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THE EFFECT OF FOLIAR FERTILIZATION AND ROOT STIMULATE AT GROWTH OF OLIVE'S (*OLEA EUROPAEA* L.) SAPLINGS (NABALI AND ASHRACI)

Ammar Y. Kadhom Azawi and Auasama Y.SalihMajeed

Department of horticulture and landscape design, College of Agriculture, University of Baghdad, Iraq
Corresponding Authors: a.y.k.77790@gmail.com, ausamayahia1966@gmail.com

Abstract

This study was conducted in one of the greenhouses of the Department of Gardening and Garden Engineering (in Station B) - collage Agricultural Engineering Sciences - University of Baghdad.For 12 months, the study began from 20/3/2017 to 20/3/2018 to study the effect of Kare Combi and Rizotop in the growth of olive seedlings (Nabali and Ashrici).The first factor is the chemical fertilizer Kare Combi, which contains only the micro elements and three concentrations (0, 0.5, 1) gm.L^{-1}, which is sprayed on the leaves, and it's symbolizes it (K2, K1, K0). The addition in three batches is the period between the payments of 20 days and repeated in the autumn season, where the same concentrations are used on the date 20/9/2017.The second factor is the root catalyst Rizotop, an organic fertilizer containing some mineral elements, which is added to the seedlings and three concentrates (0, 15, 30) ml. plant $^{-1}$ and symbolizes it (R2, R1, R0) In the first three batches on 25/3/2017, the period between payments is 20 days, and it is repeated in the autumn season where the same concentrations are used on 25/9/2017.The third factor is the two types of research, the symbol of the two classes respectively (V2, V1) where V1 is the Nabali and V2 is the Ashrici ,The experiment was designed by the RCBD, three experimental factors, and three replicates of three seedlings per experimental unit, bringing the total number of seedlings (162). Statistical differences were calculated using LSD and below the probability level of 0.05. The results of the study showed that K2 (1 gm.L^{-1}) was superior to K0 (0 gm.L^{-1}) .For the following search tarts (height of stem, branches No., leaf No.) that reaches (76.1cm, 10.17 braunch. plant^{-1}, 308.5 leaf. Plant^{-1}). The K1 treatment also showed superiority over the rest of the parameters in chemical properties such as(chlorophyll, nitrogen, protein) that reaches(148.3mg.100g fresh wet, 2.157%, 13.480%) respectively. The results of the study showed that the treatment of R2 (30 ml. L^{-1}) was superior to the R0 comparison in the following characteristics (Branches No., Leaf No., Chlorophyll, Nitrogen, Protein) Whose results were respectively (10 branch. Plant^{-1}, 286.5 leaf. Plant^{-1}, 1503mg.100g fresh wet, 2.146% , 13.413%) respectively.

Keywords **- Ashrici, Nabali, Rizotop, Kare Combi**

Introduction

Olives (*Olea europaea* L.) are Return's to the Olaceae family that Includes 30 genera, It is an evergreen tree that lives in the subtropical region, Olea is the only genera that gives edible fruit, Olive trees live for hundreds of years. Tubelileh *et al*. (2004). The international olive production for the season 2011, reaches about 2565000 ton, while the international Consumption were 2387500 ton (International Olive Council, 2012). In Iraq, production reached at the same season**,** 17421 ton, And planted area is estimated with 4333 Ha. The number of fruited trees in this year is reaches about 754261 tree (Ministry of Agriculture Statistics, 2012). Olives varieties are classified according to the purpose, of the use of the varieties (Table olives, Olive oil, Dual purpose) In this study we used one of the Iraqi varieties (Ashrici) Which uses there fruits as pickles and the tree were strongest in growth, it fruit was a good in color that turns black when maturity and its weight was 5-6 gm, the percentage of oil are 14-18%. The other Varity was NabaliIs one of the Syrian dual-purpose varieties, Medium-sized fruit with oil percentage up to 26%Newly entered Iraq at 2002. The success of these two varieties is hoped for in Iraq (Mehdi and Sabah, 2007). That mineral and organic fertilization is one of the basic pillars of modern agriculture because of the large demand for agricultural products, which was associated with the increase in the population in the world. And that olive fertilization programs have become important to produce, especially since this plant is characterized by the alternating bearing, Research indicates that olives do not respond to increased fertilization so we have to follow ways to increase the absorption of elements by this plant. Therios (2009) were mentioned That the absorption of nutrients by olive trees is associated with the type of mineral fertilizers or organic additives and a method added by these fertilizers Nutrients play an important role in the synthesis of proteins, carbohydrates and nucleic acids, lack of one elements

leads to a halt of growth or poor production and low quality of fruit. The sugars accumulate in the leaves, the process of photosynthesis decreases and the sugars are less secure to the roots, Inhibits their growth and thus impairs the absorption of nutrients from the soil (Saenz *et al*., 2001). Iron has an important role for the plant because it shares with some proteins in many metabolic processes like (chlorophyll synthesis, Transmission of electrons in the respiration process, photosynthesis). Thus increasing food processing and providing the necessary energy for many vital processes within the plant that lead to increased growth (Korcak , 1987). Zinc plays an important role in stimulating a number of enzymes likes Protease, Piptase, Enolase. Its decrease is causing plant growth imbalance due to the reduction of net carbon products in the rate of 50-70 % Which may be due to the low efficiency of the carbonic anhydrase enzyme that enters the zinc in its composition. It needs plants to form the amino acid Tryptophan, which is made up of IAA (Hopkins and Huner, 2004). As amino acids contribute to increasing the content of plant tissues of proteins and also contribute to the regulation of metabolic processes to acquire plants more resistance to bear the stresses of the environment as well as its role in increasing the number of leaves and their area (Lisiecka *et al*., 2011). In this context I use liquid organic fertilizer, which represents a group of organic substances rich in amino acids (Brolin, Gluetaric, glutamic). To contribute directly or indirectly to the improvement of plant growth and development through increased readiness of elements in the soil.

The aim of the research - Based on the above, the research aims to study the effect of adding paper manure in micro elements and soil fertilization with a liquid root catalyst in maximizing the use of fertilizers added to the soil and thus increasing the vegetative growth of the seedlings.

Materials and Methods

This study was conducted in one of the greenhouses of the B research station of the College of Agricultural Engineering Sciences-University of Baghdad. Al-Jadriya in the Department of Horticulture and Garden Engineering during the growth seasons 2017–2018, to investigate the effect of the application of chemical fertilizer Kare Combi and root enhancement Rizotop in the growth and content of some nutrients to the varieties of olive and Ashrici and Nabali. The sapling were brought from Zafaraniyastation return to Horticulture and forestry Directorate, the sapling were been from vegetative propagation and it's unique as possible as we can and planted in agriculture plastic bag 3kg capacity, then planted in agriculture plastic bag that extent 12kg planting media 3:1 pit moss and sand, Additive 21g per plant NPK Neutralfertilizer 20:20:20 for all saplings before study starting.

The design of the experiment was a factorial RCBD, with three factors, the first factor was Kare Combi a foliar chemical fertilizer Contain only micro elements with three concentration (0 ,0.5 ,1)gm.L^{-1}, the additives was spray on plant leaves, and symbolize to them (k0 ,k1 ,k2) ,The addition was in the first three times, 20/3/2017 The second and third were added twenty days after the first and second installments, repeated this at autumn season, where used concentration in the same date at 20/9/2017, second additive and third after 20 days from the first and second .the second factor was root enhancement Rizotop it was organic fertilizer contain some mineral elements, its adding to soil with three concentration (0, 15, 30) ml. $plant^{-1}$ and symbolize to them (R0, R1, R2)

It was added to the first three batches at 25/9/2019second additive and third after 20 days from the first and second. Third factor it was olive sapling with two cultivars (Nabali and Ashrici) the symbol of it (V1, V2) consequently. Note the first and second factors were fixed as recommended and twice the manufacturer's recommendations for them. "The data were statistically analyzed and their averages were measured according to the least significant difference test LSD at 5%. The Genstat program was used in statistical analysis (Payne *et al*., 2007).Experimental measurements-

Vegetative Characters

Height of Stem (cm): Measured with tissue tape from the soil surface of the bag to the top of the seedling and each plant in the experimental unit and then extract the rate.

Brunch numbers : The number of branches per plant was calculated in the experimental unit.

Leaf numbers: The number of leaves per experimental unit was calculated in the replicate.

Chemical Analysis

Determination of total chlorophyll by extracting chlorophyll in leaves using acetone (80%) And then read the light absorption of the sample by a device Spectrophotometer at two wavelength 663 and 645 nanometer. The total concentration of chlorophyll was then determined (mg.L^{-1}) from this equation (Goodwin, 1976) :

Total chlorophyll (mg/L) = 20.2 D (645) + 8.02D(663)

Determination of Nitrogen (%): by Kjeldahl device (Jackson,1958)

Determination of protein (%): This tart was calculated in plant leaves on the basis of calculating the percentage of total plant nitrogen in the following equation (A.O.A.C., 1970) :

Total Protein (%)= nitrogen (%) x 6.25

Results

Height of Stem(cm): According to the table (1) we saw that the treatment K2 (1g.L^{-1}) "Kare Combi" it gives higher height stem reaches 76.61 cm compared with control that gives lower height stem reaches 72.06 cm. while the Rizotop treatment was Not significant in this tart, We did not observe any significant response to the olive cultivars under condition of two factors ,at triple interaction there was superiority of the treatment (V2K0R2) at other treatment in this tart, where height of stem reaches 91.00cm, while treatment (V2K1R1) gives lowest height of stem that reaches 65.67cm.

Number of secondary branches: According to the results of the table (1) we saw superiority at K2 at this tart that gives highest number of branches reaches 10.17 branch per plant , while the treatment K0 (0 g.L^{-1}) gives lowest number of branches that reaches 7.67 branch per plant. We also note the superiority of the treatment R2 (30 ml.L^{-1}) Rizotop that gives highest number of branches reaches 10.00 branch per plant at other treatments, while the control treatment gives lowest number of branches reaches 7.78 branch per plant. There was no significant response to the olive cultivars under consideration. As for the triple interaction between the treatments, we note the superiority of the treatment (V1K2R2) at other treatments of the experiment that gives highest number of branches reaches 13.00 branch per plant, while the treatment (V2K0R2) lowest number of branches reaches 6.33 branch per plant.

Leaf of number: The results in table (1) showed superiority of K2 at other treatments in this tart, gives 208.8 leaf per plant, compared with the control that gives lowest number of leaf reaches 230.7 leaf per plant. The second factor Rizotop also superior at the treatment R2 gives highest number of leaf reaches 283.5 leaf per plant compared with other treatments (R1 ,R0) that gives lowest number of leaf reaches (246.3, 258.1) leaf per plant respectively. There was also no significant response to the olive cultivars in tart. The triple interference showed superiority of the treatment (V1K2R2) at other treatments, it gives highest number of leaf reaches 385.0 leaf per plant compared with the treatment (V1K0R0) that gives lowest number of leaf reaches 195.3leaf per plant.

Table 1 : The Effect of foliar fertilization and Root Stimulate and their Interaction in Vegetative Properties at Olive Varieties (Nabali and Ashraci).

Treatment		Height of Stem (cm)	Branch no. (branch.plant^{-1})	Leaf No. (leaf.plant^{-1})
Kare Combi	K0	72.06	7.67	230.7
	K1	74.28	9.44	266.3
	K2	76.61	10.17	303.8
Rizotop	R0	74.56	7.78	258.1
	R1	72.94	9.50	246.3
	R2	75.55	10.00	283.5
Cultivars	V1	74.11	9.41	261.9
	V2	74.52	8.78	275.4
Triple Interaction	V1K0R0	68.67	7.33	195.3
	V1K0R1	72.67	7.33	249.3
	V1K0R2	69.00	10.33	295.0
	V1K1R0	76.00	8.00	230.0
	V1K1R1	73.67	12.33	275.0
	V1K1R2	78.67	9.00	249.3
	V1K2R0	74.33	6.67	226.0
	V1K2R1	80.33	10.67	251.3
	V1K2R2	73.67	13.00	385.0
	V2K0R0	72.00	7.00	231.0
	V2K0R1	74.00	8.33	243.3
	V2K0R2	91.00	6.33	334.3
	V2K1R0	66.67	8.33	268.0
	V2K1R1	65.67	8.33	247.0
	V2K1R2	77.00	11.00	316.0
	V2K2R0	74.67	8.67	233.3
	V2K2R1	79.33	9.67	332.0
	V2K2R2	70.33	11.33	273.3
LSD	K	3.221	1.042	25.22
	R	NS	1.042	25.22
	V	NS	NS	NS
	VKR	7.889	2.522	61.79

Chlorophyll contents in leaf : The results according to the table (2) there was a significant effects for Kare Combi for this tart Where the treatments (K2, K1) were shown superiority at the control treatment, they gives highest content reaches (146.1, 148.3) mg per 100gm fresh wet Respectively, while the control gives lowest content of chlorophyll reaches 127.3 mg per 100gm fresh wet . while the same table showed significant effect for Rizotop to this tart, Where the treatment R2 is superior by gives greatest content of chlorophyll were reaches 150 mg per 100gm fresh wet compared with control treatment that gives lowest content reaches 128.3 mg per 100gm fresh wet. According to the same table, we did not find any significant response to the cultivars of this research for the other factors. The interference between the three factors had significant effect on this tart, where the treatment (V2K2R2) superior significantly by gives highest content of chlorophyll in leaf were reaches 166.0 mg per 100gm fresh wet, compared with other treatments, while the treatment (V2K0R0) gives lowest content of chlorophyll reaches 94.9 mg per 100gm fresh wet.

Nitrogen content in leaf : According to the table (2) we note a significant effect for foliar fertile at leaf content of Nitrogen, there where superiority in two treatments (K2, K1) because they gives highest content of nitrogen in leaf reaches (2.151, 2.157%) compared with control treatment that gives lowest nitrogen percentage reaches (2.086%) and also there was a significant effect for root enhancer Rizotop in the same tart according to the same table, the treatment (R2) was significantly higher in this tart by giving it the highest nitrogen content reaches 2.146% compared with control treatment that gives 2.105% only. As for the response of the research cultivars of the experiment there was superiority of Ashrici CVS on Nabali at this tart by contain highest percentage of nitrogen reaches 2.141% compared with Nabali CVS that contains 2.121% nitrogen only. according to table 3 there are a significant effect for the three factors of the experiment at this tart, from its there was superiority of (V2K1R2) treatment on other treatments for gives highest nitrogen contents reaches 2.253% compared with other treatments, while the treatment (V1K0R0) gives lowest nitrogen contents reaches 2.023%.

Protein content in plant : The results showed according to the table (2) there was a significant effect of foliar spraying of mineral elements at the percentage of protein in plants, Both treatments (K1, K2) were superior in this tart by gives higher percentage of protein in leaf reaches (13.480, 13.445%), while the control treatment gives lowest protein contain reaches 13.182% and also we note there was a significant effect of root enhancer at this tart were we found that superiority of R2 at other treatments by gives highest protein percentage reaches 13.413%, while the control treatment gives lowest content of protein reaches 13.146%. Ashrici CVS superior at this tart by gives highest content reaches 13.465% at Nabali CVS that gives lowest content reaches 13.357 %.

The interaction between triple factors gave significant effect at this tart, where the treatment (V2K1R2) superior on other treatments that gives highest content reaches 14.081%, while the treatment (V1K0R0) gives lowest content of protein reaches 13.643%.

Table 2 : The Effect of foliar fertilization and Root Stimulate and their Interaction in chemical contains at Olive Varieties (Nabali and Ashraci).

Treatment		Chlorophyll content mg. 100g fresh weight	Nitrogen (%)	Protein (%)
Kare Combi	K0	127.3	2.086	13.185
	K1	148.3	2.157	13.480
	K2	146.1	2.151	13.445
Rizotop	R0	128.3	2.105	13.146
	R1	143.4	2.143	13.397
	R2	150.0	2.146	13.465
Cultivars	V1	139.9	2.121	13.357
	V2	141.2	2.141	14.081
Triple Interaction	V1K0R0	127.5	2.023	12.643
	V1K0R1	130.6	2.073	12.956
	V1K0R2	130.3	2.096	13.100
	V1K1R0	137.0	2.130	13.312
	V1K1R1	158.4	2.140	13.375
	V1K1R2	143.9	2.153	13.456
	V1K2R0	142.2	2.160	13.495
	V1K2R1	140.8	2.183	13.643
	V1K2R2	148.6	2.136	13.350
	V2K0R0	94.9	2.093	13.081
	V2K0R1	136.8	2.140	13.375
	V2K0R2	144.0	2.093	13.081
	V2K1R0	130.4	2.113	13.206
	V2K1R1	152.8	2.153	13.456
	V2K1R2	167.2	2.253	14.081
	V2K2R0	137.7	2.110	13.187
	V2K2R1	141.1	2.173	13.581
	V2K2R2	166.0	2.146	13.413
LSD	K	7.24	0.014	0.128
	R	7.24	0.014	0.128
	V	NS	0.011	NS
	VKR	17.73	0.034	0.314

Discussion

According to the results of the tables (1) note that the Kare Combi had an effective effect in the following characteristics of the main leg height, number of branches, number of leaves). This is due to the fact that it contains a mixed of micronutrients (iron, manganese, zinc, boron and copper). These nutrients influence the synthesis of proteins as well as their involvement in the electron's transmission chain within the cell where Bishop (1971),That these elements participate in the process of oxidation and reduction in the electron transfer system in the process of photosynthesis, and has an effective influence in the contribution of the manufacture of porphyrin, which is part of chlorophyll and this corresponds with Machold and Stephan (1969) Who said that iron is necessary for the oxidation stage of Coproporphyrinogen to Protoporphyrinogen in chlorophyll synthesis.

Iron and zinc Effected on synthesis of proteins contains, will directly or indirectly affect the synthesis of proteins that participate with photosynthesis such as Phytoferritin Which is found in the plastids to assist in the process of photosynthesis. Dekock *et al*. (1960) reported. That the total iron in the leaves of the plant is stored a lot in Ferric Phosphoprotin that called Phytoferrin, Hyde *et al*. (1963) suggested that Phytoferrin. In the leaves as iron is used by mature plastids in photosynthesis, Neish (1939) reported that was Plastids contains 80% of the total iron of the plant, Also increase the activity of the plastids to the accumulation of carbohydrates increases the dry weight of the total vegetative and root, and zinc has an important work in the manufacture of tryptophan. It is an intermediate compound in the biosynthesis of IAA, which affects the size and elongation of cells, which increases plant size. Tusi (1948) showed that zinc is required in the manufacture of tryptophan biologically because tryptophan is the initiator of the IAA composition of this has the role of zinc indirectly in stimulating growth. Which resulted in the observation that the addition of Kare Combi led to an increase in plant height due to all of the later, This is consistent with what was found by Moussawi and others (2014) who added iron Rasha on the leaves of olive seedlings of the class of Kashtawi in addition to boron, resulting in an increase in plant height, while Araji and Hamdani (2012) who used iron with nitrogen on pears trees, which led to an increase in plant height. The treatment of Kare Combi also affected the increase in vegetative growth clearly as the number of branches and number of leaves increased, Al-Shammari *et al*. (2011), who sprayed paper with boron and copper, agreed with the increase in the number of branches significantly. A number of researchers also agreed that the addition of mineral fertilizers containing iron, zinc, copper and boron has increased the number of leaves in the plant (Ismail *et al*., 2012). The increase in the number of leaves and leaf content of chlorophyll led to an increase in the size of the plant, which is consistent with what was found (Shalsh *et al*., 2012) We note from the results of tables (1) that the first factor Kare Combi had a significant effect in Chemical content of plant leaves under investigation we noted there were increased in leave contains of (chlorophyll, nitrogen, protein). This is due to the containment of Kare Combi on the iron element, which increased the content of leaves of chlorophyll and important elements such as nitrogen, as iron has an important role in the growth and metabolism of many nutrients necessary for plant growth (Jacobson and Oertli, 1956; Dekock *et al*., 1960) Were the iron is used in the synthesis of Flavoproteins, which have an active role in the bio-oxidation processes and also in the synthesis of the lipids of nuclear membrane , green plastids and mitochondria, which has an effect in the biosynthesis of Ferredoxin (Mengel and Kirkby, 1979). Which led to the accumulation of carbohydrates because of the activity of plastids and this accumulation led to the activation of the chain of transmission of electrons inside the cell and this was agreed with (Machold and Stephan, 1969; Price *et al.*, 1972). This was reflected in the synthesis of proteins due to nitrogen uptake of the NPK fertilizer added to the experiment in general and this resulted in the absorption of nitrogen from the soil by Kare Combi, by activating the enzymes responsible for the absorption and transport of these elements (Taize and Zaiger, 2010). This agreed with the many researchers who worked on the olive cultivar Kastawi where they found when spraying iron and boron, which led to an increase in plant content of chlorophyll, carbohydrates and other mineral elements (Moussawi and khodher, 2014). The second factor Rizotop is a fertilizer added to soil to stimulate the growth of roots and this contains the same elements in the previous Kare Combi in addition to nitrogen and in several forms and also the component Molybdenum. The inclusion of Rizotop on multiple forms of Nitrogen is very important to increase the root absorption, despite the nature of the soil in which these plants are planted in addition to the nitrogen in some forms lead to change the pH of the soil added to it (Taize and Zaiger, 2010). The results of tables (1) showed that Rizotop had a significant effect on the vegetative traits under study (number of branches, number of leaves). This may be due to the fact that Rizotop contains various forms of nitrogen, which is an indispensable element due to its entry into the manufacture Amino acids and its contribution to the manufacture of proteins and nucleic acids (Mengel and Kirkby, 1979) Where it enters the biosynthesis of chlorophyll, where the green plastids contains 78% of the nitrogen found in the plant (Jifons *et al*., 2005). It has a role in the formation of amino acids such as tryptophan acid. This acid is the initiator in the manufacture of IAA, which enters the division, elongation and cell (Taize and Zaiger, 2010). Resulting in the number of branches and the number of leaves and this result from the increased content of the leaves of chlorophyll, which increased the process of photosynthesis increased the manufacture of carbohydrates and accumulation in the legs of the plant, affecting C / N ratio and this is agreed with Cheng *et al*. (2010). This was consist by (Al-Joboory, 2011: Al-Rubaay, 2016) and may be attributed to the role of elements associated with nitrogen, which increases the absorption of the plant when added by the soil in the increase of the division of mast cells and increase in the number of branches leading to an increase in the number of leaves, which increases the efficiency of the total vegetative (Ling and Silberbush, 2002). While the

results of the second factor Rizotop was different from the first factor in these tarts because it contains nitrogen and in several forms we note that the effect on the content of some elements, not all of them according to table (2) as the different forms of nitrogen have led to a significant increase of chlorophyll, Which constribte the biosynthesis of chlorophyll (Majeed and Jude, 2016) who attributed the increase of chlorophyll to increased nitrogen fertilization while chlorophyll has increased the photosynthesis, which led to the accumulation of carbohydrates reflected in the increase of vegetative growth, Since Rizotop contains a mixed of mineral elements positive ionization, it will contribute to the chain of transmission of electrons activated photosynthesis increased carbohydrate accumulation in the plant, which led to increased vegetative growth and this leads to an increase in the proteins manufactured and in the leaves as noted in the same table, this was agreed with (Fernandes- Escobar *et al*., 2006). And that biosynthesis of Sucrose in the plant leads to increased absorption of mineral elements of the soil and this is consistent with previous studies linked the content of leaves of carbohydrates and absorption of the major and minor elements when increasing fertilization (Han *et al*., 2008), The elements in Rizotop also affect the mobility and transport of nutrients in the plant, which increased the absorption of the roots and increased some elements in the plant (Mengel *et al*., 2001).

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