Influences of Humic Acid and Sea Force on Olive Tree Growth (*Olea europaea* L.)

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Abstract

This study was conducted during 2019 on olive trees *Olea europaea* L. cv. Sorani, growing in a private orchard located on the south around Erbil Governorate, Kurdistan region, in order to identify the most suitable fertilizer, using two types of fertilizer; humic acid and seaweed extract (sea force) applied as foliar applications each at four levels (0, 2, 4 and 6 ml.L^{-1}).). Vigor and fruit properties of trees were measured. Both fertilizers resulted in significant differences in the majority of studied parameters at 6 ml.L^{-1} concentration, in which chlorophyll, leaf area, number of leaves/shoot, shoot length, oil content, TSS, fruit diameter, fruit weight, pulp weight and seed weight were increased significantly compared to other concentrations of humic acid and seaweed.

Key Words: Olive tree, Sorani cv., humic acid, seaweed force

تاثير الهيوميك اسيد و السي فورس على نمو اشجار الزيتون (*Olea europaea* L.)

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الخلاصة

أجريت هذه الدراسة خلال عام 2019 على أشجار الزيتون *Olea europaea* L. صنف صوراني المزروعة في بستان خاص يقع جنوب محافظة أربيل، إقليم كردستان-العراق ، وذلك من أجل التعرف على أنسب السماد باستخدام نوعين من الأسمدة؛ حمض الهيوميك ومستخلص الأعشاب البحرية رشا على الأوراق كل واحدة منها على أربعة مستويات (0 ، 2 ، 4 و 6 مل.لتر$^{-1}$). تم قياس خصائص النمو والثمار للأشجار. نتج عن كلا السمادين اختلافات معنوية في معظم المتغيرات المدروسة بتركيز 6 مل.لتر$^{-1}$، والتي تضم الكلوروفيل، مساحة الورقة، عدد الأوراق/فرع، طول النموات، محتوى الزيت، المواد الصلبة الذائبة ، قطر الثمرة ، وزن الثمرة، و وزن اللب. حيث زادت جميع هذه الصفات مقارنة مع التركيزات الأخرى لحمض الهيوميك والأعشاب البحرية.

الكلمات المفتاحية: أشجار زيتون، صنف صوراني، حامض هيومك، الأعشاب البحرية.

Introduction

Olive *Olea europaea* L. is one of the world's oldest cultivated tree crops, dating back over 8000 years. Its origins can be traced back to ancient times on the Mediterranean Sea's eastern shore. Olives have spread throughout the Mediterranean basin, which is still the primary region for olive production today (Osman *et al.*, 2010).

Olive trees thrive in several parts of Iraq's central and northern regions, with Nineveh being the major producer, with cultivation in Nineveh, Kirkuk, Baghdad, Erbil, and Duhok (Mahdi, 2007). The importance of olive fruit comes from its high caloric content and nutritional value, as the fruit is high in vitamins (A, B, C, D, E, and K) as well as minerals (K, Ca, Mg, and P) (Ibrahim and Khlaef, 2007).

Olive oil is also high in monounsaturated fatty acids and contains phenolic substances, which have anti-oxidant qualities (Hill and Giacosa, 1992). Many countries, like Spain, Italy, Greece, Turkey, and Tunisia, rely heavily on international olive production. Olive trees provide two major products: oil and table olives, which are produced by a variety of cultivars such as Coratin, Klamata, Picual …etc. Although the olive tree's nutrient requirements are lower than those of many other fruit trees, a lack of these requirements causes the tree to suffer from serious physiological problems (Dimassi *et al.*,1999 and Popovic *et al.*,1999). The results showed that adding 8 $ml.L^{-1}$ humus to the fruit resulted in an increase in fruit weight, length, flesh weight, and nitrogen content. (AL-Tememe *et al.*,2018). Hidayatullah *et al.* (2018) investigated the effect of humic acid fertilization at various amounts of potassium humate (0, 50, 75, 100, 125, and 150 $g.tree^{-1}$) on apple trees planted in limestone soils, they found that the potassium humate fertilizer supplied to the trees equaled to 125 and 150 g, the most fruits per tree and enhanced tree output the most. Khan *et al.* (2019) investigated the effect of humic acid fertilization on apple trees in 2017 and 2018 using three concentrations (0.05, 0.010, and 0.015 percent)all of which resulted in increased tree yields, especially when the concentration was 0.015 percent compared to the other concentrations.

AL-Barwari and AL-A'araji (2020) confirmed that the addition of nitrogen and humic acid separately, as well as their two-way interactions, had significant effects on yield and specific characteristics (total soluble solids, total carbohydrates in the fruits, and percentage of oil in the fruits), particularly at the levels of 450 g $N.tree^{-1}$ and 75 g humic $acid.tree^{-1}$. Sea force includes nearly all of the minerals and trace elements required for human and plant survival, as well as amino acids and Vitamins (Safa Biological Sea Plants). Sea force is also a major source of iodine (melson) (Berlyn and Russo, 1990). The efficiency of sea force as a plant growth stimulant may be modified by the species included and the manufacturing technique utilized (Turan and Kose, 2004). Mansour *et al.* (2006) studied the effects of applying algal extract to thirty 12-year-old Anna Apple trees. The use of algal extract was found to be particularly successful in increasing shoot length, leaf area, total leaf carbohydrates, and leaf mineral content.

Seaweed extract is useful in sustainable agriculture because it is organic and biodegradable (Cassan *et al.*,1992). The application of seaweed products in diverse crops may result in higher crop yield, quality, and inorganic element uptake from the soil, plant stress resistance, reduced incidence of fungal and insect attack, and lower production costs (Berlyn and Russo, 1990; Fornes *et al.*,2002).

The aims of this study were to investigate the effect of application of the current fertilizers practice in olive orchards to the soil as supplementary amendments to trees and reduce pollution happened concerning both soil and underground water. The goal was to compare between the fertilizer sin various concentration on olive trees.

Materials and methods

This experiment was carried out on olive tree (7) years olds (Sorani cv.), in one of the olive orchard far away from Erbil city about (20 km) to the south. Olive trees with uniform size and vigor in growth were selected to receive treatments, humic acid (0, 2, 4 and 6 $ml.L^{-1}$) and sea force extract (0, 2, 4 and 6 $ml.L^{-1}$) using foliar application techniques and each fertilizer was added in 3 dosages every 20 days, at the growth stage, flowering stage and fruit set stage . Tween 20 (0.01%) used as wetting agent. The trees were monitored twice a week plus recording daily air temperature. The experiment was designed as randomized complete block design (RCBD) with 3 replicates (3 trees/replicate). Data were subjected to analysis of variance to determine the significant differences and Duncan's multiple range test ($P \leq 0.05$) was used for means comparison when F test was significant.

Table (1): Some of the soil physic and chemical properties used in the study.

Characteristics	Experiment media
pH (pH-meter)	7.80
EC (Electrical conductivity)	0.3 des/m
Organic mater	1.08 %
Nitrogen %	0.150
P_2O_5	5.56
K_2O	112 ppm
Soil texture	Loamy Clay

*The data were analyzed at Erbil Directorate of Agricultural Researches.

The following parameters for each treated trees were measured:

1- Vegetative growth parameters:

Random samples were selected from each replicate to measure leaf chlorophyll content, leaf area (cm^2), number of leaves/shoot and shoot length (cm) according to (Ahmed and Morsy, 1999), and the length of the terminal shoots (cm) on the 4 chosen branches of each tree was measured at the end of experiment.

2- Fruit parameters:

A sample of 10 random mature fruits per tree were used for the determination of TSS, fruit weight, fruit diameter, pulp weight and seed weight.

3- Fruit oil percentage:

Results and Discussion

The results of the study (Table 2) indicate to the existence of significant results for growth parameters which resulted in significant increases of chlorophyll content (77.94%), leaf area (4.6 1 cm2), number of leaves/shoot (9.09) and shoot length (10.72 cm), while regarding fruit parameters, humic acid (6 ml.L-1) resulted in significant increases of fruit oil content (33.45 %), TSS (15.15), fruit diameter (8.69 cm), fruit weight (4.81 g), pulp weight (4.00 g) and seed weight (0.21 g). Increasing in vegetative growth and fruit characteristics are agreed with Ibrahim (2013).

Table (3) shows the most significant results for growth parameters which resulted in significant increases of chlorophyll content (77.96 %), leaf area (3.89 cm2), number of leaves/shoot (9.87) and shoot length (9.97 cm), concerning fruit parameters, there were significant increases in oil content (33.15 %), TSS (15.15), fruit diameter (8.46 cm), fruit weight (3.67 g), pulp weight (2.92 g) and seed weight (0.25 g), recorded at 6 ml.L-1. This result of increasing the vegetative growth and fruit of the trees caused due to increasing uptake of the elements and agree with results of (Ibrahim, 2013)

The results presented in Table (4) reveal the consistent and most significant results for growth parameters which resulted in significant increases of chlorophyll content (82.39 %), leaf area (10.56 cm2), number of leaves/shoot (15.02) and shoot length (13.97 cm), while fruit parameters recorded significant increases in fruit oil content (40.30 %), TSS (23.04%), fruit diameter (10.99 cm), fruit weight (9.22 g), pulp weight (5.92 g) and seed weight (0.25 g), recorded at the interaction between both fertilizers (6 * 6 ml.L-1). This also may be a result of increasing the vegetative growth and some fruit parameters which may increase the uptake of the elements and agree with the results of (Maksoud et al., 2009 and Ibrahim, 2013).

As we compare among the two fertilizers, we see significant differences in means between treatments, humic acid fertilizer and seaweed extract at (6 ml.L-1) and (6 * 6 ml.L-1) dramatically increased the values of the majority of studied parameters, and dominated on the other concentrations. his also may be a result of increasing the vegetative growth and fruit parameters of the olive tree Sorani cv. which may increase the uptake of the elements and enhance the ability of nutrients t

Table (2): Effect of humic acid on the growth of olive trees.

Treatments / Parameters	Leaf chlorophyll content (%)	Leaf area (cm^2)	Number of leaves/ shoot	Shoot length (cm)	Fruit oil content (%)	TSS (%)	Fruit diameter (mm)	Fruit weight (g)	Pulp weight (g)	Seed weight (g)
Control	53.18 d *	2.13 c	4.00 c	3.61 c	19.28d	9.90 c	4.42 c	1.71 c	1.22 c	0.81 d
2 $ml.L^{-1}$	60.96 c	2.31 c	5.03 c	7.54 b	22.19 c	12.12	6.58 b	3.20 b	2.54 b	0.66 c
4 $ml.L^{-1}$	70.21 b	3.44 b	7.20 b	8.33 b	29.06b	14.14a	7.15 b	3.30 b	3.17 a	0.49 b
6 $ml.L^{-1}$	77.94 a	4.16 a	9.09 a	10.72a	33.45 a	15.15a	8.69 a	4.81 a	4.00 a	0.21 a

* The means followed by the same letters within a column are significantly not different according to Duncan's Multiple Range Test ($P \leq 0.05$).

Table (3): Effect of seaweed extract on the growth of olive trees.

Treatments / Parameters	Leaf chlorophyll content (%)	Leaf area (cm^2)	Number of leaves/ shoot	Shoot length (cm)	Fruit oil content (%)	TSS (%)	Fruit diameter (mm)	Fruit weight (g)	Pulp weight (g)	Seed weight (g)
Control	67.03 c *	2.32b	4.21 b	6.35 d	17.05 c	10.1 c	5.17 d	1.94 d	1.54 c	0.50 d
2 $ml.L^{-1}$	66.54 c	2.75b	5.39 b	8.00 c	25.08b	11.11c	6.54 c	2.33 c	1.79 b	0.34 b
4 $ml.L^{-1}$	68.47 b	3.48a	8.47 a	8.61 b	32.24a	13.13b	7.80 b	3.25 b	2.85 a	0.33 b
6 $ml.L^{-1}$	77.96 a	3.89a	9.87a	9.97 a	33.15a	15.15a	8.46 a	3.67 a	2.92 a	0.25 a

* The means followed by the same letters within a column are significantly not different according to Duncan's Multiple Range Test ($P \leq 0.05$

Table (4): Effect of interaction between humic acid and seaweed extract on the growth of olive trees.

Treatments / Parameters	Leaf chlorophyll content (%)	Leaf area (cm^2)	Number of leaves/ shoot	Shoot length (cm)	Fruit oil content (%)	TSS (%)	Fruit diameter (mm)	Fruit weight (g)	Pulp weight (g)	Seed weight (g)
0 * 0	51.07 i	1.8 0 i	5.00 h	5.18 j	19.20 k	10.11 i	4.14 g	1.90 i	1.12 e	0.78 m
0* 2 ml.L^{-1}	60.84 h	2.15 h	5.26 h	5.92 j	21.22 j	12.12 h	6.38 f	2.29 g	1.54 e	0.75 l
0* 4 ml.L^{-1}	60.51 h	3.22 g	6.00 g	6.11 i	26.64 h	13.13 g	7.10 e	3.11 f	2.24 d	0.77 k
0* 6 ml.L^{-1}	63.90 g	4.6 1 f	6..00 g	6.89 i	26.05 h	15.15 f	7.99 e	3.75 f	2.81 d	0.54 j
2 * 0 ml.L^{-1}	62.33 g	2.97 h	6.55 fg	6.77 i	21.87 j	12.12 h	5.33 g	2.85g	2.21 d	0.50 i
4 * 0 ml.L^{-1}	63.67 g	3.98 g	7.66 f	7.89 f	20.69 j	12.78 h	6.58 f	3.32 f	2.83 d	0.45 h
6 * 0 ml.L^{-1}	73.45 f	4.67 f	8.00 e	8.65 e	23.78 i	14.65 f	7.34 e	3.87 f	2.87 d	0.40 g
2 * 2 ml.L^{-1}	74.34 e	4.88 f	6.00 g	9.53 d	27.00 g	13.65 g	7.89 e	3.77 f	2.74 d	0.38 f
2 * 4 ml.L^{-1}	74.30 e	5.76 e	7.55 f	9.82 d	28.33 f	17.59 e	8.06 d	4.21 e	2.90 d	0.35 e
2 * 6 ml.L^{-1}	74.98 e	4.89 f	7.00 f	10.01 c	30.33 e	18.88 d	8.67 d	4.70 e	2.95 d	0.34 d
4 * 2 ml.L^{-1}	73.22 f	5.62 e	8.77 e	9.57 d	26.11 j	15.32 f	7.25 e	4.00 e	2.11 d	0.34 d
4 * 4 ml.L^{-1}	74.89 e	5.77 e	10.55 d	10.75 c	35.79 d	18.91 d	8.94 d	4.89 e	2.87 d	0.31 c
4 * 6 ml.L^{-1}	75.09 d	6.01 d	12.00 c	10.93 c	37.70 c	20.23 c	9.37 c	5.39 d	3.29 c	0.31 c
6 *2 ml.L^{-1}	77.01 c	7. 21 c	12.34 c	10.55 c	37.98 c	21.06 b	9.70 c	6.03 c	4.22 b	0.30 bc
6 * 4 ml.L^{-1}	79.45 b	8.87 b	14.10 b	12.40 b	38.11 b	21.89 b	10.13 b	7.88 b	4.86 b	0.29 b
6 * 6 ml.L^{-1}	82.39 a	10.56 a	15.02 a	13.97 a	40.30 a	23.04 a	10.99 a	9.22 a	5.92 a	0.25 a

* The means followed by the same letters within a column are significantly not different according to Duncan's Multiple Range Test ($P \leq 0.05$).

References

- **A.O.A.C. (1970).** Official Method of Analysis. 11TH E d. Washington. D.C. Association of the Official Andytical Chemistry. 101

- **Ahmed, F.F. and M.H. Morsy. (1999).** A new method for measuring leaf area in different fruit species. Minia J. Agric. Res. & Develop.19: 97- 105.

- **AL-Tememe, Z.M., AL-Tamimi, H.M.A., AL-Asedy, A.A.A. and AL-Amirry, A.T. (2018).** Effect of addition of Humic acid and seaweed extract and foliar application in some characteristics on fruit growth of olive (*Olea europaea* L.) c.v Bashiqa. Vol. 5 No. 5 (2018): Proceedings of the 3rd Agricultural Scientific Conference 5-6 March 2018/ College of Agriculture / University of Kerbala.

- **AL-Barwari, Bizhar Jamal Taha and Jassim Mohammed Alwan AL-A'araji. (2020).** Effect of nitrogen and humic acid on fruit yield and qualitative characteristics of olive trees (*olea europaea* l.) cv. kistawy. Plant ArchivesVolume 20 No. 2, pp. 8716-8720.

- **Beryln, G.P. and R.O. Russo. (1990).** The use of organic bio-stimulants in nitrogen fixing trees, Nitrogen Fixing Trees Research Report, 81, 1/2.

- **Cassan L, Jeannin I, Lamaze T and Morot Gavdry JF. (1992).** The effect of the Ascophyllum nodosum extractGoemarGA14ongrowthofspinach.Botanica Marina 35:437 – 439.

- **Dimassi, K., I. Therios and A. Passalis. (1999).** Genotypic effect on leaf mineral levels of 17 olive cultivars grown in Greece. Third International symptoms on Olive Growing, Chania, Crete, Gree, 22-26 Sep. 1997. Acta Horticulturae, 474: 329-331.

- **Fornes F, Sanchez-Perales M and Guardiola JL. (2002)**. Effect of a seaweed extract on the productivity of Clementine mandarin and Navelina orange. Botanica Marina 45:486 –489.

- **Hill M, Giacosa A (1992).** The Mediterranean diet. Eur J Cancer Prev, 1, 339-40.

- **Hidaytullah, A.K., M. Mirwise, N. Ahmed and S.A. Shah (2018).** Effect of humic acid on fruit yield attributes, yield and leaf nutrient accumulation of apple trees under calcareous soil. Indian J. of Sci. and Technol., 11(15): 1-8.

- **Ibrahim A.M., and M.N.H. Khalaef. (2007)**. Olive Tree Planting, Protection and Production, Egypt.

- **Ibrahim, Zulaikha R. (2013).** Effect of Foliar Spray of Ascorbic Acid, Zn, Seaweed Extracts (Sea) Force and Biofertilizers (EM-1) on Vegetative Growth and Root Growth of Olive (*Olea Europaea* L.) Transplants cv. HojBlanca. Int. J. Pure Appl. Sci. Technol., 17(2) (2013), pp. 79-89.

- **Khan, O.A., J.A. Sofi, N.A. Kirmani, G.I. Hassan, S.A. Bhat, M.H. Chesti and S.M. Ahmad (2019).** Effect of N, P and KNano-fertilizers in comparison to humic and fulvic acid onyield and economics of Red Delicious (Malus domesticaBorukh.). J. Pharm. and Phytochem., 8(2): 978-981.

- **Lavee, S. and M. Wonder. (1991).** Factors affecting the manure of oil accumulation in fruit of olive cultivars. J. Hort. Sci., 66: 583-591.

- **Maksoud, M.A. (2000).** Response of growth and flowering of Manzanillo olive trees to different sorts of nutrients. Egypt. J. of Hort., 27(4): 513-523.

- **Mansour, A.E, Gh. Cimpoies and F.F. Ahmed. (2006).** Application of algae extract and boric acid for obtaining higher yield and better fruit quality of Anna apple, *Stiinta Agricola*, 2,14-20.

- **Mahdi, F.T. (2007).** Development of olive plantation, Popular Company of Horticulture and Forestry, Ministry of Agriculture, Iraq.

- **Osman, S.M., Khamis, M.A and Thorya, A.M. (2010).** Effect of Mineral and Bio-NPK Soil application on Vegetative Growth, Flowering, Fruiting and Leaf Chemical Composition of Young Olive Trees. *Journal of Agriculture and Biological Sciences*, (1): 54-63, 2010.

- **Popovic M., Malencic D., Gasic O. (1999).** The influence of different nitrogen concentrations on NO_3^- and protein content in olive leaves. Acta Hort., 474: 329-331.

Turan, M. and C. Kose. (2004). Seaweed extract improve copper uptake of Grapevine, Acta Agric. Scand., Sect. B, Soil and Plant Sci., 54(2004), 213-220