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EFFECT OF NUTRIENTS SOLUTION SPRAY DATES ON SOME GROWTH CHARACTERISTICS OF OLIVE SEEDLINGS

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Abstract

The experiment was carried out in the olive orchard of the college of Engineering- University of Baghdad/Al-Jadriya, for the period from April 2015 to the end of October 2015 to study the effect of both spraying the Disper Chlorophyll GS solution at four concentration levels, which were zero (C_0), spraying 0.75 g.L^{-1}(C_1), spraying 1 g.L^{-1} (C_2) and spraying 1.25 g.L^{-1} (C_3) and the spraying dates which they 1/4 (D_1), 1/5 (D_2) and 1/8 (D_3)on 3-year-old olive seedlings class (Khodairi). Each treatment replicated three times with a factorial experiment using RCBD. The experimental results showed that the interactions between factors led to a significant increase in most vegetative growth studied traits, while theC_3D_3treatment with a value of (1.25g.L^{-1}) of Disper Chlorophyll GS nutrient solution at spraying date (1/8) was gave the highest number of leaves, chlorophyll content and nitrogen, phosphorus, and potassium in leaves, as well as zinc and magnesium.

Keywords **:** RCBD, Disper Chlorophyll GS Solution, Olive Seedlings.

Introduction

Olives (*Olea europaea*) can be consider as one of the most important fruitful and economically tree in the Oleaceae family, which follows the sex Ole. The original home of this tree was the Near East, especially the Mediterranean basin, which includes Syria, Palestine and Iraq, where the tree found planted since the time of the Assyrians and the Babylonians (Mahdi, 2011). The olive tree plays an effective role in the people's lives since it's fruits use as food and it's leaves were used to extract medicinal products. As well as, olive oil is one of the best vegetable oils because it prevents atherosclerotic disease, reducing heart diseases and increasing the yellow gland activity due to the high proportions of oleic acid, linoleic and vitamin K, in addition to that olive leaves contain 9% protein (Preedy and Watson, 2010), (Al Nuaimi, 2010). The global production of olives in 2014 was about (15,401,707) tons/year with a cultivated area amounted (10,272,547) hectares, Spain olive producing was reached (4,560,400) tons/year which was represented over a quarter of the world's production, while Italy coming next with a production rate over (1,963,676) tons/year then Greece and Turkey and Morocco according to (FAO, 2016), the number of olive's fruit trees in Iraq was estimated to be approximately over 1,098,481 trees, producing up to 24768 tons with average production rate for one tree is 22.5 kg (Central office of Statistics, the government of Iraq 2014). The olive tree endures severe conditions of high temperatures and moisture decreasing and grows in various types of soils such (light, heavy and calcareous) that had a good permeability, the soil with good texture, fertility and moisture was a suitable to encourage the Vegetative and fruit growth of olive trees (Ben and Boukhris, 2002). Several studies were conducted in order to enhance the growth Olive seedlings by using either foliar or a spray chemical fertilization to overcome the high production costs that resulted from slow growth in the greenhouse and after the transfer to the permanent place, and the long duration of its youth and the difficulty of reaping its benefits. leaves feeding had important role in improving a vegetative growth trait through the contribution of nutrients to build the major and secondary compounds, especially the major ones, including nitrogen, potassium and phosphorus. These elements related to format a plants which are able to grow in a balanced manner and a vegetative and root growth is obtained, the lack of such elements causes degradation of plant growth and the possibly death may occurred (Bayoumi *et al*., 2000). Additional studies were carried out to determine the effect the time of the nutrients spraying time application in the fruit seedling growth, (Al- Hajimi, 2008) found that spraying of Total-GRO nutrient solution weekly has led to an increase in the leaves content from nitrogen, chlorophyll and leaf area compared to spraying every two weeks for apricot seedlings. (Hashim, 2013), also studied the effect of spraying humic acids time application on apricot seedlings at the beginning and mid-April, the findings showed that the first date spraying was the best by giving a significant increase in the content of the leaves from nitrogen, phosphorus and chlorophyll. The importance of spraying the nutrient solution and its effect on increasing the plant growth, fruit production and other plant characteristic. For these Reasons, an experiment study was carried out to investigate the effect of nutrient solution and it's spraying on the olive seedling.

Materials and Methods

This experiment was conducted in the olive orchard that belonged to the college of Engineering, Baghdad University/AL Jadriyah, for the period from April 2015 to the end of October 2015.The main purpose of this was to study the effect of spraying with Disper chlorophyll GS nutrient solution and spraying dates on 3-year-old olive seedlings class (Khodairi). The seedlings sprayed at early morning until full wetness, While A 36 homogeneous vegetative growth seedling of olive seedlings was considered to investigate the main variables for this study as follows:-

First: Spray treatment with Disper chlorophyll GS which includes the following treatments:

- Without spraying (Reference), noted as C_0.
- Sprayed 0.75 gm. L^{-1} from the nutrient solution, noted as C_1.
- Sprayed 1 gm. L^{-1} from the nutrient solution noted as C_2.
- Sprayed 1.25 g.L^{-1} from the nutrient solution, noted as C_3.

Second: spraying dates for the nutrient solution includes the following treatments:

- 1/4 noted as D_1 code.
- 1/5 noted as the D_2 code.
- 1/8 noted as the D_3 code.

Thus, the experiment was operational with two main factors subdivide to 12 interaction treatment ($4 \times 3 = 12$) designed according to Randomized Complete Block Design (RCBD) with three duplicates. The results of the study were statistically analyzed and the means were compared to the lowest significant difference test (L.S.D) and at a probability level of $p \leq 0.05$ (Sahoki and Wahib, 1990).

Studied Characteristic

1. Number of leaves (leaf. Plant^{-1}):- The number of leaves was calculated at the end of the experiment in October month.
2. Total chlorophyll in the leaves (SPAD Unit): The concentration of chlorophyll in the leaves on the seedlings was estimated at the end of the October using the digital SPAD meter (Felixloh and Nina, 2000).
3. The leaves content of nutrients:

In the last week of October and from the fourth to the sixth leaf of the top modern growth that full expanded, new ripping and physically active, ten completed growth leaves were collected for each experimental unit. Each group was washed with tap water, then with acidified water (0, 1 HCl) and with distilled water to remove the sustain dust and pesticide residues. The leafs were put in perforated paper bags after drying process, then they were inserted inside electrical Oven) was at a temperature of 70 ºC for three days. Finally, they were crushed manually and 0.4 gm. was digested by sulfuric H_2SO_4 and perochloreric $HClO_4$ acids by 1:4 for each of them respectively. When the processing plant extracts were accomplished the following parameters were estimated as follows :

- The total nitrogen percentage using the micro-kjldahl method according to (Chapman and Pratt 1961).
- Phosphorus percentage using Ammonium molybdate, was measured by the spectrophotometer with wavelength 882 nm (Page *et al*., 1982).
- Potassium percentage using a Flame photometer (Wiessmann and Nehring, 1960).
- Zinc (mg. kg^{-1}) dry material: the zinc element was estimated in the leaf extracts using an Atomic Absorption spectrophotometer (Allan, 1961) device.
- Manganese (mg. kg^{-1}) dry material: the manganese was estimated by Atomic Absorption spectrophotometer (Page *et al*., 1982).
- Iron: Using a spectrophotometer and by the way of (Page and *et al*., 1982) depended.

Results and Discussion

Number of Leaves (leaf plant^{-1})

The number of leaves has been a significantly affected by the spraying treatment of the nutrient solution as shown in table 1. The value of 69.0. (leaf. Plant^{-1}), C_3 treatment recorded the highest rate compared to other treatments and by a significant difference in the reference treatment which had the lowest number of leaves with a value of 51.0 (leaf. Plant^{-1}). The spraying dates have increased to this trait significantly, especially date D_3 as it a significant superiority on date D_1 with the largest number of leaves reached 64.7 (leaf. Plant^{-1}). While, the interaction between the spraying of the nutrient solution and the its date have a significant effect on this trait. the interference treatment C_3D_3 was gave the highest number of leaves counted about 77.0 (leaf. Plant^{-1}), while the interference treatment C_0D_1 had the lowest number of leaves of 47.0 (leaf. Plant^{-1})

Relative chlorophyll in the leaves (SPAD unit)

According to the statistical analysis, the total chlorophyll leaf content was significantly affected by the Disper chlorophyll GS nutrient spraying solution as shown in table 1. the highest rate of total chlorophyll was (70.0 SPAD unit) in C_3 treatment, while the reference treatment had the lowest-rate of the chlorophyll leaf content. The date of nutrient spraying (D3) has given the highest content of the leaves of chlorophyll with (70.6 SPAD unit), as for the interaction between spraying the solution and at its date, the results indicate that the interface treatment C_3D_3 recorded the highest leaf content of the total chlorophyll with (73.3 SPAD unit)compared to other treatments.

The content of nitrogen in leaves (%)

The highest nitrogen contents of 1.41% were found in leaves that had G_3 treatment which is significantly different from other treatments by 1.23%, furthermore the spraying dates have also increased the nitrogen contents specially D_3 which significantly exceeded D_1 1.36%. Moreover the interaction between the spraying dates of the nutrient solution concentrations also affected this trait ,as a result of this interaction treatment C_3D_3 showed the highest amount of nitrogen content 1.49%, while C_0D_1 interaction showed the lowest amount of nitrogen content in leaves with an amount of 1.19% as shown in Table 2

The content of phosphorus in leaves (%)

The nutrient solution has a significant effect on the phosphorus content in leaves, the treatments C_1, C_2 and C_3 gives the highest phosphorus content by 0.24%, while the reference treatment gave the lowest phosphorus content with amount of 0.18% as shown in Table 2. The results also indicate that the spraying dates did not have a significant effect on this trait, as well as the interaction effect presented that of C_3D_3 interference treatment has the highest content of phosphorus amounted to 0.29%, while the reference treatment C_0D_1 gave the less content of 0.17% as shown in Table 2.

The content of potassium in leaves (%)

The leaves contents of potassium were significantly affected by the spray treatments of the nutrient solution, the C_3 treatment gave the highest potassium content in leaves of 1.50%, while the reference treatment, which gave the lowest content of 1.30% as shown in table 3. The spraying dates was increase significantly in this trait especially for date D_3 that exceed date D_1, with heights potassium content of 1.44%. Moreover the interaction between the spraying dates of the nutrient solution concentrations also affected this trait, the interference treatment C_3D_3 recorded the highest leaves content of potassium amounted to 1.57%, while the treatment of interference C_0D_1 the lowest potassium content of 1.20% as shown in Table 3.

The content of zinc in leaves (mg.kg^{-1})

The C_3 treatment was recorded the highest zinc - containing for the leaves with 17.20 mg.kg^{-1} and by a significant difference to the reference treatment, which gave the lowest leaves content of zinc by 16.33 mg.kg^{-1} as shown in Table 3. The spraying dates were increase significantly in this trait especially for date D_3 that exceed date D_1, with heights Zinc content of 16.77 mg.kg^{-1}. Moreover the interaction between the spraying dates of the nutrient solution concentrations also affected this trait, the interference treatment C_3D_3 recorded the highest leaves content of potassium amounted to 17.47 mg.kg^{-1} while the treatment of interference C_0D_2 the lowest Zinc content of 16.26 mg.kg^{-1} as shown in Table 3.

The content of Manganese in leaves (mg.kg^{-1})

The C_3 treatment was recorded the highest Manganese - containing for the leaves with 2.16 mg.kg^{-1} and by a significant different to the reference treatment, which gave the lowest content of Manganese by 1.93 mg.kg^{-1} as shown in Table 4. The spraying dates was increase significantly in this trait especially for date D_3 that exceed date D_1, with heights Manganese content of 16.77 mg.kg^{-1}. Moreover the interaction between the spraying dates of the nutrient solution concentrations also affected this trait, the interference treatment C_3D_3 recorded the highest leaves content of Manganese amounted to 2.33 mg.kg^{-1} while the treatment of interference C_1D_{21} the lowest potassium content of 1.75 mg.kg^{-1} as shown in Table 4.

The content of iron in leaves (mg.kg^{-1})

The C_3 treatment was recorded the highest iron - containing for the leaves with 244.8 mg.kg^{-1} and by a significant different to the reference treatment, which gave the lowest content of Manganese by 209.4 mg.kg^{-1} as shown in Table 4. The results also indicate that the spraying dates and the interaction between the treatments did not have a significant effect on the iron content as showing in Table 4.

Table 1 **:** Effect of spraying schedules with nutrient solution and the interference between them on number of leaves and relative chlorophyll content (SPAD Unit) For Olive seedlings, season 2015.

	Number of leaves					**Relative chlorophyll in leaves (SPAD Unit)**				
	C_0	**C_1**	**C_2**	**C_3**	**Average**	**C_0**	**C_1**	**C_2**	**C_3**	**Average**
D_1	47.0	66.3	64.3	66.0	60.9	64.8	66.1	66.9	67.7	66.4
D_2	54.3	68.3	64.3	64.0	62.7	67.4	67.8	68.0	69.1	68.1
D_3	51.7	63.7	66.3	77.0	64.7	69.2	69.4	70.4	73.3	70.6
L.S.D5%	6.24				3.12	3.50				1.75
Average	51.0	66.1	65.0	69.0		67.1	67.8	68.4	70.0	
	3.60					2.05				

Table 2 : Effect of spraying schedules with nutrient solution and the interference between them on the nitrogen and phosphorus contents in the leaves from (%) For Olive seedlings, season 2015.

	phosphorus leaves Content (%)					**Nitrogen leaves Content (%)**				
	C_0	**C_1**	**C_2**	**C_3**	**Average**	**C_0**	**C_1**	**C_2**	**C_3**	**Average**
D_1	1.19	1.24	1.24	1.33	1.25	0.17	0.28	0.20	0.21	0.22
D_2	1.23	1.27	1.31	1.42	1.31	0.19	0.21	0.27	0.22	0.22
D_3	1.26	1.30	1.40	1.49	1.36	0.19	0.23	0.24	0.29	0.24
L.S.D5%	0.10				0.05	0.06				**N.S**
Average	1.23	1.27	1.32	1.41		0.18	0.24	0.24	0.24	
	0.06					0.04				

Table 3 : Effect of spraying schedules with nutrient solution and the interference between them on the potassium (%) Zinc (mg.kg^{-1}) contents in the leaves for Olive seedlings, season 2015.

	Potassium leaves content (%)					**Zinc leaves content (mg kg^{-1})**				
	C_0	**C_1**	**C_2**	**C_3**	**Average**	**C_0**	**C_1**	**C_2**	**C_3**	**Average**
D_1	1.20	1.29	1.33	1.44	1.31	16.44	16.39	16.51	16.95	16.57
D_2	1.34	1.35	1.40	1.49	1.40	16.26	16.44	16.66	17.17	16.63
D_3	1.35	1.38	1.46	1.57	1.44	16.30	16.51	16.79	17.47	16.77
L.S.D5%	0.12				0.06	0.23				0.11
Average	1.30	1.34	1.40	1.50		16.33	16.45	16.65	17.20	
	0.07					0.13				

Table 4 : Effect of spraying schedules with nutrient solution and the interference between them on the manganese and iron (mg.kg^{-1}) contents in the leaves for Olive seedlings, season 2015.

	Manganese Leaves Content (%) (mg.kg^{-1})					**Iron Leaves Content (mg.kg^{-1})**				
	C_0	**C_1**	**C_2**	**C_3**	**Average**	**C_0**	**C_1**	**C_2**	**C_3**	**Average**
D_1	1.91	1.75	1.83	1.95	1.86	1.91	1.75	1.83	1.95	1.86
D_2	1.89	1.97	2.07	2.19	2.03	1.89	1.97	2.07	2.19	2.03
D_3	2.00	2.18	2.25	2.33	2.19	2.00	2.18	2.25	2.33	2.19
L.S.D5%	0.26				0.13	**N.S**				**N.S**
Average	1.93	1.97	2.05	2.16		1.93	1.97	2.05	2.16	
	0.15					22.9				

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