Some viruses in *Orthotospovirus*; *Tomato chlorotic spot virus* (TCSV), *Impatiens necrotic spot virus* (INSV), *Capsicum chlorosis virus* (CaCV), *Iris yellow spot virus* (IYSV), *Melon yellow spot virus* (MYSV), *Bean necrotic mosaic virus* (BeNMV), *Groundnut ringspot tospovirus* (GRSV). Other viruses of the order Bunyavirales can cause infections in humans and animals by vectors of arthropods and rodents (Briese et al., 2013; Granval & Gracia, 1999; King et al., 2011; Rodriguez et al., 2007).The taxonomic classification of orthotospovirus species is made on the basis of N protein serology, N protein sequences and vector properties.(Goldbach & Kuo, 1996)

TSWV has a tripartite genome that consists of ambisense or negative-sense, single-stranded RNAs (Gonzalez-Scarano & Nathanson, 1996). Its virions are membrane-bound and pleomorphic in shape with a diameter that ranges from 80 to 120 nanometers in size (Calisher & Shope, 1988; Gonzalez-Scarano & Nathanson, 1996). TSWV virion composition is 5% nucleic acid, 70% protein, 5% carbohydrate, and 20% lipid (Adkins, 2000). The genome consists of three single-stranded RNAs: one negative-sense large (L) RNA and two ambisense medium (M) and small (S) RNAs (Adkins, 2000; Whitfield et al., 2005). The L RNA (~8.9kb) encodes the RNA-dependent RNA polymerase (RdRp) (331k) in the viral complementary (vc) strand. The M and S segments each encode two proteins. The M RNA (~4.8kb) encodes the precursor to the envelope membrane glycoprotein in the vc sense, and the NSm in the viral (v) sense. The NSm is essential for systemic infection of plants by tospoviruses while the glycoproteins are required for virus acquisition and transmission by thrips vectors (Turina et al., 2016). The S RNA (~2.9kb) encodes the N protein in the vc sense and a nonstructural protein (NSs)

(52.4k) in the v sense (de Haan et al., 1990). The NSs behaves as the suppressor of gene silencing to counteract plant innate defense (Chen et al., 2012; Margaria et al., 2007). Glycoproteins play a major role in this whole life cycle of virus inside the thrips. It was shown that the mutations in the ORF of glycoprotein results in the loss of transmissibility of TSWV by thrips (Nagata et al., 2000; Sin et al., 2005).

More than 1000 plant species belonging to 80 families, including many cultivated plants, ornamental plants and weeds, are the hosts of TSWV (Griep et al., 2000; Momol et al., 2002). According to the EPPO (2019) Global Database, major hosts are; *Arachis hypogaea* (Peanut), *Browallia americana* (Bush violet), *Capsicum annuum* (Pepper),*Dendranthema x grandiflorum* (Chrysanthemum),*Gerbera jamesonii* (Gerbera), *Lactuca sativa* (Lettuce), *Nicotiana tabacum* (Tobacco), *Pelargonium x hortorum* (Garden geranium), *Pericallis x hybrida* (Cineraria), *Solanum lycopersicum* (Tomato). According to EPPO (2019) Global Database, some minor hosts; *Apium graveolens* (Celery), *Cichorium intybus* (Chicory), *Cucurbita moschata* (Pumpkin) , *Solanum betaceum* (Tamarillo), *Solanum melongena* (Eggplant), *Solanum tuberosum* (Potato), *Stevia rebaudiana* (Stevia) , *Pittosporum tobira* (Japanese Cheesewood), *Amaranthus retroflexus* (Red-root amaranth), *Solanum nigrum* (Black nightshade), *Sonchus oleraceus* (Sow thistle), *Taraxacum officinale* (Dandelion), *Cucumis sativus* (Cucumber), *Datura stramonium* (Jimsonweed), *Spinacia oleracea* (Spinach), *Convolvulus arvensis* (Bindweed), *Hibiscus trionum* (Venice mallow), *Brassica oleracea* (Broccoli).

TSWV symptoms differ in type, severity and extent, ranging from local chlorotic and necrotic lesions in hypersensitive responses, to irregular chlorotic and necrotic areas, ring spots, necrotic streaks, line patterns, stunting, mottling and wilting when the virus is translocated systemically through the plant (Jericho, 2005; Persley et al., 2007). Other symptoms can include bronzing, curling, dark brown streaks on leaf petioles and stems, stunting and cessation of growth (Persley et al., 2007). Sensitivity to TSWV can vary markedly across genotypes and cultivars. Symptoms in some genotypes can be conspicuous and result in severe damage, whereas others under similar conditions might only develop mild symptoms, affecting only some parts of the plant. Symptom expression can also differ depending on the strain of TSWV that infects the plant (Mandal et al., 2006).

Transmission of TSWV by Vectors

The TSWV is known to carry 14 different species of thrips (Pappu et al., 2009; Whitfield et al., 2005). Among the 14 species vectoring the virus, the species *Frankliniella occidentalis* Pergande and *Thrips tabaci* Lindeman are the most common (Pappu et al., 2009). TSWV is circulative and replicative, which means that the virus is circulated by the insect hemolymph (blood) and replicates in the insect's internal tissues. The cycle of virus acquisition and transmission begins with larval feeding on infected plant tissue (de Assis Filho et al., 2005). The virus passes through the midgut of the insect and spreads to various cells and organs, including the salivary glands. The virus is transmitted to an uninfected plant when saliva is injected into the plant tissue during feeding.

The unusual virus-vector relationship is a challenge in efforts to manage TSW (Momol et al., 2004). Primary spread of the disease (initial entry into a crop) is due to infections caused by incoming viruliferous adults from outside sources that include uncultivated and cultivated plant hosts. Adults persistently transmit, meaning that they are infected for life, and their control with insecticides does not prevent transmission due to the short time of feeding for infection to occur (Momol et al., 2004). Secondary spread (within a crop) is caused by viruliferous adults that acquired the virus as larvae feeding on an infected plant. For secondary spread, thrips need to colonize and reproduce on infected plants within a crop. Control of the larvae before their development to adults is effective in preventing secondary spread. Infection and replication of TSWV inside the thrips is a complex process and is governed by multiple interactions between virus and host proteins. During its journey from midgut to salivary glands, TSWV has to cross at least six membrane barriers inside the thrips (Whitfield et al., 2008).

After TSWV particles are transmitted to the plant by the vector thrips, they propagate systemically within the plant via NSM proteins. TSWV particles have been observed in epidermal and mesophyll

cells, stomata, tracheids, sieve tubes, phloem parenchyma, and even among the chromosomes whose nuclear membrane had been broken during mitosis (Francki & Grivell, 1970).

Management of TSWV

It is very difficult to eradicate viruses in regions where they have infected crops because these viruses have a wide host range and efficient vectors. As with all viruses, once the pathogen has entered the plant, it is practically impossible to break the host-pathogen relationship or even just reduce disease development (Pappu et al., 2009; Riley, Joseph, Srinivasan, et al., 2011). Tactics employed in *Orthotospovirus* management must be based on thorough understanding of epidemiological principles and must fall within Integrated Disease Management (IDM) approaches that include biological, chemical, cultural, host-plant resistance and physical control (Culbreath et al., 2003).

None of the available management strategies is satisfactory against to the virus (Ullman et al., 1997). Strategies focused on thrips control, have been virtually impossible due to thrips high fecundity, propensity to develop insecticide resistance and a host range that includes many TSWV-susceptible crops (Adkins, 2000). Some measure of control can be achieved using thrips-proof mesh tunnels in the field (Cho et al., 1998; Prins & Goldbach, 1998). In the management of TSWV, applications for vector types are common. However, due to the problem of resistance to insecticides, application errors in chemical control against vectors (dosage, quantity, duration ...) and the pesticides being hazardous to health, the effectiveness of the applications is low (Cho, 1989; Rice et al., 1990).

Winter and summer annual and perennial weeds as virus reservoirs and hosts of thrips vectors may be as primary infection sources, therefore effective weed control methods are necessary not only to prevent a direct harmful effect of weeds on crops but also from a virus epidemiological point of view (Cho et al., 1986; Takács et al., 2006).

Resistance to TSWV

Host resistance is the most effective and economical means of managing any disease, including TSWV. Conventional tomato breeding often begins by screening germplasm resources, typically wild tomato relatives, to identify sources of resistance. Once identified, a resistant accession is backcrossed to cultivated tomato to introgress the resistance allele.

There are several DNA markers (also called molecular markers), namely RFLP, RAPD, CAPS and SSR, which are used in tomato breeding (Smiech et al., 2000). DNA markers are used for germplasm characterization and marker aided indirect selection for genetic improvement of various oligogenic and polygenic characters (Singh, 2005). Molecular markers are used in breeding studies related to TSWV.

Stevens et al. (1995) mapped *Sw-5* between restriction fragment length polymorphism (RFLP) markers CT71 and CT220 near a telomeric region of chromosome 9 and also reported one random amplified polymorphic DNA (RAPD) marker 421R likely within 0.5 cM of *Sw-5*. *Sw-7* an amplified fragment length polymorphism (AFLP) marker was potentially identified to be linked to the gene and the gene was mapped on Chromosome 12 flanked by the markers T1263 (45.0 cM) and SSR20 (58.2 cM) (Price et al., 2007).

The first resistance source to TSWV was found in *Solanum pimpinellifolium* (Samuel et al., 1930). Over the years, seven TSWV resistance loci have been identified, designated as the dominant and allelic *Sw-1a* and *Sw-1b*; three recessive genes: *Sw-2*, *Sw-3*, and *Sw-4*; and three dominant genes: *Sw-5*, *Sw-6*, and *Sw-7* (Finlay, 1953; Saidi & Warade, 2008). *Sw-5*, originally introgressed in the cultivar 'Stevens', is currently the primary source of TSWV resistance in commercial tomato varieties worldwide (Stevens et al., 1992). In addition to conferring a broad-spectrum resistance to TSWV isolates, *Sw-5* also confers resistance to closely related *tospovirus*es, including *Tomato chlorotic spot tospovirus* (TCSV) and *Groundnut ring-spot tospovirus* (GRSV) (Soler et al., 2003).

The resistance mediated by *Sw-5* follows the gene-for-gene relationship (Staskawicz et al., 1995) by triggering the typical hypersensitive response (HR) around the TSWV infection foci, limiting virus spread to distal parts of the plant. The avirulence (Avr) protein targeted by the resistance *Sw-5* gene is unknown to date. Previous work has revealed that the *Sw-5* locus contains at least five paralogues

(denoted *Sw-5a* to *Sw-5e*), but only the *Sw-5b* gene is necessary and sufficient to confer resistance against TSWV (Spassova et al., 2001).

Different biological variants of TSWV exist which have altered host ranges and symptoms (Norris, 1946). This plant pathogenic virus is characterized by having enormous genetic heterogeneity. TSWV can evolve by reassortment of its genome segments which occurs during mixed infections, exploiting the genetic variability in its population (Hoffmann et al., 2001; Sin et al., 2005; Tentchev et al., 2011; Webster et al., 2011).

Unfortunately, several *Sw-5* resistance-breaking strains of TSWV have been identified in various regions around the world, including the U.S. mainland (Batuman et al., 2017; Ciuffo et al., 2005). Sequence comparison among TSWV isolates revealed that the ability of the virus to overcome *Sw-5* is associated with C to Y amino acid substitutions at position 118 (C118Y) and T to N substitutions at position 120 (T120N) in the TSWV movement protein (NSm). The NSm protein is responsible for cell-to-cell movement, tubule formation, symptomology, host-range determination and interactions with the TSWV N protein (Batuman et al., 2017; Lopez et al., 2011). There is therefore an urgent need to utilize other TSWV resistance loci in place of, or along with, *Sw-5.*

Roselló et al. (1997) described the *Sw-6* gene in the PE-18 line developed from *S. peruvianum*, but the *Sw-5* gene provides better protection than *Sw-6*. However, *Sw-6* gene has been reported to provide partial resistance to TSWV as a result of intense thrips infection (Roselló et al., 2001).

The gene *Sw-5* has provided the acceptable control of TSWV for many years. But the resistance conferred by the gene is based on a hypersensitivity response (local necrosis at primary infection sites) and may coincide with severe cosmetic damage to the fruits (Aramburu et al., 2000) and moreover, it has been overcome by virulent TSWV isolates (such as TSWV6) in Spain and Italy (Aramburu & Marti, 2003; Ciuffo et al., 2005; Margaria et al., 2004; Roggero et al., 2002). These encouraged breeders to look for a new source of resistance and their efforts resulted in the development of the *S. esculentum* line derived from *S. chilense* (LA 1938) that showed acceptable levels of resistance to TSWV in the field trials. This new source was found to be highly resistant to TSWV in the conditions of Hawaii, Florida, Georgia, and South Africa. Additionally, greenhouse screening trials have clearly demonstrated that the *S. chilense* source of TSWV resistance is resistant to TSWV6. A single dominant gene is probably responsible for this resistance. It was proposed to name this gene *Sw-7*. Presently, the *S. chilense* based germplasm is being tested in Australia, Thailand, Taiwan and plans to test it in Italy are underway (Stevens et al., 2006).

Gordillo (2009) found that 21 out of 27 hybrids carry the *Sw-5* gene, 2 carry the *Sw-7* gene, and 1 hybrid contains both the *Sw-5* and *Sw-7* genes. Further work needs to be done to determine if heterozygous resistance from *Sw-7* is not as effective as that of *Sw-5* (Riley, Joseph, Kelley, et al., 2011).

Sw-7 is an alternative locus that provides resistance to a wide variety of TSWV strains. To reveal gene networks associated with *Sw-7* resistance, the Padmanabhan team performed transcriptoma profiling and gene expression analysis. The findings suggest that it will facilitate reproductive and genetic engineering efforts to incorporate this new source of resistance in tomato for protection against TSWV.(Padmanabhan et al., 2019)

CONCLUSION

The use of the *Sw-7* gene or the new genes to be discovered is very important in new tomato breeding studies for sustainable tomato production worldwide due to the breakdown of the resistance provided by the *Sw-5* gene. In addition, in the control of virus vectors, it is important to investigate new applications and increase the efficiency of existing methods.

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STRUCTURE OF ANIMAL STOCK EXCHANGE AND SATISFACTION LEVEL IN TERMS OF PRODUCERS: A CASE OF KAHRAMANMARAS PROVINCE OF TURKEY

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ABSTRACT

Animal husbandry is the one sector with the highest possibility of creating added value in agriculture. One of the problems in the livestock sector is informality. The livestock sector is experiencing losses in unregistered animal purchases and sales. In this case, stock exchanges create an environment that minimizes losses in these informal transactions. In this study, it is aimed to investigate the structure of the stock exchange of Goksun district of Kahramanmaras province and to determine the satisfaction level of producers. For this purpose, in 2019, 80 farmers were surveyed in Goksun stock exchange. As a result, the average age of the producers was found 45.05. It was determined that 52.50% of the producers were primary school graduates. Average experience in animal husbandry activities is 24.95 years. The average annual income of the producers is 38726.25 TL. It was determined that 71.25% of the producers sold their animals live weight in the stock market and 16.25% of them sold kabbalah. 51.25% of the producers said that they do not have the idea to give up livestock activities. 16.25% of the producers insure their animals. In the stock exchange, 50.00% of the producers sold cattle and 26.25% sold sheep and goat. In the stock exchange, 35.00% of the producers bought cattle and 22.50% bought sheep and goat. It was observed that the producers were satisfied with the ease of access to the stock market. Besides, they were moderately satisfied with the cleanliness of the stock market and the animal paddocks in the stock market, not satisfied with the price in the market.

Keywords: *Livestock, Stock Exchange, Producer Satisfaction, Goksun*

INTRODUCTION

The animal stock exchange is the place where the supply and demand for all kinds of live animals are processed following specific rules to buy and sell. The parties consisting of sellers and buyers, come together in the same environment to buy and sell the product at a price in exchange for its value (Anonymous, 2013). One of the most significant deficiencies in the livestock sector is informality. Live or directly or indirectly; the livestock sector is experiencing losses in the unregistered purchases and sales. Therefore, as the stock exchanges constitute an environment in which the unregistered activity was controlled, the parties are not only buyers and sellers but also a third party is official units. Animal outlets in Turkey, published in the Official Gazette No. 28152 dated 24.12.2011 "Regulation on Licensing and Inspection Principles and Procedures' of Animal Sales Location"are licensed in the frame. In this context, in Turkey, there are a totally 144 licensed animal outlets, including 123 Licensed Animal Markets and 21 Animal Exchanges. Animals stock exchanges found in 16 provinces of Turkey (Anonymous, 2019). Goksun animal stock exchange is Turkey's 14 official stock exchanges animal. It consists of a total area of 26 thousand square meters. Seven thousand square meters of this whole area is closed area, 10 thousand square meters is a car park, 9 thousand square meters is the common area. Besides, there are 432 cattle, 1550 ovine capacity, 60 indoor and 52 open paddocks in the stock exchange. The stock exchange serves five days a week (Anonymous, 2018). There are very limited studies on animal stock market in Turkey (Hostürk, 1996; Elmacı, 2017). Aim of this study is to investigate the structure of the animal stock exchange of Göksun town in Kahramanmaraş province of Turkey and to determine the satisfaction levels of producers for animal stock exchange.

MATERIAL AND METHOD

The main material of the study was the data obtained from 80 questionnaires conducted in January-February 2019 with the producers coming to the animal stock exchange in Göksun town of Kahramanmaraş province. Secondary data of the study is composed of information obtained from related publications. The Likert-type scale was used to determine the attitudes of the producers against the animal stock market and descriptive analysis were used to determine the socio-demographic characteristics.

RESULTS

Socio-Demographic Characteristics of Producers

The age range of the producers participated in the study ranged from 21 to 65 years, with an average age of 45,05. The average number of family members of producers is 4.65. The average number of family members working in animal activities of the producers was determined to be 1.96. The average experience of livestock breeding of the producers was found to be 24.95 years. The annual income of the producers varies between 6000 TL and 20000 TL, and the average is 38726.25 TL. The average land assets of the producers ranged from 0.3 ha to 30 ha, with an average of 4.29 ha (Table 1).

Table 1. Socio-Demographic Characteristics of Producers

	Minimum	Maximum	Mean	Std. Deviation
Age	21	65	45,05	11,22
Number of family members	1	11	4,65	1,50
Number of family members working in livestock activities	1	6	1,96	1,08
Livestock experience (year)	3	45	24,95	11,51
Total annual income (TL)	6000	200000	38726,25	36090,08
Total monthly non-agricultural income (TL)	400	6000	2252,63	1610,76
Land size (da)	3	300	42,90	56,78
Land parcel size (number)	1	20	4,12	3,53

It was determined that 52.50% of the producers participating in the survey graduated from primary school, 21.30% the secondary school, 16.30% high school and 10.00% the university. In the research, it was found that 11% of the producers do not have social security, 64% belong to Social Security Institution, and 24% have a green card.

Producers Animal Production Status

In the research, it was obtained that the average number of cattle owned by producers was 13.13 and the number of sheep was 53.80. 32.50% of the surveyed producers stated that they were satisfied with livestock activities, and 67.50% indicated that they were not satisfied. It was determined that 48.75% of the producers surveyed thought to give up their livestock activities, and 51.25% did not think of giving up their livestock activities. It was found that 3.75% of the producers surveyed did not have ear numbers in their animals and 96.25% had ear numbers in their animals. It was determined that 83.75% of the producers participating in the survey did not ensure their animals, and 16.25% insured their animals (Table 2).

Table 2. Status of Producers about Animal Production

	No (%)	Yes (%)
Satisfaction of producers with livestock activity	32,5	67,5
The idea of producers to give up livestock activity	48,75	51,25
Producers' situation on making insurance of animals	3,75	96,25
Existence of ear number in producers' animals	83,75	16,25

Producers' Animal Marketing Status

0.00% of the surveyed producers sold cattle, and 26.25% sold small ruminant. While the cattle producers sold an average of 5.80 cattle, the small ruminant producers sold an average of 30.14 sheep and goat. 43.75% of cattle producers sold cows, and 11.25% sold bullock. The average of cows and bullock which producers sold was 4.31 and 5.78 head, respectively, the average price of sold cows was determined 6614.29 TL, and the average bullock sold price was to be 768.89 TL. Small ruminant sellers of which 15.00% sold goats and 11.25% sold sheep. The average of sheep and goats sold was 16,67 and 34,00 head, respectively, the average price of the sold goat was determined 879,17 TL and average price of sold sheep to be 1200,00 TL (Table 3).

Table 3. Animal Situation Sold in Animal Exchange

Animal Type	Mean (head)	Mean Price (TL)
Calf	3,38	3775,00
Heifer	2,25	5950,00
Cow	**4,31**	**6614,29**
Bullock	**5,78**	**7688,89**
Lamb	**25,00**	**1033,33**
Sheep	**34,00**	**1200,00**
Capricorn	20,00	800,00
Goat	16,67	879,17
Billy goat	11,00	1450,00
Cattle	**5,80**	
Small ruminant	**30,14**	

35.00% of the surveyed producers bought cattle, and 22.50% purchased small ruminant. Producers who purchase cattle purchased an average of 5.64 cattle, while sheep-goat farmers purchased an average of 20.44 small ruminant. 23.75% of the cattle producers bought cows, and 7.50% purchased calves. The average cows and calves' producers purchased was 4.89 and 6.83 head, respectively, the average price of the purchased cow was determined 5484.21 TL and average calves' purchased price to be 4083.33 TL. Small ruminant producers have purchased of which 10.00% of sheep and 6.25% of the goat. The average of purchased sheep was 24.38 head, the average price of purchased sheep was obtained 1000,00 TL, while the average purchased goat was determined 11,80 head and the average price of the purchased goat was 910,00 TL (Table 4).

Table 4. Animal Situation Bought in Animal Stock Exchange

Animal Type	Mean (head)	Mean Price (TL)
Young calf	3,25	3750,00
Calf	**6,83**	**4083,33**
Heifer	2,50	6250,00
Cow	**4,89**	**5484,21**
Bullock	3,25	7500,00
Lamb	**16,75**	**950,00**
Sheep	**24,38**	**1000,00**
Capricorn	10,00	800,00
Goat	11,80	910,00
Billygoat	9,00	1150,00
Cattle	**5,64**	
Small ruminant	**20,44**	

It was found that 47.50% of the producers participating in the survey purchased animals from the stock exchange for production, 12.50% for sacrifice and 40.00% for resale.

It was determined that 86.40% of producers sold animals in the stock exchange to cash need. Furthermore, 9.10% of producers sold animals to improve the quality of animals in herd, and 4.50% of them sell old animals off.

It was determined that 73.75% of the producers came from the center and villages of Goksun, 18.75% came from the center and villages of the neighboring districts of Goksun, and 7.50% came from the stock exchange from different provinces.

86.25% of the producers stated that the animal stock market provided convenience in the purchase and sale of animals, 68.75% found that the stock capacity of the animal was enough, 66.25% found that the animal quality of stock market was enough, 60.00% found that the stock market meets expectations. Besides, it was obtained that all producers paid a certain fee to sell their animals on the stock exchange (Table 5).

Table 5. Producers' Opinions on Animal Stock Exchange

Opinions	**Yes (%)**	**No (%)**
Did the animal stock exchange facilitate the purchase and sale of animals?	13,75	**86,25**
Do you think the stock capacity of the animal is enough?	31,25	**68,75**
Do you think the animal quality in the stock market is enough?	33,75	66,25
Do you find the animal paddocks in the stock market enough?	47,5	**52,5**
Did the animal stock market meet your expectations?	38,75	61,25

Producers surveyed were asked questions about their satisfaction with the stock exchange. It was determined that the producers were satisfied "with ease of access to the stock market" moderately satisfied "cleanliness of the stock market and paddocks of the stock market' and they were not satisfied with "stock market price and veterinary services" (Table 6).

Table 6. Producers' Satisfaction of Animal Stock Exchange

Satisfaction	**Mean**	**Std. deviation**	**Acceptance level**
Easy access to the stock market	**3,91**	0,88	Satisfied
Social area in the stock exchange (masjid, eating and drinking area)	**3,13**	1,56	Moderately satisfied
From the car park on the stock exchange	3,00	1,11	Moderately satisfied
The cleanliness of the stock exchange	2,91	1,41	Moderately satisfied
Price on the stock exchange	**2,45**	1,12	Not satisfied
From the veterinary service of the stock exchange	2,18	1,34	Not satisfied

CONCLUSION AND RECOMMENDATIONS

According to the research results, we determined that the producers surveyed are mostly unaware of the presence of a veterinarian on the stock exchange. Because of this, producers should be informed about veterinary services. Also, veterinarians should communicate more effectively with producers on the stock exchange. Another important case is the insufficiency of the capacity of the stock market. The number of paddocks should be increased to increase the size in the animal stock exchange. Producers generally do not insure their animals. Producers must be provided with training and consultancy services to ensure their animals. It was concluded that the producers were moderately satisfied with the capacity of the car park in the stock exchange. Efforts should be made to increase the size of the car park on the stock exchange. The animal paddocks on the stock exchange are entirely open. In winter, producers and animals are affected by the cold. An equipped heating system should be installed at the place of the animal paddocks in the stock exchange, or the animal paddocks should be covered.

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IPB GOES TO FIELD (IGTF)

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ABSTRACT

University is an agent of building nation power in 3 primary point, developing knowledge, resulting great quality graduates, and mediating of community life. Therefor, IPB create a program calls IPB Goes to Field (IGTF), to answer the last of three university pillar. IGTF is a non-curriculer program which send college studendts in order living, adaptating, and cooperating to community. The aim of this program is to facilitate IPB's associator an improve college student within in community life. The IGTF's participant which sent into some depend place must be fourth semester or more. IGTF's program consist of socialitating unto community, digging local wisdom, introducting local tourist area, and teaching surrounding students. Based on recorded data in 2011 to 2018, total side involved consist of 1-8 colleges, 6-22 regional government, 6-45 college teachers, and 242- 485 participants with 7-19 changed every year. IGTF also be run in Japan by cooperating with IPB's college associator, not Indonesia only. This program is named SUIJI-SLP. Based on data in 2013 to 2018, there are 20-61 participants in Indonesia and 12-14 participants in Japan. The outputs of IGTF is improve scholar softskill to be in community, improve community knowledge in problem solving, develope IPB's associator, and have feedback to developing "Tri Dharma" of college.

***Keywords**: Community Services, Developing Softskill, IPB's Associator.*

INTRODUCTION

University is expected to produce good soft skill and academic graduates, who the power of national building and bring the nation future better. Widely, university is a agent of building and developing nation consist of 1) developing science and technology, 2) producing good quality graduates, and 3) mediating in community and nation life. Those are called three pillar of university or "Tri Dharma" of university.

IPB Univerity is one of Indonesia's agriculture university which have good national and international academic reputation. Therefore, IPB University is expected to producing high gpa (hard skill), have sensitive feeling in agricultural and rural social problems, creatively problem solver, and have vision in Indonesia's agriculture future. To do the three pillars, IPB create a program called IPB Goes to Field (IGTF), which sending college student and college teachers to solve community problems. Moreover, IGTF teach the student college living and working together around the community. This program implicate some stakeholder ie public figure, regional government, company, non- governmental organization, etc.

IGTF is an eduction program, specifically teach the college students to life, adapt, work, and learn together around the community. This program is non-curricular program which followed by college student who want to be participant. This program is internal program in IPB University, also there is international program such as IGTF.

IPB have initiate some national and international university to bring IGTF international. This program named SUIJI-SLP (Six University Initiative Japan Indonesia – Service Learning Program). The university, who join in this program, consist of three university in Indonesia and three university in Japan. These university are IPB University, Gajah Mada University, Hasanuddin University, Ehime University, Kochi University, and Kagawa University. The participants of SUIJI-SLP is choosed from IGTF participants.

The aim of IGTS is to facilitate IPB's partner and to improve student college ability to be problem solver around the community. The IGTS's benefits is 1) improving community ability in problem solving, 2) improving sensitive feeling of student college in community's problem, 3) improving

interactive communication of student college to solve the problem around community, 4) expanding IPB's network partner, and 5) having feedback to improve activities of Tri Dharma.

METHOD

IGTF has doing since 2009 till now in every odd and even long holiday, july-august. Till 2017, IGTF has been done 10 times. The participants must be IPB's student, more than 2 years (4 semesters). Student who have skill in IGTF's program is considered. Other university which join IGTF is Paramadina University (Jakarta), Sunan Ampel Islamic University (Surabaya), Sriwijaya University (Palembang), POLTEKES KEMENKES (Tasikmalaya), Rajamanggala University of Technology Thanyaburi (Thailad), and University Putra (Malaysia).

SUIJI-SLP has doing since 2013. This program has doing twice in a year, august- september in japan and february-maret in Indonesia. The participants in choosed student who have good hard and soft skill in IGTF. The participants must be from IPB University, Gajah Mada University, Hasannudin University, Ehime University, Kochi University, and Kagawa University.

RESULT

IGTF has done some involved side, consist of college, local government, program, college teacher, and participant. IGTF's data was recorded in 2011 to 2018 and the involved side change every year (Table 1). Straight rateable found at program, college teacher and participant. There is development of total of involved side, altought there is decreasing total of involved side in some year. This condition also happen in participant total of SUIJI-SLP, there is development but decreasing participant total found at 2014 to 2016 (Table 2). IGTF has done in some province and companies (Figure 1). The place that choosen is having good development potentially in agriculture, fisheries, and animal husbandry. The province divided by some city. The highest total of cities is South Sulawesi (13 cities) and the lowest are Riau Islands, Lampung, West Nusa Tenggara, South Sumatera, and Gorontalo (1 city).

Table 1. IGTF's total of involved side in every year

Side	Total of involved side							
	2011	2012	2013	2014	2015	2016	2017	2018
College	1	1	2	2	3	3	8	3
Local government	6	7	13	8	19	9	12	22
Program	8	7	15	12	19	10	14	9
College teacher	6	25	35	18	45	25	30	24
Participant	245	242	485	322	417	322	316	262

Table 2. SUILI-SLP's total of participant in every year

Side	Sum of participant					
	2013	2014	2015	2016	2017	2018
Indonesia	0	24	22	20	30	61
Japan	14	12	13	13	13	12

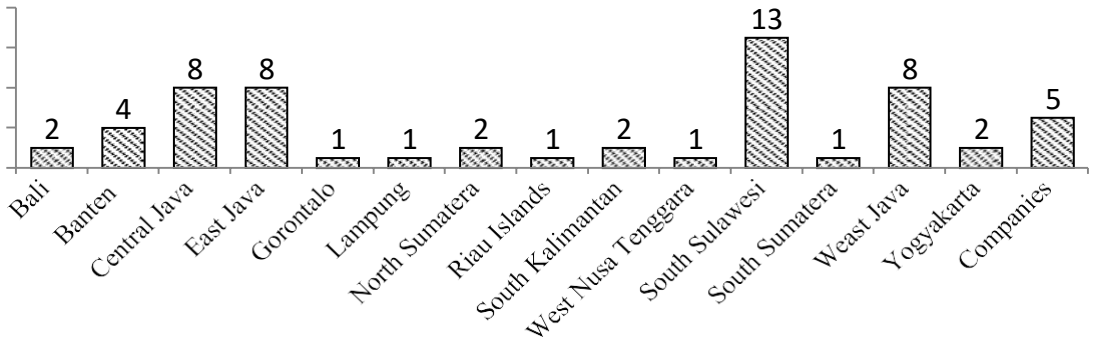

Figure 1 Total of companies and city in every province of IGTF.

Bali

There is 2 cities in Bali which is used to be place of IGTF, Bangli and Gianyar. In Bangli, the program was created is agriculture of orange, specifically Kintamani orange. Kintamani orange is on of local fruit in Bali. There is many farmer who cultivation this fruit, so need more knowledge to developing Kintamani orange agriculture. Specific program in Bangli is practicing good agricultural practice of Kintamani orange an its cultivation. Another city in Bali is Gianyar. Program in Bangli focus on agriculture and animal healtcare, specifically fish-on-rice-field (Mina Padi) development and Abdi Nusantara XI (program from veterinary medicine faculty of IPB University). IGTF's program in Bali show on Table 3.

Table 3. IGTF's program in Bali province

City	Program
Bangli	Good agricultural practice of orange
	"Kintamani" orange cultivation
Gianyar	Fish-on-rice-field (Mina Padi) development
	Animal healthcare (Abdi Nusantara XI)

Banten and South Sulawesi

There are 17 cities that used to Abdi Nusantara's program, consist of 4 cities in Banten and 13 cities in South Sulawesi. The city in Banten is Lebak, Pandeglang, Serang, and Tangerang. The city in South Sulawesi is Barru, Bone, Bulukumba, Enrekang, Gowa, Luwu Utara, Maros, Palopo, Pangkep, Pinrang, Sinjai, Takalar, and Wajo. Banten province used to Abdi Nusantara IX and South Sulawesi used to Abdi Nusantara XII. Abdi Nusantara program focus on animal healthcare. Spesific program of Abdi Nusantara consist of rabies, foodbone disease, anthrax, and zoonosis socialization and chicken vaccination. There is some city that making probiotic. But, there is one city in South Sulawesi that have Folk Farm School, Pinrang. So, Pinrang city have 2 program, that are Abdi Nusantara XII and Folk Farm School (SPR). The city that used to Abdi Nusantara show on Table 4.

Table 4. The city that used to Abdi Nusantara (Banten and South Sulawesi)

Province	City	Program
Banten	Lebak	Animal healthcare (Abdi Nusantara IX)
	Pandeglang	Animal healthcare (Abdi Nusantara IX)
	Serang	Animal healthcare (Abdi Nusantara IX)
	Tangerang	Animal healthcare (Abdi Nusantara IX)
South Sulawesi	Barru	Animal healthcare (Abdi Nusantara XII)
	Bone	Animal healthcare (Abdi Nusantara XII)
	Bulukumba	Animal healthcare (Abdi Nusantara XII)
	Enrekang	Animal healthcare (Abdi Nusantara XII)
	Gowa	Animal healthcare (Abdi Nusantara XII)
	Luwu Utara	Animal healthcare (Abdi Nusantara XII)
	Maros	Animal healthcare (Abdi Nusantara XII)
	Palopo	Animal healthcare (Abdi Nusantara XII)
	Pangkep	Animal healthcare (Abdi Nusantara XII)
	Pinrang	Animal healthcare (Abdi Nusantara XII) Folk Farm School (SPR) development
	Sinjai	Animal healthcare (Abdi Nusantara XII)
	Takalar	Animal healthcare (Abdi Nusantara XII)
	Wajo	Animal healthcare (Abdi Nusantara XII)

Central Java

The other province of IGTS is Central Java. This province has 8 cities that used to IGTF, that are Banjarnegara, Brebes, Demak, Kebumen, Kudus, Magelang, Pekalongan and Tegal. The program focus on cultivation (Demak, Kebumen, Pekalongan, and Magelang), agrotourism (Banjarnegara and Tegal), aquaculture (Brebes and Pekalongan), farm (Kudus), and pest and disease control (Pekalongan). Detail of IGTF's program in Central Java show on Table 5.

Tabel 5. IGTF's program in Central Java

City	Program
Banjarnegara	Durian agrotourism development
Brebes	Aquaculture development
Demak	Bell fruit cultivation
Kebumen	"Kalina" papaya cultivation
Kudus	Buffalo farm development
Magelang	Chili cultivation
	Horticulture development
Pekalongan	Mellon cultivation development
	Fisheries production and aquaculture
	Pest and unified plant disease (PHT) control
	Raising livestock
	Irrigation governance
	Durian plant clinic
Tegal	Cyber extention development
	Local wisdom digging
	Village-tourism development

East Java

East Java is the other of IGTF's location. Total city that used to IGTF is 8 cities, Bojonegoro, Kediri, Madiun, Malang, Mojokerto, Nganjuk, Ngawi, and Pasuruan. The program focus on folk farm school (Bojonegoro and Kediri), cultivation (Bojonegoro, Kediri, Madiun, Mojokerto, Nganjuk, Ngawi), agriculture development (Bojonegoro, Madiun, Malang), animal husbandry (Kediri and Pasuruan), agricultural processing (Madiun), and disaster recovery (Kediri). There is an unique program in Kediri, disaster recovery after Kelud eruption. Eruption of Kelud Mountain will destruct the environment, disturb stability economic, and cut the community activity. This program will help community to prepare the situation after eruption and fix any problem of its. IGTF's program in East Java show on Table 6.

Table 6. IGTF's program in East Java

City	Program
Bojonegoro	Folk farm school (SPR)
	Rice cultivate mechanization development
Kediri	Animal vaccination
	Field recovery after Kelud eruption
	Folk farm school (SPR)
Madiun	Rice cultivation
	Banana processing
	Agriculture product processing
Malang	Integrated farm and agriculture development
Mojokerto	Konjact cultivation
Nganjuk	Irrigation and soil fertilization
	Rice and onion cultivation
Ngawi	Organic rice cultivation
Pasuruan	Ongole crossbred cow farm

West Java

Next province is West Java. The city in west jawa consist of Bandung, Bogor, Ciamis, Subang, and Sukabumi. IGTF's program in this province focus on soil management (Bandung and Bogor), cultivation (Ciamis), animal healthcare (Bogor), fish production (Sukabumi), and folk farm school (Subang). Detail of IGTF's program in west java show on Table 6.

Table 6. IGTF's program in West Java

City	Program
Bandung	Bio-pore making practice and socialization
Bogor	Posdaya development
	Soil and household garbage management
	Grounds intensification
	Animal healthcare (rabies zoonosis)
Ciamis	Rice cultivate mechanization
Subang	Folk farm school (SPR) development
Sukabumi	Fisheries resource production

North Sumatera, Riau Islands, South Kalimantan, South Sumatera, West Nusa Tenggara, and Yogyakarta

The other province have 1-2 city/cities. These province are North Sumatera, Riau Islands, South Kalimantan, South Sumatera, West Nusa Tenggara, and Yogyakarta. Province which have 1 city is Riau Islands (Batam), South Sumatera (Muara Enim), and West Nusa Tenggara (Sumbawa). The other province is North Sumatera (Serdang Bedagai and Tapanuli Utara), South Kalimantan (Barito Koala and Tanah Bumbu), and Yogyakarta

(Klaten and Kulon Progo). IGTF's program in these province focus on cultivation (Serdang Bedagai, Tanah Bumbu, Klaten, and Kulon Progo), green space (Batam), plant protection (Tapanuli Utara), folk farm school (Barito Koala, Muara Enim, and Sumbawa), and simple technology (Klaten). Detail of IGTF's program in these province show on Table 7.

Table 7. IGTF's program in North Sumatera, Riau Islands, South Kalimantan, South Sumatera, West Nusa Tenggara, and Yogyakarta

Provinve	**City**	**Program**
North Sumatera	Serdang Bedagai	Rice culture
	Tapanuli Utara	Plant clinic
Riau Islands	Batam	Green space regulation
South Kalimantan	Barito Koala	Folk farm school (SPR) development
	Tanah Bumbu	Rice cultivation development
South Sumatera	Muara Enim	Folk farm school (SPR) development
West Nusa Tenggara	Sumbawa	Folk farm school (SPR) development
Yogyakarta	Klaten	Husk stove (tungku sekam) development Rice cultivation
	Kulo Progo	"Menoreh Kuning" durian culture

CONCLUSION

IGTF is a good program to sending participants in some location to digging potentially resources. Then, the resources used optimally to bring prosperous life. IGTF can bring forward community to the better future to be smart people (problem solver and good self-sufficient) in sustainable agricultural and build good community life in harmony.

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FRAGRANT ORNAMENTAL PLANTS

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ABSTRACT

Scent is the most important item that has an effect on the World and people realized it in first ages of life. Scents have always been a trait which is irreplaceable for all times. In today's World scent has an important role while everything is growing into a massive mechanism. Scent gives living creatures a safe place, tasting and enjoying abilities deciding on dangerous areas (i.e. poisonous). Between people and creatures smelling is not really well known, also people don't we it as much as the other living creatures do. People also don't we sense of smell while using the rest of senses a lot. However it comes in first lane in herbal habitat World. It is possible to see everywhere an amazing flower with an amazing scent. Researches about scented flowers aren't enough fresh plants, leaves and sprout scent make people remember fresh ness and spring. A scent gives people happiness, peace and relaxing. In this study scented plants and smell is explained.

Keywords: *Perception, Sense, Smell, Fragrant Ornamental Plants, Landscape*

INRODUCTION

The history of scientific studies on the sense of smell is not based on very old dates. In 1991, the olfactory receptors of mammals were discovered by Buck and Axel, putting an end to the controversy over the fundamental nature of the coding related to the sense of smell. Subsequent genetic research has revealed findings that will enable us to look at the issue from a wider horizon. It has been revealed that some of the 1500 receptors that mediate smell and taste come from a broad parent family, and about 3% of the genes are related to this. Another finding revealed by the research revealed that very few of people's 350 olfactory receptor genes is functional. While there are three basic receptors that allow all colors and wavelengths to be seen for visual perception, sense of smell is revealed through the effective use of hundreds of receptors, each with multiple recognition capabilities. This leads to the conclusion that a person can make a distinction between thousands of beautiful odors when well concentrated (Çakır, 2010).

Fragrance is one of the most powerful and impressive features of plants. Scent-scattering plants can be found almost anywhere. However, research and studies about fragrant plants are rarely done and are not used much in our country. Today, in landscaping studies, the visual and ecological features of plants as well as the olfactory features are evaluated (Coşkun, 2011).

The use of fragrant flowers dates from the ancient past to the present. It was used as an ornament for the purpose of providing therapy to people with disabilities. These flowers have been circulated between countries and delivered to many consumers. Later, exotic scented perfumes began to be produced from these flowers (Nesbitt, 2005). This study provides information about the concept of smell and fragrant ornamental plants.

SMELL CONCEPT

In order to detect the smell of a substance, gas molecules that mix from nutrients into the air must dissolve in mucus fluid in the nasal cavity. When gas molecules are dissolved in the mucus fluid, it stimulates the sensory cells in the yellow region (chemically stimulated). This stimulus is transmitted through the sensory nerves to the relevant center of the brain. Thus the smell is taken (Figure 1.) (Anonymous1, 2018).

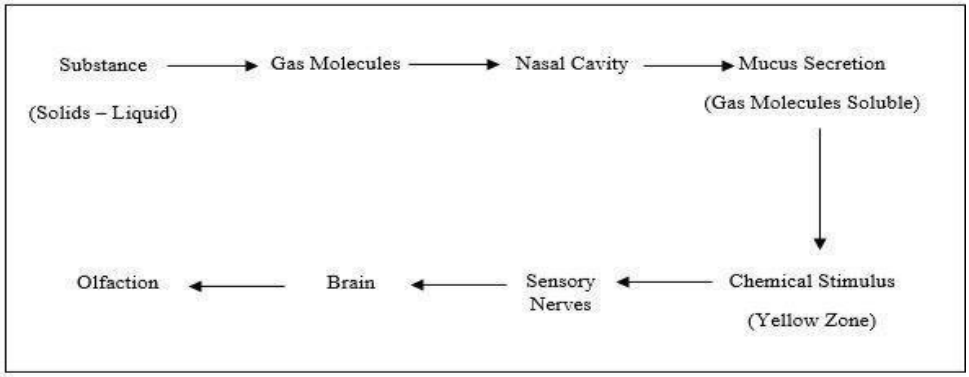

Figure 1. Olfactory Cycle (Anonymous1, 2018)

If the smell of a substance constantly comes to the nose, the nose can't detect it after a while. Because the sensory cells get tired quickly. Thanks to this feature, the nose allows us to stand in very heavy-smelling environments without being disturbed. People can distinguish the scent between 2000-4000 varieties (Anonymous1, 2018).

Smells also affect cognitive abilities. The researchers concluded that odors stimulate the part of the brain concerned with emotions, so decisions made are not logical but more emotional (Anonymous1, 2015).

IMPORTANCE OF SMELL

The sense of smell makes a difficult contribution to human life, and makes important contributions to human safety, nutrition, desire and well-being (Elgörmüş, 2014).

The sense of smell is the oldest sense; it extends to the primitive senses that even bacteria have, evolving to detect chemicals in the air and water. Before sight, hearing and even touch, the sense of smell was developed so that living things could react to the chemicals around them. It is possible to see through four light sensors in the human eye. The receptive cells here convert light from language the brain understands into electrochemical signals. The sense of touch depends on at least four types of pressure, as well as various receivers that detect hot, cold and pain. But these are overshadowed by the sense of smell. Because there are more than 1,000 receivers that enable people to smell. These are regenerated as long as we live and vary according to the smells we are used to. This complex structure allows us to distinguish a large number of different odors from each other (Anonymous1, 2014).

CLASSIFICATION OF SMELL

The classification of odors dates back to Carl von Linné (known as Linnaeus, the scientist who initiated the scientific classification with binary naming) (Uçar, 2013). Fragrances have been tried to be classified for years, but there is no generally accepted classification in the world due to the difficulties in describing fragrances. People have a hard time depicting the smells they perceive and putting them into words. Often perceived odors are attempted to be described by objects that exist in the world. For example, the smell of lemon, the smell of orange, the smell of pine, the smell of lavender, the smell of bleach, the smell of coffee. Furthermore, the fact that new scents can be obtained by mixing different scents makes it more difficult to name scents.

There are many odorous substances (pheromone) in nature. These substances were previously studied under four classes (Baykaldı, 2015).

Pleasant smelling, acid, burnt, bad smelling, recently, camphor, musky, floral, mint (menthol), ether-like (etherol), sharp (purgent) and bad smelling (putrid) seven fragrance classes have been proposed.

Whether any odor is irritating is associated with a factor of 4. These are the frequency of smell expressed as the frequency of perception of smell, the intensity of smell that is the effectiveness of smell, the unpleasant smell that is defined as the undesirable character of smell, and the duration of exposure to smell (Altun, 2018).

EFFECTS OF SMELL ON HUMANS

Sense of smell is located in the brain region that affects memory and creativity. It's always a working mechanism; it evaluates good and bad instantly. It has been determined that sense of smell in human affects 75% of daily emotions and plays an important role in memory (Anonymous2, 2018).

The smell center, also called the limbic system, controls the emotions of memory. It controls the secretion of hormones that affect appetite, nervous system, body temperature, stress level and concentration. Since the olfactory system is located in the brain, sense of smell is closely related to memory, mental state, stress, and concentration (Anonymous1, 2009).

In history, Ibn Sina and Biruni have seen that plant odors prevent many diseases by applying them on human treatment. They found that some plants have a positive effect on memory and strengthen memory. Again Hz. Mevlana said that the smell opens the eye of the heart and emphasized that it affects the smell (Anonymous2, 2010).

According to Lorig (1999), the sense of smell in humans is often neglected and misunderstood. According to many scientists, it plays a backstory role. According to recent evidence, the human sense of smell is not in the background, but in the subconscious. While smell affects a person's brain activities, the person may not realize that their behavior is driven by smell. This suggests that odors have complex and perceptually hidden effects (Uçar, 2013).

SCENTED ORNAMENTAL PLANTS

Fragrant ornamental plants were identified in this study. The research is divided into classes of plant taxa, trees, shrubs, creeping and climbing plants, flowers, aquatic plants, and groundcover (Table 1).

Table 1. Some important fragrant ornamental plants identified by literature research

Trees	**Shrubs**	**Creeping and climbing plants**
Latin Name of The Plant	Latin Name of The Plant	Latin Name of The Plant
Citrus sp.	*Rosa sp.*	*Lonicera etrusca*
Tilia tomentosa	*Philadelphus*	*Wisteria sinensis*
Elaeagnus angustifolia	*Symphoricarpus sp.*	*Jasminum nudiflorum*
Fraxinus ornus	*Mahonia aquifolium*	*Vigra caracalla*
Prunus serrulata	*Rhododendron*	*Clematis virginiana*
Liquidambar orientalis	*Buddleja davidii*	**Flowers**
Jacaranda mimosifolia	*Callistemon sp.*	Latin Name of The Plant
Ailanthus altissima	*Rosa canina*	*Dianthus caryophyllus*
Magnolia grandiflora	*Abelia x grandiflora*	*Hyacinthus orientalis*
Robinia pseudoacacia	*Viburnum opulus*	*Narcissus pseudonarcissus*
Albizzia julibrissin	*Nerium oleander*	*Lilium sp.*
Cinnamomum camphora	**Groundcover**	*Matthiola incana*
Amorpha fruticosa	Latin Name of The Plant	*Pelargonium hybrida l.*
Cercis siliquastrum	*Lavandula officinalis*	*Petunia hybrida*
Syringa vulgaris	*Santolina chamaecyparissus*	*Freesia sp.*
Cupressus macrocarpa 'goldcrest'	*Rosmarinus officinalis*	*Hoya carnosa*
Ginkgo biloba	*Thymus serpyllus*	*Paeonia sp.*
Liriodendron tulipifera l.	*Salvia officinalis*	*Matricaria chamomilla l.*
Arbutus andrachne	*Senecio cineraria*	*Aquilegia sp.*
Sophora japonica	*Artemisia absinthium*	*Nicotiana tabacum l.*
Aquatic Plants	*Hyssopus officinalis*	*Hosta plantaginea*
Latin Name of The Plant	*Ocimum basilicum*	*Osmanthus heterophyllus*
Iris kerneriana ascherson	*Melisa officinalis*	*Convallaria majalis l.*
Nelumbo nucifera	*Capparis sp.*	*Primula vulgaris*
Nymphaea sp.	*Alyssum maritima*	*Lathyrus odoratus*
Acorus calamus		*Polianthes tuberosa*
Valeriana officinalis		*Begonia semperflorens*
Menyanthes trifoliata		*Passiflora caerulea*

The following are the characteristics, fragrances, and uses of some of the fragrant ornamental plants that are important in the list and much used in the landscape.

Trees

***Tilia tomentosa* (Silvery Linden)**

Family: *Tiliaceae* (Ekren, 2014).

Homeland: Europe, China, North America (Forrest, 2006).

Fragrance: The Flower is strong and fragrant. The drooping flower bundles have a yellowish color and a characteristic scent. It is grown because of its fragrant flowers and as a shade tree.

Areas of use in landscape: Valuable in Park and landscape areas. It is a species suitable for use in Landscape Studies in open natural areas with its magnificent structure, forming large canopy areas and the beautiful smell of its flowers (Ekren, 2014) (Figure 2.a.)

***Elaeagnus angustifolia* (Spindle)**

Family: *Eleagnaceae* (Anonymous1, 2007).

Homeland: There are as many as 40 species that live naturally in southern Europe, Asia and the Americas (Anonymous1, 2007).

Scent: It is a tree that gives off beautiful smells when it blooms, creating a beautiful appearance. When you pluck it from its branches and put it in a water during the blooming season of the spindle tree, a peaceful and spacious fragrance forms at home (Anonymous3, 2018).

Areas of use in landscape: It is mostly used as a single in parks and gardens. It is also used as a fence plant on Vineyard and garden edges (Anonymous4, 2018) (Figure 2.b.).

***Fraxinus ornus* (Flowering Ash Tree)**

Family: *Oleaceae* (Tekocak, 2015).

Homeland: Southern Europe and Asia (Anonymous5, 2018).

Fragrance: Very attractive in May, fragrant, cream-white in color, its flowers collected in dense terminal panicles are quite decorative (Anonymous5, 2018).

Areas of use in landscape: They are frequently used as ornamental plants in parks and gardens due to their fragrant white flowers and vivid green leaves (Tekocak, 2015). It is suitable to be planted 4-5 mt. apart and it is a good bounding around the outer perimeter of the parks. Since it is a half shade tree, it is also suitable for use in alles (Figure 2.c.).

***Ginkgo biloba* (Temple Tree)**

Family: *Ginkgoaceae* (Anonymous7, 2018). Homeland: China (Anonymous8, 2018).
Smell: The drug has a weak, distinctive smell and a slightly bitter taste (Zeybek and Haksel, 2011). The use of male plants should be considered because the fruits are foul-smelling. The fruits are in the scent of olive prinas (Anonymous9, 2018).

Areas of use in landscape: It is used as a single or group in parks and gardens. The fruits seen in female plants smell very bad so the male tree is preferred in parks and landscaping arrangements (Anonymous8, 2018). It is also used in road and street plantings (Figure 2.d.).

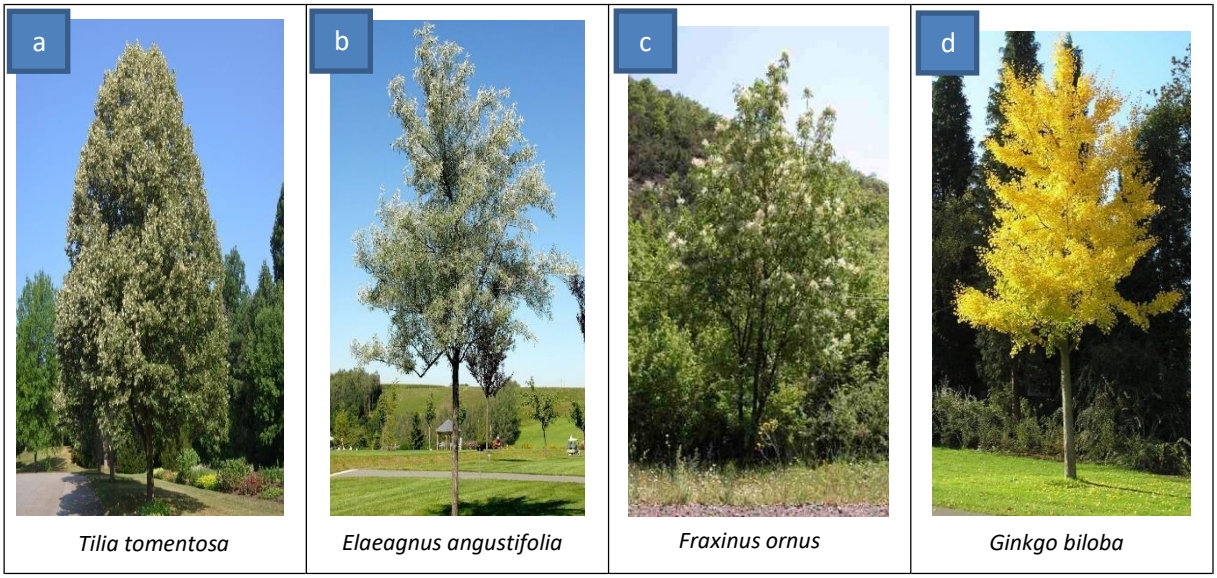

Figure 2. *Tilia tomentosa, Elaeagnus angustifolia, Fraxinus ornus and Ginkgo biloba* (Anonymous6, 2018; Anonymous1, 2019; Anonymous2, 2019; Anonymous3, 2019)

Shrubs

***Rosa sp.* (Rose)**

Family: *Rosaceae* (Keskinoğlu, 2013).

Motherland: Anatolia and Central Asia (Terzi, 2015).

Fragrance: Anatolia is one of the important regions where fragrant garden roses are born and spread throughout the world. The Rose, which is actually a kind of thorny shrub, has deeply influenced people since ages with its beautiful scent and gorgeous flowers of various colors and has always, had a very special and distinguished place in all cultures (Keskinoğlu, 2013). She is recognized as the Queen of flowers by gardeners because of the smell and beauty of her flowers (Terzi, 2015).

Areas of use in landscape: In addition to the bush type roses evaluated as group and single in the Garden, climbing, hugging, spreading roses are used in pergola, fence, wall edges, entrances, door and window edges (Terzi, 2015) (Figure 3.a.).

***Viburnum opulus* (Rough Snowball)**

Family: *Caprifoliaceae* (Gündoğar, 2013).

Homeland: Europe, North West Africa, Turkestan and Canada (Gündoğar, 2013). Fragrance: Its flowers are pleasantly fragrant and highly decorative (Ekici, 2005).

Especially in winter and the first days of spring hybridized species smell pleasant. In winter it gives almond-scented pink flowers. It leaves a pleasant smell to the garden when it is harvested (Nesbitt, 2005).

Areas of use in landscape: Snowballs are preferred plants in landscape studies with white ball flowers and leaf coloration in autumn. It is especially suitable for use as an emphasis and hedge plant in fund-raising or focal point for other colored plants (Figure 3.b.).

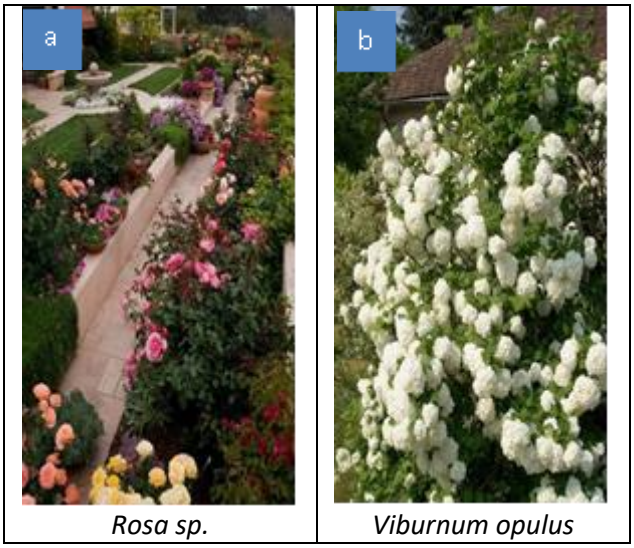

Figure 3. *Rosa sp*. and *Viburnum opulus* (Anonymous2, 2014; Anonymous9, 2019)

Creeping and Climbing Plants

***Wisteria sinensis* (Purple Panicle)** Family: *Fabaceae* (Anonymous7, 2019). Homeland: China (Anonymous7, 2019).

Fragrance: Its fragrant flowers are quite decorative (Ekici, 2005). Its flowers, which are pleasant and fragrant, are in larger panicles in the spring season, while smaller panicles are encountered in the summer season (Anonymous10, 2018). Even if the flowers wilt, they still smell. It opens its first flowers before it leaves (Anonymous7, 2019).

Areas of use in landscape: It has the property of rapid development. All parts of the plant, especially branches and trunk shells, fruits and seeds are poisonous should be kept away from children's Gardens. Suitable for use as facade greening in landscape arrangements (Ekici, 2005). It is used in parks, gardens and roadsides. It is often used by scamming into an object or wrapping it in gazebos (Anonymous7, 2019) (Figure 4.a.).

***Vigra caracalla* (Scented Selluka Ivy)**

Family: *Fabaceae* (Anonymous1, 2012).

Homeland: The central part of the Americas and a little further south of the central part (Anonymous11, 2018).

Fragrance: Selluka is perhaps one of the most fragrant flowers blooming vines. The plant, known as Izmir Ivy, is known for its wonderfully fragrant flowers, which form helices in the summer and form panicles such as a bunch of grapes. Flowers, orange, vanilla, bergamot, lemon flowers, such as many fragrances have collected themselves, summer days, these fragrances continue to spread seductive. (Anonymous2, 2017).

Areas of use in landscape: Used in railings, pergolas and gazebos (Anonymous1, 2013).

They are fragrant ornamental plants for terraces and Winter Gardens (Figure 4.b.).

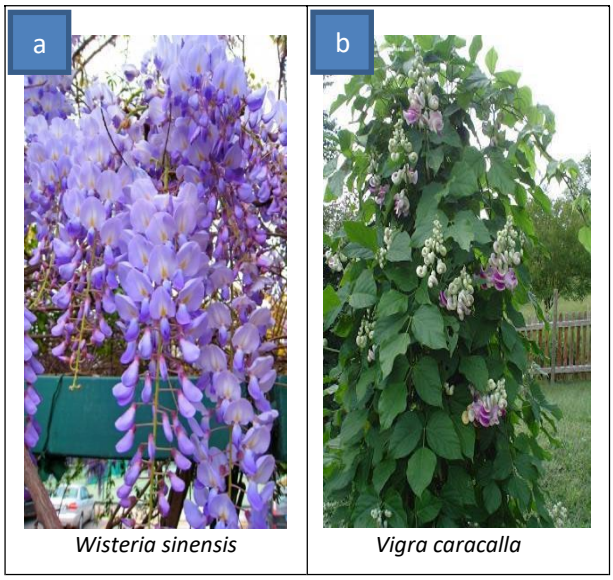

Figure 4. *Wisteria sinensis and Vigra caracalla* (Anonymous1, 2012; Anonymous8, 2019)

Flowers

***Matthiola incana* (Gillyflower)**

Family: *Cruciferae* (Anonymous2, 2007).

Motherland: Turkey, Southern Europe, Aegean Islands (Ekici, 2005).

Smell: They smell at night (Nesbitt, 2005). The scent of the gillyflower flowers comes from the essential oil it carries. It has four petaled flowers forming clusters at the tip of the branches. When fully opened, it gives the environment a pleasant smell (Anonymous1, 2008).

Areas of use in landscape: It is used both individually and in groups. It is used in combination with winter flowers. Counted from our native flowers (Anonymous2, 2007) (Figure 5.a.).

***Pelargonium hybrid* (Sardinia)** Family: *Geraniaceae* (Alp, 2017). Motherland: South Africa (Ekici, 2005).

Fragrance: The geranium group, which includes many species, varieties and hybrids, is cultivated because of the beautiful smells and exotic shapes of its leaves. Her flowers aren't very flashy. But there are more than 200 forms of culture whose leaves contain many other fragrances such as roses, cinnamon, apples, oranges, walnuts. The flowers of fragrant-leaved graveolens are pink-red Balsam-scented (Anonymous3, 2014).

Areas of use in landscape: Grown in curbs and parters in parks and gardens (Anonymous2, 2013) (Figure 5.b.).

***Hoya carnosa* (Candle Flower)**

Family: *Apocynaceae* (Anonymous12, 2018).

Homeland: The rainy forests of Southeast Asia and Northern Australia (Anonymous10, 2019).

Fragrance: It is a highly decorative and easy-to-grow plant with its fragrant, elegant flowers that make it feel like it is made of wax (Anonymous10, 2019). It is quite beautiful but has a heavy smell; giving people sleep indoors (Anonymous13, 2018). It stinks at night (Piante, 2018).

Areas of use in landscape: Parks and gardens, pots are used in dangling (Figure 5.c.).

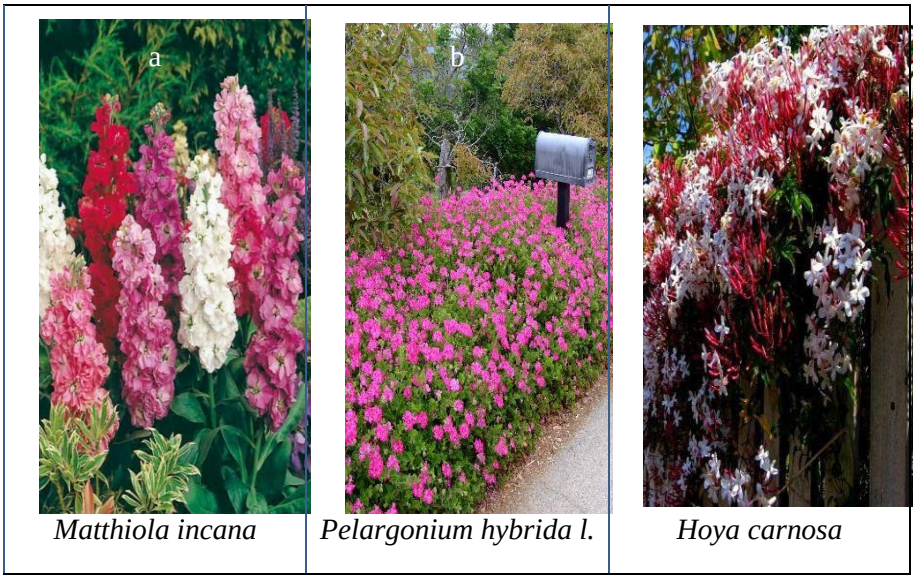

Figure 5. *Matthiola incana*, *Pelargonium hybrida l. and Hoya carnosa* (Anonymous2, 2012; Anonymous3, 2017; Anonymous11, 2019)

Aquatic Plants

***Nymphaea sp.* (Lotus)**

Family: *Nymphaeaceae* (Water Lilies) (Anonymous14, 2018).

Homeland: Europe, the north of Africa and the Middle East (Anonymous14, 2018).

Fragrance: Lotus flower is an antimicrobial flower. The sweet smell of your flower makes you sleep. In addition, the water lily plant is used in ornamental pools to prevent foul smell of pool water while improving pleasant smell and visual appearance (Anonymous12, 2019).

Areas of use in landscape: It usually grows naturally in slow-flowing rivers, lakes and ponds. It is used in outdoor or greenhouse pools and garden arrangements due to its fragrant and showy flowers (Figure 6.a.).

Figure 6. *Nymphaea sp.* (Anonymous12, 2019)

Ground Cover

***Lavandula officinalis* (Lavender)**

Family: *Lamiaceae* (Zeybek and Haksel, 2011).

Homeland: Grows naturally in southern Europe and England.

Fragrance: The flowers are special and fragrant. It attracts bees and butterflies because of its smell. Dried flower situations are used as olfactory (Zeybek and Haksel, 2011).

Areas of use in landscape: It is used in groups with its Modern and pleasant appearance, its distinctive scent and its emphasis on landscape, in curbs, low fences, windows and pots, in rock gardens and in areas with hillside views (Figure 7.a.).

***Rosmarinus officinalis* (Rosemary)**

Family: *Lamiaceae* (Aslan Öz, 2017).

Homeland: Mediterranean Basin (Anonymous5, 2019).

Smell: The body is composed of many branches and is fragrant. Flowers found in panicles on an axis are aromatic and beautifully scented (Aslan Öz, 2017).

Areas of use in landscape: Rock, balcony, terrace and roof gardens, as well as parks can be used. Suitable for fence purposes. Suitable for use on arid, rocky, Gizzard and sandy slopes (Ekren, 2014) (Figure 7.b.).

Lavandula officinalis *Rosmarinus officinalis*

Figure 7. *Lavandula officinalis* and *Rosmarinus officinalis* (Anonymous4, 2019; Anonymous6, 2019)

CONCLUSION and SUGGESTIONS

One of the most complex systems in the world, the human brain's important tasks includes receiving and evaluating the signals from the sensory organs. One of the stimuli to the sensory organs is the olfactory event formed by the movement of olfactory molecules into the nose (Altun, 2018). Smell is each of the chemicals that can be detected by the sense of smell, usually found in very small concentrations dissolved in air (Kandemir and Muluk, 2016).

The sense of smell is one of our most important senses and is located in the part of our brain that affects emotion, memory and creativity. The sense of smell runs for 24 hours and is the only sense that can never be "turned off." It is the body's first and most defining trial mechanism, assessed instantly when an environment is good or bad (Anonymous2, 2018).

Research has shown that odors affect almost everything, such as dreams, emotions, stress, pain, concentration and memory. For example, the smell of lavender releases hormones that make you feel good and make you happy; but the smell of Rose lower blood pressure and relaxes you (Anonymous1, 2017).

An important part of the plant material used in landscaping works, flowers, fruits and leaves, as well as the visual properties of the fragrant plant because of the essences they contain. Fragrant plants placed near entrances, roadsides, balconies, terraces and seating areas, which are often important places of the garden in garden arrangements, attract a great deal of interest to the community, especially with the fragrance gardens that have become widespread in recent years (Coşkun, 2011).

Plantations in the landscape should be given more space to scented ornamental plants and studies should be made to be used according to the effects of smell. Fragrant ornamental plant culture has started to decline by the day. For example, roses do not smell as much as they used to. Taking into account this situation, more attention should be given to fragrant ornamental plants and attempts should be made to encourage the production of plants.

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USING OF ENTOMOPATHOGENIC VIRUSES

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ABSTRACT

One of the most important factors that negatively affect yield and quality in plant production is pests. Chemical control methods are commonly used in the control of insects that cause losses in different plant products. Especially in the recent years, due to the global warming seen on the earth, it is observed that increasing of populations and species of pests in agricultural areas, and occurring of new pest species that have not been seen before in a certain area. Because of these, insecticide uses in growing areas has also increased year by year. Since these insecticides are harmful to the environment, human health and non-target organisms, alternative control methods should be used for controlling pests. Biological control of pests is one of these methods. Classically, parasitoid and predatory insects are used in this method. Also, entomopathogenic microorganisms are used in biological control of pests. Especially viral entomopathogens are seen as highly specific and effective biological control agents. In recent years; for pest control, molecular biology, gene expression and gene therapy, viruses isolated from insects have become the scientific study material that attracts the attention of the world. Almost all entomopathogenic viruses, especially baculoviruses, reoviruses, entomopoxviruses and iridoviruses, are used for biotechnological purposes. However, baculoviruses are the most studied and most widely used entomopathogenic virus group for biotechnological purposes. For example, with the baculovirus expression vector technology, entomopathogenic characteristics of AcNPV (Autographa californica nucleopolyhedrovirus) have been developed and become more effective entomopathogenic by transferring gene or genes encoding enzymes that regulate hormones, pest toxins (eg; Bacillus thuringiensis toxin) and pest hormones to the virus genome. In this review; entomopathogenic viruses and their potential in biological control of pests are given in general.

Keywords: *Baculoviridae, Biological control, Entomopathogenic virus, Entomopoxviridae, Insect.*

INTRODUCTION

Insecta class of Arthropoda branch in the animal kingdom constitutes the largest living group with more than 1 million identified species. Insects constitute 80% of the animal species defined in the world. Insects are not only capable of causing significant losses by feeding on plants and carrying diseases, but also have the capacity to feed and carry diseases on animals and humans. Of the approximately 1 million 300 thousand known insect species, only less than 1% is harmful to nature and humanity (Demir et al., 2008).

The use of microorganisms within the scope of biological control is called "microbial control (Peter, 1984). Most of the organisms used in biological control are bacteria, viruses, fungi, nematodes and protozoa. Entomopathogenic viruses are among the microorganisms that infect insects and kill them (Hunter-Fujita et al., 1998; Miller and Ball, 1998).

Into the biological control, pathogen group constitute important items. Insect pathogens are safe to use around workers, beneficial insects, and other non-target species and can often be tank mixed with commercial insecticides. The group is represented by infectious microorganisms causing lethal or deleterious effects on susceptible individuals. These can be bacteria, viruses, fungi, protozoa, and nematodes, and are frequently used as bioinsecticides, which are sprayed on pest populations. Nowadays, the market for bioinsecticides is about 2.5% of total insecticide market and it is estimated that will rise to 4.2% by 2010. Although bacterial bioinsecticides represent the greatest majority of them, viruses constitute an important component of this type of agents, especially the baculoviruses. These constitute the most diverse group of entomopathogenic viruses which have been found practically exclusively on insect populations, mainly within the orders Lepidoptera, Hymenoptera, and Coleoptera, although some few have been found in crustaceans and spiders.

This review deals with one of the beneficial uses of viruses because, as any other living organisms, insects are subject to virus infections. Many of these infection cause lethal diseases to susceptible individuals and, therefore, viruses can be important biotic factors that keep insect populations densities under natural control., The

basic biology of entomopathogenic viruses families, replication, production, genetic, uses in the field, and their advantages and limitations were briefly reviewed in this study.

Viruses as Entomopathogens

Some viruses may be embedded in another protein structure as well as the protein envelope surrounding them, and this structure is called inclusion body. Viruses embedded in inclusion structures are called embedded viruses (OV - Occluded Virus). To date, inclusion structures have only been identified in virus families such as Baculoviridae, Reoviridae and Poxviridae (Hunter-Fujita et al., 1998).

The use of viruses as biological control agents has many advantages. The most important of these is that they have narrow host susceptibility, that is, they have an effect directly on the organisms they target (Demirbag and Belduz, 1997). Many genes of industrial, agricultural, medical and economic importance are produced abundantly in expression vectors developed from these viruses. In addition, these viruses have been used as gene therapy vectors in recent years. Almost all insect viruses, mainly baculoviruses, reoviruses, entomopoxviruses and iridoviruses, are used for biotechnological purposes (Nalçacıoğlu, 2003; Demir, 2004; Sezen, 2004). However, the most widely studied and most widely used insect viruses for biotechnological purposes are baculoviruses (Possee, 1997; Inceoglu et al., 2001; Kost et al., 2005; Knipe et al., 2007).

Families of Entomopathogenic Virus

There are 13 families of viruses used as entomopathogenic viruses. The most important of these virus families are Baculoviridae and Entomopoxviridae (Anonymous, 2018).

1. Baculoviridae
2. Entomopoxviridae
3. Reoviridae
4. Iridoviridae
5. Ascoviridae
6. Polydnaviridae
7. Parvoviridae
8. Birnaviridae
9. Rhabdoviridae
10. Caliciviridae
11. Nodaviridae
12. Tetraviridae
13. Picornaviridae

BACULOVIRIDAE

Baculoviruses have; enveloped, polyhedral and double-stranded DNA (Hayakawa et al., 2000; Herniou et al., 2001; Theilmann et al., 2005). Although 90% of the protein of the virus is polyhedrin protein, this protein is not necessary for the replication of the virus in the cells, but only the protein plays a role in the formation of PIBs that protect the virus particles under natural conditions. Therefore, *polh* gene which expresses polyhedrin protein enables in using effectively in biotechnological applications of Baculoviruses.

Autographa californica nucleopolyhedrovirus (AcNPV, Baculoviridae), originally isolated from alfalfa caterpillars, belongs to the genus *nucleopolyhedrovirus* and is the most studied member of the Baculoviridae (Demirbag, 1993).

Thanks to Baculovirus expression vector technology, the killing capacity of AcNPV is improved by the inclusion of genes or genes encoding the enzymes that regulate hormones (McCutchen et al., 1991; Reilly and Miller, 1991) Stewart et al. (1991) form a recombinant AcNPV containing the gene encoding a neurotoxic protein for insects from the genome of North African scorpion (*Androctonus australis*) (Scorpiones: Buthidae).

Recent studies have shown that the movement of the virus from tissue to tissue begins with primary infection of the insect middle intestine, and then that the respiratory system is the main target of the virus. Thus, by changing the infection target, the effect of the virus can be achieved in a short time.

Some Baculoviruses used for biological control (Demir, 2008);

- *Agrotis segetum* GV »Gray wolf» Corn, lettuce, cotton
- *Cydia pomonella* GV (CpGVa) »Apples inner worm» Apples, pears, walnuts
- *Plodia interpunctella* GV (PiGVb) »Dry fruit moth» Stored food products
- *Spodoptera exigua* NPV »Striped leaf worm» Vegetables and greenhouse plants
- *Spodoptera littoralis* NPV »Cotton worm» Cotton, tobacco, banana, corn, tomato
- *Mamestra brassicae* NPV »Cabbage moth» Cabbage, cotton
- *Neodiprion sertifer* NPV »Pine leaf bee» Pine tree

ENTOMOPOXVIRIDAE

According to virus morphology, host species and genome size Entomopoxviridae family is divided into 3 genera;

- Genus A Coleoptera group viruses (*Melolontha melolontha* EPV),
- Genus B Lepidoptera (*Amsacta moorei* EPV) and Orthoptera group viruses (*Melanoplus sanguinipes* EPV),
- Genus C includes Diptera (*Chironomus luridis* EPV) group viruses.

Infection Type

The first process of larval infection begins with the dissolution of the inclusion structures in the alkaline medium of the intestine, just like baculoviruses. Released virions are transmitted to the intestinal epithelial cells by fusion between the virion outer membrane and microvilli to produce primary infection. Following virus replication in the cell cytoplasm, some virions go out of the membrane again without being embedded in the spheroid, causing infection in other tissues. Others are embedded in the spheroid in the cytoplasm. The most important feature of a virus-infected cell is the fact that mature virions are embedded in a protein structure that forms spheroids.

In recent years, entomopoxviruses have been isolated from Orthoptera insects, usually from locusts. In particular, the entomopoxvirus isolated from *Locusta migratoria* (Orthoptera: Acrididae) is very important because this species of grasshopper causes enormous economic damage in Africa and Asia.

Many mosquito species are also highly susceptible to EPV infection. *Melanoplus sanguinipes* EPV, isolated by Henry and Jutila (1966), has been found to infect many species including the same sex.

Disease symptoms vary among hosts. The larvae of *Estigmene acrea* (Lepidoptera: Erebidae) infected with AmEPV show symptoms such as lack of movement and balance until late hours of infection. The larvae of *Elasmopalpus lignocellus* (Lepidoptera: Pyralidae) infected with EPV change their color from brown to red and the hemolymph becomes whitish-blue due to the filling of the hemolymph with spheroids.

In recent years, entomopoxviruses have been used as an expression vector system in biotechnological studies. EPVs as biological control agents for many harmful species in particular against grasshoppers, cicadas and mosquitoes where baculoviruses are never isolated. The most important disadvantage of EPVs compared to baculoviruses is that the time to kill the hosts is very long, and this problem can be overcome by the introduction of genetically modified EPVs by the introduction of foreign genes into the EPV genome.

Biopreparates of Entomopathogenic Virus

- **Tutavir** - *Phthorimaea operculella* granulovirus (PhopGV)
- **Littovir** - *Spodoptera littoralis nucleopolyhedrovirus* (SpliNPV)
- **Spexit** - *Spodoptera exigua nucleopolyhedrovirus* (SeNPV)
- **Madex** – *Cydia pomonella granulovirus* (CpGV)
- **Spodovir** – *Spodoptera frugiperda nucleopolhedrovirus* (SfMNPV)

Some Researches about Entomopathogenic Viruses

In a study conducted in Indonesia Se-NPV local isolate *Spodoptera exigua* in the laboratory and greenhouse. For comparison, the chemical insecticide Lambda Cyhalothrin was used. In the laboratory experiment, Se-NPV larvae 5 caused by 77.5% during the day and prevented the feeding capacity of SeNPV *Spodoptera exigua* by 0.43 g per day. In addition, SeNPV reduced pupae weight by 0.063 g. In the greenhouse experiment, Se-NPV administration can cause 100% larval death and reduces the density of onion in which *Spodoptera exigua* is harmful 10.43% (Supyani, 2014).

In another study conducted on soybeans in Brazil; entomopathogenic bacteria and viruses have been applied together and separately against harmful insects. Mortality rates were calculated as 96.05% for infection with *Bacillus thuringiensis* and 61.05% for infection with *Anticarsia gemmatalis* 7 days after the application. For both entomopathogens were used together 90.26% mortality was observed *in vivo* conditions (Knaak et al., 2005).

Ringworm *Malacosoma neustria* (Linnaeus, 1758), which is a worldwide pest for hazelnut, plum, oak, poplar and willow trees cause great economic losses. *Malacosoma neustria nucleopolyhedrovirus* (ManeNPV) were isolated from eggs collected in Turkey. In this study, the complete genome sequence of ManeNPV-T2 has been shown and its genome has been compared with other baculovirus genomes and as a result it is thought to have potential as a microbial control agent (Gencer et al. 2018).

RESULT

Viruses isolated from insects in recent years; agricultural research, molecular biology, gene expression and gene therapy. Usually, the use of pesticides is inevitable in the fight against diseases and pests that arise during the plant production process. Due to the chemical structure of pesticides or their misuse and untimely use, crop plants, non-target organisms, groundwater, natural equilibrium and thus humans are damaged. There is also the economic dimension of this event. The raw materials of all pesticides used in our country are sourced from abroad.

Therefore, unnecessary and excessive use of pesticides is of great importance in terms of damaging the national economy. For controlling of biotic factors that are problematic in plant production; “Integrated” control the concept of control based on the use of all known control methods in harmony with each other.

Therefore, we can reduce the amount of pesticide use by adopting an integrated control approach. For this purpose, an environmentally friendly, sustainable and cheap control method such as ‘Biological Control’ needs to be made more widespread. Entomopathogenic microorganisms are used together with parasitoid and predatory insects in biological control of pests. Especially viral entomopathogens are seen as highly specific and effective biological control agents.

Scientists are at the beginning of exploiting these viruses, and insect viruses are thought to be used more as a potential control agent in the future. Rapid developments in the fields of molecular genetics and biotechnology are expected to make insect viruses much more popular in the future and to be more effectively offered to human beings.

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DIVERSITY AMONG PUMPKINS LANDRACES (*CUCURBITA* SPP.) GROWN IN TUNISIA USING FRUIT AND SEED QUANTITATIVE TRAITS

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ABSTRACT

*Pumpkins (*Cucurbita *spp.) are gourd squashes of the genus Cucurbita and the family Cucurbitaceae. The landraces are a very important source of genetic diversity, and are an important genetic resource for plant breeders. The aim of the present study was to evaluate 10 pumpkin landraces collected from local farmers from Monastir and Sousse areas of Tunisia, in order to select the best accessions for seed production, fruit consumption and next breeding programs. Diversity was assessed using 15 morphological traits related to the fruit and seeds. The results evidenced that the pumpkins landraces corresponds to 3 species; C. maxima (4 accessions), C. pepo (2 accessions) and C. moschata (4 accessions). Significant differences were found for all the traits revealing a large diversity among the accessions and among the 3 species of Cucurbita. Principal component analysis generalized 15 quantitative traits to two principal components which explained 76.21% of the total variability. Cluster analysis divided accessions into three main clusters mainly on fruit characters.*

Keywords*: Pumpkins, Cucurbita species, landraces, genetic resources, diversity, cluster analysis.*

INTRODUCTION

The genus *Cucurbita* incorporating pumpkin, squashes or vegetable marrows is the most economically valuable genus of the Cucurbitaceae family with 27 species, five of which (*C. moschata*, *C. pepo*, *C. maxima*, *C. mixta* and *C. ficifolia*) are cultivated all over the tropical and sub-tropical world. The term "squash" is generally employed to designate the forms of *C. pepo*, that are used immature, all baking cultivars of *C. maxima* and the cushaw-type cultivars of *C. mixta*, used mature and the term "pumpkin" is normally applied to the edible fruit of any species of *Cucurbita* utilized when ripe (Whitaker and Robinson, 1986).

Pumpkin now occupies a prominent place among the vegetables owing to its high productivity, nutritive value, good storability, long period of availability and better transport potentialities (Hazra et al. 2007). They are generally cultivated for their fruits and sometimes for their oil seeds, flowers and leaves (Fu et al., 2006). The estimated world production of pumpkins and gourds (*Lagenaria*) was 17.7 million tons from 1.4 million ha (FAO, 2015). According to the same source, China is by far the most important producer (4 million tons, constituted especially of *Benincasa*), followed by India (3.5 million tons) and the U.S.A. (750 000 tons). Production from Africa was estimated at 1.8 million tons from 140 000 ha, corresponding to an average yield of 12.8 t/ha. In Tunisia, the estimated production was 92 450 tons of fresh fruits from 2 523 ha (DGPA, 2015).

Cucurbits are versatile fruits fleshy shell, seeds, and even their flowers are edible. The immature fruits of various cucurbita have been used for culinary purposes in different parts of the world. Pumpkin fruits when riped, can be boiled, baked or steamed (Roberts, 2006). The benefits of cucurbita fruits are very important in terms of human health, purification of blood, removal of constipation and are good for digestion and supplying energy (Bisognin, 2002). Raw or roasted pumpkin and squash seeds are used as a snack food for human consumption in many cultures all over the world. Seed extract has been reported to have antidiabetic, antitumor, antibacterial, anticancer and antioxidant activities. It has also been found to have strong hypotriglyceridemic and serum cholesterol lowering effects (Fu et al., 2006).

Pumpkins have significant economic importance in Tunisia, especially as familiar agriculture because of its rusticity, nutritional values, post-harvesting conservation. There is no improved cultivar of squash and pumpkin in Tunisia and the production of *Cucurbita* is based on local accessions and landraces. These landraces are a very important source of genetic diversity, and are an important genetic resource for plant breeders.

Diversity in plant genetic resources provides opportunity for plant breeders to develop new and improved cultivars with desirable characteristics (Govindaraj et al., 2015) hence determination of the degree of variation of quantitative and qualitative traits present in genetic resources is important for breeding programs (Escribano et al., 1998).

The aim of the present study was to evaluate the phenotypic diversity and relationships between *Cucurbita* landraces and selection of the best accessions from various regions of Tunisia for seed production, fruit consumption and next breeding programs.

MATERIAL AND METHODS

Plant material and experimental design

This study was conducted during 2018-2019 at Sahline experimental station of the Regional Research Centre on Horticulture and Organic Agriculture (CRRHAB). 10 pumpkin landraces were collected from local farmers from Monastir and Sousse areas of Tunisia.

The accessions were classified into 3 species of *Cucurbita*; *C. pepo* (2 accessions), *C. maxima* (4 accessions) and *C. moschata* (4 accessions). The classification was made according to Whitaker and Davis (1962) and Chakravarty (1982). The most discriminative traits between the 3 species are related to the peduncle (smooth or spongy; angled or cylindrical; expanded or flared at fruit attachment).

Accessions were initially sown in compost, and seedlings at the three-leaf stage were transplanted to the greenhouse. Three replications containing 10 plants of each accession were arranged in a randomized complete block design (RCBD). Spacing was 3m between rows and 1m between plants. Soil preparation, fertilization, plant protection, and other growing practices were usual for *Cucurbita* cultivation. Plots were irrigated every week during the season. All plots were weeded manually to maintain proper weed control. After fruits ripening, they were harvested and moved to laboratory for investigating their characteristics.

Evaluated traits

The following traits were considered in this study: peduncle length, peduncle diameter, fruit number, fruit fresh weight, fruit yield, seed yield, fruit cavity diameter, flesh thickness, seed weight, fruit weight/seed weight, 100 seeds weight, seed number, seed length, seed width and seed index (length/width).

Statistical analysis

The data were subjected to basic statistics and an ANOVA was executed to provide the significant differences of characters between accessions. Duncan's multiple range tests were used to compare means for each trait. The principal component analysis (PCA) and hierarchical clustering analysis (HCA) with the squared Euclidean distance and the Ward's method were performed using the SPSS statistics version 20.

RESULTS AND DISCUSSION

Local landraces have adapted to the natural environment in which they originate, and these landraces are important resources of the germplasm management and genetic improvement. These landraces may be utilized in a breeding program to increase genetic diversity and to develop useful inbred lines (Kasrawi, 1995).

In our study, 15 quantitative traits from observations of the seeds and fruits were used according to the UPOV standards. Descriptive parameters including minimum, maximum, means, variance, standard deviations, and coefficients of variation (CV) of the quantitative traits were provided (**Table 1**). A high variation was obtained and some traits displayed a high value for CV such as peduncle diameter (51%), fruit weight (77%), fruit diameter (44%) and 100-seed weight (54%). The results evidenced that the collected landraces corresponds to 3 species; *C. pepo* (2 accessions), *C. maxima* (4 accessions) and *C. moschata* (4 accessions). Analyses of variance revealed significant differences among the accessions and among the 3 species of *Cucurbita* for all the studied parameters. Hernandez et al. (2005) stated that phenotypic diversity within populations of *Cucurbita* is high and includes variation in shape, size and color of fruits; number and size of seeds; quality, color and thickness of fruit flesh and precocity in fruit production among other traits.

PCA generalized 15 quantitative traits to two principal components which explained 76.21% of the total variability. The first component accounted for 48.24% of the total variation, and was mainly defined by fruit

weight, fruit length and fruit flesh thickness. The second component accounted for 27.96% of the total variation and was correlated to 100 seeds weight and peduncle diameter.

Cluster analysis divided accessions into three main clusters mainly on fruit characters (**Figure 1**). Cluster I included six accessions (C4, C10, C7; C6, C24 and C15) of *C. pepo* and *C. maxima* which had higher values of seed number and intermediate values of fresh weight (4 to 10 kg). Cluster II contained one accession C25 of *C. moschata* with short peduncule diameter which had lowest value of fruit weight (<1 kg) and lowest seed number and weight. Cluster III contained one accession C8 of *C. moschata* with highest value of fruit yield (19.60 kg) and low seed number.

The analysis of molecular markers and the biochemical composition should be conducted to deepen the assessment of the genetic variation of these landraces which could be used in a breeding program to increase genetic diversity and to develop useful inbred lines.

Table 1. Descriptive parameters including minimum, maximum, means, standard deviations, and coefficients of variation (CV) of the quantitative traits in pumpkin landraces

	Minimum	Maximum	Means	SD	CV %
Peduncle length (cm)	5.00	13.67	8.21	3.03	36.90
Peduncle diameter (cm)	3.33	16.00	9.16	4.73	**51.63**
Fruit weight (kg)	0.73	19.60	7.00	5.42	**77.42**
Fruit length (cm)	25.00	61.50	38.42	11.87	30.89
Fruit diametre (cm)	26.33	80.00	75.08	33.14	**44.13**
Flesh thikness (cm)	2.97	6.70	4.30	1.31	30.46
Seed number	192	682	320	120	37.50
100 seed-weight(g)	7.40	46.03	21.78	11.96	**54.91**

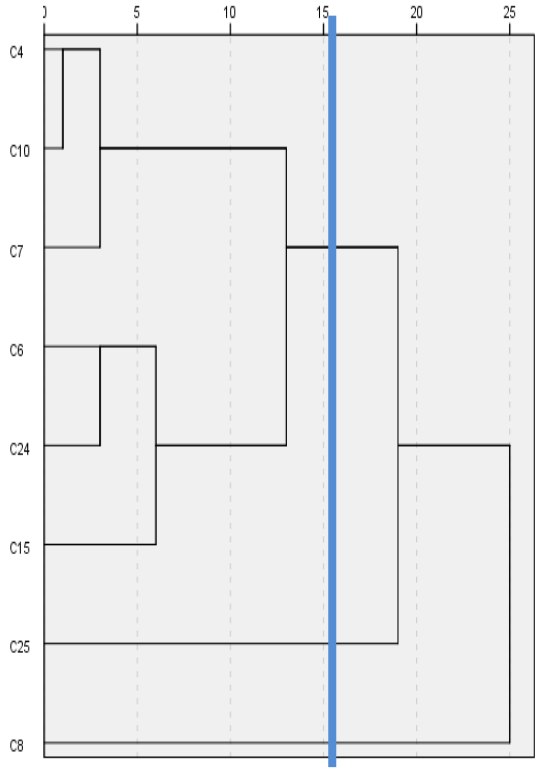

Figure 1. Dendrogram generated by hierarchical cluster analysis showing the relationships among the pumpkin landraces using fruit and seed quantitative traits.

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CHARACTERIZATION OF TUNISIAN GENETIC RESOURCES OF WATERMELON (*CITRULLUS LANATUS*)

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ABSTRACT

In Tunisia, watermelon [Citrullus lanatus (Thunb.) Matsum. & Nakai] is largely consumed in summer as a fresh fruit. This cucurbit is cultivated in various areas in the country. The landraces are a very important source of genetic diversity, constituting an important genetic resource for plant breeders. The aim of the present study was to collect and characterize fruit diversity of watermelon landraces collected from local farmers from Monastir and Sousse areas of Tunisia. The landraces were categorized for 20 variables of fruit features according to UPOV descriptors for watermelon. Also, these landraces were screened by artificial inoculation for their resistance to Fusarium oxysporun f.sp niveum (FON) races 0 and 2 to identify sources of resistance to Fusarium wilt. Significant differences were found among accessions for the quantitative traits recorded, revealing a large diversity. The evaluated watermelon landraces expressed a wide range of phenotypes including fruit size, flesh color, rind pattern, FON disease resistance and sweetness.

***Keywords**: Citrullus, disease resistance, diversity, Fusarium wilt, genetic resources, landraces, phenotypes, watermelon.*

INTRODUCTION

The annual *Citrullus lanatus* (Thunb.) Matsum. & Nakai, the dessert watermelon, is the best known among all *Citrullus* species. It is a warm-season annual vegetable crop that is grown on 3.5 million hectares worldwide (Faostat, 2015). Native to Sudan and Egypt, it includes wild and cultivated forms (Paris, 2015). It is a member of the *Cucurbitaceae* family along with cucumber, squash, and melon. Watermelon originated in western Africa (Chomicki and Renner, 2015) then spread to the Middle East and then China. The fruit is grown for its edible endocarp, rind, and seed oil. The colored flesh, though 93% water, contains significant amounts of carbohydrates, vitamin A, and lycopene (Wehner, 2008).

The sweet flesh of *C. lanatus* has resulted in its spread throughout the world and it has become one of the most extensively consumed vegetable fruit crops. The genus *Citrullus* includes six additional diploid species, three of which are also of importance (Jarret et al. 1997). These are the egusi watermelon (*C. mucosospermus* (Fursa) Fursa), the citron watermelon (*C. amarus* Schrad.) and the colocynth (*C. colocynthis* (L.) Schrad.).

Cultivars express a wide range of phenotypes including fruit size, flesh color, rind pattern, disease resistance and sweetness. Each growing region has a set of cultivars that are widely grown and are suited for local environmental conditions (Wehner, 2008). Despite geographic and phenotypic diversity, the genetic variation of cultivated watermelon is limited (Levi et al., 2001). Analysis of genome-wide diversity revealed that cultivars from Asia, Europe and America are derived from one of three subsets of sweet watermelon accessions from Africa (Nimmakayala et al., 2014). As such, estimates of genotypic variation among cultivars have been low.

The narrow genetic base of dessert watermelon (*Citrullus lanatus*) cultivars creates a continuous challenge for researchers and breeders aiming to improve the crop for disease resistance. High yield, high fruit quality and early maturity are the principle objectives for watermelon breeding (Gusmini and Wehner, 2005).

Fusarium wilt is one of the most economically important diseases of watermelon. The disease is present worldwide, and it can result in yield losses nearing 100% when severe (Egel and Martyn, 2013). The pathogen that causes this disease is the fungus *Fusarium oxysporum* f.sp *niveum* (FON). There are four known races of FON (0, 1, 2 and 3), distinguished by their ability to infect watermelon varieties with different resistance genes (Netzer,

1976; Davis et al. 2012). The Evaluation of the resistance of local cultivars to this pathogen is promising for the identification of resistance genes but also to ensure the valorization of this germplasm.

In Tunisia, watermelon genetic resources are poorly characterized and additional studies are needed to properly collect, classify and evaluate them. The aim of the present study was to evaluate the phenotypic diversity between watermelon landraces and to screen them for Fusarium wilt resistance in order to select the best accessions for further breeding programs.

MATERIAL AND METHODS

Plant material and experimental design

The watermelon material used in this study consisted of 15 watermelon landraces collected from local farmers from Monastir and Sousse areas of Tunisia. Seeds were initially sown in peat and seedlings at the three-leaf stage were transplanted to the greenhouse at the Sahline experimental station of the Regional Research Centre on Horticulture and Organic Agriculture (CRRHAB) during 2018-2019.

Three replications containing 10 plants of each accession were arranged in a randomized complete block design (RCBD). Seedlings were transplanted 1.2 m apart in-row and 1.8 m apart between rows. Fertilizer was applied with synthetic chemical fertilizers (145 kg N ha^{-1}, 140 kg P ha^{-1}, 210 kg K ha^{-1}) to plots and soluble fertilizer was applied weekly via drip irrigation. Plants were irrigated 3 times per week as needed. All plots were weeded manually to maintain proper weed control. After fruits ripening, they were harvested and moved to laboratory for investigating their characteristics.

Morphological traits evaluated

Watermelon landraces were evaluated for 20 morphological traits and productivity. Watermelons were selected randomly from the different blocks. Four ripe fruits were harvested per block per accession. Ripe watermelons were harvested, in June, at their horticultural maturity which was determined according to tendril browning, yellowing of the ground spot, and loss of surface gloss and to a thumping sound which changes from a metallic ringing when unripe to a soft hallow sound when ripe.

The following traits were recorded: (1) days to first male and female flower, (2) number of days from sowing to first mature fruit, (3) Marketable fruit from each plot were harvested, weighted, and counted, (4) average fruit weight, (5) number of fruit per plant, (6) fruit shape, (7) type of stripes, (8) width of stripes, (9) size of insertion of peduncle, (10) depression at base, (11) fruit length, (12) fruit width, (13) thickness of pericarp, (14) main flesh color, (15) flesh firmness using a hand-held penetrometer with 10 mm solid probe, (16) total soluble solids (TSS) expressed as Brix in fruit juice were determined using a digital refractometer, (17) seed color, (18) seeds number and (19) 100-seed weight.

Screening for resistance to FON

Watermelon plants (at the 1st true leaf stage) were inoculated by FON races 0 and 2. Inoculation was performed by immersing the roots in the conidial suspension (10^6 conidia/ml) while stirring for 2 min. For each accession, 12 plants were tested per FON race. The inoculated seedlings were transplanted into 0.5 l pots with sterile substrate. The pots were placed in a growth chamber at 26°C / 24°C (16 h day) for 30 days. Plants were examined every 7 days and disease severity was assessed based on a 1 to 4 scale 1 = Healthy plant; 2 = Delayed growth or atrophy of up to 50% compared to the resistant control; 3 = Presence of yellowing leaf lesions, wilting and poor root development and 4 = Death plant (Odibert et al., 2016). The line PI296341 was used as resistant control to races 0 and 2 and the line Black Diamond as susceptible control to both races. The lines Charleston Gray and Calhoun Grey were used as resistant to race 0 and susceptible to race2.

Statistical analysis

The data were subjected to basic statistics and an ANOVA was executed to provide the significant differences of characters between accessions. Duncan's multiple range tests were used to compare means for each trait. The principal component analysis (PCA) and hierarchical clustering analysis (HCA) with the squared Euclidean distance and the Ward's method were performed using the SPSS statistics version 20.

RESULTS AND DISCUSSION

Most local watermelon cultivars have disappeared from fields because they have been replaced by hybrids and modern cultivars. The assembly and the conservation of genetically and morphologically diverse watermelon germplasm are essential activities to increase genetic variability and to ensure the current and future success of watermelon breeding programs. For this reason, on-going efforts are needed to collect, maintain and evaluate *Citrullus* germplasm.

In this study, several watermelon landraces were collected from local farmers and the evaluated traits from observations of the fruits and seeds were used according to the UPOV standards. The evaluation of these watermelon genetic resources and their exploitation for sustainable agriculture is needed.

The evaluated watermelon landraces expressed a wide range of phenotypes including fruit size and shape, flesh color, rind pattern, disease resistance and sweetness. the ANOVA revealed significant differences among the watermelon landraces for all the quantitative parameters evaluated (data not shown) and a high variation was obtained for some traits which displayed a high value for coefficients of variation; fruit weight (37%), seeds number (43%) and 100-seed weight (32%) revealing a large diversity. Wehner (2008) stated that each growing region has a set of cultivars that are widely grown and are suited for local environmental conditions. The same author showed that the phenotypic diversity within populations of watermelon is high and includes variation in shape, size and color of fruits; number and size of seeds; quality, color and thickness of fruit flesh and precocity in fruit production among other traits. In contrast, Levi et al. (2001) showed that despite geographic and phenotypic diversity, the genetic variation of cultivated watermelon is limited.

Enhancing genetic diversity and host plant resistance in watermelon cultivars is a priority that will enable the maintenance and improvement of the current levels of production. In this study, the screening of watermelon landraces for resistance to FON races 0 and 2 revealed interesting genotypes which showed partial resistance to these races. The screening will be done once again in order to confirm the results.

The PCA and the Hierarchical cluster analysis divided our local watermelon landraces into 4 clusters mainly on fruit sweetness (data not shown).

Results obtained herein could be used in breeding programs and promotion of local varieties. Further analysis using molecular markers should be conducted to deepen the assessment of the genetic variation. Biochemical analysis should be conducted too, in order to select the promising genotypes.

ACKNOWLEDGMENTS

The authors thank the research unit UR13AGR09-Integrated Horticultural Production in the Tunisian Centre-East, CRRHAB for financial support. This work was partially financed by the Ministerio de Ciencia, Innovacion y Universidades AGL2017-85563-C2-2-R jointly funded with FEDER funds.

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RECENT DEVELOPMENTS IN THE WORLD TRADE ORGANIZATION AGREEMENT ON AGRICULTURE AND ADAPTATION OF TURKEY

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ABSTRACT

Competition in international trade with globalization has brought with it the need for a regulatory institution for the trade of countries. Today, the most important organization that meets this need is the World Trade Organization (WTO), founded in 1995. This study is aimed to assess recent developments in the WTO Agreement on Agriculture and Turkey's compliance status. A total of 164 countries are WTO members, including Turkey. Therefore, it has a wide domain. The members in WTO are grouped according to their development level. According to the agricultural agreement, the commitments made by each group of countries on domestic support, export subsidies and market access were implemented. Conferences at the ministerial level after the WTO Agriculture Agreement (Singapore 1996, Geneva 1998, Seattle 1999, Doha 2001, Cancun 2003, Hong Kong 2005, Geneva 2009, Geneva 2011, Bali 2013, Nairobi 2015, Buenos Aires 2017) are being evaluated. The evaluation of recent reforms to Turkey located between developing countries is very important. Turkey has fulfilled the commitments on market access and export subsidies. Turkey did not make any commitments on domestic support, because the de minimis rate (10%) did not exceed. Although there is an important liberalization in the world agricultural trade by the WTO agricultural agreement, non-tariff barriers such as food safety standards are also observed. It is in particular for developing countries such as Turkey should be considered the best at the conference.

Keywords: *The World Trade Organization Agreement on Agriculture, Turkey, market access, domestic support, export subsidies*

INTRODUCTION

The effect of globalization, which has been effecting since the 1990s, has led to a significant increase in the foreign trade of countries. Developing countries' agricultural foreign trade is important in terms of correcting foreign trade balance and eliminating the balance of payment problems. Competition in international trade with globalization has brought the need for a regulatory organization for the trade of countries (Çiftçi and Atıcı, 2018). Until 1995, the General Agreement on Tariffs and Trade (GATT) is the only international organization that regulates the trade rules between the countries that operate under the name of WTO after 1995. It aims to remove any obstacles that restrict foreign trade. In other words, increasing the welfare level of countries by removing tariffs, quotas, and incentives that cause restriction and deterioration of foreign trade is the main mission of this institution. However, in the liberalization of trade, the WTO has not been as successful in the agricultural sector as in the industrial sector. Decisions taken by the WTO are generally in the interest of developed countries. In the following stages, it was stated that the WTO negotiations on agricultural subsidies will be very difficult to find a solution soon, as in the previous negotiations. With the effect of the expansion of international trade in the world, there was a need to create some new international organizations. With the new approach called globalization, institutional structures at the international level have come to the forefront. These organizations are established within the United Nations such as The International Monetary Fund (IMF), World Trade Organization (WTO) and World Bank (WB). These three important organizations have played major roles in the globalization process in the world. Because with globalization, goods, services and capital are expected to circulate globally. Agricultural products are also included in this scope and are affected by developments (Azmak, 2012). The domestic supports given by countries to ensure the stability of the prices of agricultural products and increase agricultural incomes can also adversely affect the agricultural trade and increase the export chances of these products by decreasing the unit costs of these products. With the regulations introduced in the field of domestic supports, the practices in this regard are bound to certain rules and it is aimed to reduce the supports provided (Büyükerşen, 2008). Although

the WTO has made decisions to discipline trade-distorting subsidies in its agreements on agriculture, agricultural support remains high, particularly in industrialized countries. This is evident when looking at the agricultural markets. The most comprehensive and important economic event that the world economy has witnessed regarding the agricultural sector is the Uruguay negotiations (Örnek, 2007). After the completion of the Uruguay Round, the WTO was established on January 1, 1995, with the participation of 123 countries, including Turkey, and today plays an important role in international trade with its 164 members. The WTO constitutes a forum for all trade negotiations, including agriculture, and all decisions taken within the framework of the WTO are the result of negotiations between members (Ensari, 2015).

With the WTO agreement, it can be said that longer years are needed to talk about full free trade in the world. Because, first of all, non-tariff barriers (quota, import bans, distinction taxes, etc.) turn into very high rates of customs duties (Azmak, 2012).

The aim of this study; examining the structure of the WTO, the WTO Agricultural Agreement and recent reforms. Also, the determination of the WTO Agreement on Agriculture of the country groups as domain and compliance with the WTO decision situation in Turkey is evaluated.

WORLD TRADE ORGANIZATION

WTO deals with the global rules of trade between nations. Its main function is to ensure that trade flows as smoothly, predictably and freely as possible (WTO, 2018). The WTO officially became operational on 1 January 1995. The WTO has proved to be the main body of the international trade system and has given confidence to the member states with its determination to resolve disputes between the member states (MFA, 2018).

Multilateral trade agreements have an important place in the history of the WTO. These agreements are as follows (Örnek 2007):

1947 Geneva Conference (Switzerland),
1949 Annecy Conference (France),
1951 Torquay Conference (England),
1956 Geneva Conference (Switzerland),
1960-1961 Geneva “Dillan Round” (Switzerland),
1964-1967 Geneva “Kennedy Round” (Switzerland),
1973-1979 Geneva "Tokyo Round" (Switzerland),
1986 -1993 Punta del Este "Uruguay Round".

The Agricultural Agreement, which was signed in the Uruguay Round, aims to identify and control protective policies that prevent free agricultural trade and to gradually reduce protectionism in the agricultural field rather than providing full liberalization of agricultural foreign trade (Ay and Yapar, 2005). The WTO has 164 members. This number was 62 in the Kennedy Round, 102 in the Tokyo Round and 123 in the Uruguay Round (WTO, 2018).

AGRICULTURAL AGREEMENT

For many years, agricultural products have been protected by higher tariffs and a wider range of non-tariff barriers than industrial products, due to their importance for national economies. Although discussed agricultural issues in some rounds of talks in the framework of the GATT, binding decisions have not been taken in this regard. With the signing of the Agricultural Agreement, the agricultural trade was largely regulated (Büyükerşen, 2008).

According to the Agricultural Agreement, countries are divided into three groups. These are the developed countries, the developing countries and the least developing countries (Aydın, 2004).

Market Access

Market access includes arrangements to reduce the protection measures applied in the importation of agricultural products and to make the importation of agricultural products subject to tariffs only (Büyükerşen, 2008).

Domestic support

In WTO terminology, subsidies, in general, are identified by “boxes” which are given the colors of traffic lights: green (permitted), amber (slow down — i.e. need to be reduced), red (forbidden). In agriculture, things are, as usual, more complicated. The Agriculture Agreement has no red box, although domestic support exceeding the

reduction commitment levels in the amber box is prohibited; and there is a blue box for subsidies that are tied to programs that limit production (WTO, 2018).

Red box: Nearly all domestic support measures considered to distort production and trade (with some exceptions) fall into the amber box, which is defined in Article 6 of the Agriculture Agreement as to all domestic supports except those in the blue and green boxes. These include measures to support prices, or subsidies directly related to production quantities.

These supports are subject to limits: "de minimis" minimal supports are allowed (generally 5% of agricultural production for developed countries, 10% for developing countries); 32 WTO members that had larger subsidies than the de minimis levels at the beginning of the post-Uruguay Round reform period are committed to reducing these subsidies (WTO, 2018).

Blue box: At present, there are no limits on spending on blue box subsidies. In the current negotiations, some countries want to keep the blue box as it is because they see it as a crucial means of moving away from distorting amber box subsidies without causing too much hardship. Others wanted to set limits or reduction commitments, some advocating moving these supports into the amber box.

Green box: Domestic support for agriculture that is allowed without limits because it does not distort trade, or at most causes minimal distortion. They tend to be programs that are not targeted at particular products, and include direct income supports for farmers that are not related to (are "decoupled" from) current production levels or prices. They also include environmental protection and regional development programs. (WTO, 2018).

In terms of domestic support, developed countries pledged a 20% reduction for 6 years and developing countries pledged a 13% reduction for 10 years. The least developing countries do not have to commit to a discount.

Export subsidies

Developed country members are required to reduce, in equal annual steps over 6 years, the base-period volume of subsidized exports by 21% and the corresponding budgetary outlays for export subsidies by 36%. In the case of developing country members, the required cuts are 14% over 10 years concerning volumes, and 24% over the same period concerning budgetary outlays (WTO, 2018).

From 1996 to 2017, the Ministerial Conferences and the topics discussed were as follows:

1996 Singapore: Investigation by the WTO Agriculture Committee on progress in the implementation of the Agreement on Agriculture commitments, to address the challenges of the developing world economy.

1998 Geneva: The implementation of the Information Technology Agreement

1999 Seattle: Sanitary and Phytosanitary Measures, Dispute Resolution Mechanism, Intellectual Property Rights

2001 Doha: Doha Declaration adopted. Private and favorable treatment implemented in developing countries will be an integral part of the negotiations on agriculture as it can meet food safety requirements (Kurtuluş Kara, 2012).

2004 Cancun: Its main objective is to examine the progress in the negotiations and other work under the Doha Development Agenda

2005 Hong Kong: The main goal is to solve several problems that will shape the final agreement of the Doha Development Agenda that the members hope to complete at the end of 2006.

2009 Geneva: capacity development and trade assistance for developing countries, Discussion of the least-developed countries duty-free market access requests

2011 Geneva: Importance of Multilateral Trade System and WTO, Trade and Development, Doha Development Agenda

2013 Bali: Allowing entering the market without commitments and tariffs for the development of the Least Developed Countries, Trade Facilitation Agreement Bali Package created.

2015 Nairobi: Cotton and cotton-related products originating from least developed countries shall be provided with tariffs and entry to the quota-free market (Akman and Aran, 2015).

2017 Buenos Aires: Ministerial Decision on Fisheries Subsidies, Work Programme on Electronic Commerce, TRIPS non-violation and situation complaints, Work Programme on Small Economies

WTO AGRICULTURE AGREEMENT AND TURKEY

Turkey, on 26 March 1995 and has been a member of the WTO. It has signed all WTO agreements. Turkey, as a developing country, has fulfilled our commitment to discount. Turkey's domestic support notifications had not done since 2002, makes it difficult to analyze whether it is compatible with current support agreements, our country is in the process of negotiating their situation prevents a clear way to reveal. (Sarıal, 2015). Turkey has the right to use export subsidies for 44 products and has agreed not to use export subsidies in the coming years except these 44 products (MAF, 2018).

RESULTS AND DISCUSSION

Initially, each member state of the WTO has been treated very sensitively on the principles of equal treatment, while in recent years it has been observed that the WTO conferences have been mainly regulating the interests of the developed countries. To increase the competitiveness of underdeveloped and developing countries, it is necessary to provide flexibility in terms of commitment, subsidies and internal supports. These countries, whose economy is based on agriculture, need to take measures to protect their markets from foreign markets.

Turkey in the group of developing countries in the Agreement on Agriculture. Turkey within the scope of the WTO Agreement on Agriculture to market access and export subsidies have been given to fulfill their commitments. Turkey has no commitments on domestic support because it does not exceed the de minimis rate. Turkey should pay attention to the WTO criteria when creating their agricultural policies.

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PROSPECTING, INVENTORY AND IN SITU CONSERVATION OF AGRO-DIVERSITY IN THE TRADITIONAL OASES OF GAFSA- TUNISIA

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ABSTRACT

Tunisian oases retain a considerable agro-diversity of date palm, fruit species and vegetable crops. However, this agro-diversity is subject to genetic erosion. To fill this gap we undertook the prospecting and inventory of genetic resources of date palm and fruit trees in Gafsa- oases- Southwestern-Tunisia using a field survey and farmer interviews. The inventory of local species and varieties (species richness, varieties richness) was carried out and biodiversity indices (Shannon–Weaver, Simpson, etc.) were calculated. In situ conservation of local cultivars was realized by the Institute of Arid Regions (IRA) of Médenine- Tunisia. Gafsa oases (Sakdoud, Ksar, Lela, Gafsa and El Guettar) are characterized by a high diversification of local species and varieties. The result of our investigations allowed us to identify 23 date palm varieties and 11 fruit trees species. Fruit trees crop is mainly based on olive trees with a percentage of 62 % of total. Date palm represents a percentage of 18.48 % of total inventory trees. We surveyed 13 species of vegetable crops where cultivated (pepper, bean, chard, turnip, etc.). Shannon–Weaver indices are 2.38 and 0.47 for fruit trees and date palm, respectively. Concerning in situ conservation, a number of farmers were selected based on their receptiveness and awareness. Local cultivars of date palm, olive, fig, pomegranate, apple, apricot, table vine were introduced in the El Guettar oases. Future prospects include the expansion of in situ on-farm replanting and strengthening of collaboration and interchange of experiences with the local population.

PROSPECTION, INVENTAIRE ET CONSERVATION *IN SITU* DE L'AGRODIVERSITE DANS LES OASIS TRADITIONNELLES DE GAFSA- TUNISIE

INTRODUCTION

Les systèmes de production oasiens en Tunisie sont essentiellement basés sur l'association : palmier dattier - arboriculture fruitière - cultures maraîchères et fourragères. Cet ensemble qui recèle une importante diversité génétique constitue un système harmonieux et complémentaire. Le palmier dattier occupe une place prépondérante dans l'occupation des sols, suivi par l'arboriculture fruitière et les cultures maraîchères et fourragères. Le palmier dattier constitue un important patrimoine génétique. Il représente aussi la principale culture dans la formation du revenu des exploitations phœnicicoles par rapport aux autres cultures (Kadri et Van Ranst 2002 ; Kouki et Bouchaouach, 2008).

L'écosystème oasien regorge de plusieurs potentialités (variétés locales, potentiel en eau, savoir- faire local, encadrement technique). Cependant, les oasis tunisiennes connaissent depuis plusieurs décennies une perte de l'agrodiversité qui ne cesse de s'accélérer (Haj Ahmed et al. 2002 ; Ben Saleh 2012). En effet, le milieu est soumis à de fortes pressions telles que la rareté d'eau, la salinisation des nappes phréatiques et des sols **(**Job 1992), l'infestation de certaines espèces par des maladies et des ravageurs (DGEQV 2015). Sur le plan foncier, l'exiguïté des propriétés et leur extrême morcellement, conséquences des règles de transmission de l'héritage ont conduit à une baisse des revenus. Également, L'économie du marché a favorisé l'extension exagérée des dattes *Déglet Nour* aux dépend des autres variétés. Les variétés de faible valeur économique sont soit exploités pour le '*Legmi*', soit arrachés pour être plantés comme arbres ornementaux, surtout dans les zones touristiques. Plusieurs variétés locales de cultures maraîchères et d'arbres fruitiers se raréfient de plus en plus. Elles sont concurrencées par des variétés introduites (Ferchichi et Hamza 2008). Face à cette situation, la prospection, la conservation et la réintroduction du patrimoine phytogénétique oasien s'imposent pour garder aux systèmes de culture leur agrodiversité.

C'est dans ce cadre entre le présent travail qui est une action de la mission "Appui spécifique aux activités de protection de la biodiversité oasienne'', du projet "Gestion Durable des Ecosystèmes Oasiens Tunisiens (GDEO)", Ministère de l'Environnement et du Développement Durable. Ce travail tente de présenter les résultats de prospection et l'inventaire dans les oasis de Gafsa. Nous visons ainsi la description de la biodiversité, le recensement des espèces cultivées et l'énumération des variétés locales et celles les plus menacées de disparition en vue de mettre en place une stratégie pour la conservation et la gestion durable de l'agrodiversité.

METHODOLOGIE DE TRAVAIL

La région de Gafsa appartient à la partie sud-ouest de la Tunisie. Elle couvre une superficie approximative de 7807 km^2 et représente 4,8% du pays voire 8,6% de la totalité du Sud tunisien où s'installe 3.2% de la population tunisienne (DGEQV 2015). Les oasis du Gafsa sont des oasis continentales de montagne qui se différencient par leur altitude et leur latitude. Elles sont plus pluviales et moins chaudes que les autres oasis continentales. Les caractéristiques agriculturales de ces oasis ont permis de classer l'oasis historique de Gafsa comme oasis SIPAM à la suite de la reconnaissance officielle de la FAO. Les oasis de Gafsa comptent cinq principales oasis : Sakdoud, Ksar, Lela, Gafsa et El Guettar. C'est une vaste étendue de 2400 ha soit 6% de la superficie totale des oasis tunisienne dont 530 ha dans l'oasis d'El Guettar (Job 1992 ; Sghaier 2010).

La prospection des oasis des de Gafsa a été effectuée en se basant sur une approche participative permettant de choisir les sites de la prospection selon les recommandations et les indications des membres de GDA et des agriculteurs âgés. Le déroulement des prospections des 5 oasis (Sakdoud, Ksar, Lela, Gafsa et El Guettar) est réalisé pendant la période de Juin 2015 au Juin 2016. La prospection permettra la caractérisation des différents paramètres de l'agrodiversité et des différents facteurs de production afin de pouvoir évaluer l'état de l'agrodiversité oasienne, de contribuer à sa préservation et à son exploitation durable. La collaboration des membres des GDA à Zarat nous a beaucoup facilité la tâche de la collecte des données et le repérage des variétés rares chez les agriculteurs.

RESULTATS ET DISCUSSION

Au cours de notre travail, 86 parcelles ont été enquêtées et touchant les 5 oasis sus-indiquées (Sakdoud, Ksar, Lela, Gafsa et El Guettar). Les paramètres influençant la production ont été notés ainsi que le type et le nombre des espèces et/ ou variétés cultivées.

Les oasis de Gafsa comportent la culture de trois étages : le palmier dattier, comme premier étage, abrite un étage moyen d'arbres fruitiers et dans les secteurs peu ombragés un étage herbacé formé de cultures maraîchères et fourragères avec une structure totalement différente des autres oasis tunisiennes. Les oasis de Gafsa regorgent d'une diversité spécifique et variétale très importante. On a noté la présence de 12 espèces d'arbres fruitiers qui sont actuellement cultivées dans les parcelles visitées y compris le palmier dattier. Les différentes espèces ainsi que le nombre et le pourcentage des espèces recensées sont répertoriées dans le Tableau 1.

La culture arboricole des oasis de Gafsa est principalement basée sur l'oléiculture avec un pourcentage de 62 %, le palmier dattier vient en deuxième rang avec un pourcentage de 18,48 %. Ce schéma est presque le même dans toutes les oasis à l'exception de l'oasis de Sekdoud où on a noté la dominance du palmier dattier avec un pourcentage de 53,61 %. Le troisième rang est dépendant des oasis, le poirier et le grenadier de 12,9 % dans l'oasis de Lela et le pistachier dans l'oasis d'El Guettar avec 10,15 %.

Tableau 1. Nombre et pourcentage du total de palmier dattier et des espèces fruitières recensées dans les 5 oasis de Gafsa

Oasis	**Lela**		**Sekdoud**		**Legsar**		**Gafsa**		**El Guettar**		**Total**	
Espèces	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**
Palmier dattier	6	9,68	312	53,61	228	16,23	84	11,35	585	15,42	1215	18,48
Olivier	38	61,29	251	43,13	1135	80,78	632	85,41	2020	53,26	4076	62,00
Grenadier	8	12,90			12	0,85			359	9,46	379	5,77
Figuier	2	3,23	4	0,69	9	0,64	24	3,24	125	3,30	164	2,49
Pistachier			14	2,41					653	17,22	667	10,15

Abricotier			1	0,17					13	0,34	14	0,21
Pommier									2	0,05	2	0,03
Poirier	8	12,90			1	0,07			12	0,32	13	0,20
Oranger					6	0,43					6	0,09
Citronnier					14	1,00					14	0,21
Pêcher									2	0,05	2	0,03
Amandier									22	0,58	22	0,33

Le profil variétal du palmier dattier est très riche dans les oasis de Gafsa avec plus d'une vingtaine de variétés identifiées. Cependant, la population de palmier dattier est fortement dominée par *Deglet nour, Ftimi, Besser Helou* et *Kenta* (Tableau **2**).

Au niveau des variétés recensées On a noté la présence de 23 variétés de palmier dattier, certaines sont ubiquitaires dans toutes les oasis notant la variété *Deglet nour, Ftimi, Besser Helou et Kenta* sont particulièrement appréciées par les agriculteurs pour leur qualité supérieure et les revenus élevés qu'elles rapportent. Ce qui justifie leur dominance dans les exploitations par rapport aux autres variétés. D'autres cultivars sont rares et ils sont notés uniquement dans quelques parcelles (Tableau 2).

L'oasis de Lela est dotée d'une richesse phœnicicole assez faible et on a noté la présence que d'une seule variété : *Ftimi*, et d'autres pieds anonymes nommés en tant que *Khalt*. L'oasis de Sekdoud se caractérise par une tendance vers la monoculture de *Deglet nour*, et un degré moins les variétés *Besser Helou* et *Kenta*. L'oasis de Legsar montre la prédominance de *Deglet nour* et *Ftimi* avec la présence de *Kenta, Bisr Helou* et *Ksebba* avec des pourcentages de 15,32 %, 13,06 % et 9,91 %, respectivement. L'oasis de Gafsa a aussi la prédominance de *Deglet nour* et *Ftimi* mais avec seulement *Besser Helou* en troisième rang. Dans ces deux dernières oasis, dix autres variétés ont été répertoriées avec un pourcentage très faible (< 6%). L'oasis d'El Guettar est plus diversifiée, on a noté la présence de 20 variétés dans les secteurs visités. Dans cette oasis, la variété *Deglet nour* est très fréquente avec un pourcentage du fait proche de 50%, *Alig* et *Kenta* viennent par la suite avec des scores plus faibles, 19,66 % et 8,55 %, respectivement. Plusieurs autres variétés ont été trouvés mais avec des pourcentages très faibles. Certaines de ces variétés sont cités pour la première fois et ne se trouvent pas dans les listes des travaux antérieurs (Rhouma 1995 ; Rhouma 1996 ; Ferchichi et Hamza 2008). Ce sont les variétés *Khwat Kenta, Kebrechou* et *Bou Maaiza.*

Tableau 2. Nombre et pourcentage du total des variétés de palmier dattier recensées dans les 5 oasis de Gafsa

Oasis	**Lela**		**Sekdoud**		**Legsar**		**Gafsa**		**Elguettar**		**Total**	
Variété	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**
Deglet Nour			24	76.92	61	27.48	17	20.24	289	49.40	607	49.96
Ftimi	4	66.67	24	7.69	56	25.23	41	48.81	115	19.66	24	19.75
Gonda							5	5.95	9	1.54	14	1.15
Horra					5	2.25					5	0.41
Kenta			3	0.96	34	15.32			5	8.55	87	7.16
Hamouri									5	0.85	5	0.41
Arichti					2	0.90					2	0.16
Amari					2	0.90	1	1.19	13	2.22	16	1.32
Ksebba					22	9.91	2	2.38	4	0.68	28	2.30
Gosbi					6	2.70			3	0.51	9	0.74
Bidh Hmam							1	1.19			1	0.08
Khalt	2	33.33							25	4.27	27	2.22
Hlouwa					5	2.25			3	0.51	8	0.66

Besser Helou			45	14.42	29	13.06	15	17.86	21	3.59	11	9.05
Rtob					2	0.90			16	2.74	18	1.48
Kentichi					4	1.80	2	2.38	2	0.34	8	0.66
Hissa									4	0.68	4	0.33
Ghares Souf									1	0.17	1	0.08
Khwat Kenta									7	1.20	7	0.58
Kadhouri									2	0.34	2	0.16
Kebrechou									11	1.88	11	0.91
Bou Maaiza									4	0.68	4	0.33
Sbaa Arous									1	0.17	1	0.08

Les variétés rarement rencontrées sont des variétés délaissées et elles sont actuellement menacées du fait que les pieds sont âgés et avec absence de rejets pour le rajeunissement de la population. Certaines variétés sont très appréciées et actuellement demandés principalement par les agriculteurs d'El Guettar, il s'agit des variétés *Gonda* et *Ksebba*. D'une autre part nous n'avons pas rencontré des pieds mâles *Dhokkar* ce qui pose un problème de la fourniture exogène au cours de la saison de pollinisation avec les risques phytosanitaires.

Cette richesse de la diversité génétique phœnicicole des oasis de Gafsa est par ailleurs confrontée à diverses menaces. D'une part, la rareté de l'eau et d'autre part la sélection des agriculteurs qui s'orientent vers les variétés de haute valeur commerciale. Ceci a pour conséquence un délaissement de certaines variétés qui sont menacées de disparition.

L'oléiculture est le pilier de la culture oasienne dans la région de Gafsa où on a plusieurs variétés plantées dont certaines sont autochtones. Le tableau 3 récapitule les différentes variétés ainsi que leurs effectifs dans les oasis enquêtées. Huit variétés d'olivier ont été répertoriées. La variété *Gafsi* est la plus cultivée avec un pourcentage de 84.99 % puis la variété *Chemlali* et *Sehli* (introduite) avec 5.05 % et 4.15 %. A l'exception de l'oasis d'El Guettar où toutes les variétés sont présentes, les autres oasis montrent une diversité moins élevée voire même faible.

Tableau 3. Nombre et pourcentage du total des variétés d'olivier recensées dans les oasis de Gafsa

Oasis	**Lela**		**Sekdoud**		**Legsar**		**Gafsa**		**Elguettar**		**Total**	
Variété	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**
Gafsi	32	84,21	22	87,65	1084	95,51	62	98,10	1508	74,65	3464	84,99
Sehli	6	15,79	9	3,59	4	0,35			15	7,43	169	4,15
Fouji			19	7,57	2	1,76	2	0,32	1	0,05	42	1,03
Neb Jmel			1	0,40					1	0,05	2	0,05
Tawla			2	0,80					2	0,99	22	0,54
Zarrazi					27	2,38	1	1,58	34	1,68	71	1,74
Chemlali									206	10,20	206	5,05
Jebali									10	4,95	10	2,45

Le grenadier n'est pas une espèce ubiquitaire, il n'est rencontré que dans les oasis de Lela (une seule variété), Legsar (deux variétés) et El Guettar (4 variétés) (Tableau 4). La variété *Gabsi* prédomine les oasis de Lela et Legsar alors que la variété *Tounsi* est en tête dans les oasis d'El Guettar. Dans ces dernières oasis les variétés *Arbi* et *Gtari* sont considérées comme locales et elles sont très peu rencontrés et donc menacées.

Tableau 4. Nombre et pourcentage du total des variétés de grenadier recensées dans les oasis de Gafsa

Oasis	**Lela**		**Sekdoud**		**Legsar**		**Gafsa**		**El Guettar**		**Total**	
Variété	Nombre	%	Nombre	%	Nombre	%	Nombre	%	Nombre	%	Nombre	%
Gabsi	8	10	-	-	1	83,33	-	-	97	27,02	115	30,34
Beldi			-	-	2	16,67	-	-			2	0,53
Tounsi			-	-			-	-	254	70,75	254	67,02
Arbi			-	-			-	-	6	1,67	6	1,58
Gtari			-	-			-	-	2	0,56	2	0,53

Les variétés les plus répandues dépendent des oasis. On trouve la variété *Hammouri* dans les oasis de Lela et Sekdou, la variété *Soltani* dans les oasis de Legsar, les variétés *Gaaa Zir* et *Bither* à Gafsa et la variété *Bou Guerra* à El Guettar (Tableau 5). Une bonne diversité génétique est observée dans les oasis de Gafsa et principalement à El Guettar. Toutefois, les agriculteurs des oasis d'El Guettar nous ont avertis de la disparition et la rareté des variétés *Soltani, Gaaa Zir* et *Bazzoul Khadem* qui sont très appréciées et très recherchées.

Tableau 5. Nombre et pourcentage du total des variétés de figuier recensées dans les oasis de Gafsa

Oasis	**Lela**		**Sekdoud**		**Legsar**		**Gafsa**		**El Guettar**		**Total**	
Variété	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**	**Nombre**	**%**
Hammouri	2	10	3	75,00					2	1,60	7	4,27
Bither			1	25,00	2	22,22	5	20,83			8	4,88
Soltani					6	66,67	3	12,50			9	5,49
Khaddouri					1	11,11	2	8,33	12	9,60	15	9,15
Gaaa Zir							9	37,50	3	2,40	12	7,32
Bazzoul Khadem							2	8,33	5	4,00	7	4,27
Sawoudi							3	12,50	15	12,00	18	10,98
Hammouri									1	8,00	1	6,10
Dhokkar									3	2,40	3	1,83
Tounsi									5	4,00	5	3,05
Bou Guerra									7	56,00	7	42,68

L'enquête a montré que cette espèce n'est rencontrée que dans les oasis de Sekdoud et d'El Guettar. Le pistachier est planté intensivement dans les oasis d'El Guettar où il y a 98 % des pieds répertoriés. Deux variétés ont été notées *Arbi* (50 %) et une autre introduite de l'Italie (42 %). A côté on a noté la présence des pieds mâles avec un pourcentage de 9 %.

Sept autres espèces d'arbres fruitier ont été rencontrés, ces espèces se trouvent principalement dans les oasis Legsar et El Guettar. Il s'agit de : l'Abricotier (*Arbi*), le Pommier (*Arbi*), le Poirier (*Arbi* et *Bougolla*), l'Oranger (*Hlou* et *Garess*), le Citronnier (*Sheiri*), le Pêcher (Arbi) et l'Amandier.

Seules les oasis d'El Guettar et Lela ont montré la présence des cultures maraîchères et 13 espèces ont été notées dans les parcelles prospectées. Les cultures les plus fréquentes sont : la blette, le piment, le navet et la fève, La majorité les agriculteurs enquêtés assurent l'autoproduction de leurs semences locales qui les conservent depuis longtemps, Les semences introduites sont rarement rencontrées (deux agriculteurs d'El Guettar) et ce, dans le cas du piment et de l'aubergine,

Pour les cultures fourragères, la luzerne, elle est rencontrée dans les oasis d'El Guettar chez 15 % des parcelles visitées,

CONCLUSION

Les résultats ont montré une dégradation de la diversité agricole avec la perte de plusieurs variétés, Ceci est essentiellement dû à la rareté de l'eau, des problèmes phytosanitaires (maladies, ravageurs) de la sélection variétale par les agriculteurs qui s'orientent vers les variétés de haute valeur commerciale,

Dans les oasis de Gafsa telles que Sekdoud et El Guettar on remarqué la dominance de la variété *Deglet Nour* et on a signalé une régression importante des variétés de moindre valeur commerciale. Il est a signale également, la dominance de l'oléiculture par rapport aux autres cultures fruitiers. La monoculture de la variété *Gabsi* est un point faible qui augmente la sensibilité de sa culture et qui menace sa durabilité, La présence de l'olivier dans les parcelles oasiennes entraine la dégradation de l'étage phœnicicole et par la suite le palmier dattier se transforme en culture de bordure. On a constaté engament, l'effort fourni par les agriculteurs dans la conservation des espèces fruitières. Les cultures maraîchères sont encore présentes dans quelques oasis, Toutefois, plusieurs variétés locales se font de plus en plus rares, L'encouragement des agriculteurs pour leurs maintiens *in situ* est plus que nécessaire pour la préservation de ces ressources génétiques adaptées aux conditions des oasis.

Egalement, Les résultats obtenus lors des différentes explorations de terrain ont montré que diverses contraintes pèsent sur les systèmes de production oasiens. Ces contraintes sont d'ordre naturel, technique et socioéconomique et concernent toutes les exploitations avec des degrés différents.

Donc, La conservation des variétés de palmier dattier, espèces fruitières, maraîchères et fourragères *in situ* devient ainsi une condition vitale pour la durabilité de ces systèmes de production, Enfin, cette régression de l'agrodiversité fait appel à une action commune des chercheurs, agriculteurs, développeurs et collectivités locaux pour sauvegarder les espèces et variétés menacées et réintroduire celles disparues.

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NEPOVIRUSES

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ABSTRACT

Plant viruses are very destructive pathogens on different plant species in the world. It's really hard to estimate economic value of yield losses on crops. It's very important to know about epidemiology of virus diseases for controlling efficiently these pathogens. Transmission ways of viruses has an important place in their epidemiology, For this reason, preventing the transmission of viruses from one plant to another, in other words to prevent their spread, is one of the most common control methods. Nepovirus is a genus of viruses in the order Picornavirales, in the family Secoviridae and these viruses naturally infect plants. These viruses are transmitted by nematodes and have a polyhedral particle structure. The particles are mostly 25-30 nm long. Viruses in this group are transmitted by nematodes of the genus Xiphinema and Longidorus. Also, some of them are transmitted by seed. They differ in their serological properties, but have similarities about their physical properties and the similarity of the symptoms they cause. Infected plants show little or no symptoms at all. Typical properties of Nepoviruses are that they cause serious symptoms especially at the tops of the plants, but the leaves that subsequently develop are apparently and completely normal, even though they contain viruses. Grapevine fan leaf virus (GFLV), the first virus detected to be transmitted by a nematode (Xiphinema index), is also Nepovirus. The genus contains many important plant viruses, such as, Tomato ringspot virus (ToRSV), Tobacco ringspot virus (TRSV), and Arabis mosaic virus (ArMV). In this rewiev, symptoms on host plants, virus transmission mechanism, epidemiology, and controlling methods of Nepoviruses were summarized.

Keywords: *GFLV, Nematode, Nepovirus, Secoviridae, Xiphinema index.*

INTRODUCTION

Although it had been known since the early part of the twentieth century that soil could be a source of virus infection to newly established plants, the first direct demonstration that soil nematodes transmit plant viruses was not reported until 1958 (Hewitt et al., 1958). Quickly thereafter, other examples of virus transmission by nematodes were reported (Harrison and Cadman, 1959; Jha and Posnette, 1959), leading to the current acceptance of 30 nematode species that are known to transmit 15 viruses.

The term *Nepovirus* means a virus with polyhedral morphology transmitted by nematodes. They are a large group of more than 40 viruses, each of which may attack many annual and perennial plants and trees. They cause many severe diseases of trees and vines. *Nepovirus*-infected plants often show severe shock symptoms initially or in early spring but later in the season show partial recovery during which the symptoms (chronic symptoms) are milder or disappear completely (Anonymous, 2019)..

GENOM STRUCTURE

Nepovirus particles and their genomes are very similar to those of *comoviruses*. They are about 30 nanometers in diameter and have bipartite genomes, i.e., RNAs of 8 to 8.4 kilobases and 3.4 to 7.2 kilo-bases. The RNAs have a 5' Vpg and a 3' polyadenylate tail and their genes are similar to and arranged as in *comoviruses*. The shell of *nepoviruses*, however, consists of one, two, or three types of protein subunits. Several *nepoviruses* contain satellite RNAs in their particles, which depend on the virus for their replication. The species in this genus are clustered into three subgroups 'A', 'B' and 'C', based on the length (Anonymous, 2019).

- Subgroup A has an RNA-2 of 3,700–4,000 nt in length, present in both M and B components.
- Subgroup B has an RNA-2 of 4,400–4,700 nt in length, present only in the M component.
- Subgroup c has an RNA-2 of 6,400–7,300 nt in length, present in M component particles that are sometimes barely separable from those of B component.

They are classified as type **IV viruses** (ssRNA[+]) under the Baltimore classification system, and consequently contain bipartite, linear, single stranded positive sense **RNA** genomes. The two genome segments are encapsulated separately into two different icosahedral particles. Each of the genome segments produces a

different polypeptide, which undergoes a series of steps (i.e. proteolysis, and other post-translational modifications) in order to produce a functional protein.

RNA 1:

The first segment (RNA1) is approximately 8,000 nucleotides in length and appears as a single copy in each B type virion. It encodes the proteins that are important in replication and is the first gene to be activated.

RNA 2:

The second segment (RNA2) is approximately 4,000–7,000 nucleotides in length and usually appears as a single copy in each M type virion. It encodes the proteins that are important in cell-cell transmission and evasion of cellular defenses (De Souza et al., 2016, Koloniuk et al., 2018).

Table 1. Member Species of the Genus (Anonymous, 2019)

Virus species	Abbreviation	Virus species	Abbreviation
Apricot latent ringspot virus	ALRSV	*Grapevine Bulgarian latent virus*	GBLV
Arabis mosaic virus	ArMV	*Grapevine chrome mosaic virus*	GCMV
Arracacha virus A	AVA	*Grapevine deformation virus*	GDefV
Artichoke Aegean ringspot virus	AARSV	***Grapevine fanleaf virus***	**GFLV**
Artichoke Italian latent virus	AILV	*Grapevine Tunisian ringspot virus*	GTRSV
Artichoke yellow ringspot virus	AYRSV	*Hibiscus latent ringspot virus*	HLRSV
Beet ringspot virus	BRSV	*Lucerne Australian latent virus*	LALV
Blackcurrant reversion virus	BRV	*Melon mild mottle virus*	MMoV
Blueberry latent spherical virus	BLSV	*Mulberry mosaic leaf roll*	MMLRaV
Blueberry leaf mottle virus	BLMoV	*Mulberry ringspot virus*	MRSV
Cassava American latent virus	CsALV	*Myrobalan latent ringspot virus*	MLRSV
Cassava green mottle virus	CsGMV	*Olive latent ringspot virus*	OLRSV
Cherry leaf roll virus	CLRV	*Peach rosette mosaic virus*	PRMV
Chicory yellow mottle virus	ChYMV	*Potato black ringspot virus*	PBRSV
Cocoa necrosis virus	CoNV	*Potato virus B*	PVB
Crimson clover latent virus	CCLV	*Potato virus U*	PVU
Cycas necrotic stunt virus	CNSV	*Raspberry ringspot virus*	RpRSV
Grapevine Anatolian ringspot	GARSV	*Soybean latent spherical virus*	SLSV
Tomato ringspot virus	ToRSV	*Tobacco ringspot virus*	TRSV
Aeonium ringspot virus	AeRSV	*Tomato black ring virus*	TBRV

SYMPTOMS and BIOLOGY

Nepoviruses are widely distributed in temperate regions. The natural host range of *nepoviruses* varies from wide to restricted, depending on the virus. Ringspot symptoms are characteristic, but mottling and spotting are equally frequent. Twelve species are acquired and transmitted persistently by *longidorid* nematodes (*Xiphinema*, *Longidorus* or *Paralongidorus* spp.), three are transmitted by pollen, one is transmitted by mites (blackcurrant reversion virus) and the others have no known biological vector. Seed and/or pollen transmission is very common. In herbaceous plants, the symptoms induced by *nepoviruses* are often transient, with newly emerging leaves appearing symptomless a few weeks after infection (the so-called "recovery" phenomenon). Symptom recovery is associated with induction of RNA silencing, an antiviral defense, and is sometimes (but not always) accompanied with reduced concentration of viral RNAs (Ghoshal and Sanfacon, 2015).

TRANSMISSION

Viruses of twelve species are acquired and transmitted non-persistently by longidorid nematodes *Xiphinema*, *Longidorus* or *Paralongidorus* spp), three are transmitted by pollen, and viruses of one species are transmitted by mites (blackcurrant reversion virus). The others have no known biological vector (Susi, 2004). Seed and/or pollen transmission is very common (Anonymous, 2019).

CONTROL

Strategies to control crop diseases caused by nematode-transmitted viruses can be directed at either the vector nematode or the virus. Difficulties arise because the virus-vectoring nematodes are protected in the soil and cannot be treated directly, have wide host ranges, and can survive in soil for long periods. Similarly, if the virus is

targeted, difficulties arise because of their wide host ranges, which include many weed species. In addition, the ability of the viruses to spread via infected seed, pollen, and plant-propagation material and the natural diversity in the species and strains of nematode-transmitted viruses make management difficult. Nevertheless, a number of different approaches to nematode and virus control have been taken. Historically, practical control of nematodes has involved the application to the soil of nematicidal or nematistatic chemical treatments. However, many of the most effective fumigant and postplant nematicides have either been banned or their use has become highly regulated (Zasada et al., 2010). While many nematicides have been shown to control nematodes that transmit viruses (Bileva et al., 2009; Hwang et al., 2010; Ingham et al., 2007), future use will depend upon the regulatory status of each nematicide in any given location. Management practices other than the use of chemicals will be relied upon heavily in the future. Alternative control measures based on exclusion, genetic resistance, biological control, and cultural practices require an extensive knowledge of nematode and virus biology to achieve satisfactory results. Specific information about the nematode and virus, including accurate identification, host range, life cycle, survival strategies, and persistence, will be needed to effectively manage this disease complex.

The most common Nepovirus :*Grapevine fanleaf nepovirus* (GFLV) (Secoviridae)

Grapevine fanleaf virus (GFLV) is responsible for fanleaf degeneration, which is the most severe virus disease of grapevines (Raski et al., 1983; Bovey et al., 1990; Martelli and Savino, 1990). This disease occurs worldwide in almost all temperate regions where *Vitis vinifera* and hybrid rootstocks are cultivated.

Crop losses caused by GFLV vary from moderate to high, affecting more than 80% of the crop depending on the virulence of the virus isolate, the susceptibility of the grapevine variety, and environmental factors (Bovey et al., 1990; Martelli and Savino, 1990). Fruit quality is also altered by GFLV with a substantial decrease in sugar content and titratable acidity.

In the vineyard, GFLV is transmitted from grapevine to grapevine by the ectoparasitic nematode *Xiphinema index* (Hewitt et al., 1958). GFLV-infected grapevines often show a patchy distribution in diseased vineyards, as a result of a plant-to plant virus transmission by the nematode vector and its limited movement in the soil.

GFLV causes a variety of symptoms in grapevines that differ in type and severity (Martelli, 1993). Leaves become distorted and asymmetrical with sharply toothed margins, closer primary veins, and an open petiolar sinus. These typical foliar symptoms resemble a fan, hence, the name of the virus and the disease. Other foliar symptoms include chlorotic mottling, yellow mosaic with partially or completely chrome-yellow leaves, and vein-banding with light-green to chrome-yellow chlorotic bands along the veins. Obscure speckles and small yellow spots are also observed (Raski et al., 1983). Canes can also be malformed, showing short internodes, double nodes, fasciations, and zigzag growth between nodes (Raski et al., 1983).

Control Methods of GFLV

Using of virus-free certified seedlings,

Immediate removal of diseased rootstocks and vines,

New vineyards shouldn't be established on vector nematode infected areas,

After the old vineyards were removed from the infected areas, the new vineyard is not established in that area for at least three years, and during this time, cereals can be cultivated,

Also, if possible, controlling of vector nematodes by using nematicides may be advisable.

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COMPARISON OF ENVIRONMENTAL POLLUTION CONTROL VIA BIOLOGICAL REMEDIATION METHODS

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ABSTRACT

Biological mineralization is a basic process that microbial organisms form decomposing materials resulting in the removal of the pollutant as well as biological recovery changing on the type of pollutant. Two main mechanisms are possible: microbiologically controlled decomposition and microbial produced mineralization. These processes are regulated and living organisms produced different minerals which are serve important structural roles. This mechanism may include improvement of intercellular or essential inorganic/organic matters which special anions are introduced their composition regulating these essential ions concentration state is achieved. Mineral elements can be changed in the microorganism when its conditions into the row solution is thermodynamically unacceptable. Including this, mineral elements are changed any unapparent regulation control application, this changes in the high saturated system via the uptake or change of different metabolites and to the redesign of materials. It is a rule that precipitation nuclei, this is as surface cells which important for precipitation. Living organism's relation with soil/water pollutants may happen in organism of cell surface. This is depended in pollutant nature; the interrelation may affect to the oxidative state modification of the pollutant element. If it is anion or cation, the situation of the number of oxidations can result in its decomposition, this process was known as bio-decomposition, this is a regular procedure of used organism types. This process includes the different biochemical processes of the chemicals with cell membrane depletion, then inducing the change of their state to minerals. The last effectiveness in the general environment has a decrease for soluble ions concentration of. This procedure can explain for mechanism of contamination of polluted sites. This process studied on different organisms. It is very important for respectively in the benefits it assures to the microorganisms involved. The mineralization occurred via microbial activity may be related fully organized operations or microorganisms may also act as determiner of the bio-decomposition. The most general bio-minerals precipitated via microorganisms including oxides, phosphates, nitrate, sulphides, and others, and these may have specialized many biochemical properties which heavy metal absorption capacities and redox catalysis are. Some aquatic microorganisms have capability for bioaccumulation of water pollutants from the aquatic environment. In this case of the microbial composition maybe tested for heavy metal removal capability. In this investigation different types of organisms have been compared for their ability of removing pollution originating from different heavy metals.

Keywords: *Heavy metals, removal, accumulation, decomposition, microorganism*

INTRODUCTION

The bio-remediation process can be carried out by cleaning and rehabilitating previously contaminated areas and by cleaning the contaminated areas in proximity, or by coincidentally producing, storing, transporting and using inorganic and organic chemicals [1, 2]. Bioremediation says the removing possibility, removing, immobilizing or oxidizing elsewhere in the environment under the influence of bacteria [3-5], fungi [3, 4] and plants [5-7]. The design of the improvement in the biological remediation process was carried out with the study of the different fields such as molecular biology, analytical chemistry, environmental engineering, chemical engineering, microbiology and biochemistry. Different studies are conducted in this bio-developmental area. [8-10].

Systematic use in the design of environmental improvement systems designed with biological processes has been well developed and documented today [1, 4, 10-26]. Natural microorganism species are mainly used by

contemporary environmental biotechnology and natural removal techniques, or techniques used for the inorganic pollutant's removal from the environment. The most important virtue of bioremediation techniques over other biologic processes is that utilization of enzymatic systems which are developed in the nature by very long time period and are thus very specific. With the combination of these methods, it is possible to break down even the most dangerous contaminants. At present, metabolic pathways have been identified for compound degradation considered as non-degradable [12]. Laboratory and field techniques are available to assess the applicability of biodegradation of pollutants in specific areas [19, 27, 28].

Today, with the experience collecting over the last decade, the understanding of multidisciplinary technology in several aspects has been improved. However, there are still new technical and non-technical issues related to the implementation of bioremediation technology to a large extent. The level of non-technical uncertainty about technology may bring together financial, social, regulatory and legal issues. Issues which are non-technical may occasionally invalidate potential technical applicability for a particular application. the successful implementation of environmental biotechnology may be achieved with a combination of technical and non-technical issues.

It is not possible to examine every aspect of bioremediation in detail and to examine the obtained results by the giant researcher's community in industry and science in recent decades. However, this study is a general research and can be considered as a compilation of important books and selected articles from the literature.

Effects on Bioremediation

The conversion of dangerous contaminants into less harmful species by microorganisms is one of the most significant principles of bioremediation. Therefore, the biological improvement of pollutants is an implementation of microbial metabolic activity. Microorganisms act as biocatalysts through enzymatic removal and catalyse the progression of biochemical reactions that remove the targeted pollutants. So, bioremediation techniques can only be applied in biological living environments. Microorganisms act against pollutants only when various factors are available to support them producing energy and nutrients to form more cells. Rarely, under natural conditions in a polluted area, a process called intrinsic bioremediation occurs to a large extent, the basic interventions can occur without human interference. Mainly, bioremediation needs the formation of engineering systems for producing germ-stimulating materials and is an engineering process called bioremediation. Bioremediation is based on speeding up the required biodegradation reactions by promoting the growth of plenty of microorganisms and at the same time optimizing the environment in which organisms should carry out detoxification reactions [29].

Microbial restrictions

A successful bioremediation study is based on the use of suitable microorganisms [30- 33]. Theoretical consortia of naturally occurring species or genetically engineered microorganisms can be such microbial populations. Many systems are focused on the use of microbial species that occur naturally and are not well defined. In other words, in desired applications, microbial populations are effective, but full population characterization should be well known. This data shortfall isn't fundamentally the result of a logical insufficiency, but or maybe the steady energetic adjustment of microbial species to their environment. An illustration of the capacity of these microbial populations to adjust to the nearness of man-made chemicals is within the well-documented field of antibiotics, where quick adjustment of pathogenic organisms and their immunization with particular classes of antibiotics as a result of abuse.

Biological availability of pollutants

Pollutants must be bioavailable to be biodegradable [34]. Bioavailability relates to the physical state of the toxin and the plausibility of viable contact between the microorganism and the pollutant. This contact is best when the microorganism contaminant interface is maximized. As for the physical state, microorganisms by and large break up contaminants from the fluid stage and cannot successfully corrupt a contaminant until they are broken up within the oceanic environment, scattered from nanopores or from non-aqueous stage fluids (NAPL's) into the bulk arrangement. In such cases, the rate of natural debasement can be controlled by dissemination, desorption or disintegration rates. Polar, water-soluble contaminants have simpler bioavailability. For hydrophobic contaminants, the expanded contact surface of the contaminant - microorganisms may require the expansion of surfactants. The division of a chemical between its broken down / unstable states and exchange rates data gets to

be imperative in characterizing its bioavailability. Bioavailability includes the effects of both chemical and physical parameters that ultimately determine the microbial utilization potential of a compound and hence its biodegradability potential [12, 23, 28, 34].

Other pollutant properties

For pollutant properties, pollutant-soil interactions are critical to the capability of pollutant mobility and removal technologies for pollutants. Important pollutant properties consist of solubility of water, constant of dielectric, density and aqueous media chemistry, vapour pressure, coefficient of diffusion and molecular weight [25].

Today, bioremediation methods, which are applied in most places, are used to stimulate natural populations of microbes in the contaminated area, by adding suitable nutrients, mainly by providing oxygen, carbon, phosphorus and nitrogen, creating optimum pH conditions, humidity and other important factors. Natural biodegradation is preferred to increase the growth and activity of microorganisms [14].

Although trace amounts of some metals are important for microbial growth, regions found heavily contaminated by these metal ions at high concentrations in soil or water environment generally block any activity in the metabolism of cells, therefore bioremediation process is affected directly [32]. High concentrations within the stage may have poisonous impacts on microorganisms, indeed in case the same chemicals are effectively corrupted at low concentrations. Toxicity hinders or moderates microbial metabolic movement and frequently anticipates the development of unused biomass required to quickly evacuate poisons. The degree and instruments of toxicity depend on toxicants, concentrations and microorganisms uncovered. A few natural compounds are poisonous to targeted life forms, such as insects and plants, and may be poisonous to organisms. Such compounds incorporate herbicides, pesticides, rodenticides, fungicides and bug sprays. In expansion, a few classes of inorganic compounds such as cyanides and asides are harmful to numerous organisms; In any case, these compounds may corrupt taking after a period of microbial adjustment [32].

Bio-stimulation can be modified by adding nutrients to promote the biodegradation rate of contaminants by natural microorganisms, such as oxygen and other electron acceptors, as well as nitrogen and phosphorus. This alternative is additionally chosen when there's a characteristic microbial population within the region that has the potential to break down chemicals, but in reality needs oxygen, nitrogen or other supplements to break them down. The lost components can at that point enter the system and the disturbing movement of the microbial community can be actuated. Most bioremediation frameworks utilize a few shapes of bio-stimulation [24, 31].

Bio-augmentation enhances, but does not alter, the non-native allochthonous microorganisms or inoculated native species or inoculated microbes, such as lipase, proteinase, cellulase, *etc*., of pollutants, added microorganisms, the established microbial population. For the most part, microscopic organisms with the vital catalytic exercises and other fundamental properties are infused straightforwardly with contaminants, more often than not with supplements. Bio-growth may be required where microbes with the vital catalytic movement, in spite of the fact that show within the locale, are flawed and / or exceptionally gradually sullying contaminants.

Biotransformation of metals, metalloids and radionuclides

The toxicity and versatility of the components depend basically on the properties of the soil which are essentially influenced by soil pH, redox conditions and surface chemistry. These are all-natural components that can be optimized by controlling microbial exercises to decrease the chance of overwhelming metals in sea-going situations. Microorganisms cannot change over metals into distinctive components. Be that as it may, they may change the microenvironment around the microbial cell and catalyse oxidation, diminishment, methylation and alkylation responses that influence the solubility and portability of numerous metals. In addition, microbial cells offer a number of conceivable Physico-chemical interaction components (eg. complexion, coordination, chelation, particle trade, adsorption, micro-precipitation) that cause immobilization with dissolvable metal, radionuclide, and metalloid species [18, 30, 35-39].

Biological precipitation

Metabolic factor processes change the environment around the microbial cell. Beneath high-impact conditions, microorganisms increase the oxygen solubility of the electrons reachable from the electron donor atom (often within the case of bioremediation where a natural toxin is found) or water seepage from the ground to the

aquifers. Natural carbon is mineralized to carbon dioxide and oxygen is diminished to water. The created broken up carbon dioxide increments the alkalinity and pH of the microenvironment of the cells and permits the overabundance bicarbonate to accelerate the metal particles as metal hydroxides $Me(OH)_x$ or carbonate $Me_2(CO_3)_x$ [35, 37].

In an anaerobic environment, nitrates may act as terminal electron acceptors. The method known as denitrification is broadly utilized in municipal wastewater treatment units. The expulsion of nitrates is changed over to nitrogen gas through the intermediate nitrite. From the oxidation of the carbon source, bicarbonates are created which increments the pH of the medium. Solvent metal particles are accelerated as metal hydroxide or carbonate having responses comparable to the oxygen-consuming metabolic state. Pseudomonas and Alcaligenes sp. immobilizing broken down metal species by the activity depicted already [35, 37, 40].

Bio-oxidation

Biodegradation of components does not continuously decrease their versatility and may have a negative impact. For instance, under anaerobic conditions, As(V) within the arsenate shape (AsO_4^{3-}) can moreover work as an alternative electron acceptor and can be decreased to more harmful and more mobile As (III) within the shape of arsenide (AsO_2^-). This process is reversible since the arsenide can be reoxidized to arsenate and in this way re-immobilized beneath high-impact conditions. Essentially, Mn (IV) is diminished to more mobile Mn (II) by a more harmful conjointly reversible response beneath anaerobic conditions [12]. Detailed information on arsenic geomicrobiology can be found within the writing [22, 38, 41, 42].

Bio-sorption

Biosorption can be characterized as specific metal/metalloid or radionuclides bringing about immobilization of dissolvable species by microbial cells. Metal maintenance by various parts of metabolically dynamic or latent cells can happen by different systems: complexation, chelation, coordination, particle trade, precipitation, decrease [43, 44]. Biosorption is a procedure with some particular properties. It can viably isolate from broke down metals or exceptionally weakened complex arrangements. This makes biosorption a perfect option for the treatment of high volume, low focus complex wastewater. Nonetheless, today biosorption isn't viewed as a focused free innovation on the grounds that the industrial applicability of the procedure is very restricted and pilot applications have demonstrated impediments on the utilization of latent microbial biomass, chiefly on account of the expense of planning a reasonable biosorbent material.

Then again, high focuses in the treatment water antagonistically influence the take-up of metals focused by the immobilized microbial biomass and make it increasingly hard to recoup and reuse the organic material. Nonetheless, on account of metabolically dynamic microbial cells, biosorption adds to the general sequestration and immobilization of metal particles as a parallel component in combination with other metabolic intervened systems, for example, bio precipitation and bio-decrease [43-45]

Phyto-remediation

Phytoremediation is characterized as the utilization of vegetation intended to isolate, expel, aggregate, evacuate, debase and/or detoxify squanders containing inorganic and natural poisons from soil, residue, surface waters and groundwater [29, 46]. Plant source remediation frameworks are commonly viewed as inactive, minimal effort, low innovation procedures and utilize normal plants including trees, vegetable plants, herbs and even yearly weeds to process overwhelming metals, inorganic particles, radioactive components and natural mixes. Phytoremediation is viewed as an elective bioremediation alternative appropriate for soils having properties that hinder the accomplishment of regular innovations (eg, low penetrability, immersion, thick structure, blends of toxins). At the point when appropriate plants are planted in contaminated soils, the root framework works as a scattered take-up framework. Contaminations are taken up with soil water and debased, processed and/or separated in the plant, while vanishing from air particles boosts the development of soil water in the plant. Certain plants have been distinguished which can draw in and concentrate metals and other inorganic atoms from soil to leaves, stems, seeds and roots. Usually utilized hyperaccumulators incorporate sunflower (*Helianthus agnus*), Indian mustard (*Brassica juncea*), crosses (*Thlaspi caerulescens, T. elegans*), violets (*Viola calaminaria*), serpentine (*Alyssum bertolonii*), corn, bother and dandelion [12]. Development plants would then be able to be gathered and prepared by burning, treating the soil or anaerobic processing to aggregate and/or recuperate contaminants [22].

Phytoremediation has demonstrated to be valuable for generally immobilization for soils contaminated with shallow depths of pollutants, and for natural pollutants by and large appropriate to tolerably hydrophobic fabric. Cases thereof are toluene, benzene, PAHs, xylenes, ethylbenzene, and numerous chlorinated solvents. Natural compounds may be corrupted or immobilized within the root locale or consolidated into shoot tissues and metabolized.

CONCLUSIONS

Bioremediation may be a multidisciplinary innovation and requires information and in-depth understanding of all relevant logical regions for fruitful usage. Nowadays, the microbes use various processes such as precipitation, biosorption, enzymatic transformation of metals, complexation to remove pollutants from various environment. Microorganisms possess inherent biological mechanisms that enable them to survive under heavy metal stress and remove the metals from the environment. Environmental factors play a major role in the success of bioremediation as the microbes used will be hampered if appropriate environmental conditions are not available.

With new advances in technology genetically altered microorganisms may be more effective than the natural ones.

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GREEN ECONOMIC ANALYSIS FOR USING ·F WASTEWATER IN IRRIGATION IN GHARBIA GOVERNORATE

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ABSTRACT

Green economy is a new model of fast-growing economic development, which is based mainly on knowledge of environmental economics and reducing the depletion of resources and environmental degradation, especially water resources, which are the main objectives of the green economy and sustainable development Wastewater reuse is a very low-cost alternative, especially when water is of adequate quality, The problem of the study is the misuse of unconventional water resources, which is represented in agricultural wastewater and wastewater in a way that wastes its economic value due to the large quantities of unconventional wasted water, Failure to take advantage of them will lead to serious environmental, health and economic damages leading to conflicts with the basic principles of sustainable development and the 2030 strategy

The research also aimed to measure the development of treated and reused wastewater in Egyptian agriculture and greening the analysis of the effect of different types of irrigation water on some economic and productive variables of rice crop used dummies variables. The research was based on preliminary data collected from a stratified random sample of 80 farmers of the study area in Gharbia Half of them were treated wastewater mixed with agricultural wastewater and the other half used freshwater for irrigation. The most important results were that the annual growth rate of the total amount of wastewater reused in Egyptian agriculture during the study period was about 4.6% and that the greening of the treated wastewater leads to environmental pollution (trap pollution) with increasing water supply. And other benefits which led to the achievement of green growth and thus the good life of the entire population horizontally and vertically, and that is economically, socially and environmentally sustainable, leading to Zero West for sewage and animal and plant waste, The differences between the quality of water used, productivity, total costs and technical efficiency of rice crop were also significant By using dummies variables.

INTRODUCTION

Green economy is a new model of fast-growing economic development, It is based primarily on knowledge of environmental economics and aims to address the interrelationship between human economics and the natural ecosystem, Water conservation, reducing resource depletion and environmental degradation are among the most important objectives of the green economy wastewater reuse is a low-cost alternative, especially when water is of adequate quality.

RESEARCH PROBLEM

The problem of research is the misuse of non-conventional water resources, namely agricultural wastewater and wastewater, In the form that wastes its economic value due to the large quantities of unconventional wasted water, which does not benefit from them lead to serious environmental, health and economic damage This leads to conflict with the basic principles of sustainable development and the 2030 strategy. **Research aims:**

The research aimed at the following: 1 - The development of the amount of wastewater reused in Egyptian agriculture and greening 2 - Analysis of the impact of different types of irrigation water on some economic variables and productivity of rice crop by using dummies variables.

RESEARCH'S METHOD AND DATA SOURCES

The research was based on preliminary data collected from a stratified random sample through a questionnaire questionnaire which included 80 farmers of the study area in Gharbia governorate, half of whom are treated wastewater users mixed with agricultural wastewater the other half used fresh water for irrigation. The

research was based on the use of statistical methods descriptive and quantitative appropriate to the objectives and nature of the study As well as based on the calculation of averages and simple linear regression and multiple analysis of variance, correlation coefficient It also used the dummies variables In the comparison between the productivity of the two types of irrigation water in the production of the most important field crops covered by the research is the rice crop.

THE PREVIOUS STUDIES

Omar's study, et al (Reference No. 2) entitled "Irrigation with Reuse of Treated Wastewater and Agricultural Wastewater", showed that Egypt's growing population is not matched by a similar increase in water resources, hence the inevitable reuse of treated wastewater and water. Agricultural drainage, taking into account the health and economic constraints of this water Egyptian conditions necessitate bringing and converting wastewater and effluent into suitable quality for irrigation unrestricted by certain crops, with a wide succession of crops that can be irrigated, while trying to devise technological treatment that suits the environmental and economic requirements. The importance of international tourism and the export of agricultural products should be taken into account when using such water. When forced to use this water as expected, the major challenge is to stop soil salinization, despite the fact that fresh water supplies are limited and threatened by pollution. ,.

Mustafa (Reference No. 3) entitled "The economic and environmental effects of using low quality water in Egyptian agriculture a study aimed at identifying the economic and environmental impacts arising from the use of such water quality in irrigation and comparing it to the state of fresh water. The researcher used production functions to measure the productive efficiency of water resource use in agriculture In addition to the use of the EIA matrix to identify the environmental impacts resulting from the use of low water quality in irrigation, it was found through the study of inputs and outputs in the sample farms there is a double increase in the amount of irrigation water, net nitrogen and current capital and manual labor In the case of the use of fresh and blended irrigation water and agricultural drainage respectively, and in the case of the use of wastewater for irrigation was not to use municipal fertilizer, and the reduction of the amount of nitrogen added as noted the decrease of manual work and increase the number of automatic working hours in the case of irrigation with wastewater Health To avoid harmful health effects in addition to increasing the rate of seeds and pesticides due to fungal infections and the spread of harmful insects and rodents, and for the physical output of crops grown by sample and irrigated with fresh water comes in the first rank Followed by irrigated with sewage followed by irrigated with mixed water and then finally irrigated with agricultural wastewater ..

The World Health Organization (WHO) study (Reference No. 4) "Wastewater Reuse in Agriculture", showed that reuse of wastewater (wastewater) in agriculture is economically feasible and will generally lead to the provision of additional water sources and organic materials. To improve the soil Improving the environment by preventing or minimizing discharges to surface water, conserving fresh water sources, and improving the economic efficiency of investments in wastewater disposal and irrigation. The study also examined the reasons why wastewater is not used as a resourceWhere it is not considered for five main reasons: 1 - lack of information available on its benefits. 2. Fear of potential health risks. 3. Cultural influence. 4-Lack of a comprehensive analysis of the economics of reuse projects, 5- Good practices on wastewater reuse in areas without planning or weak design plans. The study showed that waste water reuse has two main purposes First, it improves the environment by reducing the amount of waste discharged into waterways. The second is to conserve water resources by reducing the demand for freshwater extraction.

RESEARCH'S RESULTS AND ITS DISCUSSION

First: Evolution of the amount of wastewater reused in agriculture and greening

Table (1) shows the wastewater reused in agriculture during the period (2000 - 2016), where the average quantity of the average irrigation water used in agriculture is about 1.90% , Where the state has recently turned to the use of agricultural wastewater and health in agriculture to expand the reclamation of desert land and converted into productive land to meet the needs of the necessary community members , The amount of wastewater reused in Egyptian agriculture ranged between 0.6 billion m3 in 2000 as a minimum and a maximum of 1.3 billion m3 in the period from 2007 to 2008 The period from 2011 to 2016 with an annual average of about 1.11 billion m3. Estimating the annual growth rate of the total amount of wastewater reused in Egyptian agriculture during the

study period, It has been shown that it is on an upward trend with a growth rate of about 4.6% as shown by equation (1) in table (2) ..

Table (1) The relative importance of wastewater reused in Egyptian agriculture during the period (2000 – 2016).

Average per acre m 3	%Total quantity of recycled wastewater	The amount of wastewater reused 1 billion m3	Total amount of water used in agriculture	Cultivated area	the year
76.57	1.11	0.6	54.05	7.836	2000
75.52	1.09	0.6	55.23	7.945	2001
85.92	1.37	0.7	50.97	8.147	2002
110.93	1.74	0.9	51.78	8.113	2003
120.79	1.84	1.0	54.30	8.279	2004
131.19	1.94	1.1	56.80	8.385	2005
140.73	2.03	1.2	59.00	8.527	2006
152.10	2.19	1.3	59.30	8.547	2007
154.17	2.17	1.3	60.00	8.432	2008
125.24	1.80	1.1	61.00	8.783	2009
143.00	2.04	1.25	61.30	8.741	2010
150.83	2.13	1.3	60.90	8.619	2011
147.74	2.13	1.3	61.10	8.799	2012
145.38	2.09	1.3	62.10	8.954	2013
145.80	2.08	1.3	62.35	8.916	2014
142.92	2.08	1.3	62.35	9.096	2015
142.84	2.09	1.3	62.15	9.101	2016
128.92	1.90	1.11	58.51	8.542	Mean

Source: Compiled and calculated from: Central Agency for Mobilization and Statistics And the water balance of Egypt - scattered numbers) .Statistical Yearbook(

Table (1) Annual growth rate of the quantity of reused wastewater and the Acre share of this quantity in Egypt during the period (2000 – 2016) .

N	The equation is half-logarithmic	R^2	F	Annual growth rate
1	$\hat{Y}_1$= - 0.339 + 0.046 X_I Ln)** 5.818)** (- 4.223(	0.693	** 33.851	4.6
2	$\hat{Y}_2$= 4.503 + 0.037 X_I Ln)** 4.824)** (57.511(	0.608	23.272**	3.7

amount of reused wastewater is in m3 ،Values between parentheses represent the value of the distribution (T) ,(Y_1) The amount of reused wastewater is in m3 , (Y_2) Represents the share of Acre of the quantity used for the reuse of wastewater m 3 (X_i) As the time variable during the period (2000 - 2016), ** is significant at 0.01

The Acre share of the amount of reused wastewater

Table (1) shows that the average Acre share of the amount of wastewater reused in Egyptian agriculture during the period (2000 - 2016) amounted to 128.92 m3, Estimating the directional values of the evolution of the Acre share of the quantity of wastewater reused in Egyptian agriculture during the study period, It has been shown to be on an upward trend with a growth rate of about 3.7% as shown by equation (2) in table (2) . The average Acre share of the amount of wastewater reused in Egyptian agriculture ranged between 75.52 m3 in 2001 and a minimum of 150.83 m3 in 2011.This indicates an increase in the amount of wastewater reused in agriculture and the share of Acre. ,.

Greening of wastewater (Reference No. 6) Some non-green studies suggest that water uses will be unsustainable and that both surface and groundwater stocks will be reduced. Under the green investment scenario, water uses will be within sustainability limits while achieving sustainable development goals **.**

One of the most important axes of greening water is: It is the recycling of all stages of wastewater and use it in the new lands to establish industrial agricultural bodies such as planting trees, forests and pastures and thus animal production farms and then the industries of paper and wood and organic fertilizers .

The overall results of water greening were ; Bridging part of the increasing water gap, increasing water productivity, full water recycling (zero sewage), minimizing pollution in waterways, soil, groundwater, drinking

water, preventing diseases and health problems, improving health and providing millions to treat pollution problems ,Using reclaimed water in reclaimed land, cultivating fodder and pastures for livestock, planting trees for wood, furniture, paper and compost industries, purifying the environment from pollution (trap pollution), increasing water supply , The above leads to jealousy to achieve green growth and thus the good life of the entire population, horizontally and vertically, in a manner that is economically, socially and environmentally sustainable, And environmentally down to: - Zero west for sewage and for animal and plant waste and Zero unemployment.

Secondly : - Analysis of the effect of different types of irrigation water on economic and productive variables of rice crop using Dummy Variable References (8, 7, 5)

Analysis of the Effect of Irrigation Water Quality on Economic and Productive Variables of Rice Crop Using Dummy Variable , Where the productivity of irrigation water mixed with agricultural wastewater is compared with the productivity of freshwater irrigation water in one equation and can be put in the following form.

$$X_t + \beta_2 \left(D_t \; x_t \right) + ut \;\; \beta_{1t} + D_t \propto_2 + \propto_1 = y_t$$

Where the physical output (Y_T) Quantity of irrigation water used m3 (x_t) The variable X_t D_t is the result of multiplying the image variable X_t with the variable D_t (ut) A probabilistic random variable whose expected value is equal to zero. The productivity of irrigation water is therefore wastewater. .

$\beta_1 X_t$ $+ \propto_1) = X_t . 0 = D_t$ l y_t (E

The productivity of freshwater irrigation water

$(\beta_1 + \beta_2) X_t$ $) + \propto_2 + \propto_1) = (X_t . 1 = D_t$ l y_t (E

This model was estimated in the form of X, D, x d of rice crop at the level (agricultural season) and another model was estimated that includes only two variables are X, D , In the following section we will analyze the impact of different types of irrigation water on productivity, total costs and technical efficiency of both types of irrigation water using the rice variant of the rice crop. Analyze the results of these models in order. Where the value of the physical product is = y and the value of the total cost of the crop = y_1 and the technical efficiency number of the crop = y_2.

1- Analysis of the effect of different types of irrigation water on rice crop production function using Dummy Variable.

The most impotent results:

First model: $Y^{\wedge} = -.548 + .001 X + .393 D + 7.299 D X$

(-3.83)** (29.54)** (1.58) (1.83)*

$R^2 = 0{,}948$ F = 462.93**

The numbers in the model indicate the significance of the variables X and X D and the stator and the non-significance of the imaginary variable D , There was also a difference in the inclination n coefficient of the production function of the irrigation water variable and there is no difference in the fixed part due to the non-significant coefficient of the variable D , It can be calculated as follows .

Production function of wastewater $Y^{\wedge} = -.548 + .001x$

Freshwater production function $y^{\wedge} = -.548 + (0.001 + 7.299) X$

$-.548 + 7.300 X Y^{\wedge} =$

Second model: $Y^{\wedge} = -.683 + .001 X + .839 D$

(-5.49)** (35.52)** (15.50)**

$R^2 = 0{,}946$ F=672.11**

It is clear that the significance of each of the coefficients of this model, whether the fixed part or the coefficient X or the coefficient of the image variable D and also confirmed that there is a significant difference on the fixed part of the function .

Production function of wastewater $Y^{\wedge} = -.683 + .001 X$

Freshwater production function $Y^{\wedge} = (-.683 + .839) + .001 X$

$.001x + .156 = Y^{\wedge}$

Therefore, the change of water quality for rice yield has had a significant effect on the tendency of the productive function of irrigation water in one model and the fixed part in another.

2- Analysis of the effect of different types of irrigation water on the total cost of rice yield using Dummy Variable.

The most impotent results:

First model: $Y^{\wedge}_2 = 834.2 + .950\ X + 665.85\ D - .170\ D\ X$

(4.15)** (31.82)** (1.90) (-3.04)**

$R^2 = 0{,}949$ F 474.11**

The numbers in the model indicate the significance of the variables X and X D and the stator and the non-significance of the imaginary variable D , There was also a difference in the inclination n coefficient of the production function of the irrigation water variable and there is no difference in the fixed part due to the non-significant coefficient of the variable D , It can be calculated as follows .

Production function of wastewater $Y^{\wedge}_2 = 834.2 + .950\ X$

Freshwater production function $Y^{\wedge}_2 = (834.2 + 0) + (.950 - .170)$

$834.2 + .780\ X$ $Y^{\wedge}_2 =$

$Y^{\wedge}_2 = -1148.46 + .901\ X - 373.71\ D$

Second model:

(6.33)** (33.92)** (-4.79)**

$R^2 = 0{,}943$ F=638.37**

It is clear that the significance of each of the coefficients of this model, whether the fixed part or the coefficient X or the coefficient of the image variable D and also confirmed that there is a significant difference on the fixed part of the function .

Production function of wastewater $Y_2 = -1148.46 + .901\ X$

Freshwater production function $Y_2 = (-1148.46 - 373.71) + .901\ X$

$X\ .901 + -1522.17 = Y_2$

Therefore, the change of water quality for rice yield has had a significant effect on the tendency of the productive function of irrigation water in one model and the fixed part in another.

3- Analysis of the effect of different types of irrigation water on the technical efficiency of rice yield using .Dummy Variable.

The most impotent results:

First model: $Y^{\wedge}_3 = .189 + 7.904\ X + .761\ D - 7.58\ X$

(4.64)** (13.10)** (10.74)** (-6.69)**

$R^2 = 0{,}866$ F = 163.37**

The figures in the model indicate the significance of the variables X, X D, D and the stator. Also, there was a difference in the slope coefficient of the production function of the irrigation water variable and there is a difference in the fixed part as well and can be calculated as follows:

X $Y^{\wedge}_3 = .189 + .\ 7.904$ Production function of wastewater

Production function of wastewater $Y^{\wedge}_3 = (.189 + .761) + (7.904 - 7.580)\ X$

$.950 + .342\ X$ $Y^{\wedge}_3 =$

$Y^{\wedge}_3 = .329 + 5.751\ X + .298\ D$

Second model:

(7.53)** (8.99)** (15.67)**

$R^2 = 0{,}787$ F=141.90**

It is clear that the significance of each of the coefficients of this model, whether the fixed part or the coefficient X or the coefficient of the image variable D and also confirmed that there is a significant difference on the fixed part of the function .

Production function of wastewater $Y^{\wedge}_3 = .329 + 5.751\ X$

Freshwater production function $Y^{\wedge}_3 = (.329 + .298) + 5.751\ X$

$5.751\ X + .627 = Y^{\wedge}_3$

Therefore, the change of water quality for rice yield has had a significant effect on the tendency of the productive function of irrigation water in one model and the fixed part in another .

This means that the effect of irrigation water quality on productivity, total cost function and technical efficiency of rice crop is significant This is consistent with the analysis of the significant differences between the quality of water used, productivity, total costs and technical efficiency of rice crop **.**

Through the results of the research we can recommend the following:

1 The necessity of adopting some factors that will reuse wastewater, especially wastewater after treatment as an unconventional water resource to bridge the gap between the increasing demand for water and the stability of supply while taking environmental hurdles and trying to control the negative effects of this use
2 Efficient use of water, especially irrigation water with the reuse of all types of gray water gray water and waste water in the light of conditions and controls to protect humans and other organisms
3 Periodic assessment of the environmental and economic effects of soil properties and crops grown in treated wastewater and agricultural wastewater reuse areas
4 condemn the loss and damage in the water to zero zero west

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AN ECONOMIC STUDY OF FOOD SECURITY AND GRAIN SELF-SUFFICIENCY IN EGYPT

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ABSTRACT

Increased consumption is seen as population increases and production and climatic conditions increase . Especially as the group is experiencing a large food gap between production and consumption. The research problem is the existence of the food gap in the food group, which is the most important component of the food gap in Egypt and the most The aim of the research is to assess the state of food security and self-sufficiency of the grain group in Egypt. The most important results Research in the decline in the food gap of the cereal group annually by about 5.8% the study period of a year (2000-2017). The percentage of self-sufficiency of the cereal group decreased by 1.22% per year . Egypt relied on the outside to meet its needs of grain group by about 35% . It was found that the grain group achieved a period of production efficiency consumption was about 246 days, and showed a decline in the period of production adequacy consumption of the grain group with a growth rate of about 0.9%. Thus, this indicator indicates a decline in food security in the study. The period of import coverage for consumption of the grain group in Egypt was about 127.2 days. The total strategic stock of the grain group was about 94.1 thousand tons, enough for only 246.3 days. The data indicate a decrease in the food security coefficient of the food group in Egypt. The average food security of the cereal group was about 0.06 during the study period of a year (2000-2017).

The results of the study showed that the factors of the determinants of the food security and self-sufficiency factors of the group of grains were found in the double logarithmic picture, which included the introduction of the variables (the quantity of production from the grain group and the population). The multiple regression coefficients of these two variables were also significant at the mean levels of 0.01.

The use of Dummy Variables showed no significant effect of the January 2011 revolution on food security, self-sufficiency, and gap of grain group. Which may be due to the short period available after the revolution of January 2011 and until now, a period not exceeding seven years to reflect the impact of this revolution.

INTRODUCTION

Food is one of the major problems facing many countries in the world, Especially the Arab countries, Successive food crises have led to the need to look for the causes of these crises, Food deficits are rising sharply and accelerating at a high rate to widen the gap between production and consumption as a result of unequal growth with population growth.

Achieving food safety within the country means insufficient production equivalent to or exceeding domestic demand. Relative food security refers to the state's ability to provide goods or foodstuffs in whole or in part. Food security is based on four main themes: (1) Food Availability (2) Food Accessibility (3) Efficiency and Sustainability (4) Policies and Agency. In order to create a strategic stock of the commodity through the provision of the government or the private sector to provide the necessary quantity to meet the expected demand in a future period of time.

The Study Problem:

The problem of food production deficit is one of the main manifestations of the economic crisis in Egypt. Overcoming this problem has become a major concern of Egyptian economic and development policies. It is noticeable that the food gap and in the crops of agricultural commodities of the main grains in particular worsens year after year. The food gap is not only an economic problem, but also affects many political, social and health problems.

The problem of research is the inability of the quantities available from the local production of the grain group to meet the actual needs of the population. This affects the realization of Egyptian food security.

Objectives of the study:

The main objectives of the study are:

(١) Conduct appropriate econometric analysis to identify the concepts used in an economic study of food security in Egypt.

(2)Review the specific variables of the food gap, self-sufficiency ratio and the percentage of dependence on the group of cereals in Egypt.

(3)Review the specific variables of the food security factor of the grain group in Egypt

(٤) Studying the relations of multiple regression between the food security coefficient of the grain group and its determinants

(٥) Study the relationships of multiple regression between the self-sufficiency of the grain group and its determinants

(6) The implications of the January 2011 revolution on food security and the self-sufficiency ratio and the food gap of the grain group using Dummy variables.

RESEARCH METHODS AND DATA SOURCES:

The study was based on both descriptive and quantitative analytical method of data. As a simple and multiple regression method for the variables of the study as the study was based on the estimation of food security indicators of the grain group in Egypt for the following set of equations[١]:

1- Daily Domestic Consumption = Total Domestic Consumption / 365 days.

٢-Production Adequacy Period for Consumption = Gross Domestic Product / Gross Daily Domestic Consumption.

3-Import Coverage Period for Consumption = Annual Import / Total Daily Domestic Consumption.

4-Total periods = period of adequacy of production for consumption + period of coverage of imports for consumption.

5-The amount of surplus and deficit in domestic consumption (strategic stock) = (total periods of production adequacy for consumption, The period of import coverage for consumption - 365) X (daily domestic consumption).

6-Sufficiency period of local consumption surplus = the amount of surplus in daily domestic consumption / consumption.

7- Food security factor = the amount of annual change in the volume of strategic stock / annual domestic consumption. Or the sum of the change in the volume of strategic stock / average annual domestic consumption. The value of the food safety coefficient ranges from zero to the correct one, as the closer to zero the lower the food safety coefficient and vice versa.

The study relied on a set of secondary data published in the Ministry of Agriculture and Land Reclamation and the Central Agency for Mobilization and Statistics. The study also relied on many references, researches and studies related to the subject of the study.

RESEARCH RESULTS AND DISCUSSION

First: Concepts related to food security:

The following are some of the concepts related to food security in Egypt issued by the Food and Agriculture Organization (FAO). The World Bank, in addition to some definitions addressed by many others.

(1)Definition of the Food and Agriculture Organization (FAO)

It defines food security as ensuring that all people at all times have enough food to live an active and healthy life. This can only be achieved by stable food supplies that are physically and economically available to all[٢].

FAO has addressed two concepts of food security:

[١]Maha Abdel Fattah Ibrahim Sayed (Doctor): Egyptian Food Security. Reality and Horizons of the Future, a reference paper presented to the Permanent Scientific Committee of Agricultural Economic and Social Sciences for the promotion of professors and assistant professors, Faculty of Agriculture, Ain Shams University, August 2016, Mansoura University, Volume (3), Issue (12), 2012. , Egypt.

[٢] UN Standing Committee on Nutrition ,2004 ,Annual Report .

(A) Absolute food security is intended to produce food within a country equivalent to or higher than domestic demand. This level is synonymous with complete self-sufficiency and is therefore called self-food security.

(B) Relative food security means the ability of a State or a group of States to provide goods or foodstuffs in whole or in part, and is also known as the ability of individuals at all times to have access to adequate food for their vital and healthy lives. The principles of food security are food availability, access to food, acceptance or diversity, adequacy and continuity, policies and regulations.

(2)Definition of the World Bank[١]

According to the World Bank, food security is defined as "the ability of people at all times to have adequate food for their activity and health. A country's food security is achieved. When this country is marketing and commercial systems able to provide citizens with adequate food at all times, even in times of crisis and even Times of worsening domestic production and international market conditions.

(3)Other definitions of food security:

One of these tariffs deals with food security as the provision of foodstuffs to the state to meet the basic and basic needs of the population, with the provision of stock to be resorted to in the event of food production disasters or in the case of the inability of States to access food shortages by importing from abroad [٢]. The World Health Organization defines food security as "the situation that occurs when all people at all times have access to adequate food and security that enables them to have a healthy and effective life" [٣]. The Agency for International Development (USAID) defined food security: "Human beings have at all times the physical and economic potential to have enough food to satisfy their food desires so that they can live a healthy and productive life.[٤]"

Second: Specific variables of the food gap, self-sufficiency ratio and the percentage of external dependence of the grain group [٥]in Egypt

The following are a set of variables used in the estimates of the food gap, self-sufficiency ratio and the dependency ratio of the grain group, which included: the quantity of grain production, the quantity of grain imports, the quantity of grain exports, the quantity of grain available, the amount of grain per capita, quantity The food gap of cereals

1-Evolution of the quantity of production of the grain group in Egypt:

The study of the evolution of the quantity of grain production in Egypt in the period (2000-2017) and shown in Table (1) shows that it witnessed a fluctuation noticeable during that period and ranged between a minimum capacity of 20.708 thousand tons in 2011 and a maximum capacity of 25.624 thousand tons in 2006 with an average annual It reached about 22.889 thousand tons during the study period.

The study of time trend of the evolution of the quantity of production of grain crops during the period (2000-2017) shown in equation (1) in Table (3) shows that Secular trend has taken a growing statistically significant at the level of 0.01 and an annual increase rate of about 0.16% of Annual average during the study period.

٢- Evolution of the quantity of grain imports in Egypt:

The study of the evolution of the quantity of imports of cereals in the period (2000-2017) and shown in Table (1) shows that it began to fluctuate during that period between a minimum of about 6803 thousand tons in

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[٤]F.Riely ,N.Mock ,B.Cogil,L. Bailey and E.KENEFICK, Food Aid security Indicators and Framework for Usa in the Monitoring and Evaluation of food Aid programs Food and Nutrition Technical Assistance project (FANTA),USAID, 1999.
[٥]Cereal crops (wheat, barley, maize, sorghum and rice).

2004 and a maximum of about 21328 thousand tons in 2017. The annual average amount of grain imports in Egypt was about 12202 thousand tons during the study period

By estimating the general time trend equation for the quantity of grain imports in Egypt during the period (2000-2017), it was found that the most suitable models of the general time trend are represented by the simple linear model shown in equation (2) in table (3). The annual increase in grain imports amounted to 621 thousand tons representing about 5.1% of the annual average during the period under review. The value of the coefficient of determination of about 0.77 indicates that about 77% of the changes in the quantity of grain imports in Egypt is mainly due to those factors whose effects reflect the time factor.

٣-Evolution of the quantity of grain exports in Egypt:

The study of the evolution of the quantity of grain exports in the period (2000-2017) shows that it has fluctuated during that period between a minimum of about 210 thousand tons year 2011 and a maximum of about 1817 thousand tons year 2007. The annual average amount of grain exports was 766 thousand tons Table number (1)

Measuring the secular trend equation for the evolution of the quantity of grain exports in Egypt during the study period, it was found that the most suitable models of the general time trend are represented by the linear picture, the results of which are shown in equation number(3) in tablenumber (3). Statistically at the level of0.05 and at an annual decrease rate of about 5.3% of the annual average amount of grain exports during the period under study.

٤- Evolution of the amount of grain available for consumption in Egypt:

The study of the evolution of the quantity available for consumption of cereals in Egypt during the period (2000-2017) showed that it achieved a noticeable increase during that period, reaching about 28446 thousand tons year 2001 and a minimum of about 43277 thousand tons and a maximum of year 2017 with an increase rate of about 34.3%, the average The annual amount of disposable grain consumption is about 34336 thousand tons during the study period.

By estimating the general time trend equation for the development of the quantity available for consumption of grains during the period (2000-2017) and its results are shown in equation (4) in Table No. (3) shows that the quantity available for consumption of grain in Egypt has been increasing annually by about 699 thousand tons annually at an annual increase rate The average coefficient (R2) was about 84% of the changes in the available grain consumption due to factors that reflect their time.

٥-Evolution of the amount of per capita grain in Egypt:

The study of the evolution of the average annual per capita available for consumption of cereals during the period (2000-2017) showed that it began to fluctuate during that period and ranged between a minimum of about 415.6 kg in 2014 and a maximum of about 482.2 kg in 2005 and an annual average of about 445.0Kg during the same period.

The study of the general time trend of per capita development during the period under study (2000-2017) and its results are shown in equation (5) in table No. (3) shows that per capita has decreased during that period by about 0.943 kg and an annual statistically insignificant rate of about 0.2% The average coefficient of change (R2) was about 0.58, which means that about 58% of the changes in the average annual per capita grain are due to those factors whose effects reflect the time factor.

Table (1) Evolution of Gap Size, Self-Sufficiency Ratio and Overseas Dependency Ratio of Grain Group During the Period (2000-2017)

The years	Domestic production Thousand tons	Imports thousand tons	Exports thousand tons	Available for consumption Thousand tons	population Thousand people	Average per capita Kg	The gap is a ton	For self-Sufficiency%	Rate Dependency the outside %
2000	21681	9279	364	30596	63976	478.2	8915	70.9	30.3
2001	21857	7636	1047	28446	65336	435.4	6589	76.8	26.8
2002	21800	9271	708	30363	67976	446.7	8563	71.8	30.5
2003	22514	8047	808	297513	67976	437.7	7239	75.7	27.0
2004	23283	6803	1112	28974	69330	417.9	5691	80.4	23.5
2005	24714	10896	1534	34076	70668	482.2	9362	72.5	32.0
2006	25624	9635	1477	33782	72009	469.1	8158	75.9	28.5
2007	22108	10577	1817	30868	73655	419.1	8760	71.6	34.3
2008	22777	12508	294	34991	75225	465.2	12214	65.1	35.7

2009	24193	11489	948	34734	76823	452.1	10541	69.7	33.1
2010	21273	12988	968	33293	78728	422.9	12020	63.9	39.0
2011	20708	16868	210	37366	80410	464.7	16658	55.4	45.1
2012	22293	13123	374	35042	82550	424.5	12749	63.6	37.4
2013	24352	13749	632	37469	84629	442.7	13117	65.0	36.7
2014	23825	12504	252	36077	86814	415.6	12252	66.0	34.7
2015	24041	15896	527	39410	88958	443.0	15369	61.0	40.3
2016	22786	17047	301	39532	91023	434.3	16746	57.6	43.1
2017	22370	21328	421	43277	95203	454.6	20907	51.7	49.3
Average	22900	12202	766	34336	77294	445	11436	67	35
Amount of year change	37.4	621	(40.6)	699		(0.943)	(661)	(1.22)	1.06
year growth rate	0.16**	5.1**	(5.3)**	2**		(0.2)*	(5.8)**	(1.8)*	3.10**

Where it indicates:

Available for consumption = Domestic production Imports - Exports, Gap = Production - Available for consumption

Percentage of self - sufficiency = production / consumption × 100, dependency ratio = import / consumption * 100

-The numbers in parentheses are negative values

**** -Significant at Significant Level 0.01 * Significant at Significant Level 0.05**

-year growth rate = (amount of change / average phenomenon) x 100

Source: Compiled from: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Food Balance Bulletin in

Egypt. Different numbers during the period (2000-2017).

Third: the development of the food gap and the ratio of self-sufficiency and the rate of Dependency the outside of the grain group:

Evolution of the food gap of the grain group:

Study and review of data table NO (1) shows that the food gap of the grain group has achieved a noticeable increase during the period under study (2000 - 2017) and ranged between a minimum of about 5691 thousand tons in 2004 and a maximum of about 20907 thousand tons in 2017 and an average annual It reached about 11,436 tons.

It is evident from the equation of the general time trend of the development of the quantity of the food gap of cereals in the period (2000-2017) and shown in equation NO (6) in table No (3) .that the food gap of cereals has been decreasing during that period by about 661 thousand tons at a statistically significant annual decrease rate. It reached about 5.8% of the year average during the period under study. The value of the coefficient of determination of about 0.76 indicates that about 76% of the changes in the grain gap in Egypt is mainly due to those factors whose effects reflect the time factor.

1- Evolution of grain self-sufficiency ratio in Egypt :

The study of the evolution of the self-sufficiency ratio of cereals in the period (2000-2017) showed that it witnessed a decrease during that period and reached a minimum of 51.7% in 2017 and a maximum of about 80.4% in 2004. The average annual self-sufficiency ratio of cereals was 67.5% during the period under review - Table NO (1).

Estimating the general time trend formula for grain self-sufficiency ratio in Egypt during the period (2000-2017). The results are shown in equation NO (7) in table NO (3) shows that the self-sufficiency ratio of cereals has decreased by about 1.22% during the study period referred to in the study.

2- Evolution of the rate of Dependency the outside of grain crops in Egypt:

The study of the evolution of the proportion of Egypt's dependence on foreign needs to meet the needs of grain crops in the period under study showed that it amounted to about 35% as an average engineering during the study period, and ranged from a minimum of about 23.5% in 2004, and a maximum of about 49.3% in 2017.

The estimation of the general time trend equation for Egypt's dependence on foreign countries in the grain group in the period (2000-2017), which is illustrated by equation No. (8) in table No. (3) shows that it achieved a significant annual increase statistically amounted to about 1.06% or equivalent to a significant annual growth rate. Statistically, it was about 3.1% and the value of the coefficient of determination indicates that about 70% of the changes in the percentage of external dependence of grain crops in Egypt is due mainly to those factors whose effects reflect the time factor.

Fourth: coefficient of food security and its determinants

The following is a review of four sets of specific variables of the food security factor for cereals, which included the local consumption today, the period of production adequacy for consumption, the period of import coverage for consumption and the amount of surplus in domestic consumption (strategic stock). It will be followed by a review of the food security factor for cereals in Egypt.

1- Specific variables of cereal food security factor in Egypt

(A) Local consumption today of cereal crops in Egypt:

The study of the development of local consumption today for cereal crops in the period (2000-2017) and shown in Table NO (2) shows that it has witnessed a noticeable increase during that period and ranged from a minimum of about 77.9 thousand tons in 2001 to a maximum of about 118.6 thousand tons in 2017 and an average An annual average of 94.1 thousand tons during the period under review.

The study of the general time trend of the daily local consumption of cereals during the period (2000-2017) and the results are shown in equation (9) in table No. (3) shows that the daily domestic consumption has increased during that period by about 1.92 thousand tons and a statistically significant annual rate reached About 2.04% of the annual change in the daily consumption during the period under review. The value of the coefficient of determination, which is about 0.84, indicates that about 84% of the changes in the daily local consumption of grain in Egypt is mainly due to those factors whose effects reflect the time factor.

(B) Production Sufficiency Period for Consumption of Cereal Crops in Egypt:

The study of the development of production efficiency for consumption of grain crops during the study period (2000-2017) and shown in TableNO (2) showed that it witnessed a significant decrease during that period and ranged from a minimum of 188.7 days in 2017. A maximum of about 293.3 days in 2017 and The annual average was about 246.3 days during the period under study.

By examining the general time trend of the development of the period of production adequacy for the consumption of grain crops per day during the period under study (2000-2017) and its results are shown in equation NO(10) in table NO (3) shows that the period of production adequacy for consumption of cereal crops per year decreased by about 4.45 days, and at an annual statistical significant discrepancy. It reached about 1.8% of the annual average. The value of the coefficient of determination indicates that about 69% of the changes in the period of adequacy of production for grain consumption in Egypt is mainly due to those factors whose effects reflect the time factor.

Table (2) Specific Variables Specific Food Security Index Cereal Group in Egypt During the Period (2000-2017)

The years	Local consumption today (Thousand tons)	The period of production adequacy for consumption per day	Period of import coverage for consumption per day	Total two periods per day	Surplus or deficit		For coefficient of food security*
					Amount of surplus in domestic consumption per day (strategic stock)	Sufficient period of surplus and deficit for domestic consumption per day	
2000	83.8	258.6	110.7	369.3	364.0	4.3	0.029
2001	77.9	280.5	98.0	378.4	1047.0	13.4	0.083
2002	83.2	262.1	111.4	373.5	708.0	8.5	0.056
2003	81.5	276.2	98.7	374.9	808.0	9.9	0.064
2004	79.4	293.3	85.7	379.0	1112.0	14.0	0.088
2005	93.4	264.7	116.7	381.4	1534.0	16.4	0.121
2006	92.6	276.9	104.1	381.0	1477.0	16.0	0.116
2007	84.6	261.4	125.1	386.5	1817.0	21.5	0.143
2008	95.9	237.6	130.5	368.1	294.0	3.1	0.023
2009	95.2	254.2	120.7	375.0	948.0	10.0	0.075
2010	91.2	233.2	142.4	375.6	968.0	10.6	0.076
2011	102.4	202.3	164.8	367.1	210.0	2.1	0.017
2012	96.0	232.2	136.7	368.9	374.0	3.9	0.029
2013	102.7	237.2	133.9	371.2	632.0	6.2	0.050
2014	98.8	241.0	126.5	367.5	252.0	2.5	0.020
2015	108.0	222.7	147.2	369.9	527.0	4.9	0.042
2016	108.3	210.4	157.4	367.8	301.0	2.8	0.024
2017	118.6	188.7	179.9	368.6	421.0	3.6	0.033
Average	94.1	246.3	127.2	SUM	13794	153.6	**Average = 0.06**
Amount of year change	1.92	(4.45)	٣,٨٨	**Strategic Inventory = 13794**		**Food Security = 0.4**	
year growth rate	2.04**	(1.8)**	٣,٠٥**				

*Value of food security = (strategic stock / average quantity Consumption the local year)
The numbers in parentheses are negative,
** significant at 0.01**, significant at 0.05*
Source: Calculated from Table N0. (1)

(C) Period of import coverage for consumption of grain crops in Egypt:

The study of the evolution of the period of import coverage for consumption of grain crops in Egypt during the study periodAs shown in Table NO (2), it showed fluctuation during that period and ranged between a minimum of 85.7 days in 2004, a maximum of about 180 days in 2017 and an annual average of 127.2 days.

By examining the general time trend of the evolution of the period of import coverage for consumption of daily grain crops during the period under study (2000-2017) and its results are shown in equation NO (11) in Table No (3) shows that the period of import coverage of consumption of grain crops annually increased by about 3.88 days, and a significant annual increase rate A statistic of about 3.05% of the annual average. The value of the coefficient of determination of about 0.695, but about 69.5% of the changes in the period of import coverage for consumption of cereal crops in Egypt is mainly due to those factors whose effects reflect the time factor.

Table (3) Linear General Direction Equations for Grain Group for: Production, Imports, Exports,Available for consumption, per capita, self - sufficiency ratio, ratio rate of Dependency the outside , today consumption

Statement	The general time trend equation	R^2	F	% year change	Equation number
The production quantity is one thousand tons	$\hat{Y}_{1i} = 22545 + 37.4X_i$ (٦,١)**)** 34.17(	0.55	38٠٠.**	0.16	١
The quantity of imports is one thousand tons	$\hat{Y}_{2i} = 6304 + 621\ X_i$)**7.35(**6.90(	0.77	54.05**	5.1	٢
The quantity of exports is one thousand tons	$\hat{Y}_{3i} = 1152 - 40.6X_i$)**-2.00)**(5.24(	0.20	4.00**	5.3	٣
Available for consumption	$\hat{Y}_{4i} = 27697 + 699\ X_i$)**8.99)** (32.91(	0.84	80.77**	2	٤
Average per capita	$\hat{Y}_{5i} = 454 - 0.943\ X_i$)**-9.99)** (44.03(	0.58	9.8**	0.2	٥
Gap for grain	$\hat{Y}_{6i} = -5152 - 661\ X_i$)**-7.14)**(-5.14(	0.76	50.99**	5.8	٦
% For self-sufficiency	$\hat{Y}_{7i} = 79.1 - 1.22\ X_i$)**-5.98)** (35.76(	0.69	35.74**	-1.8	٧
% rate of Dependency the outside	$\hat{Y}_{8i} = 24.7 + 1.06\ X_i$)**6.07)** (13.05(	0.70	36.85**	3.10	٨
Local consumption (today)	$\hat{Y}_{9i} = 75.9 + 1.92\ X_i$)** (٨,٩٧)**32.82(	0.84	80.45**	2.04	٩
The period of production adequacy for consumption per day	$\hat{Y}_{10i} = 289 - 4.45\ X_i$)**-5.98)** (35.80(	0.69	35.72**	١,٨	١٠
Period of import coverage for consumption per day	$\hat{Y}_{11i} = 90.4 + 3.88\ X_i$)**6.04)** (13.01(	0.69	36.52**	3.05	١١

Ŷ1i = estimated value of the production quantity of a thousand tons of grain per year i.
Ŷ2i = estimated value of the quantity of imports from the group of thousand tons of grain per year i.
Ŷ3i = estimated value of the quantity of exports of a thousand tons grain group per year i.
Ŷ4i = estimated value of available consumption from thousand tons per year i.
Ŷ5i = estimated value per capita of a grain group in kilograms per year i.
Ŷ6i = Estimated Gap Nutritional Value Group of 1000 Grain Tons per Year i.
Ŷ7i = estimated self-sufficiency ratio in year i.
Ŷ8i = estimated rate of Dependency the outside ratio in year i.
Ŷ9i = estimated Local consumption (today) year i.
Ŷ 10i = estimated value of production adequacy period for consumption per day in year i.
Ŷ 11i = Estimated import coverage period for consumption per day in year i.
Xi = time variable where 21, ..., i = 2.1
The numbers in parentheses below the coefficients express the calculated (t) value.
significant at level = (0.01) **, (0.05) *
Source: Calculated from Table N0(1) and (2) data.

(D) The amount of surplus in domestic consumption (strategic stocks) and the surplus adequacy period for cereal crops in Egypt:

The study of the development of surplus in domestic consumption and surplus adequacy period for cereal crops shows that the total surplus in domestic consumption (strategic stock) of cereal crops during the study period is about 13.794 million tons, enough for about 153.6 days. The surplus in domestic cereal consumption ranged

from a minimum of about 210 thousand tons in 2011, enough for about 2.1 days, and a maximum of about 1.817 million tons in 2007, for about 21.5 days.

2- Food Security Factories for Cereal Crops in Egypt

The value of the food security coefficient ranges from zero to the correct one. The closer to zero, the lower the coefficient of food security and vice versa. Table no (2) shows the decrease of food security coefficient of grain crops in Egypt during the study period (2000-2017). The average value during this period was about 0.06, and the value ranged from a minimum of about 0.017 in 2011, and a maximum of about 0.143 in 2007. The decrease in food security coefficient of grains is due to the lack of supply and dependence on imports to meet the required requirements, in addition to the decrease. Strategic cereal stock, which is disproportionate to large consumption due to population increase.

Fifth: Multiple Regression Relationships between Cereals and Food Security Factors

In order to identify the most important variables for the food security coefficient of grains, the following steps were followed:

A - Identification of independent variables likely to affect the food security coefficient

These variables were limited to five variables as follows:

X1i: estimated self-sufficiency ratio of grain group per year (i).

X2i: The amount of grain production in thousand tons per year (i).

X3i: the amount of imports of grain group thousand tons per year (i).

X4i: Amount available for consumption from the cereal group of thousand tons per year (i).

X5i: The population of Egypt per thousand people in the middle of the year (i).

Table (4) Attempts to measure the multiple regression relations in both linear and logarithmic image between the food security coefficient of grains and its determinants in the period (2000-2017)

The formula	Try number	The equation	R^2	F	Equation number
Linear	1	Y_i= -0.250 + 0.00293X_1 + 0.000005 X_2 (-1.90) (3.01)* (0.85)	0.44	6.02**	1
	2	Y_i= - 0.032 + 0.000011X_2-0.000002X_5 (-0.23) (1.94) (-2.62)**	0.39	** 4.77	2
	3	Y_i= - 0.045 + 0.000013X_2 – 0.000005X_4 (-0.34) (2.22)** (-2.92)**	0.43	5.72**	3
	4	Y_i= - 0.064+0.000008X_2 – 0.000005X_3 (- 0.44) (1.34) (-2.37)*	0.35	**٤,٠٧	4
Double logarithmic	١	logY_i= - 16.0 + 3.54 logX_1 + 1.90 logX_2 (-1.٧0) (3.٣٢)** (0.85)	٠,٤٩	.17**٩	5
	٢	logY_i= - 7.2 + 4.80 logX_2 – 3.08 logX_5 (-0.66) (2.06)*(-2.77)**	٠,٤١	**٥,٢	٦
	٣	logY_i= - 8.97 + 5.44 logX_2 – 3.54 logX_4 (-0.92) (2.47)** (-3.32)**	٠,٤٩	٧,١٨**	7
	٤	logY_i= - 11.7+3.50 logX_2 – 1.21 logX_3 (- 1.13) (1.52) (-2.79)**	٠,٤٢	٥,٣٥**	٨

log yi :Food Security Coefficient for Grain Group in Year (i).

1log x1i: logarithm of the estimated self-sufficiency ratio of grain group per year (i).

Log x2i :: The logarithm of the production quantity of the grain group thousand tons per year (i).

Log x3i: The logarithm of the quantity of imports of grain group thousand tons per year (i).

Log x4: The logarithm of the quantity available for consumption from the grain group thousand tons per year (i)

Log x5i: The logarithm of the population of Egypt per thousand people in the middle of the year (i).

Source: Compiled and calculated from data table (1) and (2) study.

B- Measuring the relationship between independent and dependent variables:

Based on the Klein matrix of the simple correlation coefficients in both the linear and logarithmic formulas between the explanatory variables shown in Tables NO (1) , (2) in the Appendices. A linear duplication problem was found between the variable (x3) and both (x4) , (x5) as well as betweenvariable (x4) andvariable (x5). Consequently, to avoid the problem of linear duplication, the attempts in the linear image were limited to four attempts. The different formulas have been differentiated based on both statistical and economic logic.

By reviewing the measurement results of the different attempts ,whether in the linear or double logarithmic form, it was found that the most successful multiple regression attempts came in the logarithmic form, which is shown in equation (6) in table NO (4), as follows:

$$\log Y_i = -7.2 + 4.80 \log X_2 - 3.08 \log X_5$$
$$(-0.66) \quad (2.06)^* \quad (-2.77)^{**}$$
$$R^2 = 0.41 \qquad F = 5.28^{**}$$

Where it indicates:

Yi: Food Security Coefficient for Grain Group in Year (i).

log x2: The logarithm of the amount of grain production per thousand tons per year (i).

log x5: The logarithm of the population of Egypt per thousand people in the middle of the year (i).

Reviewing estimates of variables:

The analysis results indicate that the explanatory variables in this equation account for about 41% of the changes in the food security coefficient of grains. The regression coefficients were significantly (0.01) based on the value of (F),At a significant level of (0.01).

Sixth: Multiple Regression Relationships Between Self-Sufficiency of Grain Group and Determinants:

In order to identify the most important variables of self-sufficiency of grains, the following steps were followed:

A- Identification of independent variables likely to affect self-sufficiency:

These variables are limited to four variables as follows:

X1: The amount of grain production per thousand tons per year (i).

X2: the amount of imports of grain group thousand tons per year (i).

X3: Amount available for consumption of grain group thousand tons per year (i).

X4: The population of Egypt per thousand people in the middle of the year (i).

B - Measuring the relationship between independent and dependent variables:

Based on the Klein matrix of the simple correlation coefficients in both the linear and logarithmic formulas between the explanatory variables shown in tables (3), (4) of the appendix, it was found that there is a problem of linear duplication between the variables (x3), (x4) and the variable (x2) as well as between The variable (x3) at the variable (x4) to avoid the problem of linear duplication has been limited to the attempts in the linear image in three attempts and similarly also limited to three attempts in the logarithmic double image. The different versions were differentiated based on both statistical and economic logic and took into account each attempt not toIncluded in any two variables increases between them m I hope the simple 0.7 correlation table shows the number (5) the results of attempts.

Table (5) Attempts to measure the multiple regressive relationships between grain self-sufficiency and the most important determinants of it in the period (2000-2017)

The formula	Try number	The equation	R^2	F	Equation number
Linear	**1**	$Y_i = 68.7 + 0.00101X_1 - 0.00198X_2$ (11.40)** (3.97)** (-22.43)**	0.97	**271.4	1
	2	$Y_i = 70.3 + 0.00268X_1 - 0.00187X_3$ (15.79)** (14.18)** (-30.65)**	0.98	**506.29	2
	3	$Y_i = 74.6 + 0.00223X_1 - 0.000752X_4$ (5.29)** (3.82)** (- 9.13)**	0.86	** 45.44	3
Double logarithmic	١	$\log Y_i = 1.43 + 0.442 \log x_1 - 0.377 \log x_2$ (4.24) ** (5.86) ** (-2658)**	0.98	**382.56	4
	٢	$\log Y_i = 1.99 + 1.00 \log x_1 - 1.00 \log x_3$ (244.47) ** (547.79)** (-1128.13)**	0.99	681.84 **	5
	٣	$\log Y_i = 2.60 + 0.830 \log x_1 - 0.900 \log x_4$ (2.75) ** (4.09)** (-9.26)**	٠,٨٦	** ٤٦,٩٤	6

Where it indicates:

log yi: logarithm of the estimated self-sufficiency ratio of grain group per year (i).

log x1i: Logarithm of the amount of grain production per thousand tons per year (i).

Log x2i: The logarithm of the quantity of imports of grain group thousand tons per year (i)

Log x3i: The logarithm of the amount available for consumption from the grain group of thousand tons per year (i)

Log x4i: The logarithm of the population of Egypt per thousand people in the middle of the year (i).

Source: Compiled and calculated from the data of table NO (1) and (2) study.

By reviewing the measurement results of the different attempts, either in the linear or double logarithmic form, it was found that the most successful multiple regression attempts came in the double logarithmic image shown in equation NO (6) in table NO (5), which was as follows:

$$\log Y_i = 2.60 + 0.830 \log x_1 - 0.900 \log x_4$$
(2.75) ** (4.09)** (-9.26)**
$R^2 = 0.86$ F=46.49**

Where it indicates:

Log yi: logarithm of the estimated self-sufficiency ratio of grain group per year (i).

Log x1i: Logarithm of the amount of grain production per thousand tons per year (i).

Log x2i: The logarithm of the population of Egypt per thousand people in the middle of the year (i).

The results of the analysis in this equation indicate the significance of the previous model statistically at the level of 0.01 as evidenced by the value of the modified determinant coefficient, which amounted to about 0.86 that about 86% of the changes in the self-sufficiency ratio of the grain group is attributed to the change in the variables included in the model, which was the amount of production of the group Grain (X1) and population (X3) showed significant significance for each of these two variables with a level of 0.01.

Seventh: The Implications of the January 2011 Revolution on the Food Security, Self-Sufficiency Ratio and the Food Gap of the Grain Group by Using Dummy Variables

Dummy variables are used as a representative of some qualitative or descriptive variables. These variables take only two control values, namely zero and one. They take one value when there is a certain property and take the value zero in the absence of this property.

To illustrate how the Dummy variables were used to measure the impact of the January 2011 revolution on the food security ratio, the self-sufficiency ratio and the food gap of the cereal group, a multiple regression model was developed that involves the introduction of two explanatory variables, one of which is a quantitative variable (Xi), which reflects years, and a qualitative variable Dummy (Di) Expresses the time period: the first two periods

are the period before the revolution, ie, until 2010 and the second period is the period beginning in 2011, which continues until now and can formulate the relationship between the dependent variable (Yi) ratio of food security or self-sufficiency and the gap of the grain group and this Variable In the form of an explanatory function following multiple regression:

$\hat{Y}_i = a + \beta_1 X_i + \beta_2 D_i + \beta_3 D_i X_i$

Where it indicates:

Ŷi: Estimated food security of cereal group per year (i) .

a: Constant function.

Di: The Dummy variable takes the zero value for years in the pre-revolution period January 2011 which is the period (2000-2010) and takes the value one in the years after the revolution (2011-2017).

Xi: time variable, i: 1,2 ..... 17.

Di X i: Multiplication The variable Dummy Di in time Di.

By estimating the multiple linear regression model referred to, the impact of the January 2011 revolution on food security, the self-sufficiency ratio and the gap of the cereal group can be studied as follows:

1-If the value of (t) is significant for all coefficients Xi, Di, Di Xi, it is inferred that there is a distinct trend line for each of the two periods under study before and after the January 2011 revolution and that there has been a change in the section and inclination in each of the study periods and represents Form the equation in the following image:

$\hat{Y}i = a + \beta_1 X_i$ The period before the January Revolution (before January 2011)

$\hat{Y}i = (a + \beta_1) + (\beta_1 + \beta_3) Xi$ It represents the period after the January 2011 revolution.

2- If (t) is not significant for the Di, Di Xi coefficient, it is inferred that there is one direction line with the same section and inclination in the period before the revolution of January 2011 and beyond and represents the form of the equation in the following picture:

$\hat{Y}i = a + \beta_1 Xi$

3- If (t) is significant for Di and not significant for Di Xi, it is inferred that there is a distinctive trend for each of the periods studied (before and after the January 2011 revolution) and that there was a change in the section without affecting the inclination and represent the form of the equation In the following picture:

$\hat{Y}i = a + \beta_1 Xi$ (Before the January Revolution)

$\hat{Y}i = (a + \beta_1) + \beta_1 X_i$ (The period after the January 2011 revolution)

4- If (t) is not significant for Di and significant for Di Xi coefficient, it is inferred that there is a distinct trend line for the period after the January Revolution that corresponds to the general trend line in the period after the revolution in the syllable and differs from it in inclination and represents the form of equations In the following picture:

$\hat{Y}i = a + \beta_1 Xi$(Represents the period before the January 2011 revolution)

$\hat{Y}i = a + (\beta_1 + \beta_3) X_i$ (Represents the period after the January 2011 revolution)

The following is a review to measure the impact of the January 2011 revolution on food security and the self-sufficiency ratio and the gap of the grain group.

Table (6) The Impact of the January 2011 Revolution Using Dummy Variables on Food Security, Self-Sufficiency and GapIn the period (2000-2017)

F	R^2	The equation	Equation number	The dependent variable
3.71**	0.443	$\hat{Y}_{1i} = 0.0636 + 0.00264X_i - 0.0490D_i - 0.00156D_i X_i$ (3.13)**(0.88) (0.53-)(0.24-)	**1**	**Food security**
		$\hat{Y}_{1i} = 0.0636 + 0.00264X_i$ (Before the January 2011 revolution)	**2**	
		$\hat{Y}_{1i} = 0.0636 + 0.00264X_i$ (After the January 2011 revolution)	**3**	
11.47**	0.711	$\hat{Y}_{2i} = 77.5 - 0.875X_i - 2.9 D_i - 0.093D_i X_i$ (25.76)**(-1.97)(-0.21))-0.09)	**4**	**Self-sufficiency**
		$\hat{Y}_{2i} = 77.5 - 0.875X_i$ (Before the January 2011 revolution)	**5**	

		$\hat{Y}_{2i} = 77.5 - 0.875X_i$ (After the January 2011 revolution)	**6**	
17.39**	0.788	$\hat{Y}_{3i} = 6307 + 434X_i - 3225\ D_i + 387D_i\ X_i$ (4.75)**(2.22)* (-0.54)) 0.89)	**7**	**Gap**
		$\hat{Y}_{3i} = 6307 + 434X_i$ (Before the January 2011 revolution)	**8**	
		$\hat{Y}_{3i} = 6307 + 434X_i$ (After the January 2011 revolution)	**9**	

Where it indicates:

Di: A pseudo-variable takes the zero value before the January 2011 revolution and the value one in the post-revolution period.

Xi: Time i: 1, 2, ... 18.

Source: Compiled and calculated from the data of Table no (1) and (2) in the study

***The impact of the January Revolution on food security, self-sufficiency ratio and the gap of the cereal group:**

- **The impact of the January Revolution on the food security of the grain group:**

The effect of the January 2011 revolution on the food security of the grain group in the period (2000-2017) is measured by using the method of the variables in the function. Equation (1) in Table no (6) was reached. There was a significant impact of the January 2011 revolution on the food security of the grain group and that the food security of the grain group took the same direction in terms of section and inclination during the pre- and post-revolution periods, which is shown in equation no (2,3) in table no (6).

- **The effect of the January 2011 revolution on the self-sufficiency ratio of the grain group:**

Measuring the impact of the January 2011 revolution on the self-sufficiency ratio in the period (2000-2017) using the method of Dummy variables. For the revolution of January 2011 on the self-sufficiency of the grain group and self-sufficiency of grain took the same direction in terms of section and inclination during the two periods before and after the revolution, as shown in equation no (5.6) in table no (6).

- **The impact of the January 2011 revolution on the gap of the grain group:**

Equation no (7) in Table no (6) shows the effect of the January 2011 revolution on the grain gap and due to the insignificance of the coefficients of this, this level of significance is evidenced by the absence of a significant effect of the January 2011 revolution on the gap of the grain taking the same direction In terms of syllable and inclination during the pre- and post-revolution periods, which are shown in equation no (8.9) in Table no (6).

Recommendations:

Taking into account the high strategic stocks of the grain group in Egypt enough for six months. Research shows that the strategic stock of the grain group is not enough for only 156 days. Increasing the domestic production of the food group in Egypt to reduce dependence on the outside as this is a food exposure that is dangerous to food security. It was found that Egypt depends on abroad to meet its needs of the grain group by about 35%. It is necessary to adopt methods to increase the productivity of food in Egypt to increase domestic production, especially for the grain group, where it was found that the domestic production of the grain group is only enough to 246.3 days of consumption. Develop economic policies related to raising the food security rates of the food group. The food security coefficient decreased to about 0.06 for the grain group during the study period.

***Keywords**: Egyptian food security, food gap, Egyptian economy,Dependency the outside.*

Appendix

Table (1) Matrix of simple correlation coefficients in the linear picture between the variables specified for the food security coefficient of the grain group in the period (2000-2017)

variable	Y_i	X_1	X_2	X_3	X_4	X_5
Y_i	1					
X_1	0.647	1				
X_2	0.330	0.267	1			
X_3	-0.524	-0.972	-0.103	1		
X_4	-0.496	-0.889	0.188	0.953	1	
X_5	-0.485	-0.849	0.120	0.900	0.928	1

Where it indicates:

Yi: Food Security Coefficient of Grain Group in Year (i).

X1: estimated self-sufficiency ratio of grain group per year (i).

X2: The amount of grain production per thousand tons per year (i).

X3: the amount of imports of grain group thousand tons per year (i).

X4: Amount available for consumption from grain group thousand tons per year (i).

X5: The population of Egypt per thousand people in the middle of the year (i).

Source: Compiled and calculated from the data of table no (1) and (2) study.

Table (2) Matrix of the Simple Correlation Coefficients between the Specific Variables of the Food Security Factor of the Grain Group in the Logarithmic Model (2000-2017)

variable	Log yi	Log x1	Log x2	Log x3	Log x4	Log x5
Log yi	1					
Log x1	0.682	1				
Log x2	0.338	0.274	1			
Log x3	-0.571	-0.968	-0.067	1		
Log x4	-0.530	-0.884	0.206	0.952	1	
Log x5	-0.497	-0.842	٠,١٣٥	0.896	0.922	1

Where it indicates:

Log yi :food security coefficient of cereal group per year (i).

Log x1: The logarithm of the estimated self-sufficiency ratio of grain group per year (i).

Log x2: The logarithm of the amount of grain production per thousand tons per year (i).

Log x3: The logarithm of the quantity of imports of grain group thousand tons per year (i).

Log x4: The logarithm of the amount available for consumption from the grain group thousand tons per year (i). **Log x5:** The logarithm of the population of Egypt per thousand people in the middle of the year (i).

Source: Compiled and calculated from the data of table (1) and (2) study.

Table (3) Matrix of Simple Correlation Coefficients in Linear Image Between the Specific Variables of the Self-Sufficiency Ratio of the Grain Group in the Period (2000-2017)

variable	Y_i	X_1	X_2	X_3	X_4
Y_i	**1**				
X_1	**0.267**	**1**			
X_2	**-0.972**	**-0.103**	**1**		
X_3	**-0.889**	**0.188**	**0.953**	**1**	
X_4	**-0.849**	**0.120**	**0.900**	**0.928**	**1**

Where it indicates:

Yi: estimated self-sufficiency ratio of grain group per year (i).

X1: The amount of grain production per thousand tons per year (i).

X2: the amount of imports of grain group thousand tons per year (i).

X3: Amount available for consumption of grain group thousand tons per year (i).

X4: The population of Egypt in the middle of the year (i).

Source: Compiled and calculated from the data of table no (1) and (2) study.

Table no (4) Matrix of Simple Correlation Coefficients Between the Specific Variables of the Self-Sufficiency Ratio of the Grain Group in the Logarithmic Image (2000-2017)

variable	logY	logx1	log x2	Logx3	Log x4
Logy	**1**				
logx1	0.274	1			
Log x2	-0.968	-0.067	1		
Log x3	-0.884	0.206	0.952	1	
Log x4	-0.842	0.135	0.896	0.922	1

Where it indicates:

logy: logarithm of the estimated self-sufficiency ratio of grain group per year (i).

log x1: Logarithm of the amount of grain production per thousand tons per year (i).

log x2: The logarithm of the quantity of imports of grain group thousand tons per year (i).

log x3 The logarithm of the amount available for consumption from the grain group of thousand tons per year (i).

log x4: The logarithm of the population of Egypt per thousand people in the middle of the year (i).

Source: Compiled and calculated from the data of table no (1) and (2) study.

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TEMPORAL DYNAMICS OF TAN SPOT EPIDEMIC OF THE DURUM WHEAT DRIVING IN A CONVENTIONAL CROPPING SYSTEM *VS* A CONSERVATION CROPPING SYSTEM

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ABSTRACT

The introduction of the Conservation Agriculture System (CA) helps to correct and repair the mistakes made by the conventional system, but little study has been done to evaluate the impact of this introduction on fungal diseases in general and Tan spot in particular, which tends to show up remarkably in AC cultures. The main objective of this work is to understand the behavior of the epidemic of this disease under different modes of culture and under the climatic conditions of the studied region with different previous cultures to better control it. we have followed the evolution of the tan spot disease in a durum wheat crop driving in two production systems (SP): conservation agriculture mode (AC) and conventional mode (CV), with different previous crops (wheat, barley and vetch) according to time. The highest incidence of the disease is recorded in the previous crop barley in both modes (77% in AC and 79.33% in CV), followed by one registered in crop plants according to the AC mode with the previous crop wheat (70%). Durum wheat grown after wheat in CV method showed the lowest incidence (60%). A significant amount of primary inoculum on straw left on the soil surface in AC could be the cause of increasing the intensity and precocity of attacks due to the fungus. The following of the spread of the disease plants showed that the spread of the disease is vertical from bottom to top. The level of the disease depends largely on the culture system, it is less important in plants sown in AC mode although the amount of primary inoculum in the latter is higher than that in the conventional system. Similarly, to the severity of the disease, the results showed that the previous crops whose cultivation system is conservation agriculture showed the lowest severity of the disease. In this work, the disease induced losses of 49.33% of yield in AC system and 51.22% in conventional agriculture system. It causes losses of around 39.83%, 49.15% and 64.82% when wheat is preceded respectively by vetch, wheat and barley.

Key word: *Tan spot, Pyrenophora tritici-repentis, conservation agriculture, development of epidemics, loss of yield.*

INVESTIGATION OF VULNERABILITY AND CLIMATE RESILIENT SUSTAINABLE AGRICULTURAL DEVELOPMENT IN PUNJAB, PAKISTAN

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ABSTRACT

Agricultural production systems are complex, interlinked and highly dependent on natural ecosystem services regarding input and output relations. Pakistan agriculture is in transformation stage from traditional to modern and mechanized agriculture and face several climatic and market-based challenges for sustainable production. Developing countries, including Pakistan are prone to climate change due to their inadequate technological and institutional capacity for adaptation to dynamic climatic factors. Two crop zones, Rice-Wheat and Cotton-Wheat were selected. Primary and secondary data were utilized in trade off analysis (TOA) multidimensional model to assess the current and future impacts of climatic variation in crop production and to estimate the adaptations of proposed adaptation packages. This analysis utilized comprehensive climate, crop and socioeconomic farm data. Two crop model APSIM and DSSAT under five GCMs for RCP 4.5 and 8.5 were used to analyze the variation under different scenarios of development. Results showed that Climate change had significant impacts on cotton wheat and rice and reduce the crop yield substantially under all climate and economic scenarios. The results indicated that the yields of rice, wheat and cotton would decline by 16, 10 and 70 percent respectively in midcentury scenario (2070). Yield reduction would result in decrease the net farm returns resulting in increased poverty in farming community. Reduction in yield also threaten food and income security in agricultural economy. The results also indicated that there would increase in net returns due to adoption of proposed adaptations, that will increase per capita income and reduce the overall poverty.

Key Words: Climate Change Vulnerability, Climate Resilient, Agricultural Development, Pakistan

SYNTHESIS AND CHARACTERIZATION OF PURE LTA ZEOLITE FROM TUNISIAN RED CLAY: APPLICATION IN WATER TREATMENT

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ABSTRACT:

In this study, LTA zeolite was successfully synthesized by modification of the red Tunisian illito-kaolinitic clay (rich in iron, Fe_2O_3 = 7%) via alkaline fusion method using NaOH as activation agent. The crushed powder of clay was mixed with 2 M of NaOH and heated at 600°C for one hour in order to transforming it into highly disordered and amorphous phases. Crystallization of zeolites was making at different temperature (60°C, 90°C, and 110°C) and reaction times (4h, 8h, 24h). The synthesized products have been identified with X-Ray Diffraction, Fourier Transform Infrared spectroscopy, chemical analysis and scanning electronic microscopy (SEM). This clay mineral was converted to pure LTA zeolite, which has good size uniformity near to 900 nm and cation-exchange capacity (CEC) about 300 meq/100g. These properties make this material suitable in industrial applications like water treatment (adsorption), molecular separation and catalysis.

Keywords: *Clay, Fusion method, LTA zeolite, CEC,*

THE CHANGING FACE OF PAKISTANI WOMEN: PERCEPTIONS, DETERMINANTS AND CHALLENGES TO BECOME ENTREPRENEURS

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ABSTRACT

Active participation of women in economy is one of the factors which differentiates world's north from south. Most of the southern parts of the world have been male dominating but this trend is changing as women becoming aware about their rights and responsibilities with belief that they are no less than men in any field of life. This trend is supported with increasing contribution of women entrepreneurs in economic activities but still this contribution is not massive especially in countries like Pakistan where females constitutes around 50% of the population. Though small yet useful, contribution by women entrepreneurs in economy is generally welcomed as it brings under focus the untapped potential. Considering the importance of women entrepreneurship in national economy, this study was designed to explore and analyze factors affecting women's choice to become entrepreneurs. A sample of 100 women entrepreneurs was selected from major cities of Pakistan using convenient and snow ball sampling techniques. Factor analysis was used to identify major factors whereas binary logistic regression was employed to analyze impact of major factors on choice of women to become entrepreneurs. Middle age women and women with education up to bachelor preferred to become entrepreneurs. Furthermore, women from nuclear family system preferred to become entrepreneurs for the reason that they could economically support their families. It was also noted that most of the women entrepreneurs were from the families having more number of females than males. Passion for career advancement, strong personal characteristics, previous professional experience, desire for improvement in living standard, risk taking ability and family support have significant impact on choice of women entrepreneurs to start new business ventures while innovation and self-actualization have statistically insignificant impact. Major challenges faced by women entrepreneurs include over demanding multiple family ties, low risk bearing ability, lack of education and relatively tough competition for new entrants. It is suggested that women should be encouraged towards entrepreneurship by enhancing their skills through capacity building and training programmes. It is suggested to share success stories of women entrepreneurs at national level and promote advocacy for such enterprises by engaging recently established women's chambers of commerce and industry in the country.

***Key words:** women, entrepreneurs, advocacy, binary logistics, factor analysis*

EFFECTS OF CLIMATE CHANGE ON WEEDS

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ABSTRACT

In recent years, activities such as rapid population growth, industrialization, urbanization and unconscious consumption of natural sources, have many negative effects on natural balance. As a result of these negativities, environmental problems arise. Global warming is one of the environmental problems faced today. Global warming can be defined as, the process of overheating of the Earth more than it should be due to greenhouse gases, such as H_2O (water vapor), CO_2 (carbon dioxide) and CH_4 (methane), slight prevention of sunlight reflecting from the Earth to the space. It is inevitable that, the rise of CO_2 concentration due to the global warming and the changes in the precipitation regime and amount because of the heat will affect plants as a whole. As a matter of fact, different researchers presented that the climate change and increase in CO_2 concentration cause alteration in plant growth, the rise in carbon dioxide affect the progress of cultivated plants in a positive way whereas, the rise in the heat and ozone affect the progress in a negative way. As a result of global warming, it can be thought that increasing CO_2 amount will increase crop production in general. However, the existence of weeds, which cause serious losses in productivity and quality, refute this opinion. The genetic variability of the weeds, which are constantly competing against cultivated plants in terms of light and place, is quite rich when compared with cultivated plants. Therefore, they can adapt to any changes that occur in the environment. Ultimately, cultivated plants would be affected more by the differences caused by global warming. Moreover, as a result of climate change, the decrease in the event of herbicide activity, an effective weapon against the weeds, will make weeds much bigger matter.

Keywords: *Climate Change, Agriculture, Weeds.*

GREEN SYNTHESIS OF THE GINGER MODIFIED GOLD NANOPARTICLES AND INVESTIGATION OF ITS CATALYTIC ACTIVITY

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ABSTRACT

Dyes are the major effluents from various industries such as paper, plastic, leather, food, and textiles that cause significant pollution. There are several methods in the literature such as chemical reduction, catalytic degradation, adsorption and coagulation for the safe disposal of these compound. Among them, the chemical reduction of organic molecules using a strong reducing agent in the presence of noble metals such as Pt, Au, Ag and Cu is one of the famous removal methods in this field.

In this study, we developed ginger/gold nanoparticles (Gng-AuNPs) and evaluated their potential to be degradation of Rhodamine B (RhB) dye. Toxic chemicals are used in several of the processes for production of nanoparticles, either in the form of reducing agents to reduce various metal salts to their corresponding nanoparticles, or as stabilizing agents to prevent agglomeration of nanoparticles. These compounds are highly dangerous to organisms and to the environment, and due care must be exercised in their proper handling and disposal of toxic chemicals.

Various herbs and plant sources occlude powerful antioxidants that are present as phytochemical constituents in seeds, stems, fruits and leaves. These naturally occurring antioxidants have existed in the human food chain for thousands of years and are known to be non-toxic to living organisms and to the environment. The synthesis of metallic nanoparticle using plant extracts as the reducing agents is one of the most widely used green methods. For example, ginger was used to produce gold nanoparticles and the synthesized nanoparticles were found to have superior catalytic property to organic molecules degradation. In this study, using ginger extract at room temperature (25^{o}C) characterized using spectroscopic techniques and the potential of Gng-AuNPs with regard to the catalytic degradation of a organic dye (e.g., RhB) was evaluated in the presence of $NaBH_4$.

The prepared Gng-AuNPs was characterized using Fourier transfer infrared spectroscopy (FT-IR), transmission electron microscopy (TEM), and Scanning electron microscopy (SEM-EDX). The synthesized nanoparticles have been successfully applied as a catalyst in the degradation of RhB by $NaBH_4$.

Keywords: *Rhodamine B, catalytic degradation, ginger, gold nanoparticle.*

CROPSYT MODELING FOR ENHANCING WATER USE EFFICIENCY AND IMPROVING DURUM WHEAT PRODUCTION

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ABSTRACT

The development of the irrigation scheme within the context of the water scarcity remains one of the crucial issues of the agricultural activity. The situation could get worse with the climate change threatening even the food security of most of the developing countries. Hence, water use efficiency is essential to overcome these constraints and to preserve productive and sustainable agricultural activity. The aim of this work is to optimize the use of irrigation water and to increase the production of the durum wheat through improving irrigation practices. For this, a field survey was carried out with a sample of 80 farmers belonging to the irrigated areas from the gouvernorate of Siliana in the Tunisian semi arid region. This survey allowed to gather technical and economical data of the irrigated durum wheat activity during 2015 cropping year. Using CROPSYST, a crop model has been developed in order to replicate the farmers' practices in terms of cultural system and the inputs use mainly water and fertilizers. The model was calibrated and validated using statistical data of three cropping years 2015, 2016 and 2017. In terms of the achieved yield, the results of the model showed a difference of 1% according to referenced data. The simulation showed that increasing the water quantity by 20% might increase the average yield by 15% whereas changing the irrigation calendar could raise it by 19%.

Key Words : *Wheat, Water, Yield, CROPSYST, Tunisia*

EFFECT OF IMMATURE CHICKPEA FLOUR SUPPLEMENTATION ON PHYSICAL AND SENSORY PROPERTIES OF CRACKERS

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ABSTRACT

In this study, immature chickpea flour (ICF) was used in the cracker production at 0, 10, 20 and 30% ratios. The effect of ICF on color, diameter, thickness, spread ratio, textural and sensory properties of crackers was investigated. Color L* and a* values reduced, whereas b* and SI values increased with the increasing ratios of ICF in crackers. The spread ratio results of crackers increased from 14.43 to 20.29 with the supplementation of 30% ICF. The use of ICF in the production of crackers resulted in lower hardness values than that of control. The crackers containing 10% of ICF demonstrated higher sensory scores than control. This study indicates the ICF can be used up to 20% ratio in cracker formulations with good consumer acceptability.

Keywords: Immature green chickpea, Crackers, Texture, Sensory properties

3D PRINTING TECHNOLOGY IN BAKERY PRODUCTS

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ABSTRACT

Three-dimensional (3D) printing technology has become popular in many different industrial fields such as medicine, engineering, environment and food applications in recent years. In food products, 3D printing technology mainly focused on extrusion with liquid or low-viscosity materials. This technique has a great potential to produce bakery products with complex shapes, elaborated textures and tailored nutritional contents. In particular, 3D printing allows different ingredient optimization for cookies. Besides, this technology also provides an opportunity to develop dough, pasta and snack formulations. In this review, 3D printing technology and its use in bakery products were compiled.

Keywords: *3D printing technology, Bakery products, Extruded products, Cereal-based snacks*

AN ECO-FRIENDLY APPROACH IN SEED TECHNOLOGY: THERMO PRIMING

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ABSTRACT

Availability of using seed thermo priming technique were investigated to physiologically improve seedling quality and performance of aubergine cv. 'Pala 49' seeds during germination and early seedling growth. Aubergine seeds were primed at different temperatures (45 and 50°) and for different periods (5, 10, 15, 20, 25 and 30 min). Untreated seeds were evaluated as the control. Following thermo priming treatments, the seeds were surface dried and then subjected to germination tests. Having completed the experiments, responses of aubergine seeds to thermo priming treatments were observed on the bases of both viability (normal germination rate) and vigour (mean germination time and germination index) parameters. When the overall data were assessed, the optimum protocol that provide physiological enhancement in aubergine seeds was determined. The best results were obtained from the thermo priming treatment conducted at 45°C for 20 min followed by surface drying of seeds. Consequently, these results suggested that thermo priming could be used both in seed and seedling industries to improve seed quality and performance. Furthermore, based on the results of this study, the addition of "thermo priming" as a new pre-sowing technique to the current procedures of the regulations for organic farming and good agricultural practices would be a useful strategy from different points of view.

Keywords: *Solanum melongena, thermo priming, normal germination rate, mean germination time, germination index*

CITRUS IN BENIN REPUBLIC: PAST, PRESENT AND FUTURE CHALLENGES

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ABSTRACT

Citrus spp. is a magnificent crop fruit well known across the world for its nutritional and medical properties. The crop is characterized by an abundant yield and is then a consistent cash-flow provider around the world. This paper provides past and current researches and knowledges linked to citrus production in Benin Republic in order to point out research gaps that should be fill-up for its sustainable production. Since the early stage of modern citrus production, the crop fruit was facing increasing biotic, abiotic as well as technical constraints. Citrus production is in jeopardy in the country and this situation may turn to a nightmare if no actions are undertaken to mitigate their constraints.

THE SAFETY OF BLOOD ANTIPROTOZOAL DRUG COMBINATION IN SHEEP

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ABSTRACT

Babesiosis, theileriosis and anaplasmosis are the most transmitted diseases by ticks. In some cases, these diseases can be found together and some drug combinations can be used for treatment. The aim of this research was to determine the possible side effects of simultaneously administered imidocarb, buparvaquone and oxytetracycline combination at the maximum dose and maximum treatment period in sheep. For this purpose, imidocarb (2.4 mg/kg, IM), buparvaquone (2.5 mg/kg, IM) and oxytetracycline (20 mg/kg, IM) were simultaneously administered to 10 sheep, 2 times with 3 days interval. Blood samples were taken before 0 (Control) and at 0.5, 1, 2, 3, 4, 5 and 6 days after administrations. Serum biochemistry, blood gases and complete blood cell count were measured by specific autoanalyzers. Increased levels of lactate dehydrogenase, aspartate aminotransferase, alanine aminotransferase and blood urea nitrogen and decreased levels of alkaline phosphatase, white blood cell and sodium were established ($P<0.05$). In addition, statistically significant fluctuations were observed ($P<0.05$) in the levels of glucose, bicarbonate, potassium, ionized calcium and chlorine. In conclusion, it may be stated that combination of imidocarb, buparvaquone and oxytetracycline do not causes serious cardiotoxicity and nephrotoxicity in healthy sheep, and they may show just a transient effects on the liver function, blood gases and hemogram parameters. In our opinion, combination of imidocarb, buparvaquone and oxytetracycline may show more side effects in the infected sheep than healthy ones.

Keywords: *Imidocarb, buparvaquone, oxytetracycline, safety, sheep*

COOKING QUALITY, TEXTURAL AND SENSORY PROPERTIES OF NOODLES ENRICHED WITH BLACK CHICKPEA FLOUR

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ABSTRACT

The cooking quality, color values, textural and sensory properties of noodles formulated with black chickpea flour (BCF) at 0, 10, 20, 30 and 40% ratios were studied. Control noodle was prepared with wheat flour. The lowest weight increase and volume increase values were obtained in control noodle. The noodle containing 10% of BCF revealed similar cooking loss and firmness results to control sample. Addition of BCF decreased color L, a*, b* and SI values of noodles compared to control. The noodle including 10% BCF displayed the best sensory characteristics. Results of this study showed that BCF can be incorporated up to 20% in noodle formulations without adverse effect on the overall acceptability.*

Keywords: *Black chickpea, Noodles, Cooking quality, Texture, Sensory properties*

EFFECTS OF *ACHILLEA MILLEFOLIUM L.* OIL EXTRACTS AND *RHIZOBIA* INOCULATION ON PHOSPHORUS CONTENT OF *PHASELOUS VULGARIS*.

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ABSTRACT

Recently, the use of extracts and essential oils from plants as an alternative plant nutritional regulator is noteworthy. However, there are no studies on the effects of different concentrations of oils obtained from these plants and their use with Rhizobium bacteria on the phosphorus content of the plant. In this study; The use of the essential oils obtained from Achillea millefolium plant and different doses of these oils (EO_0, EO_{100}, EO_{1000}) with different Rhizobium leguminasarium biovar phaseoli isolates (R_0, R_1, R_2, R_3) in beans (Phaselous vulgaris) phosphorus (P) content was investigated. The experiment was set up in the greenhouse with 3 replications of random plots according to the factorial trial plan.

According to the results of the research, the average values of the total P content of the root, stem and leaf parts of bean plant of different doses of essential oil applications were different; these values were not statistically significant. Inoculation with different R. leguminasarium biovar phaseoli isolates resulted in statistically significant ($p < 0.01$) increase in P contents of plants. The highest P content was obtained from EO_0 volatile oil dose of R_1 inoculated soils and the lowest was obtained from EO_{1000} dose of R_3 inoculated soils. In the root part of bean plant, the lowest P content was obtained from EO_{1000} dose application (0.05%) without Rhizobium inoculation and the highest P content was obtained from EO_0 dose application (0.21%) of R_3 bacterial inoculation. The lowest P content of Rhizobium inoculated EO_{1000} dose (0.18%) and the highest P content was obtained from EO_0 dose of R_3 bacterial inoculation (0.33%). The lowest P content in leaf part of bean plant was obtained from EO_{1000} dose application (0.27%) without Rhizobium vaccination and the highest P content was obtained from EO_0 dose application (0.47%) of R_3 bacterial vaccination.

Keywords: *Bean plant phosphorus content, Achillea millefolium, plant extract, essential oil, Rhizobium vaccination*

MORPHO-MOLECULAR CHARACTERIZATION OF DRUMSTICK (*Moringa oleifera*)-A MIRACLE MEDICINAL PLANTS

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ABSTRACT

Drumstick (Moringa oleifera) is one of the economically important, nutritionally rich and well-known vegetables in Bangladesh. Bangladesh Agricultural University Germplasm Center (BAU-GPC), Bangladesh Agricultural University has a collection of drumstick germplasm. Knowledge of intraspecific genetic variation is prerequisite for the conservation and improvement of drumstick germplasm. In order to estimate the morphological and molecular variation among 19 drumstick germplasm, morphological study and eight microsatellite loci were analyzed. Morphological study showed the significant variation among the germplasm and in molecular study, eight microsatellite loci were polymorphic and they contained a total of 28 alleles. Loci MO45 had the highest no. of alleles (6) and MO1 had the lowest (2) no. of alleles. Differences were observed in observed number of alleles, heterozygosities and proportion of polymorphic loci among the germplasm. Private allele, which could be used as diagnostic markers for the identification of drumstick germplasm were found for MO-005 (MO58), MO-007 (MO45) and MO-019 (MO12, MO41). Estimation of overall differentiation (F_{st}) and gene flow (N_m) revealed that a high level of genetic variation existed between germplasm with some exceptions. Genetic distance value is the highest (2.706) between MO-006 and MO-018 provide their huge genetic dissimilarities. Genetic distance based UPGMA dendrogram separated 19 germplasm into two cluster where MO-006 and MO-007 are in one cluster and remain 17 in another cluster. Private alleles found in germplasm could be used to identify specific drumstick germplasm and wide range of genetic distances among germplasm could help detect potential germplasm for development of new variety(s) through selective breeding program.

Keywords: *Moringa oleifera, Drumstick, Mporphlogy, Moecular, SSR, Dendogram*

RESPONSE OF DIFFERENT DOSES OF OLIVE PULP BIOCHAR AND SULFUR ON MICROBIAL ACTIVITY OF SOIL

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ABSTRACT

It is well known that biochar can use as soil and plant amendment. However, little information is available on the influence of biochar and sulfur combination on the microbiological parameter of soil. Thus, aim of this study is to determine the combination of biochar (BC) and sulfur (S) amendment basal respiration (BR) and bacteria population (BP) of soil. The result depicted that influence of BC and S interactions on basal respiration was significantly ($p<0.001$) and a highest basal respiration value was found in BC %1.5 without sulfur amendment application (17.60 mg CO_2/100 g) and the lowest basal respiration value was found S (800 mg/kg) without BC application (10.10 mg CO_2/100 g). In addition, bacteria population was not affected significantly neither by the BC doses and S amendment. However, amending soil with increased doses of BC emerged in a more soil bacterial population. Overall, the combined use of BC and S can create an effective way for environmentally friendly alternative to improve soil health.

***Key words:** Soil respiration, olive pulb biochar, total bacteria*

OVICIDAL AND REPELLENT EFFECT OF FOUR PLANT EXTRACTS ON TWO-SPOTTED SPIDER MITE

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ABSTRACT

Two-spotted spider mite (Tetranychus urticae Koch - Acari: Tetranychidae) is a harmful pest for crops such as fruits, vegetables, industrial and ornamental plants. Synthetic acaricides are generally utilized against the two spotted spider mite. In the recent years, realizing the adverse effect of chemical insecticides and acaricides, attention has been diverted to develop alternate methods of pest management such as the use plant extract. In this study, ethanol extracts from sage (Salvia officinalis L.), rosemary (Rosmarinus officinalis L.), yarrow (Achillea millefolium L.) and cumin (Cuminum cyminum L.) were investigated ovicidal effect on eggs and repellent effects on adult individuals of two-spotted spider mite. The hatched neonates were recorded at day 7 and hatching rates of egg were determined. Repellent effect on adults studies were followed up for 24, 48 and 72 hours and the results were recorded. The highest ovicidal effect on T. urticae egg was found to be sage extract and the egg death rate are 100%. When the repellent effect of plant extracts on adults is examined, it is seen that the highest effective concentration is 2.5% and that the cumin extract has the effect of removing 100% of adult individuals.

Key words: *Salvia officinalis Rosmarinus officinalis, Achillea millefolium, Cuminum cyminum, Ovicidal effect, Repellent.*

ONE-STEP FABRICATION OF SUPERHYDROPHOBIC-SUPEROLEOPHILIC MEMBRANES BY INITIATED CHEMICAL VAPOR DEPOSITION METHOD FOR OIL-WATER SEPARATION

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ABSTRACT

In this study, superhydrophobic-superoleophilic membraneswere prepared by single-step deposition of poly(1H,1H,2H,2H-perfluorodecyl acrylate) (PPFDA) thin films onto stainless steel meshes having various mesh sizes by initiated chemical vapor deposition (iCVD) method. Fourier Transform Infrared (FTIR) Spectroscopy, Scanning Electron Microscopy (SEM) and Contact Angle (CA) measurements were utilized for the characterization of As-depoited PPFDA films. The oil-water mixtures were separated with functionalized meshes using a simple test setup without the use of an extra force or chemical reagent.Water contact angle measurements indicated that the meshes became superhydrophobic after coating with PPFDA, with water contact angle values over 150 degrees. The fact that the coatings are highly oleophilic with oil contact angle values close to zero was observed. The diesel oil droplets on top of the coated meshes instantly moved through the meshes. The impact of coating thickness and the mesh size on the contact angle values and the separation efficiencies were examined. High separation efficiency values up to 98.7% were observed, the value of which was dependent on the mesh pore size and coating thickness.

Keywords: *iCVD, PPFDA, superhydrophobic, superoleophilic, oil−water separation*

FABRICATION OF SUPERHYDROPHOBIC-SUPEROLEOPHILIC COTTON FABRIC BY PLASMA ENHANCED CHEMICAL VAPOR DEPOSITION METHOD FOR OIL-WATER SEPARATION

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ABSTRACT

By introducing the deposition of hexamethyldisiloxane (HMDSO) to the cotton fabric via plasma enhanced chemical vapor deposition (PECVD), the fabric surface indicated superhydrophobic (SH) property with the water contact angle values over 150 degrees and superoleophilic (SO) property with the oil contact angle of 0°. Fourier Transform Infrared (FTIR) Spectroscopy, Scanning Electron Microscopy (SEM) and Contact Angle (CA) measurements were utilized for the characterization of as-deposited HMDSO films. The oil-water mixtures were separated with SH/SO fabric using a simple test setup without the use of an extra force or chemical reagent. The impact of radio-frequency (RF) power on the contact angle values and the separation efficiencies were examined. The as-prepared fabric can be applied as effective materials for the separation of water-oil mixture with separation efficiency as high as 97.4 %.

Keywords: *PECVD, HMDSO, superhydrophobic/superoleophilic fabric, oil−water separation*

WATER PRODUCTIVITY AND SUSTAINABILITY ON AGRICULTURAL WATER MANAGEMENT

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ABSTRACT

The agricultural sector uses approximately 70% of the world's annual water consumption, thus it will be a pressure and competition on agricultural irrigation considering the other sectors' demands. Sustainability of irrigation and water is to increase and sustain more effective water management protecting the environment for the coming generations. Productivity on water is a ratio between a unit of output (production) and a unit of input (water). Crop yield increases with water availability in the root zone. However water productivity (WP) and water economic productivity (WEP) can help to determine the threshold on which water and/or irrigation level need to be applicated. The main target in irrigated agriculture is to maximize the crop yield, WP and the farmer's economic returns considering environmental issues. The WP could be increased at plant, field and basin level. In this article, water productivity (WP), economic water productivity (EWP) and land economic productivity (LEP) using different amount of irrigation water and different irrigation systems in Souheastern Anatolia Region of Turkey were evaluated using some experimental results. The amount of irrigation water used could be decreased up to 5000-6000 m^3/ha in case drip irrigation is used compared to the conventional irrigation systems (furrow irrigation, approximately 10 000 m^3/ha). Thus WP, WEP and LEP could be increased by means of surface and subsurface drip irrigation. In addition, water productivity (WP) is an important evaluation criteria in terms of efficient water use and sustainability. Thus, WP, EWP and LEP should be considered jointly for an optimization of water productivity and water saving in terms of farmers and irrigation schemes.

Key words: *irrigation, water productivity, sustainability, water economic productivity, land economic productivity*

CAN WE REPLACE DOUGH STRENGTHENERS IN BREAD FORMULATIONS?

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ABSTRACT

Consumers are becoming increasingly reluctant to purchase food products with long lists of chemical additives on the ingredients label. The greatest numbers of chemicals used for a single purpose in bread formulation are dough strengtheners. The goal of this study was to replace chemical dough strengtheners with natural ingredients. High protein content hard red spring (HRS) wheat flour was selected as a natural dough strengthening ingredient whereas hard red winter (HRW) wheat flour was used as base flour. Thirty-one treatments were prepared by blending HRW flour with different percentages (10%, 20%, 30%, and 40%) of HRS flour from wheat varieties Glenn and Linkert and two more commercial HRS wheat flour besides ten chemical dough strengtheners. Dough prepared from all the treatments were analyzed rheology by farinograph and extensograph. Then test baking by straight dough method was done for loaf volume and also texture by texture analyzer. There were significant ($p<0.05$) differences in water absorption, stability and quality of farinograph, and also extensibility of extensograph. The 40% Glenn and 40% Linkert showed the highest loaf volume of 920 cm^3 and 950 cm^3 with firmness of 1553.50 and 1525.50 mN respectively. There were also significant ($p<0.05$) differences in all other baking parameters and good correlations ($r= 0.868$) were found between stability and loaf volume. Addition of HRS flour with strong gluten characteristics may be able to replace some dough strengthening ingredients, thus shortening ingredient lists and appealing to consumers.

MICROBIAL ASSOCIATED SOIL CARBON STABILITY AS IMPACTED BY DIFFERENT RATES OF DAIRY MANURE AND INORGANIC FERTILIZER APPLICATIONS UNDER SOYBEAN PRODUCTION

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ABSTRACT

Soil carbon stability is associated with soil microbial ecology due to role of microbial activities in carbon cycling and soil health. Soil microbial attacks cause decomposition and mineralization of organic matter where soil aggregates are broken down. As an important component of carbon and nitrogen cycling, soil organic matter is an often-recalcitrant complex that is both synthesized and degraded by microbial enzyme activities and protect by soil physicochemical structure and compositions. The balance between these two competing processes determines the rate of carbon sequestration, microbial diversity and activity, enzyme dynamics. We therefore hypnotized that different application rate of manure and inorganic fertilizer can influence C stability by controlling N fractions, enzymes activities and distribution of microbial diversity (PLFA). The experiment had three different manure application rates; P-based recommended manure rate (P), N-based recommended manure rate (N) and two times N-based recommended manure rate (2N), two different fertilizer application rates; recommended fertilizer (F), high rate of inorganic fertilizer (HF), and a control (CK, no application) in a randomized complete block design with four replications. Soil samples were collected three times during 2015 before planting soybean, one month after planting, and after harvest from surface 0-7.5 cm soil depth. Results of study indicated that 2N manure applications had higher enzyme activities and stable carbon in comparison to all inorganic fertilizer application rate and control. The results documented an association between soil microbial properties and stability in soil carbon and nitrogen fractionation as impacted by manure.

Keywords: *Dairy Manure, Carbon Stability, C/N Fractions, Enzyme Dynamics, PLFA, Urease, Beta-Glucosidease*

INTERACTIONS OF SOIL AGGREGATE FORMATION AND DISTRIBUTION OF CARBON POOLS IN MIDWEST SOILS, USA

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ABSTRACT

Organic carbon, which is the most studied attribute of soil, has a strong influence on C and N dynamics, soil physical structure and associated hydraulic processes. Therefore, degradation of soil aggregates is a primary mechanism for organic carbon decline due to intensive agricultural practices such as long-term use of conventional tillage and intensive application of inorganic fertilizers. However, soil physical mechanisms under natural and managed conditions are complex. Soil is an intricate system that combines other processes such as soil ecology and clay mineralogy that must be considered when trying to understand soil physical phenomena. In the U.S. Midwest region, increasing soil organic matter beyond current levels can be a challenge since soil productivity is relatively high due to naturally high soil organic carbon contents. Thus, the present study digs into understanding three different issues; (i) the mechanisms of carbon stabilization and sequestration in Midwest soils, (ii) role of carbon cycling in formation and stabilization of soil aggregates, and (iii) how these mechanisms interact with clay minerals and microbial activities. The present work focuses on two different studies; the first is targeting different land uses in Wisconsin, and the second focuses on different doses, manure types, and inorganic fertilizer applications in South Dakota. Results document an association between soil microbial properties, and the stability of soil carbon and aggregates as impacted by manure. The present study also indicates an association between soil clay minerals and aggregate formation under different land use.

Keywords: *Carbon Stabilization, Aggregate Formation, Land-use, Manure, Inorganic fertilizer, Clay Mineralogy, Urease, Beta-Glucosidease*

DETERMINATION OF SOME PHYSICAL AND CHEMICAL PROPERTIES OF VINEYARDS OF ALAŞEHIR DISTRICT IN MANISA

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ABSTRACT

This study was conducted to determine nutritional status of vineyards where grape production is made the district of Alaşehir, which is the largest grape producing vineyard areas in the Province of Manisa. The results of the soil analysis can be summarized as follows: The soil samples vary from loamy to clayey-loamy structure, of which 72% has a loamy structure. Although the pH of the soil samples varies from strongly alkaline to notr, 48% was strongly alkaline, 38% was alkaline, 7% was mild alkaline and 5% was notr and the majority of the samples were characterized by organic matter deficiency. The salt values of the vineyard soils were not a limiting factor. In terms of total nitrogen, all samples were classified in the lower nitrogen class. Approximately 48% of the soil was calcareous, the available phosphorus was low by 29% and medium by 71% and the available potassium was found to be very low by 97% and low by 3%. And, available magnesium was very low by 3%, low by 26%, medium by 27%, higher by 28%, and very high by 16%; and the available calcium was very low by 26%, low by 27%, medium by 34% and higher by 13%. It was also found that available zinc was low in 69% of the samples; iron was adequate by 65% of the samples; manganese and copper were adequate in all samples. Significant relationships was found between nutrient element contents of the soil.

Keywords: *V. vinifera L., Vineyard, Soil Properties, Nutrient, Alaşehir.*

THE CONTRIBUTION OF GROUNDWATER ON THE YIELD AND SOME QUALITY PARAMETERS OF CANOLA *(BRASSICA NAPUS)*

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ABSTRACT

Consumption of shallow groundwater as a crop water supply depends on groundwater table depths, groundwater availability and quality, crop species, distribution of plant root system, weather conditions, and soil type. It is not possible to control all these parameters in the field conditions since groundwater contributions are highly variable and difficult to estimate. Therefore, lysimeters are often used to conduct the experiments that simulates only a single parameter at a time. In this study, the optimum groundwater depth for canola growth (Brassica Napus L.) and some quality parameters at water table depths of 30, 60 and 90 cm without irrigation condition were studied in the greenhouse condition. Canola plant's tolerance level to shallow groundwater were determined through soil profile. The highest and lowest seed weights per plant were found as 6.74 and 4.12 gr in 90 and 30 cm of water table depths, respectively. Significant differences between each treatment were obtained and the highest mean total biomass, pod weight and seed weight were calculated as 22.1, 12.6, and 6.3 gr at 90 cm water table depth treatment, respectively. The highest and lowest mean canola plant heights were 134.6 cm (at 90 cm) and 113.3 cm (at 30 cm), respectively.

Keywords: *lysimeter, canola, water table, water use efficiency, root distribution, evapotranspiration.*

IMPROVEMENT OF NEW GRAPE VARIETIES VIA CROSS BREEDING STUDIES

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ABSTRACT

Consumer demands have increased in table grape markets recently. Therefore some characteristics such as ripening time, seedless or less seeded berries, homogeneous clusters and berry composition, muscat flavor and resistance to storage conditions are aimed in table grape breeding studies.

This research was conducted in an attempt to obtain early or late, colourful or white, seeded or seedless grape varieties during 2017-2018 seasons with the context of "Improving new grape varieties with cross breeding" project in Manisa Viticulture Research Institute.

In the study; Mahrabaşı and Tahannebi varieties were used as a female flowered while Superior Seedless, Siyah Kişmiş, Sultani Çekirdeksiz S6 Type, Pembe Gemre and Prima varieties were used as pollinators. 120 and 1873 strong seeds were obtained from Mahrabaşı and Tahannebi varieties, respectively. As a result of planting, 12 plants from Mahrabaşı hybrids and 471 plants from Tahannebi hybrids were transferred to the parcel in 2019.

In 2018, Beyaz Çavuş and Pembe Çavuş varieties were used as a female variety and Bronx Seedless, Siyah Kişmiş (V9) and 1103P were used as a pollinator varieties. Also 120 and 557 seed were obtained from Pembe Çavuş and Beyaz Çavuş, respectively. 20 plants from Pembe Çavuş hybrids and 102 plants from Beyaz Çavuş hybrids were planted in tubes.

Keywords: *Table grapes, Cross breeding, Variety, Seedless, Earliness.*

MEDICINAL AND AROMATIC PLANTS USED AS PROTECTIVE IN FOODS

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ABSTRACT

The production and consumption of the products obtained from medicinal and aromatic plants in the world and Turkey are constantly increasing. Medicinal and aromatic plants, which have a wide usage area, are also lot of used in the food ındustry. It is effective to have functional properties such as antioxidants, antifungal, antimicrobial in the increase of utilization of medicinal and aromatic plants in the food ındustry. Medicinal and aromatic plants are widely used such as whole fresh and dried, leaf, root, flower, seed, bark, tuber, herbs, extracts and essential oils. Medicinal and aromatic plants are mostly used as spices and herbal teas. Thanks to secondary metabolites contained in medicinal and aromatic plants, they are used in foods as flavoring, coloring, preserving, antimicrobial and antioxidant. It is known that especially essential oils have significant potential with their components. In the food industry, the use of plant extracts is increasing day by day in order to extend food preservation and storage.It is expected that aromatic plants will be valued as an important antimicrobial, especially in organic food production, since they are natural and do not cause residual problems. It is known that natural antimicrobial effective plants which can be used in the food industry are extremely safe compared to many other antimicrobials such as synthetic antimicrobals, penicillins. Medicinal and aromatic plants and their essential oils, extracts increase the storage time of foods with antimicrobial effect when added to covenience foods. Aromatic plants that have antioxidant, antifungal and antimicrobial effects are especially marjoram, thyme, sage, rosemary, cinnamon, clove, black seed, lavender, eucalyptus, cumin, coriander, turmeric and ginger.

In this study, information about the purpose and manner of medicinal and aromatic plants used as additives in foods in our country will be given.

Keywords: *Medicinal and Aromatic Plants, Food additives, Protective, Antimcrobial*

INTRODUCTION

The long historical use of herbs and spices for their medicinal benefits is fully acknowledged, and there is a growing amount of literature concerning the potential/purported benefits of these foods from a health perspective (1).

Aromatic plants, also known as herbs and spices, have been used since antiquity as folk medicine and as preservatives in foods. The best known aromatic plants, such as oregano, rosemary, sage, anise, basil, etc., originate from the Mediterranean area. They contain many biologically active compounds, mainly polyphenolics, which have been found to possess antimicrobial, antioxidant, antiparasitic, antiprotozoal, antifungal, and anti-inflammatory properties (2).

It has long been shown that phytochemicals protect plants against viruses, bacteria, fungi and herbivores, but only relatively recently, we have learnt that they are also critical in protecting humans against diseases. Significant part of medicinal plants is consumed by humans, and as a food, it additionally improves human health and well-being in general. It is well known that a diverse array of herbs, vegetables, fruits and grains, besides having nutrients, vitamins and minerals, also possess a large variety of biologically active compounds. These bioactive components as well as their sources as a functional food have recently gained much attention and publicity. . The application of natural plant food preservatives with additional potential as health-promoting agents is especially interesting [20]. What is more, natural plant-origin, antimicrobial compounds have been investigated as alternatives to synthetic ones for preserving food quality, owing to their effectiveness against food spoilage and foodborne pathogens (3).

Metabolites produced by each living cell can be generally divided into two groups: primary metabolites and secondary metabolitess. Primary metabolites are the chemicals aimed at growth and development and include carbohydrates, amino acids, proteins and lipids. secondary metabolites are characterized as compounds believed to help plant to increase overall ability to survive and overcome local challenges by allowing them to interact with their surroundings. Most of bioactive compounds of plants are produced as secondary metabolites, giving plants

their colour, flavour and aroma. Bioactive compounds are present in all plant material: vegetables, grains, legumes, beans, fruits, herbs, roots, leaves and seeds. classification of bioactive compounds in different categories and subcategories is still inconsistent, they can be divided into three main categories: (1) terpenes and terpenoids, (2) alkaloids and (3) phenolic compounds. (3).

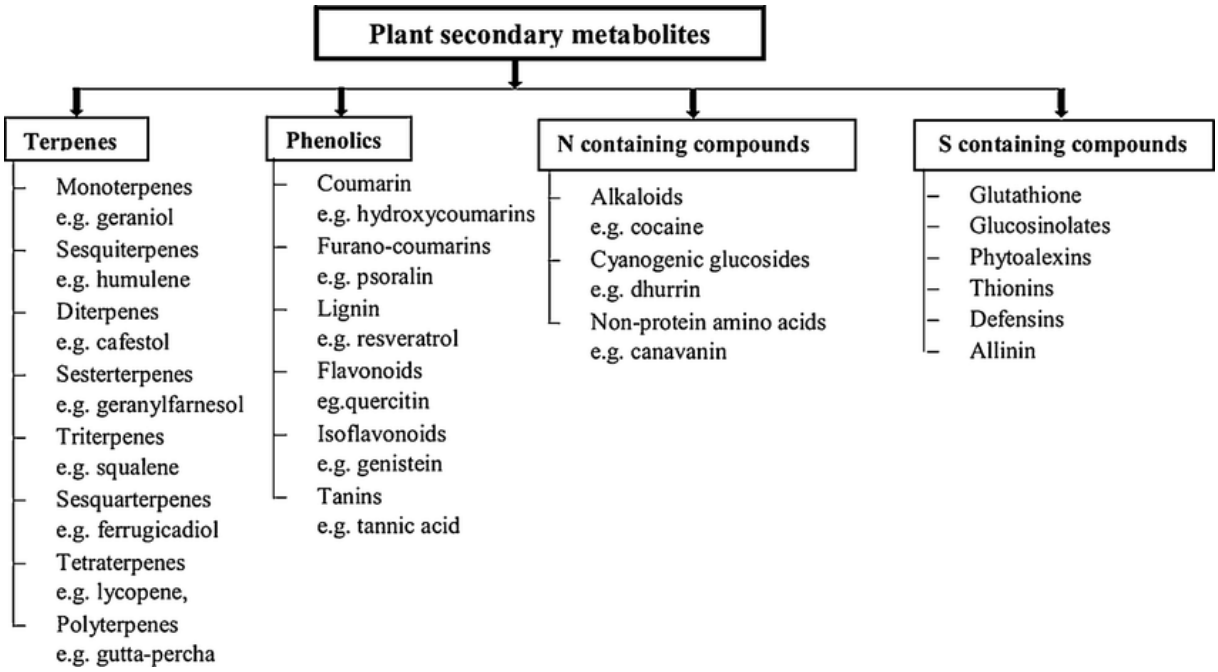

Table 1. Classification of Secondary Metabolites

Due to the richness and variety of bioactive substances contained in plants and their positive effects on human health, they constitute important raw materials used in a variety of industries. In view of their promoting properties, such as antioxidant, anti-inflammatory, anticancer, antimutagenic, antiallergenic, antifungal, antibacterial and many others, research has been intensified towards fruit, vegetables, plants, herbs and spices which will provide an attractive and functional addition to food products (3, 12).

In this study, information about the purpose and manner of medicinal and aromatic plants used as additives in foods in their properties and their secondary metabolites.

Medicinal and Aromatic Herbs

Turkey is among the leading countries in the trade of medicinal and aromatic plants as it is the supplier of raw materials for many important sectors such as herbal medicines, plant chemicals, food additives, cosmetics and perfume industries. Turkey is a country that is rich in plant diversity. It is stated by various sources that around 200 natural plant species are sold by herbalists. Although these plants are used in the field of alternative medicine in today's world, where they should actually be made use of is the field of complementary medicines. (4) Aromatic plants that have antioxidant, antifungal and antimicrobial effects are especially marjoram, thyme, sage, rosemary, cinnamon, clove, black seed, lavender, eucalyptus, cumin, coriander, turmeric and ginger.

Marjoram: Approximately 60 plant species and 17 genera share a similar flavor and color often being labelled as "oregano" *Oregano* is an herb that has been cultivated for centuries in the Mediterranean region, although now it can be found in most continents. Essential oils of Oregano has antioxidant and antimicrobial activities. The main component are carvacrol of essential oil of Oregano. Two constituents of oregano, carvacrol and thymol, contribute to the sensation of warmth in the mouth due to their actions on temperature-sensitive structures called ion channels. A variety of health benefits of oregano or its individual constituents have been the subject of scientific study. Oregano extracts and individual constituents consistently have demonstrated antimicrobial actions in vitro toward food-borne pathogens (5) Oregano has been evaluated for its anti-oxidant and anti-microbial properties with special application to food preservation. Oregano extract and essential oil present

promising methods of natural food preservation due to their bioactivities that prevent many types of food spoilage and microbial growth. (6)

Thyme: *Thymus vulgaris* L. a significant aromatic plant with around 100 species in the world is widely used for medicinal purposes as well as in culinary dishes. The genus *Thymus* are important medicinal plants, highly recommended due to a variety of therapeutic properties of their essential oils, normally known as Thyme oil. Its properties is due to its main component thymol. Fresh Thyme has the highest level of antioxidants among all herbs. *Thymus vulgaris* essential oil is one of the most commonly used essential oils in the food industry as preservatives and antioxidants (7).

Sage: Genus *Salvia*, commonly known as sage, is the largest genus in the Lamiaceae family, comprising over 900 species distributed throughout the world (8). Popular in both Italian and British cookery, sage has long, grey-green leaves with a slightly furry surface. Its aroma is pungent and it has a strong, slightly minty, musky taste. Traditionally, it's used to flavour sausages and as a stuffing for fatty meats such as goose. Also sage is used pasta sauces for meat or poultry stuffings, salads and herbal teas (9).

Rosemary: Rosemary (*Rosmarinus officinalis*, L.) is an aromatic evergreen herb widely used around the globe as a spice/seasoning, flavoring agent and for medicinal applications. Rosemary herbs and leaves contain essential oil (camphor, borneol, bornyl acetate etc.), phenolic compounds (rosmarinic acid, caffeic acid etc.), phenolic diterpenes (carnosic acid and carnosol). Native to the Mediterranean region, rosemary is now cultivated around the world due to its use as a natural food preservative and flavoring agent. *Rosmarinus officinalis* has been used as a food preservative and flavoring agent for centuries, but only recently have its preservative mechanisms been investigated. Recent studies have displayed rosemary extracts' strong antibacterial, antifungal, and antioxidant activity, all of which combine to make the plant a very effective inhibitor of food pathogens (10). Rosemary extract has been well recognized in the food industry as a natural alternative to synthetic antioxidants such as BHA or BHT (11).

Garlic (*Allium sativum*), cinnamon (*Cinnamomum zylancium*), clove (*Syzygium aromaticum*), black cumin (*Nigella sativa*), lavander (*Lavandula officinalis*), eucalyptus (Eucalyptus globulus), cumin (Cuminum cyminum), coriander (*Coriandrum sativum*), turmeric (*Curcuma longa*), ginger (*Zingiber officinale*) and fenugreek (*Trigonella foenum-graecum*), dill (Anethum graveolens) and basil (*Ocimum basillicum*) etc. can also used as spices, food supplementary and additives due to its antioxidant, antifungal and antimicrobial activities. this herbs are used to protect to spoilage because meats, dairy products, poultry products, fishes and sea products break down too quickly.

CONCLUSION

The antibacterial and antioxidant effects of plants result from the phenolic compounds and essential oils in their content, which are bioactive compounds. Essential oils may play an important role in the maintenance of food additives, since they have several biological properties, and may become a natural alternative for the control of several microbial degradation in foods. Fresh or dried herbs that will be added to meats, poultry and dairy products and other foods to protect and decrease to antimicrobial degradation of bioactive compounds as natural preservatives and antioxidants.

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CHANGE OF MICROBIAL ACTIVITY AND SOIL ORGANIC MATER UNDER LONG-TERM FERTILIZATION IN AGRICULTURAL ECOSYSTEM

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ABSTRACT

Soil microbial communities and their functional activity directly affect soil functionality through their roles in the cycling of soil nutrients, carbon mineralisation and stabilisation. The present study was undertaken with an objective to study the impact of activity chemical and organic fertilization treatments in a soddy-podzolic soil in agroecosystem over a 20-year period. Here, we report the responses of soil microbial community structure, abundance and activity, accumulation of soil organic mater in soddy-podzolic soil with different fertilizer systems.

Long-term chemical and organic fertilization enhanced the soil nutrient content available to plants, changed the microbial community structure, soil enzyme activity. Applying mineral fertilizing system causes simplification of trophic connections structure since microorganisms mainly re-orient their fermentative system easily on consuming accessible mineral compounds and get priority in development of their populations without interaction with other components of microbial grouping. A significant decrease in the activity of proteolytic enzymes in the soil for the application of mineral fertilizers was found to be 23% on average, the activity of urease was 5-13, phosphatase- 25-32, invertase- by 39-89%, compared with the experiments carried out with the application of organic fertilizers alone. Combined use of mineral and organic fertilizers has a greater positive effect on the activity of hydrolytic enzymes. After 20 years of different fertilization treatments in the crop rotation found that in the 0-20 cm soil organic mater content was only 12.3% and 5.1% higher for organic, chemical fertilizers respectively, than that with no fertilizer application or control.

Keywords: *soddy-podzolic soil, soil organic mater, soil, microbial communities, enzyme activity, fertilizer systems.*

ANTIBIOTICS AND ANTIBIOTIC RESISTANCE IN AGROECOSYSTEMS

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ABSTRACT

Environmental contamination by antibiotics is one of factors that define the health consequences of antibiotic resistance in bacteria. The combined impact of resistant strains of bacteria, enzymes that inactivate antibiotics and antibiotic compounds can have profound influence on human and ecosystem health. Existing research has focused heavily on human health effects, with relatively little known about the effects of antibiotics and antibiotic resistance on agricultural ecosystems. The fluoroquinolones are one of the most used classes of antibiotics. Enrofloxacin belongs to the class of fluoroquinolone antibiotics that have been intensively used for the treatment of bacterial infections in veterinary medicine. In the environment, enrofloxacin can undergo degradations by different processes including photolysis, biodegradation and oxidation by mineral oxides but it is not sensitive to hydrolysis. Despite these degradation mechanisms, environmental half life time of enrofloxacin is very long. This long environmental persistence of enrofloxacin can affect the growing and the activity of the soil microbial communities.

In this study, the effect of enrofloxacin on the function and structure of soil microbial communities was evaluated. Soil samples were spiked with enrofloxacin (10, 100, and 1000 mg·kg^{-1}) and were incubated for 30, 60, 90 days. Untreated controls received only water.

In pots with different concentrations of enrofloxacin were planted: Lactuca sativa var. crispa, Anethum graveolens, Thymus serpillum, Mentha piperita, Calendula officinalis.

Soil respiratory responses were inhibited at the high enrofloxacin concentrations (1000 mg·kg^{-1}) in the soils and were increased at the lowest concentration (10 mg·kg^{-1}). The maximum level of soil toxicity was 67.21% at concentration of enrofloxacin 1000 mg·kg^{-1}, in the control this parameter was 8,56%. It should be noted, the soil with a high concentration of antibiotic was characterized by a low content of nitrogen-fixing microorganisms and a high number of oligotrophic and spore-forming microbiota. Thirty seven antibiotic resistant bacterial isolates were cultured from soil. All isolates were multi-drug resistant, of which greater than 64% were resistant to 9–12 antibiotics, comprising almost all classes of antibiotic. The 12 antibiotics tested are used in agriculture, human and veterinary medicine and covered all known antibiotic classes and mechanisms of action. They included natural antibiotics such as penicillin and streptomycin, semi-synthetic antibiotics such as cefotaxime and cephalexin, synthetic antimicrobials such as ciprofloxacin and sulfamethizole, and antibiotic used as the last line of defense – vancomycin. Multi-drug resistance is defined as resistance to three or more different classes of antibiotics.

The presence of enrofloxacin in the soil, especially in high concentrations, cause negative changes in microbial community, reduces the respiratory activity of the soil and is one of important factors in the formation of soil resistome.

Keywords: *antibiotic, agroecosystem, bacteria, resistance, soil, microbial community.*

ARTIFICIAL NEURAL NETWORKS AND THEIR USE IN AGRICULTURE

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ABSTRACT

Artificial neural networks are used in many applications in agriculture. Artificial neural networks is a technique that makes various estimates using a multi-layered neural network model. When this approach was compared with various classical estimation methods, artificial neural network method was found to be powerful for similar works. In this study, artificial neural networks are introduced and information is given about application areas in agriculture. As it was seen in the studies, it was recommended to use this technique in agriculture.

Keywords: *Artificial neural networks, agriculture, multi-layer*

Introduction

In the development of computer technology, it was seen that computers that were originally developed to perform electronic calculations and perform complex calculations over time can filter and summarize large amounts of data and make comments about events using the available information.

Some scientists continue to work on computer modeling of human behavior. The most important system developed for this purpose is *artificial intelligence* applications. Artificial intelligence means that intelligent behaviors, which are called intelligence when done by human beings, are also performed by machinery. In other words; artificial intelligence is a theory that shows how the human mind works.

Artificial neural networks (ANNs) have an important place among artificial intelligence applications. Artificial neural networks (ANNs) are computer systems developed with the aim of generating new information, creating and discovering new information through learning, which is one of the characteristics of the human brain, without the need of any help.

In simple terms; artificial neural networks are the mathematical modeling of the learning process of human brain by living or experimenting. It is aimed to have the skills of learning, remembering and updating what is learned in computers. Therefore, the first studies on ANN have started with the modeling of biological nerve cells (neurons) which are the biological units of the human brain. Small connection points called synapses connect nerve cells to each other. Thus, they form clusters that perform various functions of the brain. There are approximately 5,000 trillion synapses in the brain of an adult human being.

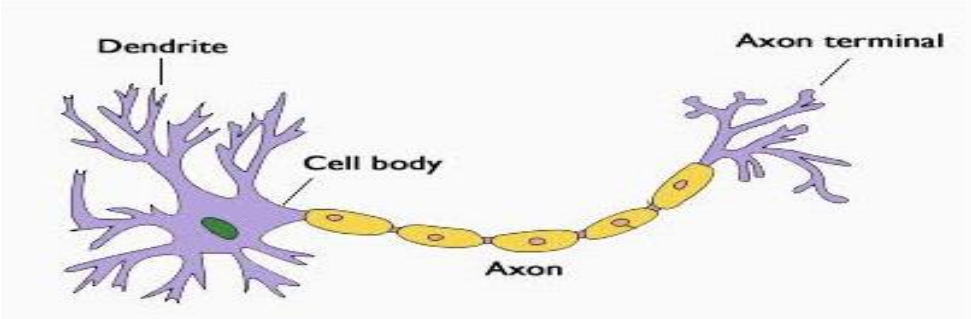


Figure 1. A biological nerve cell

A biological nerve cell consists of four parts: A body, an axon, dendrites (neural ends) and synapses (thin extensions between the axon and the other nerve cell). Dendrites transmit incoming signals to the nucleus. The nucleus gathers signals from the dendrite and transmits them to the axon. These collected signals are processed by the axon and sent to the synapses. Synapses also transmit the newly produced signals to other nerve cells.

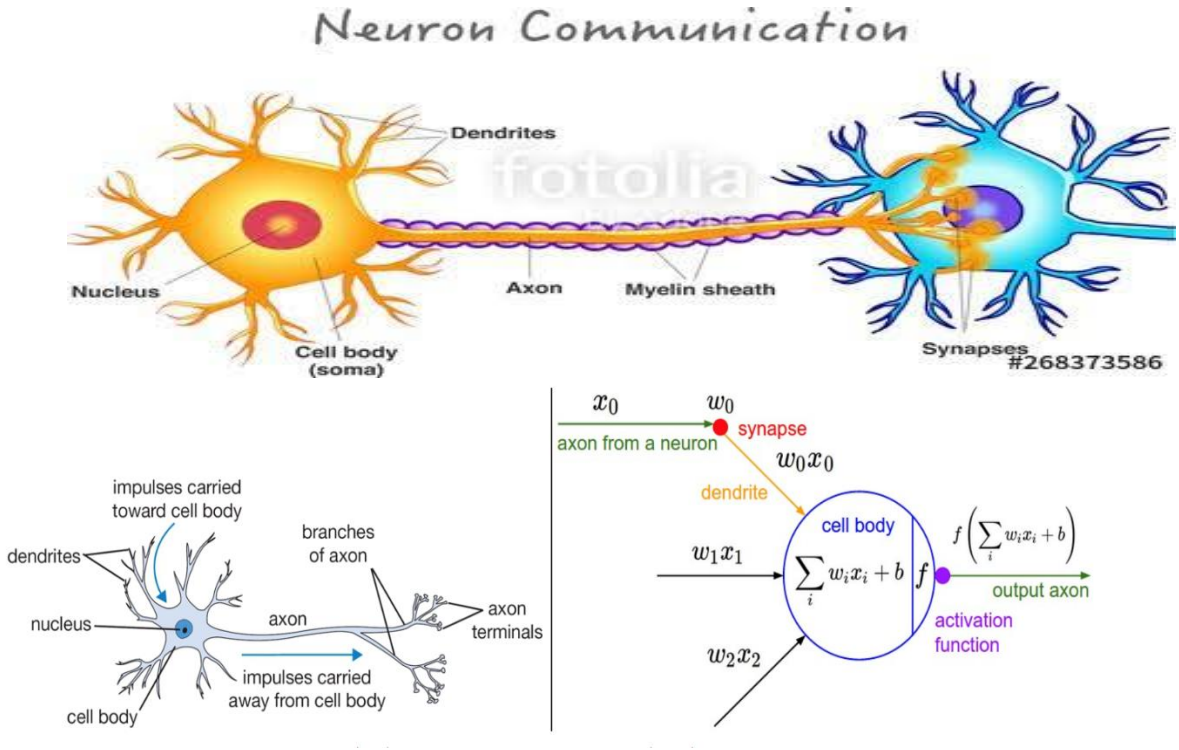
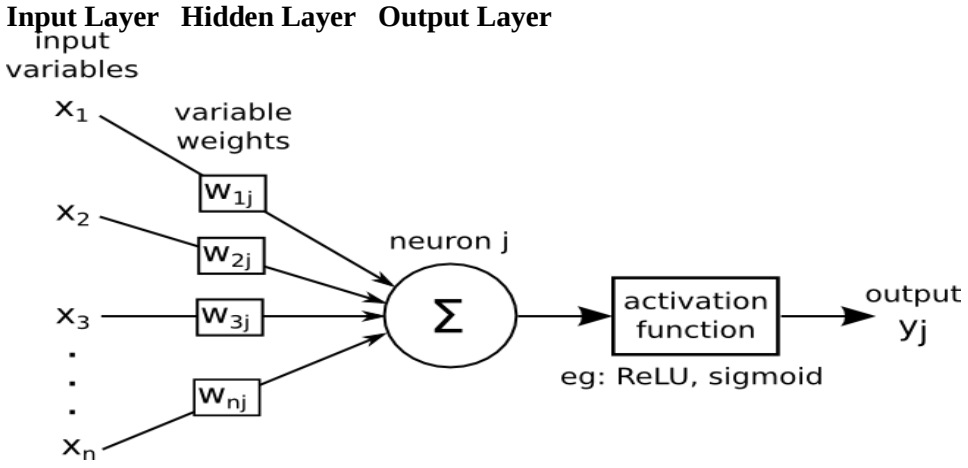


Figure 2. The similarity between biological cell and neural cell

If the behavior of the nervous system is to be modeled, its structure should also be modeled and artificial nerve cells are simulated to real nerve cells. As people gain experience, synaptic connections are adjusted and even new ones are formed. In this way, learning takes place. At least a three layers system was needed to establish a mechanism that receives, interprets and generates an appropriate decision.

The n-dimensional input vector x is converted to the output variable y using the nonlinear function. The inputs are connected to the cell by means of weights. The net function is calculated with the summation function. The net output is calculated by passing the net input through the activation function. This process also gives the output of a cell. In the ANN, obtaining one output for each input in the training set continues in a cycle.



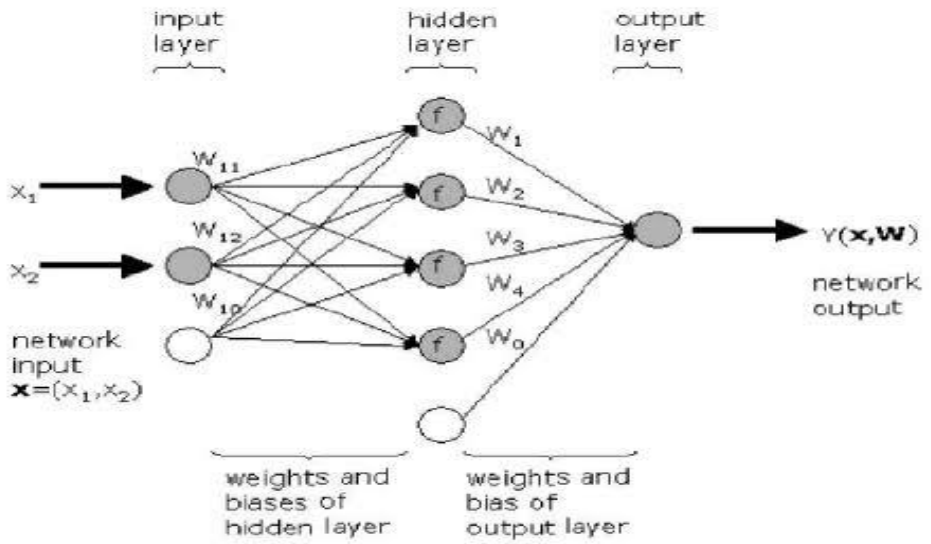


Figure 3. The architecture of ANN

In artificial neural networks, a single iteration of all input data processing is called *Epoch*. The artificial neural network learns in every epoch. With numerous epochs, the system is considered fully trained. At all these stages, the number of processing elements in the layers is also important. In artificial neural networks, training is carried out in batch processing. All training data is given to the system.

In ANN, error margin is calculated by comparing the predicted output with the observed output obtained for each input in the training set. This margin is transmitted backwards in proportion to the weights connecting the neurons from the output layer to the inlet. Weights and errors are updated until the system learns. In artificial neural networks, weights correspond to long-term memory. ANN changes these weight values as examples are shown to it.

Training ANN

In the ANN Initially weights are randomly assigned. The aim is to capture the weight values that will produce the correct outputs and keep the error rate at a certain level. ANN changes weights according to the chosen learning approach and the examples shown during the training. Reaching the correct weight values of the network is the ability to make generalizations about the event represented by the samples.

Testing ANN

The examples that we give to the network for training during the development of ANN are called the "training set" and the sampling used to evaluate the performance of the network after the training is called the "test set". The success of ANN should be tested with the tests to be performed. The output value of ANN is compared with the expected output value. ANN can be used if the desired results are obtained at this stage. If the desired results do not arrive, the ANN structure can be changed.

ANN Applications in Agriculture

Artificial Neural Networks technology has become a branch of science that attracted the attention of researchers in a short time and the studies have started to become a part of daily life after leaving the laboratories.

In recent years, ANN applications have been seen in the field of agriculture and the number of these applications has been increasing rapidly. When the studies in the literature are examined, it is seen that ANN applications in agricultural fields started from the nineties and are quite new. A summary of some of these studies is given below.

One of the leading methods of these estimation systems used recently is ANN. Statistical and ANN approaches were used in yield estimation models in plant indices. Estimation with an ANN model can yield better results than traditional estimates. (Uno et al., 2005; Snehal ,2014; Xue et al., 2014; Pandey, 2017; Adisa et al.,

2019). Uhrig et al. (1992) used a back propagation neural network with one hidden layer to predict corn yield. O'Neal et al., 2002 used ackpropagation Network to predict rice yield based on weather data; B. JI et al (2007), used neural network to predict rice yield based on soil parameters and achieve a testing error of 17.3%. Liu et al (2013) investigated crop yield of wheat and maize using the artificial neural network in response to soil parameter. The study was based on a back propagation neural network claimed that the neural network was an effective tool in predicting the crop yield in Beijing.

Table 1. Some studies crop yield estimation by using ANN in agriculture

Author/s and year	**Description**	**country**
Snehal (2014)	Crop prediction methodology is used to predict the suitable crop by sensing various parameter of soil and also parameter related to atmosphere. Parameters like type of soil, PH, nitrogen, phosphate, potassium, organic carbon, calcium, magnesium, sulphur, manganese, copper, iron, depth, temperature, rainfall, humidity	India
Xue et al (2014)	The Queensland historic wheat plantation area in hectare and wheat yield in ton from 1861 to 2007 are extracted from the report of Australian Bureau of Statistics, which gives a total of 135 entries over the past 147 years. Both plantation area in hectare and wheat yield in ton are listed in their approximated absolute values each year in the original data	Australia
Pandey and Mishra (2017.)	Crop parameters like leaf area index, biomass and plant height were used as input data, while the yield of potato fields as output dataset	India
Adisa et al (2018).	The maize production prediction and projection analysis were carried out using the following climate variables: precipitation, maximum temperature, minimum temperature, potential evapotranspiration, soil moisture and land cultivated for maize. The analyzed datasets spanned from 1990 to 2017	South Africa

In the studies carried out, ANN was used to determine crops diseases (Moshou et al., 2004; Huang, 2012; Asefpour Vakilian & Massah, 2013; Waidyarathne and Samarasinghe, 2014; Oppenheim and Shani, 2017). In our age, excessive drug use against plant diseases increases the costs and at the same time brings dangerous levels at the level of toxic substances in agricultural products. In this context, an ANN based algorithm has been developed in order to diagnose the diseases in different ways and to intervene at the right time and in the required amount. For this purpose, aerial spraying tool has been tried to be developed for "yellow rust olan which is a wheat disease. In the study, ANN was used for classification and good results were obtained and important results were obtained in the identification of plant diseases (Moshou et al., 2004).

Table 2. Some studies crop diseases estimation by using ANN in agriculture

Author and year	**Description**	**country**
Moshou et al. (2004)	Intelligent classification of different reflectance gener-ated for yellow rust diseases infected wheat samples . Neural network model gave better accuracy of 99%.	United Kingdom
Asefpour Vakilian & Massah (2013)	Identify fungal diseases in cucumber plants by obtain-ing 3-textural features from the leaf images. 5-20-2 net-work LM BBP algorithm gave highest accuracy with R- value of 0.9.	Iran
Waidyarathneand Samarasinghe (2014)	A computational modelling attempt to classify a plant disease using visual symptoms to ease crop management programmes. Weligama coconut leaf wilt disease (WCLWD), a phytoplasma-borne coconut disease characterised by three foliar symptoms (flaccidity (bending of leaflets), yellowing and marginal necrosis) found in Sri Lanka, was used to demonstrate its applicability.	Sri Lanka

Huang (2017)	Identify and grade dam-aged crop according to ei-ther insects or diseases de-fect. BPP algorithm with classification accuracy for bad, good and excellent grades as 91.8, 89.1 and 91.7% respectively.	Taiwan
Oppenheim and Shani (2017)	Presents a potato disease classification algorithm which leverages these distinct appearances and the recent advances in computer vision made possible by deep learning. The algorithm uses a deep convolutional neural network training it to classify the tubers into five classes, four diseases classes and a healthy potato class.	Israel

Some studies carried out, ANN was used to determine the crop quality (Di Scala et al., 2013; Figueroa and Ballestero, 2016; Zarifneshat et al.,2012). Disease prediction modeling (Batchelor et al., 1997). Weed and crop discrimination (Aitkenhead et al., 2003). Karaatli and Albeni (2011) forecast the planting areas of rose flower in order to guide the policies of rose sector. The variables used in this study are real prices of rose flower, planting areas of rose flower, the number of apple trees, real apple prices, real grape prices, fixed and slope dummy and time. Another application of ANN was used in the US to estimate the flowering and physiological ripening dates of soybeans. The ANN model in this case consists of four input nodes, three hidden nodes and one output node. As input data, the maximum and minimum temperatures, the photoperiod and the number of days after the crop or flowering are entered, and either the flowering day (prediction) or the ripening day (prediction) is obtained. Experiments with the network have shown that this ANN predicts an error of approximately 2-4 days. Parmar et al. (1997) evaluated peanut harvest contamination with alpha toxins by using ANN with a network structure consisting of 8 hidden layers in which a total of 4 different input data, including soil temperature, drought time, product age, and collected heat units, were used. Taner et al (2018) investigated classification of oat varieties using the artificial neural network. All of the features such as; (thousand kernel weight, geometric mean diameter, sphericity, kernel volume, surface area, bulk density, true density, porosity and color parameters) that analyzed were found to be statistically significant ($p<0.01$). R2 and RMSE values were obtained as 0.99999 and 0.00006, respectively with the developed model in test analyses for classifying the varieties.

Table 3. Some studies crop quality estimation by using ANN in agriculture

Author and year	**Description**	**country**
Fathi et al. (2011)	Predicting colour difference and mass transfer kinetics occurred at sixteen neurons hidden layer with lowest MSE and high R-values of 1.005, 2.312, 2.137 and 0.92, 0.994, 0.88 respectively on Kiwi	Iranian
Scala et al (2013)	In this study, the effects of hot-air drying conditions on color, water holding capacity, and total phenolic content of dried apple were investigated using artificial neural network as an intelligent modeling system.	Argentina
Figueroa and Ballesteros (2016)	Identification of the state of maturity of fruits with artificial neural networks	Colombia
Zarifneshat et al. (2012)	Classification into healthy and bruise volume. BDLRF learning algorithm per-formed with higher output accuracy than BB.	Iranian

In recent studies, ANN has been used to decide the most suitable irrigation time in agriculture (McClendon et al., 1996; Martí, 2009; Rocha, 2012; Huang et al., 2002). Conducted research on a McGuckin et al. (1987) developed a dynamic programming model for irrigation management which incorporated an evapotranspiration yield model. A relative yield loss was calculated based on the difference between potential and predictive transpiration. Mapp (1989) summarized the use of crop growth simulation models in determining optimum economic irrigation strategies.principal-component-based neural network model and applied it to a water level prediction. In a study conducted in the USA, ANN was used to determine the optimal irrigation time in peanut farming. As input data, twelve variables such as days of the year, water content in soil, temperatures and so on are entered. The data obtained as the output is the irrigation decision (0 - no irrigation, 1- irrigation) (McClendon et

al., 1996). In a second study of the same group of peanuts, the evaluation of aflatoxin and aflatoxin contamination of peanut harvesting was also carried out by using ANN. In the model, four variables such as soil temperature, drought time, product age and collected heat units are considered as input data. The collected heat units were calculated based on the limit of soil temperatures ranging from 23 ºC to 29 ºC. It has been observed that the most sensitive result is obtained when the collected heat value is 25 ºC and when eight hidden nodes are taken (Parmar et al., 1997).

Table 4. Some studies irrigation estimation by using ANN in agriculture

Author/s and year	**Description**	**country**
McClendon et al (1996)	Method was developed to capture the results of a computationally intensive irrigation optimization routine through the use of neural networks. The PNUTGRO peanut crop growth simulation model was modified and incorporated into a routine to search for optimal irrigation decisions using the Sequential Control Search approach. The daily environmental conditions and crop state variables associated with these optimal irrigation sequences were used to train a neural network	United States
Rocha (2012)	Develop an Artificial Neural Network that estimate the irrigation time and to contrast the results with the management based on a volume balance method on a watermelon field.	Brazil
Martí (2009)	Presents the application of artificial neural networks (ANNs) for the estimation of two relevant variables of irrigation engineering: reference evapotranspiration and integrated emitter local losses.	Spain

In some work, the artificial neural networks (ANN) were used to determine the nutrients and amendments in some crops (Kolasa-Więcek, 2013; Sartin, 2014; Suchithra et al., 2018). To solve the above problems, some soft computing methods have been used. As regards the nonlinear relationship between fertilizer application rate and its influencing factors (soil nutrients, yield, etc.), some different forms of neural networks have been used in fertilization recommendation (Pokrajac and Obradovic, 1998; Ma et al., 2004) and yield prediction procedures (Ruß et al., 2004). In addition, a neural network ensemble method was used in land evaluation (Yueju et al., 2008) and a genetic algorithm was used in fertilization model fitting (Miao et al., 2009).

Table 5. Some studies fertilization estimation by using ANN in agriculture

Author year	**Description**	**country**
Kolasa-Więcek (2013)	Studies attempt to modeling and predicting of N2O emissions from Direct Soil Emissions in relation to the use of crops and livestock population. In the analysis an artificial neural networks were used.	Poland
Sartin (2014)	Development of a multilayer artificial neural network system in reconfigurable device, with the function of identify deficiency of the Potassium macronutrient by soybean leaf.	Brazil
Suchithra and Pai (2018)	This study describes the development of fertilizer's application rate prediction model for Coconut Tree with the help of ANNs. The prediction model is developed with the soft technique of ANNs through the use of backpropagation algorithm and multilayer neural network model.	India

Conclusion

As a result, artificial neural networks can be estimated for agricultural properties. For this purpose, many data can be considered as input. As examined in the studies, the success rates of the training and test sets were found to be high. Accordingly, it is seen that artificial neural networks are more effective and faster than conventional programming techniques in terms of estimation. One of the distinguishing features of artificial neural networks is; is flexible enough to adapt to new situations and accept data entry afterwards. It will be able to achieve better learning rates with more input information related to the characteristics of the study. In conclusion, it is recommended to use artificial neural networks in many fields of agriculture and in order to advance the existing studies.

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ROLE OF HORTICULTURAL PRODUCTION ON NUTRITIONAL FOOD SECURITY, HOUSEHOLD INCOME, POVERTY REDUCTION, BIODIVERSITY, SUSTAINABLE DEVELOPMENT AND ENVIRONMENT

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ABSTRACT

Although Bangladesh is self sufficient in cereal foods but seriously suffering from nutritional foods. Recent report of UN said about 40 million peoples are suffering from malnutrition that is deficiency in nutritional food specially vitamins and minerals (hidden huger). Our recent study reveals that production of horticultural crops now a days contributing lots to fulfill the nutrition deficiency specially for the rural poor and ultra poor peoples. Recent study also found that production of fruits and vegetables in the homestead of Bangladesh supplementing household income and leads to the sustainability of horticultural production, utilization and protection of houses from adverse environmental hazards in changing climate. Recently, through the research and development by BAU-Germplasm center of improved varieties, sustainable technologies and effective extension activities contributed tremendous development in horticultural sector. This paper mainly deals with how and what extent horticultural development. . The initial achievement of research and development by BAU was to collect a vast array of improved and indigenous fruit crops growing in Bangladesh, but also drawing upon other fruit tree germplasm collections, and to conserve and study these valuable genetic resources. About 11550 fruits mother plants representing 210 species and including 86 registered varieties have been planted and maintained for sustainable development in Agriculture sector. The value of the rich species diversity in the BAU-GPC germplasm collection has been recognized outside of Bangladesh by recent support from Bioversity International, the AAS-WorldFish CGIAR Consortium, and Bangladesh Academy of Science – USDA project to further the conservation of this diversity. By itself, the BAU-GPC is an important achievement, but we envisioned additional value in the BAU-GPC, and acted upon that vision. The development of the Bangladesh Agricultural University – Germplasm Centre –the largest fruit repository in Bangladesh by research team has had a direct impact on hundreds of graduate students, thousands of fruit tree industry personnel, and tens of thousands of farmers who benefited from their improved knowledge resulting from the efforts of Dr. Rahim. Bangladeshi farmers have also benefited from the 50 million fruit tree saplings provided by this project. Furthermore all citizens of Bangladesh have benefited a more abundant supply of nutritious fruit that has resulted from BAU-GPC. In short, the BAU GPC is now become the one stop service for largest in situ fruit repository center, fruit variety development, research, extension, recreation. Sustainable agricultural development and education.

Keywords: *BAU-GPC, In-situ fruit repository, Conservation, diversity, poverty reduction, nutritional food security, household income, environmental protection.*

Horticulture for nutrition: In the world about 1.09 billion peoples are suffering from hunger i.e. deficiency in calories and protein and in Bangladesh about 10 million which need special attention (Fig. 1). Fruits and vegetables can supplement the gap. In the other hand about 2 billion peoples in the world suffering from malnutrition i.e. micronutrient and vitamins deficiency (hidden hunger) and in Bangladesh about 40 million. To solve the hidden huger fruits and vegetables will serve significant role as its content huge amount of vitamins and minerals.

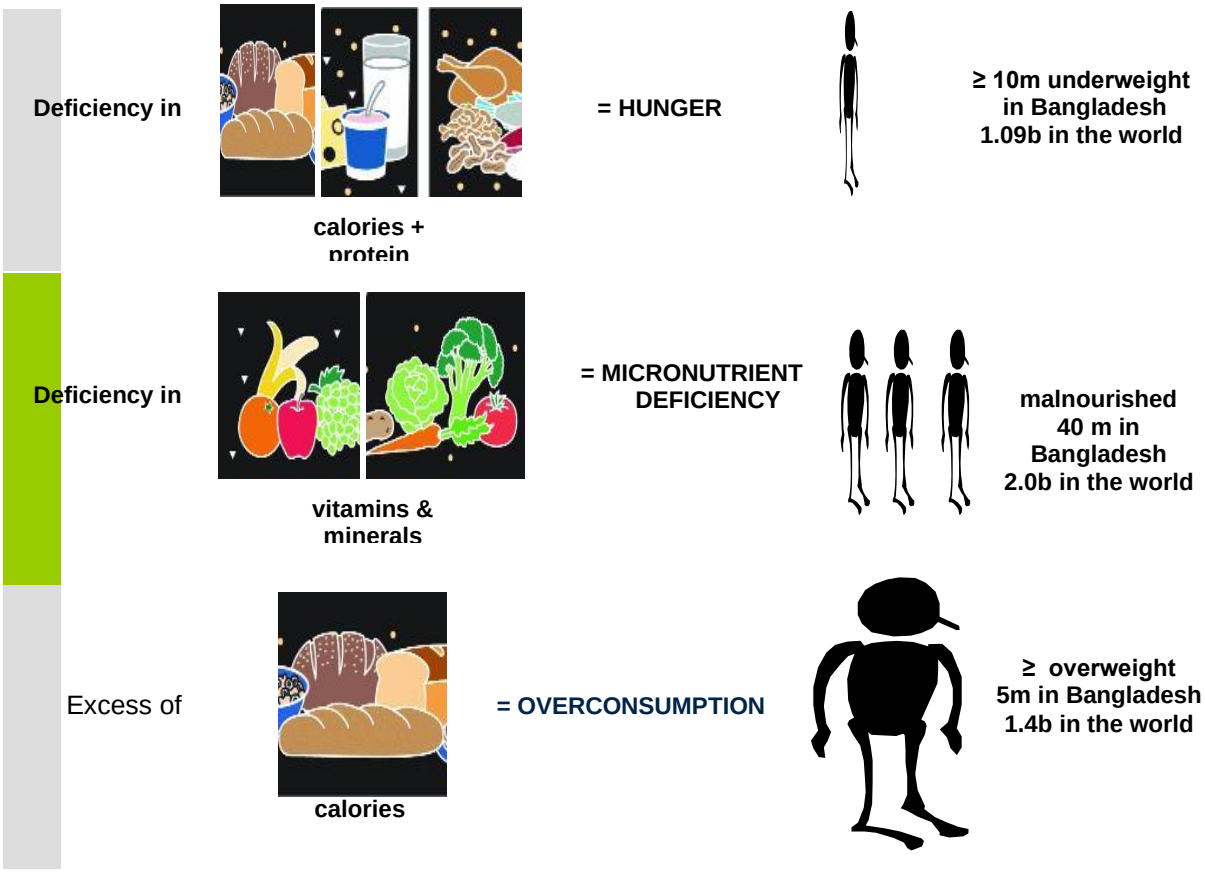


Fig. 1. The crucial gap stays: Micronutrients – the 'hidden hunger'

So, Horticulture production Target- Nutritional food security. Even in increasing world population (Fig. 2) horticulture production is essential. To have good health an adult should have 400 grams of fruits and vegetables which is equivalent to world cup foot ball (Fig. 3). Population increasing -need nutrition and income?

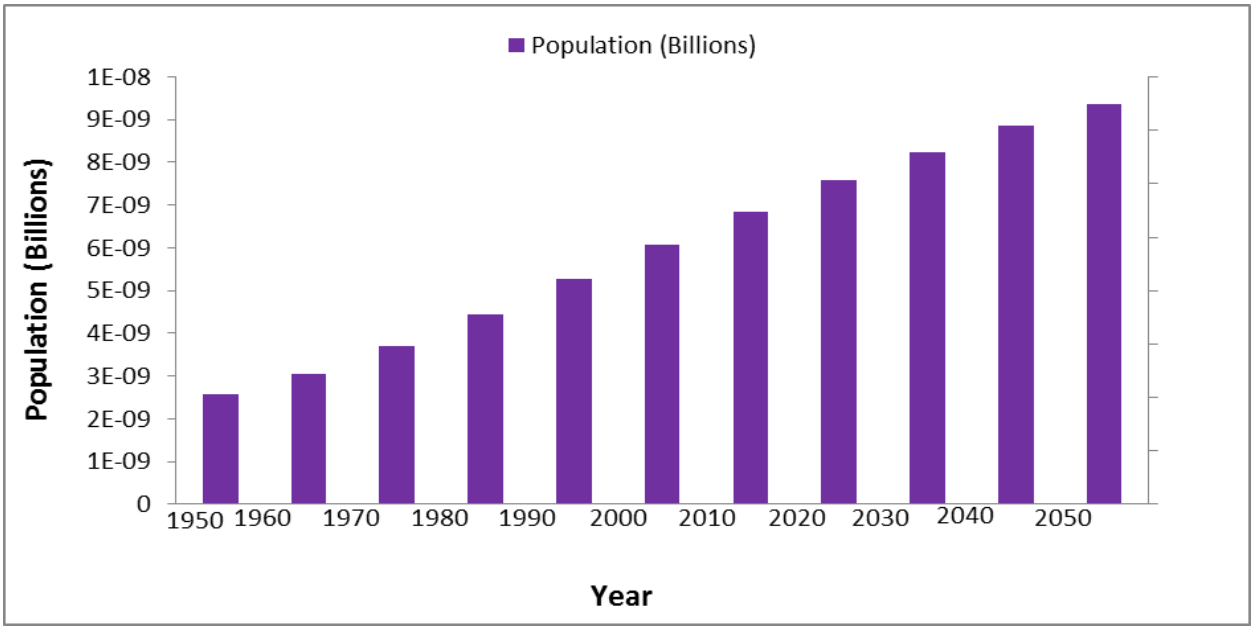


Fig. 2. World population

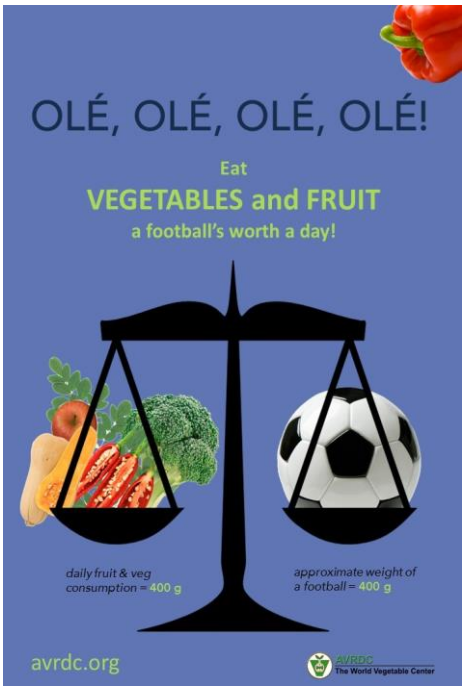


Fig. 3. Fruits and vegetables requirement

Horticulture for sustainable development

Horticulture induces general socio-economic development at the level of producer and throughout the whole horticulture value chain at local and national levels- **Producer-whole seller-retailer-consumers**

Horticulture for health

- Insufficient consumption of fruits and vegetables has many negative impacts on health, and many diseases can be attributed to a lack of vitamins and essential micronutrients in the diet.
- Addressing hidden hunger through appropriate crop and diet diversification, especially with fruits and vegetables, is a better approach.
- Challenges regarding availability, affordability, and food safety of fresh fruits and vegetables have to be considered and solved to optimize the contribution of horticulture to more diverse diets.

Horticulture Create Wealth

- Besides its potential to improve health, horticulture – especially smallholder horticulture – is a powerful tool for alleviating rural poverty and to enable poor people to grow their families out of absolute poverty.
- Fruit and vegetable production is usually more lucrative than staple crop production
- It generates more income per land area than staples, and benefits from relative insensitivity to economies of scale, especially in cases where labor is abundant and land is scarce

Income from Horticulture (Source: BAU-GPC)

- Mango- US$ 22735 per hectare
- Banana- US$ 10374 per hectare
- Wheat- US$ 1627 per hectare
- Rice- US$ 4367 per hectare

Horticulture supplement livestock production

For fodder some fruits and vegetables supply in large scale. As shown in the Fig. 4, the black Bengal goat of Bangladesh eating jackfruit leaves.

Fig. 4. Jackfruits Leaves as Fodder

Black Bengal Goat is good for skin and meat for poverty alleviation and foreign currency income

Horticulture creates employment opportunities

• The creation of employment opportunities is one of the major benefits of horticultural production, processing and marketing.

• In many cases, horticulture provides more employment opportunities and rising wage levels due to the demand for labor at the farm level, at the level of input-providing industries, and at the level of postharvest and processing industries.

• Horticulture is usually more labor intensive than staple crop production

• Horticulture makes excellent use of family labor and creates employment opportunities for farm laborers, who are often poor farmers or landless people.

• Employment opportunities result from the commercialization process induced by

• Horticultural production and the rise of associated industries in processing and trading.

• Jobs like processing, washing, labeling and bar coding are often done by landless women who have few other employment opportunities.

Fig. 5. Employment opportunity in various activities

Employment opportunity for disable peoples too


Employment opportunity school children in off time


Employment


Mrs. Rashia Begum & Md. Milon Mia Landless farmer. Income increased from homestead 216%

Horticulture creates new market opportunities

• Due to the high perishability of vegetables and a lack of storage facilities, farmers producing horticultural crops usually sell a part of their harvest at market. Thus, market integration of horticultural farmers is usually higher than for staple crop producers.

• Smallholders producing horticultural crops are enabled to break away from subsistence farming.

Horticulture empowers women

• Horticultural production, marketing, processing and consumption leads not only to nutritious and economic benefits for those involved, but also to positive behavioral changes.

• The production, handling and marketing of horticultural crops provides safe and rewarding work for women and girls.

• Women's engagement in horticultural activities enables them to take up a more self-confident role in their own families and communities, and also gain influence in household decision-making

Horticulture empower women (2)

• Horticultural production allows women to become entrepreneurs through their horticultural activities while their male partners stay in agriculture or move into other businesses, which further empowers women in their communities. In addition, female income in a household is spent to a much bigger proportion on family needs – for instance, for improved diets, supporting children's school attendance, and potentially permitting the education of girls.

Dwarf, seedless and harvest by knee down position-safe fruits



Fruit-Dwarf and harvest by lay down position-Safe fruit direct action



Fruit Combined harvesting system and women employment (TLC)-safe fruit

Fruits harvested can eat directly



Women given Training to the fruit growers




Horticulture protects and enriches agrobiodiversity

- Horticultural production protects and enriches agro-biodiversity through the utilization of modern cultivars as well as indigenous and underutilized horticultural crops; such usage helps to ensure the largest pool of plant genetic resources for food and agriculture in gene banks and other conservation facilities continues to grow.
- Due to its high inter-species diversity, horticulture provides comparatively more options for diversifying smallholder agriculture to develop new markets, spread risk, and adapt to new realities associated with climate change.
- Through different direct and indirect benefits in the production, processing, marketing and consumption of horticultural crops, horticulture also contributes to the achievement of several of the Sustainable Development Goals (SDGs).

Variety diversification

- So we need high yielding, nutritionally rich and high value carrots for every areas
- Need to train farmers, scientist for carrot production

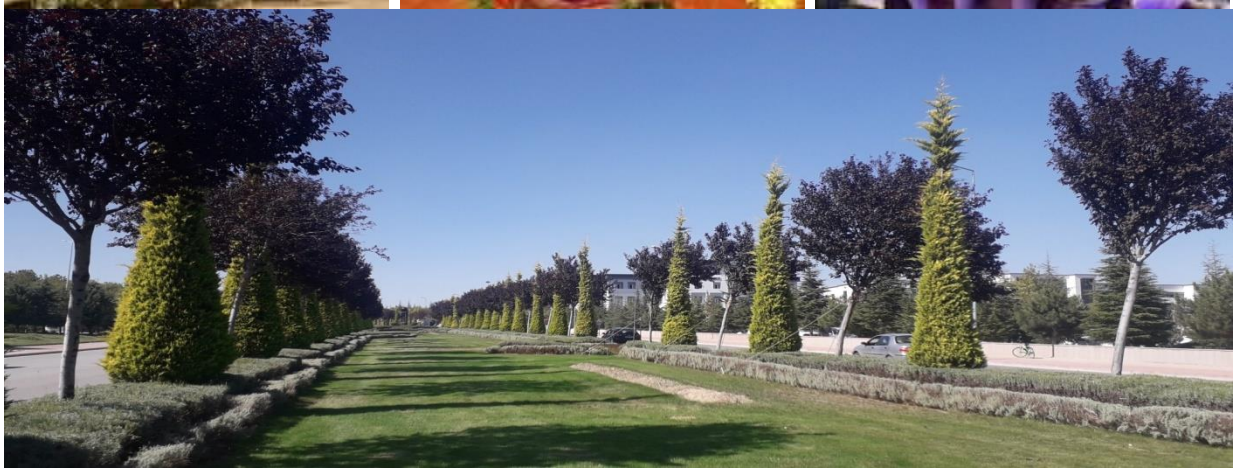
Possible Health Benefits of Unusually Pigmented Carrots

WHITE	ORANGE	PURPLE OUTSIDE ORANGE INSIDE	RED	YELLOW
				
Health benefit = Fiber to help digestion	Health benefit = Provitamin A essential for healthy eyes and immune system	Health benefit = Helps prevent heart disease & strokes, antioxidant ties up harmful free radicals and vitamin A activity.	Health benefit = Helps prevent cancer (especially prostate) and vitamin A activity.	Health benefit = Eye health (especially macular degeneration) and cancer prevention
Pigment = No pigment, like wild carrot (Queen Anne's Lace)	Pigments = Beta and alpha carotene	Pigments = Anthocyanin, beta and alpha carotene	Pigments = Lycopene and beta-carotene	Pigments= Xanthophylls, especially lutein

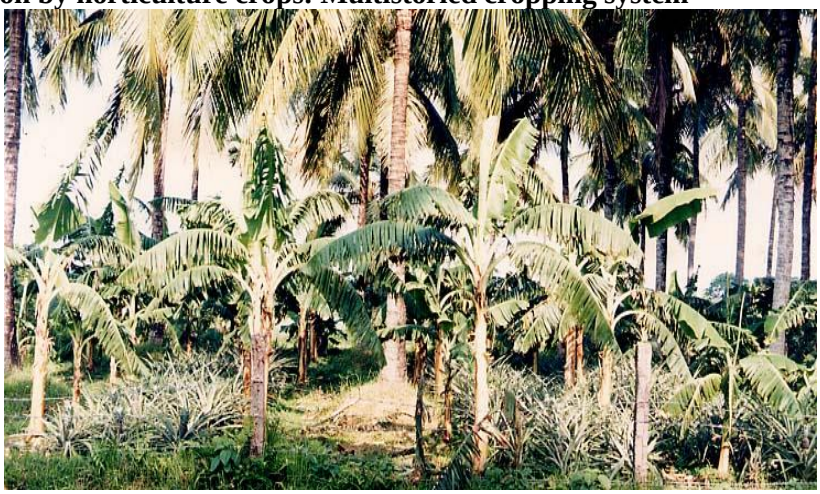
Are the pigments bioavailable? Are the carrots edible?

Flowers & Landscape: large areas for income



Vertical production by horticulture crops: Multistoried cropping system



Three layered cropping system (Pineapple+ Banana+ Coconut

Multistory vegetable production

Coconut+ lemon+ carrot

Coconut+guava+carrot

Poverty status and horticulture

• Mostly through household surveys, they found that 44 percent of the world lived in extreme poverty. The World Bank defined extreme poverty as people living on $1 or less a day. Around 1.85 billion people, or 36 percent of the world's population, lived in extreme poverty.

Poverty reduction

• Widening market access and liberalization increasingly allows rural people to escape poverty through production and exchange of horticulture crops.

• While experience shows that horticulture can offer good opportunities for poverty reduction because it increases income and generates employment

• Dynamics of rural growth in Bangladesh: sustaining poverty reduction" identifies changes in the farm and non-farm sectors of the rural economy and the policy implications and actions to foster future growth, further reduce poverty, and improve food security and nutrition.

Environment: Horticulture: carbon sink and o_2

• Climate change and horticulture: Climate change may have beneficial as well as detrimental consequences for horticulture. Some research indicates that warmer temperatures lengthen growing seasons and increased carbon dioxide in the air results in higher yields from some crops.

• Horticulture crops have greater potential for carbon sequestration than field crops and agroforestry systems.

• A mango tree can absorb as much as 24kg of carbon dioxide per year and can sequester 1 ton of carbon dioxide by the time it reaches 40 years old.

• Fruit trees renew our air supply by absorbing carbon dioxide and producing oxygen. The amount of oxygen produced by an acre of mango trees per year equals the amount consumed by 18 people annually. One mango tree produces nearly 130kg of oxygen each year. One acre of trees removes up to 2.6 tons of carbon dioxide each year.



Acknowledgements

Dr. Mithat Direk- Conference Chair

Dr. Halis Simsek- Conference Chair

BAU team here in Konya
Organizers and all committee members of ICSAE 6

PANICLE CHARACTERIZATION OF SIX FOXTAIL MILLET (*SETARIA ITALICA (L.)* BEAUV) LOCAL GENOTYPES

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ABSTRACT

Foxtail millet (Setaria italica (L.) Beauv) is one of minor cereals that is easily cultivated and potentially to be a functional food crop because its nutritional content. However, in Indonesia foxtail millet is still underutilized. Foxtail millet genotypes exploration has been carried out since 2015 and this germplasms characterization is carried out as an initial step of foxtail millet breeding project. Panicle of cereal crop is important to observe because it is used to estimate the yield potential. The objective of this study was to determine the qualitative and quantitaive morphological characters of panicles from six local foxtail millet genotypes. The study was conducted from January to July 2017 in Cikabayan Experimental Field and Post Harvest Laboratory, IPB University. The experiment was arranged in randomized complete block design with six foxtail millet local genotypes as treatment and three replications. Five genotypes from East Nusa Tenggara (Botok 2, Botok 4, Botok 10, Botok 15 and Botok 19) and one genotype from Padang were used as genetic materials. The result of panicle morphology characterization showed the diversity of panicle morphology characters in the six local foxtail millet genotypes. The panicle of 'Padang' genotype has a longer period to appear and a longer harvest time compared to the other genotypes. 'Botok 15' was genotype with the highest weight of 100 grain, while 'Padang' genotype had the lowest weight of 100 grain. Based on grain weight of ten plants showed that 'Botok 10' has the highest estimated productivity (2,61 ton ha^{-1}).

Keywords: *Cereals, Exploration, Flowering time, Morphology, Productivity*

INTRODUCTION

Foxtail millet (Setaria italica L. Beauv) is a cereal that commonly cultivated in India, Tiongkok (Ravi, 2004), America, Africa and Australia (Lin *et al*., 2012). Foxtail millet is mostly found in Maluku Region and eastern Indonesia as a subtitude for rice in the form of seeds, flour, noodles, vermicelli and other processed product (Herodian *et al*., 2009). Besides being easily cultivated on marginal land and without irrigation (Amgai, 2010) and tolerant of salinity (Ardie *et al*., 2015), foxtail millet is a functional food crop thought its high nutrient content (Tirajoh, 2015). However, there are no foxtail millet varieties that have been realeased in Indonesia, while Tiongkok has a superior variety 'Jigu 32' which has productivity 5,13 tons ha^{-1} (Lie *et al*., 2014). Therefore, foxtail millet breeding program as an alternative food diversivication and functional food sources needs to be done. In the context of increasing genetic diversity, exploration activities have been carried out since 2015 by Foxtail Millet Research Team of IPB University in several regions of Indonesia. Sulistiyowati (2015), Biantari (2017) and Sintia (2017) have carried out agronomic and morphological characterization of ICERI 1-10 genotypes that collected by Cereals Research Center of Ministry of Agriculture Indonesia. Panicle observation in cereal crops are important to observe to estimated the yield potential. This study was conducted to determined the qualitative and quantitative morphological characters of six panicles of the local foxtail millet genotypes as initial information for foxtail millet breeding program in Indonesia.

MATERIALS AND METHODS

This study wa conducted in Cikabayan Experimental Field and Post Harvest Laboratory, IPB University, Indonesia from January to July 2017. Rainfall during the study around 256 mm/month and the temperature range

was 23,0 – 31,1^{O}C (BMKG, 2017). The experiment was arranged based in a randomized complete group design with six foxtail millet local genotypes as treatment in three replications. One genotype from Padang, West Sumatera and five genotypes from East Nusa Tenggara ('Botok 2', 'Botok 4', 'Botok 10', 'Botok 15', 'Botok 19') were used as genetic materials. The observation were recorded for qualitative and quantitaive morphological characters based on International Union for the Protection of New Varieties of Plants (UPOV) 2010. Observation were made when the flower or panicle has appeared perfect until harvest and continued for post harvest observations. The qualitative characters were anther color, anthicyanin coloration of bristles, antocyanin coloration of glume, panicle attitude, panicle shape, length of bristles, grain shape, grain color, dehusked grain and type of endosperm. The quantitative characters were length of penducle (cm), panicle density (rachis per cm), number of grain per rachis, length of grain (mm), width of grain (mm), length/width ratio of grain, day to flowering (DAP), panicle filling period (Day), day to harvest (DAP), length of main panicle (cm), main panicle weight (g), number of panicle per plant, panicle weigth per plant (g), filled grain weight of the main panicle (g), empty grain weight of the main panicle (g), weight of 100 grain (g), grain weight of ten plants (g) and estimated productivity (grain weight of ten plants x 60% population per ha) (ton ha^{-1}). Quantitative data were analyzed used the F test at $\alpha = 5\%$ and $\alpha = 1\%$. Duncan Multiple Range Test (DMRT) was used to determined the significant differences among the treatment.

RESULT AND DISCUSSION

Panicle is a bunches of flowers at the tip of cereals plants. The flowers will fertilizing and filling grain until panicles are filled with grains. The panicle diversity of six foxtail millet local genotypes can be observed in the morphological diversity. Based on qualitative traits visually indicate that some genotypes have similarity and diversity in some characters (Tabel 1). Anther color of six foxtail millet genotypes has shown the diversity. 'Botok 2' and 'Botok 4' genotypes has brown anther color, while another genotypes has orange anter color. All 'Botok' genotype has not anthocyanin coloration of bristles and glume, whereas 'Padang' genotype has anthocyanin coloration of bristles and glume. 'Padang' genotypes has very long bristles. 'Botok 19', 'Botok 15' and 'Botok 10' has short bristles, while 'Botok 2' and 'Botok 4' genotypes was a genotype with medium length of bristles. Panicle attitude of all genotypes was moderatly dropping. 'Botok 2' and 'Botok 4' genotypes has cylindrical panicle shape, 'Botok 10' and 'Botok 15' genotypes has cat foot panicle shape, 'Botok 19' genotype has duck mouth panicle shape and 'Padang' genotypes has conical panicle shape.

Tabel 1. Anther color, anthocyanin coloration of bristles, anthocyanin coloration of glume, panicle attitude, panicle shape, length of bristles of six foxtail millet local genotypes

Genotipe	Anther color	Anthocyanin coloration of bristles	Anthocyanin coloration of glume	Panicle attitude	Panicle shape	Length of bristles
Padang	Orange (2)	Present (9)	Present (9)	Moderately drooping (7)	Conical (1)	Very Long (5)
Botok 2	Brown (3)	Absent (1)	Absent (1)	Moderately drooping (7)	Cylindrical (3)	Medium (3)
Botok 4	Brown (3)	Absent (1)	Absent (1)	Moderately drooping (7)	Cylindrical (3)	Medium (3)
Botok 10	Orange (2)	Absent (1)	Absent (1)	Moderately drooping (7)	Cat foot (6)	Very Short (1)
Botok 15	Orange (2)	Absent (1)	Absent (1)	Moderately drooping (7)	Cat foot (6)	Very Short (1)
Botok 19	Orange (2)	Absent (1)	Absent (1)	Moderately drooping (7)	Duck mouth (5)	Very Short (1)

Based on visual observation, genotypes which has round grain shape were 'Padang', 'Botok 10', 'Botok 15' and 'Botok 19' genotypes, while 'Botok 2' and 'Botok 4' has medium ovate grain shape. The duhusked grain of

'Padang', 'Botok 2' and 'Botok 4' genotypes were light yellow, 'Botok 10' and 'Botok 15' genotypes were medium yellow, and 'Botok 19' was gey. The endosperm character of foxtail millet grains was observed by iodine test on grain which had been split longitudonally. Grain with red coloring indicate the grain the grain contain wax, while the grain that are puplish-blue do not contain Waxy indnicating the presence of amylopectin and amylose. Grain that containing amylopectin after being coocked fluffier and tender (Mar et al., 2012). Iodin test approved that from all genotypes only 'Padang' genotype has waxy endosperm.

Tabel 2. Grain shape, grain color, dehusked grain and type of endosperm of six foxtail millet local genotype

Genotipe	Grain shape	Grain color	Dehusked grain	Type of endosperm
Padang	Round (1)	Red (5)	Light yellow (2)	Waxy (1)
Botok 2	Medium ovate (2)	Medium Yellow (3)	Light yellow (2)	Non-waxy (2)
Botok 4	Medium ovate (2)	Medium Yellow (3)	Light yellow (2)	Non-waxy (2)
Botok 10	Round (1)	Brown (4)	Medium yellow (3)	Non-waxy (2)
Botok 15	Round (1)	Brown (4)	Medium yellow (3)	Non-waxy (2)
Botok 19	Round (1)	Black (5)	Grey (4)	Non-waxy (2)

Length of penducle of six foxtail millet local genotypes was not different. The panicle density was a number of rachis per cm at the middle third of panicle. The higher panicle density value means the more number of rachis in a panicle. 'Padang' genotype has low panicle density but has higher number of grain per rachis. The Length/width ratio of grain represent the shape of the grain. Biantari (2017) said that high ratio value represent the shape of grain is ovate and low ratio value represent the shape of the grain is tend to be round.

Table 3. Length of penducle, panicle density, number of grain per rachis, length of grain, width of grain and length/width ratio of grain of six foxtail millet local genotypes

Genotype	Length of penducle (cm)	Panicle density per cm	Number of grain per rachis	Length of grain (mm)	Width of grain (mm)	Length/width ratio of grain
Padang	6,97	5,58d	112,08a	2,18c	1,65b	1,32b
Botok 2	9,07	7,09bc	59,41bc	2,40a	1,70ab	1,42a
Botok 4	12,87	6,63cd	53,19c	2,28bc	1,67b	1,37ab
Botok 10	9,87	8,19ab	77,68b	2,26bc	1,66b	1,37ab
Botok 15	8,10	6,72cd	76,09b	2,26bc	1,73a	1,31b
Botok 19	10,43	8,46a	46,61c	2,30b	1,66b	1,39a

Notes: Means followed by the same letter within each column are not significantly different based on DMRT at $\alpha < 5\%$; [1] data is transformed by the formula $\sqrt{x} + 0.5$.

Day to flowering recorded from the time the plants were transplanted to the test plot until panicles appeared. Day to harvest recorded from the time the plants were transplanted to the field until harvesting day. The day to harvest of six foxtail millet genotypes varies, starting from 32nd– 135th day after planting depending on the environmental conditions of the planting (Reddy *et al*., 2006). The Day to flowering of six foxtail millet genotypes ranged from 56 to 77 DAP. 'Padang' genotype has the longest day to flowering compared to other genotypes and the longest day to harvest (128 DAP). However, it turns out that six foxtail millet genotypes did not differ in the panicle filling period. Farmers prefer plants that have a faster harvest age because the crops will produce faster. In addition to genetic factors, the environment greatly influences the flowering period in foxtail millet. Siles et al. (2001) said that flowering in foxtail millet is also influenced by location and season. The six local genotypes did not differ in character from main panicle length, main panicle weight, number of panicles per plant and panicle weight per plant.

Table 4. Days to flowering, panicle filling period, days to harvesting, length of main panicle, main panicle weight, number of panicle per plant and panicle weight per plant of six foxtail millet local genotypes

Genotype	Day to flowering (DAP)	Panicle filling period (Day)	Day to Harvest (DAP)	Length of main panicle (cm)	Main panicle weight (g)	Number of panicle per plant	Panicle weight per plant (g)[1]
Padang	77a	48	128a	29.4	10.7	2.6	19.8
Botok 2	58b	35	94b	29.9	9.7	2.3	16.2
Botok 4	58b	41	98b	30.7	9.5	2.7	16.1
Botok 10	60b	39	99b	23.5	10.0	2.4	18.7
Botok 15	60b	38	99b	27.2	10.0	1.5	12.5
Botok 19	57b	38	93b	29.9	5.9	2.3	10.4

Notes: Means followed by the same letter within each column are not significantly different based on DMRT at $\alpha < 5\%$; [1]data is transformed by the formula $\sqrt{x} + 0.5$; DAP : days after planting.

The quantitative character of panicle is important to observed because it can be used to estimate the potential yield, as Amgai et al. (2011) characterized five foxtail millet local genotypes in Nepal. Panicle length is thought to be one of the important characteristics in increasing yield. The longer panicle, it is hoped that more seeds will be produced.

'Padang' genotype compared to another genotypes has low filled grain weight of the main panicle. All the observed genotypes has empty grain weight of the main panicle < 1g. . The environment is the factor that most influences the formation of empty grain in cereal crops. Putri *et al.* (2013) reported several factors that caused the empty grain in wheat, namely high rainfall, strong winds, and pests or diseases. In this study, grasshoper was the main pest during the panicle filling phase. 'Padang' genotype has lowest 100 grain weight, while 'Bbotok 15' genotype has the highest 100 grain weight. This shows that the 'Padang' genotype has a smaller grain size than the 'Botok 15' genotype. Grain weight of ten plants was observed to avoid over estimation of productivity which usually occurs when the estimation was based on grain weigth pe plant. 'Botok 10' genotype has the highest estimated productivity (2,61 ton ha^{-1}), while 'Botok 19' genotype has the lowest estimated productivity (1,64 ton ha^{-1}).

Table 5. Filled grain weight of the main panicle, empty grain weight of the main panicle, the weight of 100 grain, grain weight per plant, grain weight of ten plants, estimated productivity of six foxtail millet local genotypes

Genotype	Filled grain weight of the main panicle (g)	Empty grain weight of the main panicle (g)	Weight of 100 grain (g)	Grain weight per plant (g)[1]	Grain weight of ten plants (g)	Estimated productivity (ton ha^{-1})
Padang	7.3a	0.9a	0.09c	12.8	89.19b	2.14b
Botok 2	7.4a	0.5b	0.13a	17.8	86.97b	2.09b
Botok 4	7.9a	0.3c	0.13a	13.6	104.70ab	2.51ab
Botok 10	8.0a	0.6b	0.13ab	11.9	108.763a	2.61a
Botok 15	8.1a	0.6b	0.14a	10.0	105.95ab	2.54ab
Botok 19	4.3b	0.5b	0.11bc	7.5	68.45c	1.64c

Notes: Means followed by the same letter within each column are not significantly different based on DMRT at $\alpha < 5\%$;[1] data is transformed by the formula $\sqrt{x} + 0.5$.

CONCLUSION

The qualitative morphological character of panicle from six foxtail millet local genotypes shown diversity. 'Padang' genotype was a genotype with longest flowering time than another genotypes. 'Botok 15' genotype has

the highest 100 grain weight, while, 'Padang' genotype shown the lowest 100 grain weight. Based on grain weight of ten plants, 'Botok 10; genotype showed the highest estimated productivity (2,61 ton ha^{-1}).

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DETERMINATIONS OF ADAPTATION LEVEL OF SOME TABLE GRAPE VARIETIES IN TERMS OF CLIMATIC DATA IN ALAŞEHIR DISTRICT IN MANISA (IN TURKEY)

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ABSTRACT

Generally grapes are adapted to a wide range of climate; the best production occurs in regions that meet certain specific climatic conditions. Temperatures during the growing season can affect table grape quality and viability. Beneficial climatic conditions will improve the table grape quality. In this study, it is aimed that to determine suitable some table grape varieties for the cultivation in Alaşehir District in Manisa in Turkey with related to climate requirements. For this reason, long-term climatic data were collected by meteorological station of Alaşehir. In this study, heliotermic and hdyrothermic indices were calculated and evaluated for appropriate viticultural practice in this viticulture areas. Effect heat summation from budbreak to harvest for Alaşehir District was 2868.56 °C degree-days. It was found that Sultani Çekirdeksiz, Superior Seedless, Mevlana, Antep Karası, Alphonse L., Trakya İlkeren, Crimson Seedless, Red Globe, Victoria, Yalova İncisi, Early Sweeth, Autumn Royal can be adapted and grown well in terms of climatic conditions in Alaşehir.

Keywords: *V. vinifera L., Table grape varieties, Adaptaion, Climatic data*

DETERMINATION AMPELOGRAPHIC CHARACTERS OF SOME REGIONAL GRAPE CULTIVARS GROWN IN AEGEAN REGION

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ABSTRACT

This study was conducted to determine the ampelographic characters of local grape varieties of Tergöynek, Askeri, Tezeren, Urla Siyahı, Beyaz İri Üzüm and Halis Gemre according to international norms, located in the Regional Genetic Resources Collection Parcel in the Manisa Viticulture Research Institute. The ampelographic characters of the varieties were determined according to the norms of "Descriptors for Grape" prepared by the "International Board for Plant Genetic Resources" (IBPGR). The flower type (OIV 151) was described as "Hermaphrodite" in 6 varieties. In the varieties examined, average cluster size was determined as 173.30-322.50 cm^2, average cluster weight 335-740 g and average berry weight was between 3.37-5.62 g. Cluster size was determined as "Small" in one variety, "Medium" in four varieties and "Large" in one variety. Berry skin colour (OIV 225) was classified as "Green-yellow" in three varieties, "Blue-black" in two varieties and "Pink" in one variety.

Keywords: *Ampelography, Genetic resources, IBGPR, Manisa, Local grape varieties***.**

THIRD GENERATION (3G) SNACKS: PELLETS

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ABSTRACT

Third generation (3G) snacks or pellets are normally referred to as "semi-products". Pellets are products that are cooked in the extruder and pushed from the mold at a temperature below 100 ° C. The shape of the dough at low temperature, prevents water from returning to steam. The characteristic of indirectly expanding products do not directly expand at the extruder die outlet. The pellets can be stored for a long time, transported to remote locations, and distributed to small-scale snack food producers or directly to consumers. There is an additional process to give the pellets the texture and appearance of the final product. This process is expanded by frying in hot oil, inflating in hot air or microwave and with infrared heating in new variants. It is coated with flavorings and packaged to remove moisture from the product (dried to less than 12% moisture) and impart its final texture. They may also be flavored prior to expansion and may be sold as pellets for home preparation.

Keywords: *Pellet, Extrusion, 3G, Snack*

ECONOMICS OF SUNFLOWER PRODUCTION IN PUNJAB, PAKISTAN: A MEAN OF DIVERSIFICATION AND SUSTAINABLE AGRICULTURE

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ABSTRACT

Sunflower is a worldwide important oil seed crop, being cultivated on an area of 26 million hectares with a production of 17.8 million matric tones. In Pakistan, oilseed crops are being cultivated on an area of 7683 thousand hectares with a total production of 3555 thousand tones. Sunflower covered 203 thousand hectares with total production of 104 thousand tones during the year of 2017-18. The present study was conducted in Punjab, Pakistan and cross-sectional data were collected from 138 sunflower growers through a well-structured questionnaire, using strategic random sampling technique during the year 2018. The study calculated cost of production and net returns as well as identified the factors affecting the sunflower yield. The Benefit Cost Ratio (BCR) and net returns from one acre of sunflower production was estimated as 1.60 and Rs. 17841.83, respectively. Results revealed that favorable resource base, more access to education and agricultural credit and availing subsidy facility had positive and significant impact on sunflower productivity. Contacts with extension agents showed positive but non-significant relationship on sunflower yield. Farmers having large land holdings and high education level should be motivated on priority basis to cultivate sunflower crop. Hence concrete efforts should be made to motivate farming communities in order to suffice more area under sunflower cultivation. It is also recommended to assist the sunflower growers either by providing easy credit or subsidy facilities. The results suggested enhancing capacity building of agricultural extension workers about sunflower production technology so that they can disseminate required knowledge to farmers.

IMPACT OF CLIMATE SMART AGRICULTURE (CSA) THROUGH SUSTAINABLE IRRIGATION MANAGEMENT ON RESOURCE USE EFFICIENCY: A SUSTAINABLE PRODUCTION ALTERNATIVE FOR COTTON IN PAKISTAN

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ABSTRACT

Climate-smart agriculture (CSA) improves agricultural productivity and enhance farm income on a sustainable basis, enhance water and nutrients use efficiency, resilient to climatic stresses, and lowering the emissions of Greenhouse Gas (GHG) to a minimum level. Water-smart, energy-smart, carbon-smart and knowledge-smart practices and technologies significantly contributed directly or indirectly to improve productivity, enhance resilience and reduce GHG emission. Cotton is one of the important cash crops of Pakistan. It is a climate sensitive crop and suffered by multiple shocks as climate change and market discrepancies during the last two decades. The present paper aimed to estimate and compare the resource use efficiency including technical, economic and water use efficiency of adopters of CSA and non-adopters in cotton production. The study was conducted along Lower Bari Doab Canal (LBDC) irrigation system in Punjab, Pakistan. First-hand information was gathered through a well-structured and comprehensive questionnaire from 133 adopters of CSA and 65 farmers cultivating cotton with traditional methods. Input-oriented Data Envelopment Analysis technique was employed to investigate the technical, economic and water use efficiency, assuming variable return to scale. The Bootstrap Truncated Regression was used to identify the factors influencing the resource use efficiency. The results showed that the adopters of CSA were using inputs more efficiently. The analysis revealed that adopters have higher cotton yield from per m^3 irrigation water than non-adopters. Adopters were found to be financially sound, having easy access to credit and fast adaptation behavior towards environmental changes, and therefore, economically better off as compared to non-adopters. Bootstrap Truncated Regression analysis revealed that easy access to credit, provision of extension services, awareness regarding CSA, availability of good quality groundwater and right of ownership of tubewell were significantly affecting resource use efficiency. The finding suggested certain policy implications for creating awareness and financial support for the cotton growers to expedite the adaptation of CSA practices and technologies in the cotton growing area. This can enhance resource use efficiency, net farm income and livelihood of rural masses.

Keywords: *cotton; bootstrap truncated regression; resource use efficiency; climate-smart agriculture; rural masses*

EFFICIENT GROUND WATER MANAGEMENT FOR SUSTAINABLE COTTON PRODUCTION IN PUNJAB, PAKISTAN

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ABSTRACT

Climate-smart agriculture (CSA) improves agricultural productivity and enhance farm income on a sustainable basis, enhance water and nutrients use efficiency, resilient to climatic stresses, and lowering the emissions of Greenhouse Gas (GHG) to a minimum level. Water-smart, energy-smart, carbon-smart and knowledge-smart practices and technologies significantly contributed directly or indirectly to improve productivity, enhance resilience and reduce GHG emission. Cotton is one of the important cash crops of Pakistan. It is a climate sensitive crop and suffered by multiple shocks as climate change and market discrepancies during the last two decades. The present paper aimed to estimate and compare the resource use efficiency including technical, economic and water use efficiency of adopters of water smart application and non-adopters in cotton production. The study was conducted along Lower Bari Doab Canal (LBDC) irrigation system in Punjab, Pakistan. First-hand information was gathered through a well-structured and comprehensive questionnaire from 133 adopters, observing efficient ground water management and 65 farmers cultivating cotton with traditional methods. Input-oriented Data Envelopment Analysis technique was employed to investigate the technical, economic and water use efficiency, assuming variable return to scale. The Bootstrap Truncated Regression was used to identify the factors influencing the ground water use efficiency. The results showed that the adopters of efficient ground water practices have higher cotton yield from per m^3 irrigation water than non-adopters. Adopters were found to be financially sound, having easy access to credit and fast adaptation behavior towards environmental changes, and therefore, economically better off as compared to non-adopters. Bootstrap Truncated Regression analysis revealed that easy access to credit, provision of extension services, awareness regarding CSA particularly ground water, availability of good quality groundwater and right of ownership of tube well were significantly affecting resource use efficiency. The finding suggested certain policy implications for creating awareness and financial support for the cotton growers to expedite the adaptation of efficient ground water practices and technologies in the cotton growing area. This can enhance water use efficiency, net farm income and livelihood of rural masses.

Keywords: *cotton; bootstrap truncated regression; resource use efficiency; climate-smart agriculture; rural masses*

SUITABILITY OF CRIMSON SEEDLESS GRAPE VARIETY'S KORUK ON PICKLE PRODUCTION

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ABSTRACT:

Pickle is a fermantated product which is a nutrient that has traditional importance. Pickling is the process of keeping various vegetables and fruits in a salty, acidic solution called salamura for a while, which enables the product to be kept for longer. Even though the first thing that comes to mind when pickles are mentioned are pickled cucumbers, number of variations in this field is above the estimates. Fruits and vegetables are very healthy thanks to being rich in functional nutritional substances such as minerals, vitamins, diet fiber, fenolic substances and antioxidant chemicals. It's important for the pickle's nutritional values that the properties of the fruits and vegetables are passed on to the pickle during the pickling. Grape and grape derived products have been produced since ancient times. 'Crimson Seedless' is a late season table grape. The cultivar holds significant promise for commercial producers due to its late maturity and seedless, crisp berries. In this study, the use of Crimson Seedless grape variety's koruk (unripe grape) in the production of pickle was investigated. Results of the study showed that after fermentation Crimson Seedless koruk pickle gained properties that make it more likeable according to the results of the sensory analysis for taste and structure.

Keywords: Koruk Pickle, Crimson Seedless, Unripe Grape, Sensory Analysis

AN ECONOMIC ANALYSIS OF RAISIN PRODUCTION IN MANISA, TURKEY

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ABSTRACT

Turkey plays an important role in raisin production in the world due to favorable ecological conditions. Total raisin production in Turkey was 280,000 tonnes in 2018, of which Manisa contributed 261.000 tonnes. Sultani grape is the main variety for raisin. Major production of raisins (90 per cent) in the world comes from this variety. The aim of this study was to determine the unit production costs of producing raisins in Manisa, Turkey. This study was carried out by Viticulture Research Institute in Manisa during the production period 2018 -2019. Data were obtained by vineyard records. The study results showed that, raisin's variable and fixed costs per decare (1000 m^2) were USD 303 and USD 135, respectively. On the other hand, gross and net profit per decare were USD 562 and USD 426, respectively. The costs of one kg of raisin was USD 0.88. The Benefit-Cost Ratio (BCR) for raisin was 1.97, which means the income was 97% greater than the costs.

Keywords: *Raisin, Production Costs, Profitability*

AGRO-CREATIVE FIELD STATION CENTER (SLAK) IN IPB UNIVERSITY

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ABSTRACT:

SLAK is a community services program by LPPM IPB which sending the facilitators, IPB's graduates and postgraduates, to accompany the farmer, breeder, and fisherman in Indonesia. The facilitator who send is equipped with some expertises, so can be expected to help community in aplication of precision technology. The aim of this program is accompany the community toward modern and optimum farming production also to adjust IPB's precision technology consider natural and human resources. The activity consist of development program of agricultural, fisheries, and animal husbandry. The target place of SLAK program consist of 2-10 cities/towns and 3-18 facilitators change fluctuatively based the year. Based on data, 2014 to 2019, show that 2-10 cities and town have 3-12 different commodities. Another inovasion was applied by IPB in 13 different city and town with 1-8 inovasions each city/town. Outputs of SLAK program is achieve suistainable agriculcural production system and IPB's technology dissemination, agricultural yield processing system with high plus value, and increase the community income.

Key words*: Community Services, Precision Technology, Sustainable Agriculture.*

INTRODUCTION

University is an academic institution who have to fil up some demand called Tri Dharma, they are developing science and technology, producing good quality graduates, and mediating in community and nation life. To bring better future from Tri Dharma application, need program which support to dig sustainable resourches. The program must be produce optimum productivity and sustainable resourches at the same time. One university who bring a community services program is IPB University. IPB University bring a community services program is to apply IPB's innovation, which 39,65% of Indonesia innovations is IPB's innovations. Because of this, IPB create a program to bring innovation to the community life in community services program. One of this program is Agro-creative Field Station Center (SLAK), especially application of last point of Tri Dharma, mediating in community life.

SLAK is a community services activity by LPPM IPB which sending the facilitator. The facilitator will help agriculture community, especially farmer, breeder, and fisherman community. Focus of this program is to digging potentially resourches which can be developed. The facilitator must be IPB's graduate and postgraduate competently who can accompany the community. The facilitators who send in agricultural central will be equipped with some expertise. So, they can be expected to help community in application of precision technology. This program is an expert community services, which the facilitator who send in any location is choosen graduates who profesional and expert in their konowledge scope.

Outputs of this program is achieving eco-friendly sustainable agricultural production system, organizing integrated abd puls value agricultural yield processing system using agriculture by product, increasing community income (farmer, breeder, aquaculturist, and fisherman), and accomplishing dissemination IPB's technology for build up modern and optimum sutainable agriculture.

AIM

There is 2 aims of this program. First, to accompany agriculture cummunity in a agriculture productio central going to modern and optimum agriculture production system by applying IPB's technology to improve community life. Second, to apply IPB's precision technology in agriculture production central according natural and human resources.

RESULT AND DISCUSSION

Total of involved side in every year always changes. The involved side in this program is the facilitator, city/town, and comodities in every town. The participate facilitator about 3-18 person in 2014 to 2018. The lowest facilitator show at 2015 (3 person) and the highest show at 2018 (18 participants). The data of total participants show in Figure 1. Total of facilitator impact to city total and there is same changes. There is 2-10 places (cities/towns) in 2014 to 2018. The lowest cities show at 2015 (2 cities) and the highest show at 2014 (10 cities). The data of city total show in Figure 2. There is same changes of total of facilitator and total of cities. The facilitator decrease from 2014 to 2015, then increase from 2015 to 2018 and decrease again in the next year. The same condition happen in total of city, but in different number. Decreasing and increasing total of facilitators due to capacity, and the capacity is dependent of the total of city. Decreasing and increasing of total of city due to the result of scooping location, season, and agriculture commodities.

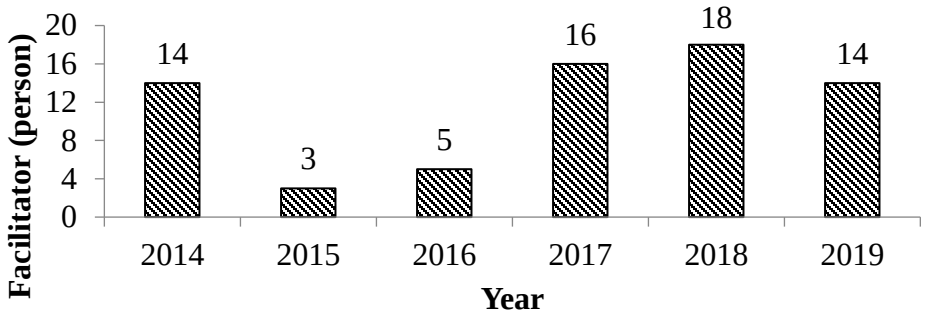

Figure 1. Facilitators in every year (2014-2019)

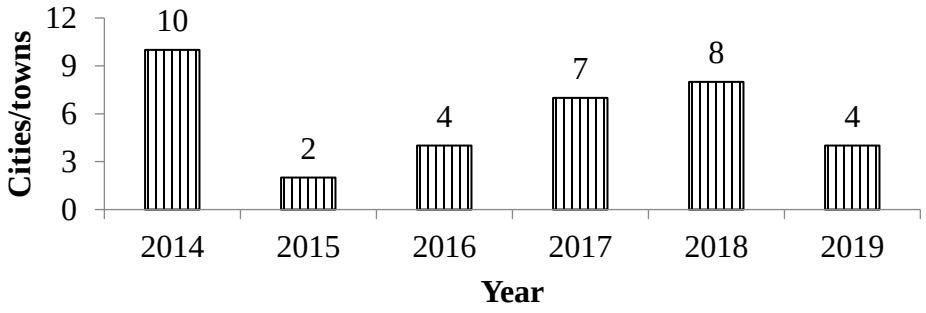

Figure 2. Cities/towns in every year (2014-2019)

Total of commodities which was recorded in every city is changes in every year (2014 to 2017). The commodity is development of agribussines. The highest commodities show at 2014 (14 commodities) and the lowest shoaw at 2015 (3 commodities). There is decreasing commodities in 2014 to 2015 and increasing in the next year. This data showed in Figure 3. The data shows that there is development of digging agriculture commodities, so digging the agriculture potential can be increasing in the next year. Different commodities in every year must be divided in some city. Data of commodities can be found in Table 1.

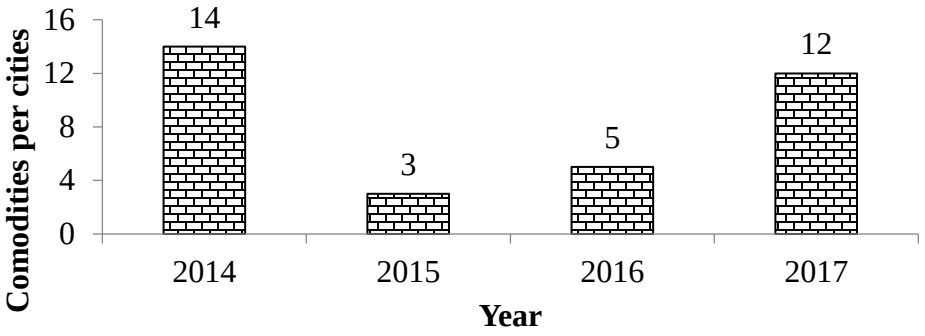

Figure 3. Commmodities per city in every year (2014-2017)

Table 1. Commodities in every city/town (2014-2017)

Year	City/town	Commodities
2014	Bangli	Orange
	Malang	Coffee
		Etawa goat
	Magelang	Chili and corn
		Cow
	Pekalongan	Forestry
		Rice
	Tegal	Farm (cow, sheep, duck)
		Freshwater fish
	Cilacap	Clam production
	Karawang	IPB3S rice
	Muara Enim	Horticulture
	Nunukan	Seaweed
	Bojonegoro	Cow
2015	Bogor	Mich-cow
		Freshwater fish
		Nutrition and community health
2016	Madiun	Banana production
	Bojonegoro	Folk Farm School (Cow)
		Folk Farm School (Milch-cow)
	Pasuruan	Folk Farm School (Cow)
	Muara Enim	Folk Farm School (Milch-cow)
2017	Madiun	"Gembili" tuber production
		Banana production
		"Talas" tuber production
		Cocoa production
	Mandailing Natal	Horticulture
		RJMPdes
	Gianyar	Fish-on-rice-field (Mina Padi)
		Cow
	Ngawi	Organic rice
	Banyuasin	IPB3S rice
	Simalungun	Coffee dan honeybee
	Lombok	Folk Farm School (Cow)

There is some IPB's innovation in every city. The innovation must be different in every city due to agriculture commodity potentially. The highest innovations show at Blitar (8 innovations) and the lowest show at Tapanuli Utara (1 innovation). Total of innovation in every city show in Table 2. The focus of innovation in every city is different. Tapanuli Utara's innovation focus on agriculture. The innovations of Magelang, Gunung Kidul, Banyumas, Banjar focus on agriculture and animal husbandry. Lampung Timur' innovations focus on agriculture and animal healthcare. The innovations of Metro, Tulang Bawang Barat focus on agriculture, animal husbandry, and animal healthcare. Blitar's innovations focus on agriculture, animal husbandry, and animal healthcare, horticulture, and marketing. Bogor's innovations focus on agriculture, animal husbandry, processing, and problem solver mapping. Banjarnegara's innovations focus on agriculture, growth agriculture using microorganism, and digging tourim potentially. Sukabumi's innovations focus on fish processing and aquaculture. Madiun's innovations focus on agriculture, processing, and planting management. The focus of innovation in every city can be found in Table 3.

Table 2. Innovation in every city/town

City/Town	Innovation/s
Magelang	5
Gunung Kidul	3
Banyumas	3
Lampung Timur	2
Metro	3
Tulang Bawang Barat	4
Blitar	8
Banjar	5
Bogor	4
Banjarnegara	4
Tapanuli Utara	1
Sukabumi	3
Madiun	3

Table 3. Focus of innovation in every city/town (30 IPB's innovations)

No	IPB's Innovation	City/town
1	Controling rice pest and disease	Magelang
		Gunung Kidul
		Banyumas
		Lampung Timur
		Metro
		Tulang Bawang Barat
		Blitar
		Banjar
2	Controling guava pest and disease	Bogor
3	Controling chili pest and disease	Magelang
		Blitar
4	Goat culture	Magelang
		Blitar
		Banyumas
		Gunung Kidul
		Tulang Bawang Barat
		Metro
5	Red sugar production	Magelang

6	Controling soil quality	Magelang
7	Cow cultivation	Gunung Kidul
		Tulang Bawang Barat
		Banyumas
8	Controling horticulture pest and disease	Blitar
9	Biogas from farm by product production	Blitar
10	Sheep fattening and population breeding	Blitar
11	Chili post-harvest processing	Blitar
12	Marketing using social media	Blitar
13	Controling ruminant disease	Lampung Timur
		Tulang Bawang Barat
		Metro
14	Cow forage fermentation	Banjar
		Bogor
15	Controling durian pest and disease	Banjarnegara
16	Controling nanas pest and disease	Tapanuli Utara
17	Fish processing production	Sukabumi
18	Aquaculture technology	Sukabumi
19	Good food processing for small business unit using fish sauce and fish brownies training	Sukabumi
20	Cassava-corn chips and “Cici” banana Dodol	Madiun
21	Improving food production quality	Madiun
22	KRPL KWT plant management	Madiun
23	Healthy snack production training	Bogor
24	Potention and problem recording villages around IPB University	Bogor
25	Planth growth promoting Rhizobacteria technology	Banjarnegara
26	Bukit Watu Sodong, Glempang village, Mandiraja, Banjarnegara landscape planning	Banjarnegara
27	Desirability and tourism object analysis	Banjarnegara
28	Agriculture problem mapping (especially rice field cultivation)	Banjar
29	Rice field cultivation training	Banjar
30	Organic fertilizer making	Banjar

CONCLUSION

Agro-Creative Field Station Center (SLAK) have been helping community to solve the problem, found potentially resources, having sutainable agriculture system, and improving community economic. This program also helping the facilitator aplly the keonwledge an helping IPB University to externalize improvement of last poin of Tri Dharma. The most succesfully program of SLAK is making compost in Banjar, Banana processing in Madiun, apllying IPB3S rice in Banjar, and folk farm school (SPR) in Bojonegoro.

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RESPONSE SURFACE METHODOLOGY FOR OPTIMIZATION OF DEGUMMING PROCESS USING NACL SOLUTION AT TUNA OIL PURIFICATION

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ABSTRACT:

Tuna oil production can be produced from the byproduct of the canning industry, but this tuna oil has low quality both in terms of appearance and quality standards, so that its utilization is also limited. The purpose of this study was to determine optimization by analysis using the Response Surface Method in the degumming process using NaCl solution in the purification of crude tuna oil by-products to produce consumption tuna oil according to 2014 International Fish Oil Standards (IFOS). The optimum response resulting from the combination of the variable factors of NaCl concentration and degumming temperature was at a concentration of 5% and a temperature of 50 °C. Validation of the optimum conditions produced free fatty acids 0.41 ± 0.07%, acid values 0.62 ± 0.11 mg KOH/g, peroxide value 2.30 ± 0.12 meq/kg, anisidine value 14.13 ± 0.09 meq/kg, and total oxidation value 18.73 ± 0.85 meq/kg. Tuna oil according to 2014 IFOS has been successfully obtained with validation of optimum conditions based on its oxidation parameters.

Keyword: *concentration, degumming, NaCl solution, purification, tuna oil*

INTRODUCTION

Tuna is one of Scrombroidae family commonly found in sea exposures with both cold and warm temperatures. Some types of tuna that can be found in Indonesian oceans are yellowfin tuna (*Thunnus albacares*), big eye tuna (*Thunnus obesus*) and cakalang (*Katsuwonus pelamis*) (Bailey et al. 2012). Tuna is a fish that has economic value both as an export commodity and local consumption. Tuna has good nutrition for growth, low-fat content, high in protein and omega-3. Utilization of tuna waste can produce products such as fish skin crackers, fishbone meal and fish oil (Setyowati et al. 2018).

Tuna oil derived from the canning industry by-product still has non-oil ingredients such as impurities, phosphatides, dark colours, free fatty acid levels, and high peroxide value which causes the quality of the by-product oil to be below the fish oil quality standard. Fish oil that can be accepted as food must eliminate the non-oil fraction with purification steps (Budiadnyani 2017).

The study of Budiadnyani et al. (2017) showed tuna oil by-product which has been carried out by the purification process (bleaching) absorbent zeolite containing 20.94% palmitic acid as the highest fatty acid. The composition of EPA and DHA in fish oil from canned tuna which is already pure is 10.81% and 12.04%. The results of research by Bija et al. (2017) showed crude sardine fish oil contained 24.86% palmitic acid as the highest fatty acid.

Tuna oil contains omega-3 fatty acids, especially eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which are essential fatty acids that are beneficial to health. Omega-3 fatty acids are needed for brain development, the retina of the eye, increased immunity and prevention of degenerative diseases, helping in the development of growth (Musbah et al. 2018). Another content of fish oil is unsaturated fatty acids (PUFAs) which are easily oxidized, causing a rancid odour (Suseno et al. 2013). The value of Indonesian fish oil imports in October 2017 is higher than the value of Indonesia's crude fish oil exports, respectively 10.056 million kg and 338.9 thousand kg (BPS 2017). The increasing demand for fish oil is a challenge for producers to produce quality and quality fish oil (Suseno et al. 2018).

The quality of fish oil produced by the home industry is still considered low so it is widely used by the community to be sold to farmers as an additional animal feed. The quality of fish oil is determined by determining the acid number and the peroxide number. Acid numbers indicate free fatty acid content in oil, while peroxide numbers indicate the level of damage to fish oil (Maulana et al. 2014). The quality of fish oil is determined by the International Fish Oil Standard (IFOS) determined by the oxidation parameters of both primary and secondary.

Oxidation parameters include peroxide value (PV) ≤ 5.00 meq/kg, anisidine value (AV) ≤ 20 meq/kg, total oxidation (Totox) ≤ 26 meq/kg and free fatty acid (FFA) value ≤ 1.50% (IFOS 2014).

Purification of fish oil through the steps of degumming, neutralization, blanching, and deodorization. Degumming phase aims to separate impurities in the form of phlegm consisting of phosphatides, proteins, carbohydrates, water and resins. Degumming can be done by degumming water and mineral salts. The use of water can separate the phosphatide impurities that can be hydrated with oil (Kulkarni et al. 2014). The process of degumming using NaCl solution was chosen because it has the ability to bind impurities, is permitted for food and is easily available at affordable prices (Ketaren 2012).

Hulu et al. (2017) reported the best results on refining sardine oil by degumming NaCl solution (1: 1) (v/v) 5% NaCl concentration (w/v). Bija et al. (2017) showed the best results on the purification of sardine oil through the degumming stage of 5% NaCl followed by the neutralization stage at 50 °C. Optimization with response surface methodology with the help of the Design Expert program version 12 trial on refining tuna oil through the process of degumming with NaCl is expected to be a byproduct of the fish oil industry in accordance with 2014 IFOS.

METHODS

Degumming process of tuna oil purification

The first degumming stage was obtained by tuna oil heated to a temperature of 50 °C and then added with 5% water (v/v) stirred using a magnetic stirrer for 15 minutes. The first semi-pure fish oil fraction and impurities were separated by ceftrifuge (10,000 rpm) for 10 minutes. The steps to produce a second semi-pure fish oil with the second degumming using NaCl solution were added oil with a ratio of 1:1 (v/v) with a concentration of 2.17%, 3%, 5%, 7%, and 7.83% (w/v) and stirred using a magnetic stirrer for 20 minutes then centrifuged (10,000 rpm) for 10 minutes. The third semi-pure fish oil was produced by neutralizing second semi-pure fish oil coupled with NaOH solution and stirred with a magnetic stirrer for 10 minutes then centrifuged (10,000 rpm) to separate the oil and impurities fraction. NaOH solution used was calculated based on determining the amount of NaOH used based on the percentage of free fatty acids (% FFA) in oil. The next stage was neutralization by adding NaOH and stirring with a magnetic stirrer for 10 minutes then centrifuged (10,000 rpm) to separate the oil and impurity fractions. The NaOH used was calculated based on determining the amount of NaOH used based on the percentage of free fatty acids (% FFA) in oil. Calculation of NaOH concentration according to Hodgum (1995) is presented in Table 1. The need for the amount of NaOH was calculated by the following formula:

$$Treatment = \frac{0{,}122\ x\ \%\ levels\ of\ FFA + excess}{\%\ NaOH\ /\ 100}$$

Table 1. Concentrations of NaOH with various degrees of Baumé

Oil	^{o}Be	% NaOH in solution	Excess of NaOH aolution (%)
FFA <3%	12-16	8-11.06	0.10-0.20
FFA 3%	14	9.50	0.25-0.47
FFA 4%	18	12.68	0.75
FFA 5%	20	14.36	0.2
FFA 15%	26	19.70	1.30

Notes: FFA = Free Fatty Acids

The next stage was bleaching with magnesol XL adsorbent as much as 5% (w/v) while being heated to a temperature of 50 °C and stirred for 20 minutes with a magnetic stirrer. The adsorbent and oil were then separated using centrifuge (10,000 rpm). The characteristics of pure tuna oil produced were then analyzed.

Analysis of tuna oil characteristics

The quality of fish oil was determined by analyzing primary quality tests including peroxide (PV) value and free fatty acid (FFA) levels. and secondary quality including p-anisidine value, acid value (AV), total oxidation

and fatty acid profile. Quality testing refers to sources such as free fat (FFA) refers to AOAC (1995), acid value refers to AOCS (1998), peroxide value refers to AOAC (1995), p-anisidine analysis refers to IUPAC (1987), analysis of total oxidation of AOCS (1997), and acid profile analysis fat refers to AOAC (2005).

Experimental designs

The study design used two independent variables namely the concentration of NaCl as X1 and degumming temperature as X2 while the response variable was the oxidation parameter namely the value of free fatty acids, peroxide value, anisidine value, acid number and oxidation chamber. The resulting data were then analyzed using Central Composite Design (CCD) type response surface method (RSM) to obtain optimum oxidation parameter values in the purification process through degumming with different NaCl concentrations and degumming temperatures. Experimental design designs as in Tables 2 and 3 were obtained using the help of Design Expert software version 12 Trial. Central Composite Design (CCD) consists of the following three parts (Jeff and Hamada 2011):

i. Corner points = nf with $xi = -1,1$; $i = 1, ..., k$ forms the factorial part of the design.

ii. Center points = nc with $xi = 0$; $i = 1, ..., k$

iii. Axial points = α with $xi = -\alpha, \alpha$; $i = 1, ..., k$. This value was determined by the number of factor variables, where $\alpha = (2k)$ ¼

CCD design consists of vertex, center point, and axial point. The axial point (α) of this study used two factor variables so that the axial value (α) = (22) ¼ = 1.414. Therefore ± 1,414 included the value used for coding. The coding of factor variables was calculated using the equation:

$$Xi = \frac{xi - X0}{\Delta xi}$$

Notes:
Xi = Code value of the variable
xi = The original value of the variable
xo = Original value of the factor variable at the center point
Δxi = Interval of the original value of the variable

Table 2 Relationship of treatment and treatment code

Treatments	Treatment codes				
	$-2^{1/2}$	-1	0	1	$2^{1/2}$
Concentration of NaCl (X1) (%)	2.17	3	5	7	7.83
Temperature of *degumming* (X2) (^{O}C)	35.86	40	50	60	64.14

Table 3. Experimental designs

Run	Factor code X1	Factor code X2	Actual factor NaCl (%)	Actual factor Temperature (°C)	Oxidation parameter
1	-1	1	3	60	Y1
2	-1	-1	3	40	Y2
3	$-2^{1/2}$	0	2.17	50	Y3
4	$2^{1/2}$	0	7.83	50	Y4
5	1	1	7	60	Y5
6	0	0	5	50	Y6
7	0	0	5	50	Y7
8	0	0	5	50	Y8
9	1	-1	7	40	Y9
10	0	$-2^{1/2}$	7	35.86	Y10
11	0	$2^{1/2}$	5	64.14	Y11

The experimental data in the laboratory were optimized to determine the linear, quadratic and interaction effects of the independent variables during the purification process which are expressed in the linear first order and second order squares as follows:

Order 1 model design

$$Y = \beta_0 + \sum_{i=1}^{k} \beta i Xi + \varepsilon ij$$

Order 2 model design

$$Y = \beta_0 + \sum_{i=1}^{k} \beta i\, Xi + \sum_{i=1}^{k} \beta ii\, Xi^2 + \sum_{i} \sum_{j} \beta\, XiXj + \varepsilon ij$$

Y = Estimated result of desired response (oxidation parameter)
Xij = Variable which includes NaCl concentration and degumming temperature
β0 = Model coefficient
βi = The linear effect of the variable on the response
βij = Effect of interaction between variables on response
βii = Quadratic effect of variables on response
εij = Error interruption

Results and Discussions

Process optimization for each response using RSM

Determination of the optimum process conditions using the RSM method includes several analyzes namely the determination of the model, analysis of variance (ANOVA) and the response of oxidation parameters. The composite design of the fish oil refining centre can be seen in Table 4. Optimization of fish oil purification showed the independent variable (X) and the response variable (Y) presented in the following equation:

Y = f(X1, X2,. ..... , Xk) + ε

Notes:

Y = response variable
Xi = independent variable / factor (i = 1, 2, 3,, k)
ε = error

Table 4. Composite design of tuna fish oil refining center with RSM

Coded variable			Response				
Run	A	B	FFA	AV	PV	AnV	Totox
1	-1	1	0.54±0.15	1.03±0.19	2.51±0.007	20.67±2.23	25.67±2.23
2	-1	-1	0.54±0.007	1.35±0.02	2.74±0.64	22.08±0.66	27.55±0.62
3	-1.414	0	0.57±0.04	0.48±0.09	2.37±0.13	19.55±0.55	24.29±0.29
4	1.414	0	0.42±0.01	1.06±0.08	4.10±0.33	27.13±0.14	35.38±0.86
5	1	1	0.64±0.13	0.49±0.10	2.66±0.09	16.86±0.52	22.16±0.69
6	0	0	0.49±0.07	0.67±0.01	1.84±0.23	16.99±0.35	20.66±0.11
7	0	0	0.44±0.007	0.59±0.21	1.61±0.07	17.12±0.46	20.34±0.61
8	0	0	0.49±0.08	0.70±0.18	1.47±0.23	15.66±1.54	18.59±1.08
9	1	-1	0.69±0.07	0.77±0.16	2.72±0.23	19.47±0.19	24.91±0.25
10	0	-1.414	0.49±0.09	0.72±0.02	2.80±0.25	17.23±0.77	22.83±1.28
11	0	1.414	0.59±0.07	1.09±0.007	3.74±0.35	23.88±0.43	31.36±0.27

Note: A = NaCl, B = temperature. NaCl (%), temperature (Celsius), FFA (%), PV (meq/kg), p-AV (meq/kg), and Totox (meq/kg).

The results of the analysis of the FFA response using the Design Expert version 12 trial have obtained the recommended model that is linear. Determination of the model was based on the SMSS parameter value of 0.0397 which indicates the model was significant ($p < 0.05$) on the response. The lack of fit value of 0.3411 shows no significance ($p > 0.05$) which indicates that the model is appropriate. The R2 value of 0.6589 which indicates that

the independent variables of NaCl concentration and degumming temperature in the process of purifying fish oil have a 65.89% effect on the response. The suitability of the R2 value obtained can be seen from the adjusted R2 value that is close to that of 0.545 or 54.5%. PRESS value of 0.0221 is appropriate because the value is smaller, then the data error is also small. The determination of the model in the FFA response can be seen in Table 5. The constraints in the optimization of the FFA can be seen in Table 6.

Table 5. Value of the parameters determining the FFA model

Model	SMSS	*Lack of fit*	*Adjusted*-R^2	R^2	PRESS	Note
Linier	0.0397	0.3411	0.5452	0.6589	0.0221	*Suggested*
Quadratic	0.2175	0.4011	0.7330		0.1305	
Cubic	0.4011		0.7432			

Table 6. Constraints on the optimization of FFA of pure tuna oil

Parameters	*Goal*	*Lower*	*Upper*
Concentration (%)	*In range*	3	7
Temperature (°C)	*In range*	40	60
FFA (%)	*Minimize*	0.42	0.69

The results of the analysis of variance (ANOVA $\alpha = 0.05$) obtained the FFA response model p value of 0/0397; it was seen that the factor that had a significant effect ($p < 0.05$) on the response was the linear effect of the NaCl concentration of 0.0224. Table 6 shows that the lowest FFA value is 0.42% and the highest is 0.69%. These results meet IFOS (2014) standard that the maximum limit of FFA value is ≤ 1.5%. The optimal conditions for the FFA response were achieved at 3% NaCl concentration and 40 °C temperature, and the optimal FFA response was 0.423%. The linear equation that optimizes the FFA response as follows:

Y = 0.503323–0.024892X1+0.002357X2

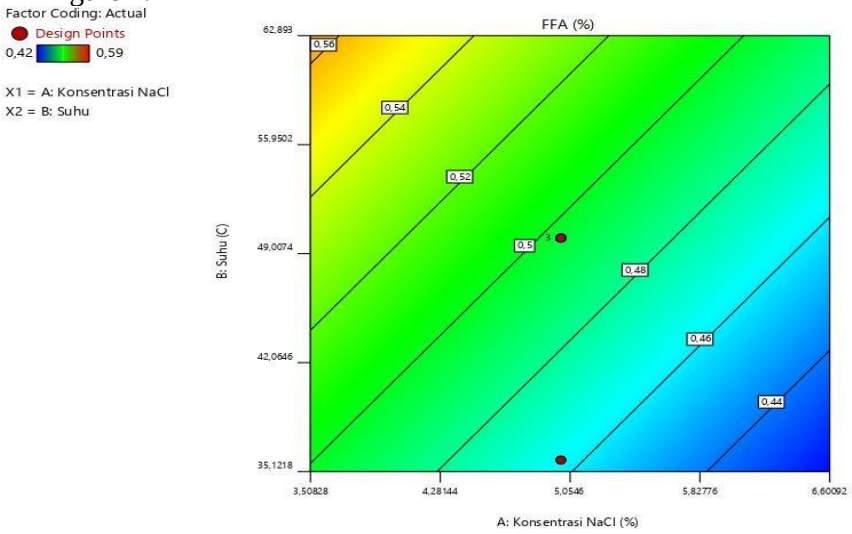
Notes:

Y = FFA response value (%)

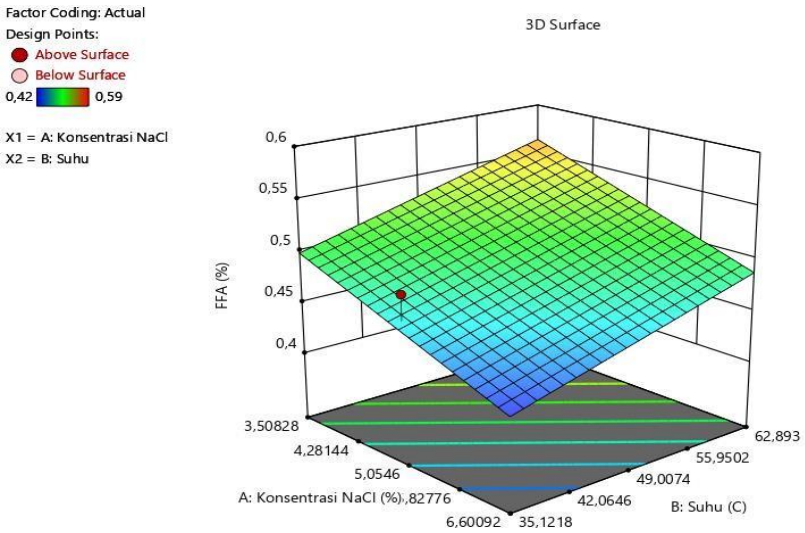
X1 = linear effect of NaCl concentration (%)

X2 = Linear temperature effect (°C)

Based on the above equation it can be seen that the linear effect of the NaCl concentration effect has a positive effect on minimizing the FFA response, but the effect of the linear degumming temperature effect has a negative effect on the minimization of the FFA response. Graph of surface contour and the 3D surface of free fatty acids (FFA) can be seen in Figure 1.



(a)



(b)

Figure 1. (a) Contour of surface response (b) Three-dimensional surface response

The results of the AV response analysis using the Design Expert version 12 trial obtained the recommended model is quadratic. The determination of the model is based on the SMSS parameter value of 0.0396 which indicates that the model is significant ($p < 0.05$) on the response. The lack of fit value of 0.2774 shows no significant ($p > 0.05$) which indicates that the model is appropriate. The R2 value of 0.8894 which shows that the independent variables of NaCl concentration and degumming temperature in the fish oil purification process have an effect of 88.9% on the AV response. The suitability of the R2 value obtained can be seen from the adjusted R2 value that is close to that is 0.7512 or 75.1%. PRESS value of 0.1301 is appropriate because the value is smaller, then the data error is also small. The model determination in AV response can be seen in Table 7. The constraints in AV optimization can be seen in Table 8.

Table 7 Values for parameter determining of the AV model

Model	SMSS	*Lack of fit*	*Adjusted*-R^2	R^2	PRESS	Note
Linier	0.3214	0.1027	0.0704	0.2770	0.2296	
Quadratic	0.0396	0.2774	0.7512	0.8894	0.1301	*Suggested*
Cubic	0.2774					

Table 8 Constraints on the optimization of AV pure tuna oil

Parameters	*Goal*	*Lower*	*Upper*
Concentration (%)	*In range*	3	7
Temperature (°C)	*In range*	40	60
AV (mg KOH/g)	*Minimize*	0.72	1.35

The results of the analysis of variance (ANOVA $\alpha = 0.05$) obtained an AV response model p value of 0.0477; it was seen that the factors that had a significant effect ($p < 0.05$) on the response were the linear effect of the degumming temperature effect of 0.0203 and the interaction effect of the NaCl concentration and temperature of 0.0399. Table 10 shows that the lowest AV value is 0.72 mg KOH/g and the highest is 1.35 mg KOH/g. These results meet IFOS (2014) standard that the maximum limit of AV value is ≤ 3 mg KOH/g. The optimal conditions for AV response were achieved at 7% NaCl concentration and 40 °C temperature, an optimal AV response of 0.644 mg KOH/g was obtained. The linear equation that optimizes the AV response as follows:

$Y = 3.80124-0.291300X1-0.099109X2 + 0.005865X1X2-0.001498X1^2 + 0.00079X2^2$

Notes:

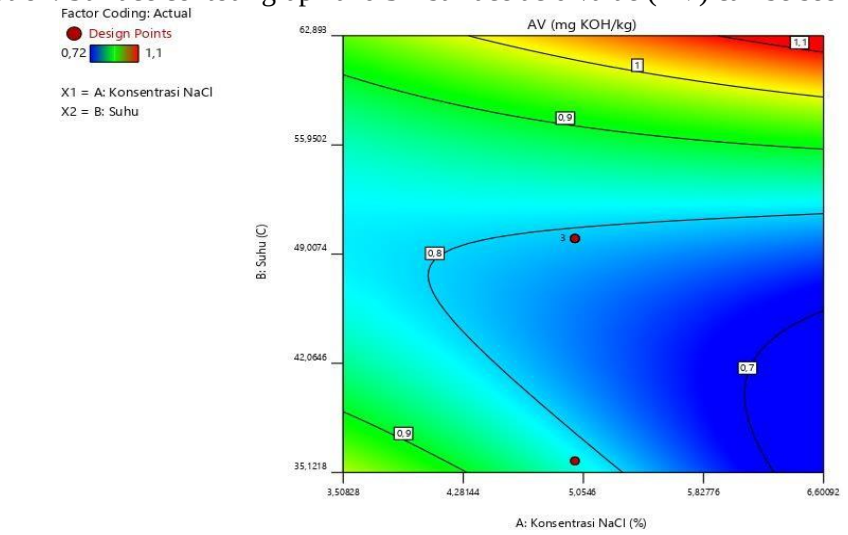
Y = AV response value (mg KOH/g) X1 = Linear effect of NaCl concentration (%) X2 = Linear effect of temperature (°C)

X1X2 = The interaction effect of NaCl concentration and temperature

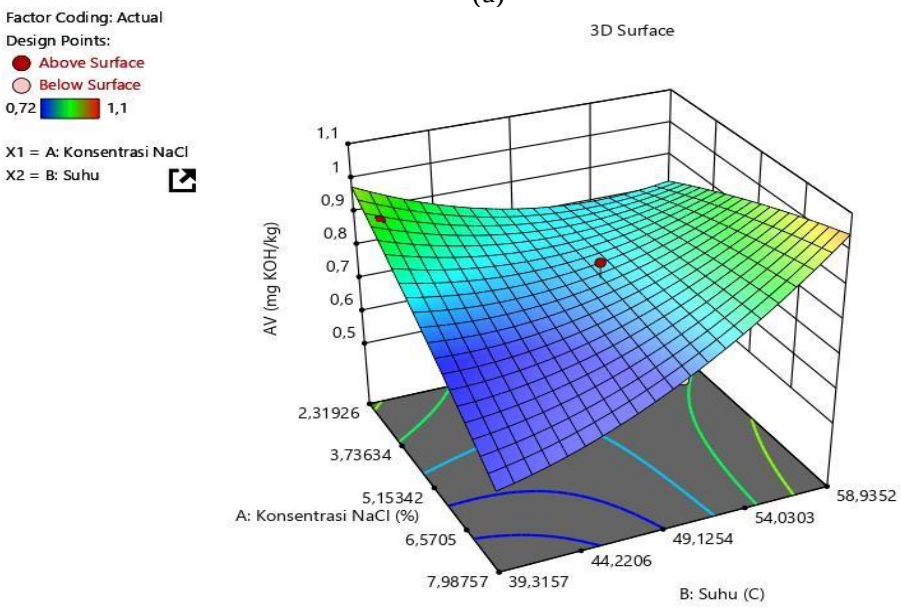
$X1^2$ = Quadratic effect of NaCl concentration

$X2^2$ = Quadratic effect of temperature

Based on the above equation it can be seen that the AV response influences the linear effect of NaCl concentration, the linear effect of degumming temperature, and the quadratic effect of NaCl concentration positively influences the minimization of AV response, but the effect of the interaction effect of NaCl concentration and degumming temperature and the quadratic effect of temperature negatively influences the AV response minimization. Surface contour graph and 3D surface acid value (AV) can be seen in Figure 2.



(a)



(b)

Figure 2. (a) Contour of surface response (b) Three-dimensional surface response

The results of PV response analysis using Design Expert trial version 12 obtained the recommended model that is quadratic. The determination of the model is based on the SMSS parameter value of 0.0134 which indicates that the model is significant ($p < 0.05$) of the response. The lack of fit value of 0.1552 shows not significant ($p > 0.05$) which indicates that the model is appropriate. The R2 value of 0.8885 which indicates that the independent variables of NaCl concentration and degumming temperature in the fish oil purification process influence 88.8% of the PV response. The suitability of the R2 value obtained can be seen from the adjusted R2 value which is close to that of 0.7492 or 74.9%. PRESS value of 7.44 is appropriate because the value is smaller, then the data error is also small. The determination of the model in the PV response can be seen in Table 9. The constraints in the optimization of the PV can be seen in Table 10.

Table 9 Value for parameters determining the PV model

Model	SMSS	*Lack of fit*	*Adjusted*-R^2	R^2	PRESS	Note
Linier	0.8814	0.0442	0.2402	0.0354	8.08	
Quadratic	0.0134	0.1552	0.7492	0.8885	7.44	*Suggested*
Cubic	0.1552					

Table 10 Constraints on the optimization of PV for pure tuna oil

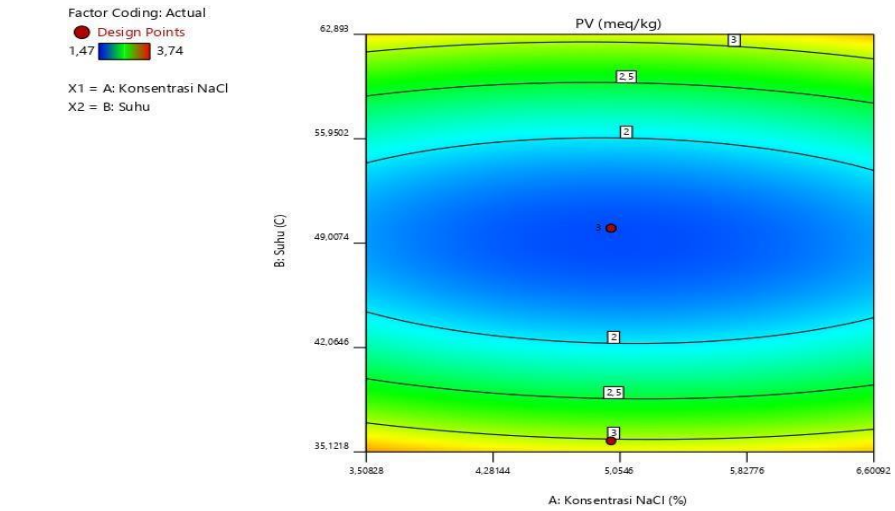
Parameters	*Goal*	*Lower*	*Upper*
Concentration (%)	*In range*	3	7
Temperature (°C)	*In range*	40	60
PV (meq/kg)	*Minimize*	1.47	4.10

The results of the analysis of variance (ANOVA $\alpha = 0.05$) obtained a PV response model of the p-value of 0.0484, it appears that a significant influential factor ($p < 0.05$) on the response was the effect of quadratic degumming temperature effect of 0.0057. Table 12 shows that the lowest PV value is 1.47 meq/kg and the highest is 4.10 meq/kg. These results meet the IFOS (2014) standard that the maximum PV value is ≤ 5 meq/kg. Optimal conditions for the PV response were achieved at 5% NaCl concentration and 50 °C temperature, an optimal PV response was obtained at 1.63 meq/kg. The linear equation that optimizes the PV response as follows:

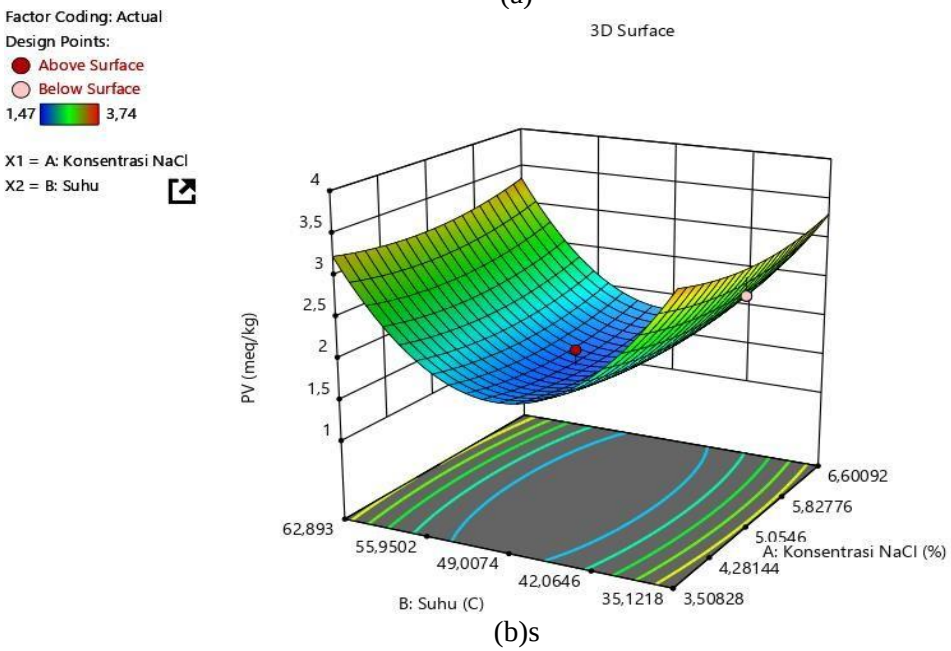
$$Y = 23.01081-0.854548X1-0.781758X2 + 0.00225X1X2 + 0.07371X1^2 + 0.00783X2^2$$

Notes:
Y = PV response value (meq / kg)
X1 = linear effect of NaCl concentration (%)
X2 = Linear effect temperature (° C)
X1X2 = The interaction effect of NaCl concentration and temperature
$X1^2$ = Quadratic effect of NaCl concentration
$X2^2$ = Quadratic effect of temperature

Based on the above equation it can be seen that the PV response influences the linear effect of NaCl concentration and the linear effect of positive degumming temperature on the minimization of the PV response, but the effect of the interaction effect of NaCl concentration and degumming temperature as well as the quadratic effect of NaCl concentration and temperature negatively influences the PV response minimization. Graph of surface contour and 3D surface value of peroxide (PV) can be seen in Figure 3.



(a)



(b)s

Figure 3. (a) Contour of surface response (b) Three-dimensional surface response

The results of the p-AnV response analysis using the Design Expert version 12 trial obtained the recommended model is quadratic. The determination of the model is based on the SMSS parameter value of 0.0085 which indicates that the model is significant ($p < 0.05$) on the response. The lack of fit value of 0.8761 shows not significant ($p > 0.05$) which indicates that the model is appropriate. The R2 value of 0.9788 which indicates that the independent variables of NaCl concentration and degumming temperature in the process of purifying fish oil have a 97.8% effect on the response of p-AnV. The suitability of the value of R2 obtained can be seen from the adjusted R2 value which is close to that of 0.9435 or 94.35%. PRESS value of 4.83 is appropriate because the value is getting smaller, then the data error is also small. The determination of the model in the p-AnV response can be seen in Table 11. Constraints in the optimization of p-AnV can be seen in Table 12.

Table 11. Value for parameters determining of the p-AnV model

Model	SMSS	*Lack of fit*	*Adjusted*-R^2	R^2	PRESS	Note
Linier	0.2186	0.0680	0.1968	0.3976	85.77	
Quadratic	0.0085	0.8761	0.9435	0.9788	4.83	*Suggested*
Cubic	0.8761					

Table 12. Constraints on the optimization of p-AnV pure tuna oil

Parameters	*Goal*	*Lower*		*Upper*
Concentration (%)	*In range*	3		7
Temperature (°C)	*In range*	40		60
p-AnV (meq/kg)	*Minimize*		15.66	27.13

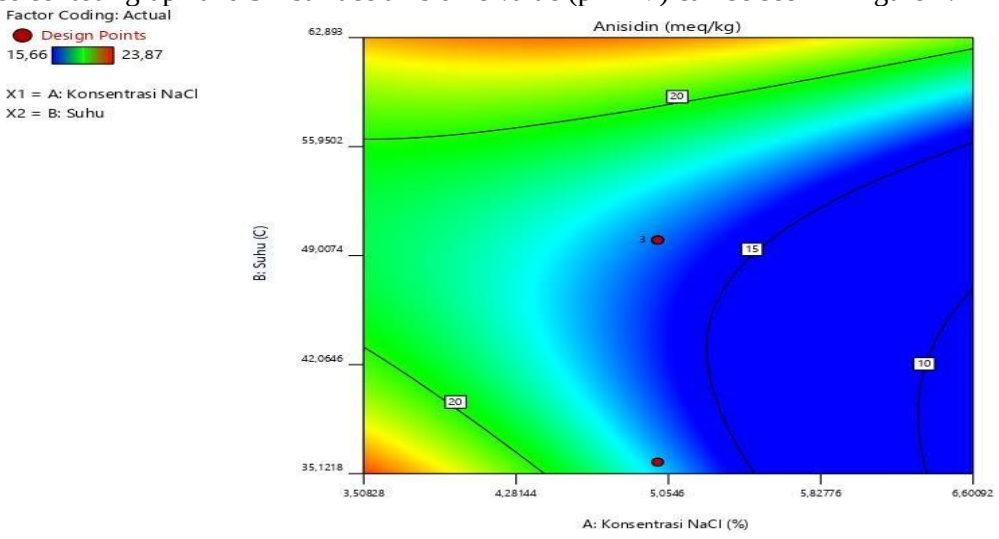
The results of the analysis of variance (ANOVA α = 0.05) obtained a p-AnV response model p value of 0.0103 contained in Appendix 4, it appears that the factors that significantly influence ($p < 0.05$) on the response is the effect of the linear effect of NaCl concentration of 0.0033, degumming temperature of 0.0057 and the temperature quadratic effect of 0.0065. Table 14 shows that the lowest p-AnV value is 15.66 meq/kg and the highest is 27.13 meq/kg. These results indicate that of the 11 runs, some have not met the IFOS (2014) standard because it is still above the maximum p-AnV value of ≤ 20 meq/kg. Optimal conditions for the p-AnV response were achieved at a concentration of 7% NaCl and a temperature of 40 °C, an optimal p-AnV response was obtained.

6,153 meq/kg. The linear equation that optimizes the response of p-AnV as follows:

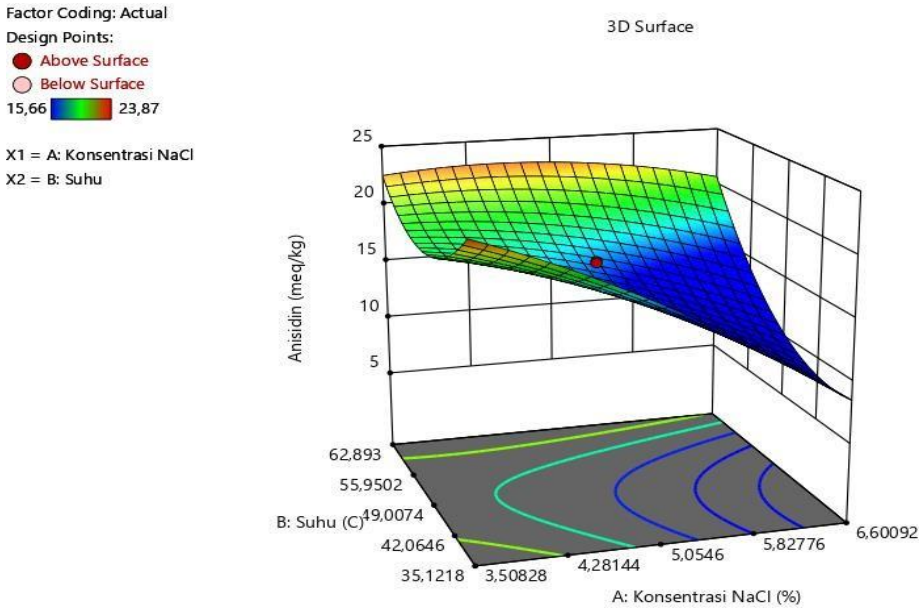
$$Y = 91.2487-4.88144X1-2.48367X2 + 0.151456X1X2-0.517261X1^2 + 0.019600X2^2$$

Note:
Y = Response value p-AnV (meq/kg) X1 = Linear effect of NaCl concentration (%)
X2 = Linear effect of temperature (°C)
X1X2 = The interaction effect of NaCl concentration and temperature
$X1^2$ = Quadratic effect of NaCl concentration
$X2^2$ = Quadratic effect of temperature

Based on the above equation it can be seen that the p-AnV response influences the linear effect of NaCl concentration, and degumming temperature as well as the quadratic effect of positive NaCl concentration on minimizing the p-AnV response, but the effect of the interaction effect of NaCl concentration and degumming temperature and the quadratic effect of temperature has a negative effect on minimizing the response p-AnV. Surface contour graph and 3D surface anisidine value (p-AnV) can be seen in Figure 4.



(a)



(b)

Figure 4. (a) Contour of surface response (b) Three-dimensional surface response

The results of the Totox response analysis using Design Expert version 12 trial obtained the recommended model is quadratic. Determination of the model is based on the SMSS parameter value of 0.0130 which indicates the model is significant ($p < 0.05$) on the response. The lack of fit value of 0.2304 shows no significance ($p > 0.05$) which indicates that the model is appropriate. The R2 value of 0.9515 which shows that the independent variables of NaCl concentration and degumming temperature in the process of purifying fish oil affect 95.1% of the Totox response. The suitability of the R2 value obtained can be seen from the adjusted R2 value that is close to that of 0.8706 or 87.06%. The determination of the model in the Totox response can be seen in Table 13. Constraints in the optimization of Totox can be seen in Table 14.

Table 13. Values of the determination of the Totox model

Model	SMSS	*Lack of fit*	*Adjusted*-R^2	R^2	PRESS	Note
Linier	0.6895	0.0443	0.1779	0.1166	29.39	
Quadratic	0.0130	0.2304	0.8706	0.9515	34.87	*Suggested*
Cubic	0.2304					

Table 14. Constraints on the optimization of Totox pure tuna oil

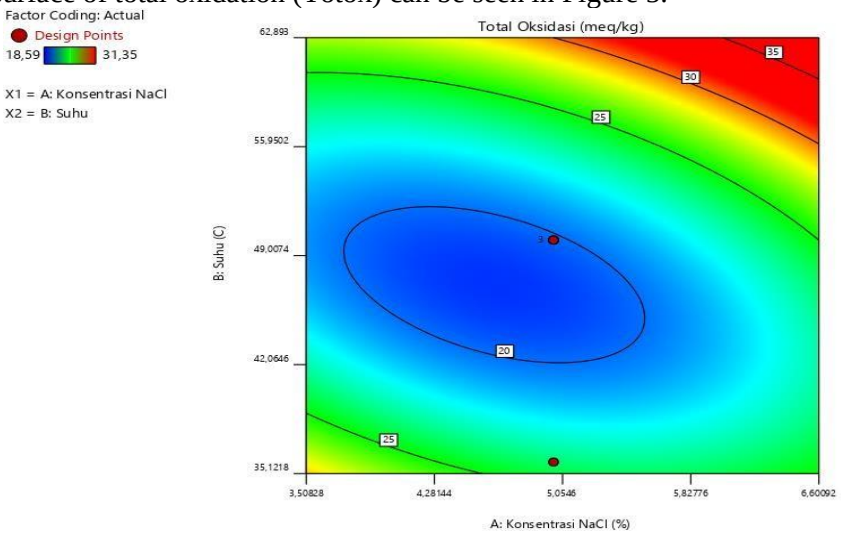
Parameters	*Goal*	*Lower*	*Upper*
Concentration (%)	*In range*	3	7
Temperature (°C)	*In range*	40	60
Totox (meq/kg)	*Minimize*	18.59	35.38

The results of the analysis of variance (ANOVA $\alpha = 0.05$) obtained a Totox response model of p value of 0.0347; it was seen that the factors that had a significant effect ($p < 0.05$) on the response were the effect of linear temperature effect of 0.0269 and the quadratic effect of 0.0252 NaCl concentration and temperature amounting to 0.0065. Table 16 shows that the lowest Totox value was 18.59 meq/kg and the highest was 35.38 meq/kg. These results indicate that of the 11 runs there is a Totox value that does not meet the IFOS standard (2014) because it is still above the maximum value of sebesar 26 meq/kg. The optimal conditions for the Totox response were reached at a 5% NaCl concentration and a temperature of 50 °C, an optimal Totox response was obtained at 19.21 meq/kg. The linear equation that optimizes Totox responses as follows:

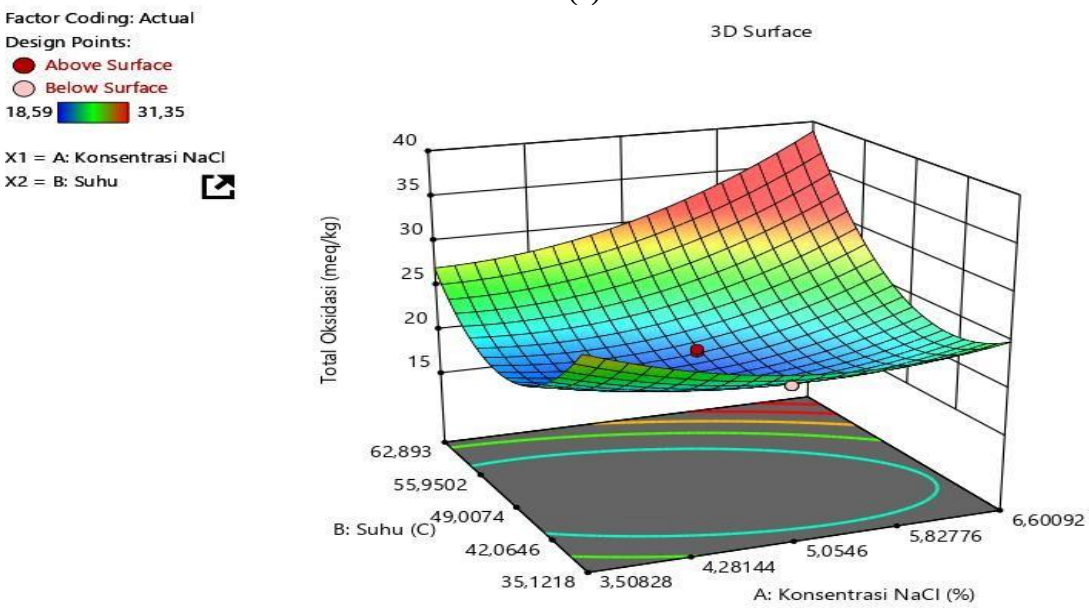
$Y = 170.4223-19.38525X1-4.50429X2 + 0.18199X1X2 + 0.1.16338X1^2 + 0.03879X2^2$

Note:
Y = Totox response value (meq / kg)
X1 = linear effect of NaCl concentration (%)
X2 = Linear effect temperature (° C)
X1X2 = The interaction effect of NaCl concentration and temperature
$X1^2$ = Quadratic effect of NaCl concentration
$X2^2$ = Quadratic effect of temperature

Based on the above equation it can be seen that the Totox response influences the linear effect of NaCl concentration and positive degumming temperature on the minimization of Totox response, but the effect of the interaction effect of NaCl concentration and degumming temperature as well as the quadratic effect of NaCl concentration and temperature negatively influences the minimization of the Totox response. Graph of surface contour and the 3D surface of total oxidation (Totox) can be seen in Figure 5.



(a)



(b)

Figure 5. (a) Contour of surface response (b) Three-dimensional surface response

Simultaneous response optimization using RSM

Simultaneous response optimization is carried out to get the desired results by combining all response variables. The independent variable is the concentration of NaCl indicated the lowest value of 3% and the highest 7%, and the degumming temperature indicated the lowest value of 40 °C and the highest value of 60 °C. The response parameters for optimization are free fatty acid (FFA) parameters, acid number (AV), peroxide value (PV), anisidin number (p-AnV), and total oxidation (Totox). Determination of response optimization simultaneously is done by minimizing all responses. Optimization of the results of fish oil purification simultaneously can be seen in Table 15.

Table 15. Optimization of the process of purifying fish oil simultaneously

Parameters	*Goal*	*Lower*	*Upper*
Concentration of NaCl (%)	*In range*	3	7
The temperature of *degumming* (°C)	*In range*	40	60
FFA (%)	*Minimize*	0.42	0.69
AV (mg KOH/g)	*Minimize*	0.72	1.36
PV (meq/kg)	*Minimize*	1.47	4.10
AnV (meq/kg)	*Minimize*	15.66	27.13
Totoks (meq/kg)	*Miniimize*	18.59	35.38

Optimal conditions of all response variables in the process of refining fish oil resulted in a NaCl concentration of 5.975% and a degumming temperature of 44.49 °C according to the Design Expert 12 trial program, the result of a free fatty acid response (FFA) of 0.459%, an acid value (AV) of 0.721 mg KOH/g, peroxide (PV) value of 1,860 meq/kg, anisidin value (p-AnV) of 12.172 meq/kg and total oxidation (Totox) of 20.911 meq/kg. The resulting desirability value of 0.877 shows that the optimum process conditions have the possibility to produce the desired response value of 87.7%.

Optimal conditions validation

The overlay plot is chosen by the program by predicting the optimal area to get the maximum value of responses and the desired variables (Adlan et al. 2011). The overlay plot graph can be seen in Figure 6. The program gives a predictive response value followed by a 95% prediction interval. A prediction interval is divided into two, namely 95% PI low and 95% PI high. PI low is the lowest value of the predicted interval while the PI high is the highest value of the predicted interval. The value in the actual column is obtained from laboratory observations while the value in the prediction column is obtained from the processing of the Design Expert program version 12 trial (Fitriana 2016). Comparison of the results of the response value on the prediction and the actual seen in Table 16.

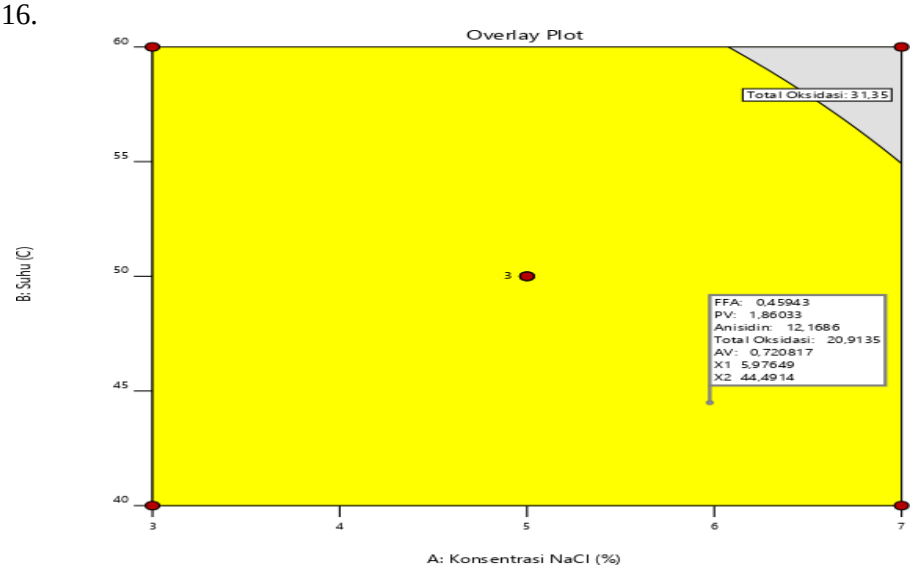


Figure 6. Graph of tuna oil refining plot overlay

Table 16. Comparison of the results of the predicted response value and the actual value

Response	Actual	Predicti on	Prediction interval 95%	
			Low	High
FFA (%)	0.41±0.07	0.45	0.41	0.50
AV (mg KOH/g)	0.62±0.11	0.72	0.61	0.82
PV (meq/kg)	2.30±0.12	1.86	1.35	2.37
AnV (meq/kg)	14.13±0.09	12.16	9.96	14.37
Totox (meq/kg)	18.73±0.85	20.91	18.33	23.49

The program provides a validation process with 5% NaCl concentration and 50 °C degumming temperature with predictive response values of FFA 0.45%, AV 0.72 mg KOH/g, PV 1.86 meq/kg, p-AnV 12.16 meq/kg, and Totox 20.91 meq/kg The actual results obtained in the validation process of all responses lie within the prediction interval of 95%. Actual response results in the validation process were FFA 0.41 ± 0.07%, AV 0.62 ± 0.11 mg KOH/g, PV 2.30 ± 0.12 meq/kg, anisidin 14.13 ± 0.09 meq/kg, and Totox 18.73 ± 0.85 meq/kg. The decrease in response results after refining free fatty acid values was 56.38%, acid values were 61.49%, peroxide values were 86.39%, anisidine values were 71.64%, and total oxidation was 77.60% (Table 17).

Characteristic and fatty acid profile of crude and pure tuna oil

The appearance of tuna oil after purification is very different from crude tuna oil which tends to be dark brown (Figure 7). Suseno et al (2012) state that pure fish oil is bright yellow. The degumming process in crude oil is needed to remove gum or mucus which are considered impurities. Separation of impurities in the form of hydratable phosphatides (hydrated) can use water and then centrifuged. This step can use a salt or acid solution such as phosphoric acid. The neutralization process with NaOH serves to reduce the value of free fatty acids in oil (Olsen et al. 2010). The process of degumming NaCl solution was chosen because it has the ability to bind impurities, is permitted for food and is easily available at affordable prices (Ketaren 2012). The percentage reduction of fish oil quality parameters after purification at optimum conditions can be seen in Table 17.

Table 17. Percentage reduction of tuna oil oxidation parameters

Parameters	Before purification	After purification	% reduction	*IFOS
Free fatty acid (%)	0.94±0.04	0.41±0.07	56.38	≤ 1,5
Acid value (mg KOH/g)	1.61±0,07	0.62±0.11	61.49	
Peroxide value (meq/kg)	16.90±1.46	2.30±0.12	86.39	≤ 3
Anisidin value (meq/kg)	49.83±0.28	14.13±0.09	71.64	≤ 5
Total of oxidation (meq/kg)	83.63±2.62	18.73±0.85	77.60	≤ 20

**International Fish Oil Standard* (2014)

(a) (b)

Figure 7. Appearance of tuna oil before (a) and after (b) purification by the degumming process using NaCl solution

Analysis of fatty acids profile from crude and pure tuna oil was analyzed using gas chromatography. Identified fatty acid compositions were 31 fatty acids. Test results of tuna oil fatty acid profile before and after purification can be seen in Table 18.

Table 18. Fatty acid profile of tuna oil before and after purification

Fatty Acid	Before (% w/w)	After (% w/w)
Lauric acid (C12:0)	0.04	0.04
Tridecanoic acid (C13:0)	0.02	0.03
Myristic acid (C14:0)	2.2	2.78
Pentadecanoic acid (C15:0)	0.52	0.66
Palmitic acid (C16:0)	13.88	16.68
Heptadecanoic acid (C17:0)	0.43	0.52
Stearic acid (C18:0)	4.06	4.89
Arachidic acid (C20:0)	0.26	0.35
Heneicosanoic acid (C21:0)	0.05	0.06
Behenic acid (C22:0)	0.13	0.16
Trichosanoic acid (C23:0)	0.05	0.06
Lignoceric Acid (C24:0)	0.13	4.72
Total of Saturated Fatty Acid (SFA)	**21.77**	**30.95**
Myristoleic acid (C14:1)	0.04	0.05
Palmitoleic acid (C16:1)	3.94	4.56
Cis-10-heptadecanoic acid (C17:1)	0.43	0.53
Elaidic acid (C18:1n9t)	0.14	0.17
Oleic acid (C18:1n9c)	12.96	15.39
Cis-11-eikosenoic acid (C20:1)	1.65	1.96
Erucic acid methyl ester (C22:1n9)	0.26	0.29
Nervonic acid (C24:1)	0.48	0.53
Total of Mono Unsaturated Fatty Acid (MUFA)	**19.9**	**23.48**
Linoleic acid (C18:2n6c)	1.4	1.68
Linolenic acid (C18:3n3)	0.5	0.58
ɣ- linolenic acid (C18:3n6)	0.09	0.1
Cis-11.14-eicosedieoic acid (C20:2)	0.24	0.26
Cis-11.14-17-eicosatrienoic acid methyl ester (C20:3n3)	0.13	0.14
Cis-8.11.14-eicosantrienoic acid (C20:3n6)	0.13	0.14
Arachidonic acid (C20:4n6)	1.55	1.78
Cis-5.8.11.14.17-eicosapentaenoic acid (C20:5n3)	2.75	0.1
Cis-13.16-doxosadinoic acid (C22:2)	0.04	0.02
Cis-4.7.10.13.16.19-decosahexaenoic acid (C22:6n3)	15.86	18.49
Total of Poly Unsaturated Fatty Acid (PUFA)	**22.69**	**23.29**
Total of Fatty Acids	**64.35**	**77.75**

From the results obtained, it can be seen that the percentage of total fatty acids of tuna oil increased after purification from 64.35% to 77.75%. In addition, the percentage of some fatty acids in tuna oil tends to increase after purification. Budiadnyani (2017) reported that the total composition of pure fatty acids of tuna (*Thunnus* sp.) after the bleaching process contained saturated fatty acids (SFA) of 37.85% and unsaturated fatty acids (MUFA and PUFA) of 62.15%. The content of EPA and DHA in fish oil the byproducts of tuna canning were 10.81% and 12.04%.

CONCLUSION

The combination of NaCl concentration factor and degumming temperature results in an optimum response at 5% and 50 °C. Validation of the optimum conditions produces FFA 0.41 ± 0.07%, AV 0.62 ± 0.11 mg KOH/g, PV 2.30 ± 0.12 meq/kg, anisidine 14.13 ± 0.09 meq/kg, and Totox 18.73 ± 0.85 meq/kg. The decrease in response results after refining free fatty acid values was 56.38%, acid values were 61.49%, peroxide values were 86.39%, anisidine values were 71.64%, and total oxidation was 77.60%. The actual value of each response is at a 95% prediction interval. This optimum condition produced fish oil according to 2014 IFOS based on its oxidation parameters.

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EFFECT OF PHOTOPERIOD ON ADULT AND EGG LAYING BEHAVIOR OF CALLOSOBRUCHUS MACULATUS

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ABSTRACT

This study was carried out to determine the Effect of Photoperiod on Adult and Egg Laying Behavior of Callosobruchus maculatus. The trails were conducted in the laboratory of Plant protection Department, Faculty of Agriculture in Selcuk University. In conditions of 30°C temperature with %70± 10 of moisture and different photoperiod regimes, (24D: 0L, 12: L12D, 24L:0D). The number of eggs laid per female, egg hatchability, the duration of oviposition, post-oviposition, copulation performance, and adult life span start from emergence of the adult pest were tested under different light/dark regimes. According to the results of the research highest oviposition duration was found in (12L:12D) and (24D:0L) respectively while lowest value of oviposition period was discovered in (24L:0D). As observation revealed also the post-oviposition period of the bean weevil adult females decreased by increasing the photophase regime or continuous illumination system and lowest post-oviposition period was exposed in (LL) condition as well. The egg hatchability of C. maculatus female was more or less similar in LD and DD regimes and both were higher than in LL photophase. As results of this experiment both sexes of the pest insect lived nearly equal periods at any tested light regimes but male higher in both LD and DD conditions respectively. Furthermore, copulation performance of the adult beetle is affected by light (LL) which reduced egg fertility and less eggs were hatched, these photoperiodic conditions mainly continuous illumination effected on insect copulation time.

Keywords: *Callosobruchus maculatus, fecundity, oviposition, post-oviposition, egg hatchability, adult longevity, mating behavior.*

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