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ROLE OF GROWTH REGULATORS NAA AND CPPU IN GROWTH CHARACTERISTICS OF OLIVE TRANSPLANTS

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Abstract

This study was conducted in Al-Nisour University College- Baghdad during 2018 growing season to investigate the influence of CPPU and IAA spray on 2 year's old trees of "Khudeiry" olive cultivar. This study included two treatments: three levels of spraying of NAA, 0 (N_0), 100 mg.L^{-1} (N_{100}) and 200 mg.L^{-1}(N_{200}) and four levels of spraying of cytokinins (CPPU), 0 (C_0), 5mg.L^{-1} (C_5), 10 mg.L^{-1} (C_{10}) and 20mg.L^{-1} (C_{20}) and their interaction. Treatments were replicated three times at factorial experiment in a RCBD. The number of transplants used was 36 trees. The interaction treatments were as follows: $T_1(N_0+C_0)$; $T_2(N_0+C_5)$; $T_3(N_0+C_{10})$; $T_4(N_0+C_{20})$; $T_5(N_{100}+C_0)$; $T_6(N_{100}+C_5)$; $T_7(N_{100}+C_{10})$; $T_8(N_{100}+C_{20})$; $T_9(N_{200}+C_0)$; $T_{10}(N_{200}+C_5)$; $T_{11}(N_{200}+C_{10})$; $T_{12}(N_{200}+C_{20})$. The experimental results showed that the interaction between NAA and CPPU rates displayed that 200mg.$L^{-1}$of NAA and 20 mg.CPPU.L^{-1} (T_{12}) appeared to the most potent treatment, as it gave the highest increased in stem diameter of 2.02 mm, highest shoot length of 9.37 cm, highest leaves area of 5429 cm^2, highest leaf iron content of 33.19 mg.kg^{-1}, highest leaf BRs content of 7.89 µg g^{-1} FW and highest leaves zeatin content of 38.23µg g^{-1} FW. The lowest value of these parameters was found in the N_0C_0 (T_1) treatment.

Keywords : NAA, CPPU, shoot length, leaves area, Olive.

Introduction

Olive is the fruit tree, which is economically important in the Oleaceae family and follows the Olea species. It was and still with economic importance especially in the life of peoples. Most scientists agree that the olive tree originated in the eastern Mediterranean. Its fruits are used as food and its leaves are extracted for medical preparations and its oil are used in cooking, making soap and cosmetics. Olive oil is one of the best vegetable oils because it protects against atherosclerosis, heart disease andit's contain high levels of Oleic acid, Linoleic acid and vitamin K (Kailis and Harris; Preedy and Watson, 2010). In 2016, the acreage of olive in the world reached about 10650068hectare, with production of 19267493 tons (FAO, 2016).The main producing countries are Spain then Greece, Italy, Turkey and Morocco (FAO, 2016).

Plant hormones (Phytohormones or growth regulators)have long been known for being closely involved in the fruit development and ripening (Seymour *et al*., 2013).During recent years, the uses of cytokinins like plant growth substances are in markets that are useful to overcome these problems if applied in appropriate dose and time manner. These are Plant growth regulators (PGR's). Plant growth regulators affect the physiology of plant growth and influence the natural rhythm of aplant. Naphthalene acetic acid, commonly abbreviated NAA is an organic compound, which is a planthormone in the auxin family and is an ingredient in many commercial horticultural products; it is also a rooting agent and used for the vegetative propagation of plants from stem and leaf cutting, NAA affects the physiological processes, growth, maturity and improving the quality of fruits (Al-Khafaji, 2014).Several studies have been conducted to determine the role of NAA in growth, leaf mineral and chlorophyll content, Abd El-Rhman *et al.* (2017) Mentioned that the foliar spray with NAA caused significant increase in shoots length, leaves number, leaves areaand leaves chlorophyll content especially at 40ppmin his study on mango trees. Hifny *et al.* (2017) reported thatthere was a positive correlation between the vegetative growth, and NAA concentrations of Washington Navel orange trees. Al-Qady *et al* (2018) They have studied the effect of spray three levels of NAA (0, 1000 and 2000) mg.L^{-1} and found the concentration of NAA at 1000 mg.L^{-1} caused significant increase in height and diameter of main stem, number of branches and leaves, leaf area, shoot dry weight, chlorophyll in leaf in Bashyki olive transplants.

Sitofex is one of plant growth regulators (N-(2 - chloro- 4-pyridinyl)- N'-Phenylurea) or (CPPU); common name sitofex) whichplays a role in cell division and cell wall elongation (Al-Khafaji, 2014). Al-Dulaimi (2015) Found thatfoliar spray with CPPU in three levels (0, 5 and10) mg.L^{-1} caused significant increase in leaves minerals content, leaves Zeatin content, leaves area and increased in stem diameter in "Aswad Diyala" fig trees. Al-Obeidi (2016) recorded that, highest leaves area, leaves mineral content and

shoots carbohydrates content it was in "Nebali" olive trees treated with CPPU as foliar spray. Hamdullah (2018) Mentioned that the foliar spray with 10 ppm of CPPU caused significant increase in shoot number, shoot length, stem diameter , leaves area and leaves mineral and hormonal content, compared with the control treatment in his study on Nebaliolive transplants. Therefore, due to few of similar studies in Iraq, this study aims to determine the effect of the growth regulators of BRs and CPPU on vegetative growth and mineral and hormonal content of olive transplants.

Materials and Methods

This study was conducted in Al-Nisour University College-Baghdad during 2018 growing season to investigate the influence of CPPU and IAA spray on 2 year's old trees of "Khudeiry" olive cultivar. This study included two treatments: three levels of spraying of NAA, 0 (N_0), 100 mg.L^{-1}(N_{100}) and 200 mg.L^{-1}(N_{200}) and four levels of spraying of cytokinins (CPPU), 0 (C_0), 5mg.L^{-1} (C_5), 10 mg.L^{-1} (C_{10}) and 20mg.L^{-1} (C_{20}) and their interaction. Treatments were replicated three times at factorial experiment in a RCBD. The number of transplants used was 36 trees. The interaction treatments were as follows: $T_1(N_0+C_0)$; $T_2(N_0+C_5)$; $T_3(N_0+C_{10})$; $T_4(N_0+C_{20})$; $T_5(N_{100}+C_0)$; $T_6(N_{100}+C_5)$; $T_7(N_{100}+C_{10})$; $T_8(N_{100}+C_{20})$; $T_9(N_{200}+C_0)$; $T_{10}(N_{200}+C_5)$; $T_{11}(N_{200}+C_{10})$; $T_{12}(N_{200}+C_{20})$.

The following parameters were determined in study season:

1. Increase in stem diameter (mm): Stem diameter were measured by (Vernier) at the beginning and end of the experiment, according to the difference between them and that such an increase in stem diameter.
2. Increased in Shoot length (cm): Taking four shoots of each experimental unit at the experiment beginning and measured annual shoots formed during the season in each unit empirical metric tape measure and mined the average branches length.
3. Shoot number.
4. Plant height: By metric measuring tape.
5. Leaves area: by estimated leaves number and leaf area(cm²) according to (Ahmed and Morsy, 1999) using the following equilibration: Leaf area = 0.53(length x width) + 1.66. then leaves area = leaves number x leaf area
6. Leaves mineral content: Leaves samples were collected for chemical analysis at the 2nd week of June. Each sample consisted of 10 leaves.$Tree^{-1}$. Leaves were washed with tap water, rinsed with distilled water, and then dried at 70 ºC until a constant weight, ground and digested according (Chapman, and Pratt, 1978). Iron; manganese and zinc were determined using atomic absorption as (Black, 1965).
7. Leaves hormonal content (zeatin, and brassinosteroids) were assayed according to (*Ŭnyayar et al.,* 1996).

The obtained results were subjected to analysis of variance according to (Elsahookie and Wuhaib, 1990) using L.S.D 0.05 for comparing differences between various treatment means.

Results and Discussions

Effects of NAA and CPPU spray on vegetative characters: The obtained results (Table 1) revealed that spraying olive transplants with NAA rates resulted in significant increase in stem diameter, shoot length, shoots number and leaves area, particularly at 200mg.L^{-1} rate as compared to untreated transplants. Olive transplants treated with 20 mg.CPPU.L^{-1} substantially significantly increased stem diameter, shoot length, shoots number and leaves area .Results indicated that the combination between NAA and CPPU rates displayed that 200mg.$L^{-1}$of NAA and 20 mg.CPPU.L^{-1}(T_{12}) appeared to the most potent treatment, as it gave the highest increased in stem diameter of 2.02 mm, highest shoot length of 9.37 cm, highest shoots number of 11.33 shoot. $plant^{-1}$ and highest leaves area of 5429 cm^2. Values in Table (1) show that plant height was not affected by NAA and CPPU spray.

The positive effects of NAA on vegetative growth may be due to the fact that NAA helps to increase the absorption of mineral elements from the soil and to benefit from plant growth, as well as to stimulate processes responsible for elongation and division of the cell (Taiz and Zeiger, 2006). Generally, these results are in harmony with those reported by Hussein (2015) and Al-Qady *et al.* (2018) when they worked on olive trees. These results are attributed to the effect of cytokinin in stimulate the formation of buds and increasing the number of leaves, by encouraging lateral branching and increased lateral buds, as well as the vital role of cytokinin in reducing the inhibitory effect of auxins in lateral buds (Gindia, 2003). These results are in agreement with those obtained by, (Al-Dulaimi, 2015) on figtrans plants; they found that the vegetative growth and leaves mineral and hormonal content positively correlated with cytokinin spray in histransplants.

Effects of NAA and CPPU spray on leaf mineral and hormonal content:

Data concerning the effect of treatments on leaves iron, zinc, manganese, BRs and zeatin content are listed in Table (2). The data cleared that NAA spray at 200mg.L^{-1} significantly increased and gave the highest leaf iron and zinc content and highest leaf BRs and

zeatin content, while NAA did not affect on leaf manganese content. Table (2) also shows that sprayed CPPU at levels 20mg.L^{-1} significantly superiority of the control treatment and gave the highest leaf iron and zinc content and highest leaf BRs and zeatin content. The interaction between NAA and CPPU significantly affected especially at 200mg.$L^{-1}$of NAA and 20 mg.CPPU.L^{-1} (T_{12}) as it gave the highest leaf iron content of 33.19 mg.kg^{-1}, highest leaf zinc content of 16.01mg.kg^{-1}, highest leaf BRs content of 7.89 µg g^{-1} FW and highest leaves zeatin content of 38.23µg g^{-1} FW. Values in Table (2) showed that leaf manganese content was not affected by NAA and CPPU spray.

The reason for these results may be due to increase growth as a result of foliar spray for NAA and its role in the division and cell elongation (Al-Khafaji, 2014),which leads to increased uptake of soil elements, thus increasing their content in the leaves. Generally, these results are in harmony with those reported by Hussein (2015) and Al-Qady *et al.* (2018) when they worked on olive trees. As for the effect of the CPPU had a significant effect on Fe, Zn, BRs and zeatin, may be due to CPPU role in stimulate new leaves this may have increased the production of hormones, especially since it is mainly built in the tops of shoots and leaves, also the direct addition of CPPU resulted in an increase of leaf zeatin. These results are in agreement with those obtained by, (Al-Hameedawi *et al.,* 2014 and Al-Dulaimi, 2015) on fig trees; they found that the leaves mineral and hormonal content positively correlated with cytokinins spray in those trees.

Table 1 : Effects of NAA and CPPU spray on vegetative characteristics of Khudeiry olive trees.

treatment		Stem diameter (mm)	Shoot length (cm)	Shoot number	Plant height (cm)	Leaves area (cm)
T_1		0.92	6.86	6.00	5.33	2506
T_2		1.15	6.96	7.00	5.36	2581
T_3		1.23	7.14	7.33	5.37	2811
T_4		1.41	7.82	7.67	5.36	3014
T_5		1.08	7.18	7.67	5.22	2881
T_6		1.38	7.28	8.00	5.23	3169
T_7		1.61	8.13	9.00	5.37	3560
T_8		1.64	8.28	10.33	5.32	4019
T_9		1.53	7.87	9.33	5.48	3588
T_{10}		1.79	8.38	10.00	5.40	4059
T_{11}		1.91	8.90	10.67	5.34	5027
T_{12}		2.02	9.37	11.33	5.51	5429
L.S.D 5%	N	0.11	0.30	0.63	N.S	99.11
	C	0.13	0.34	0.73	N.S	114.45
	Int.	0.22	0.59	1.26	N.S	198.22

Table 2 : Effects of NAA and CPPU spray on leaf mineral and hormonal content of Khudeiry olive trees.

Treatment		iron (mg.kg^{-1})	zinc (mg.kg^{-1})	manganese (mg.kg^{-1})	BRs (µg g^{-1} FW)	Zeatin (µg g^{-1} FW)
T_1		25.26	11.88	1.61	5.35	33.21
T_2		25.89	13.17	1.63	5.39	34.01
T_3		26.29	12.91	1.65	5.42	34.85
T_4		27.09	13.01	1.59	5.48	36.13
T_5		25.92	12.82	1.64	6.16	33.21
T_6		26.76	13.29	1.65	6.36	34.71
T_7		27.13	13.79	1.62	6.68	34.98
T_8		28.62	14.29	1.68	6.92	37.02
T_9		27.19	13.38	1.68	6.97	33.60
T_{10}		28.39	13.74	1.71	7.35	35.21
T_{11}		30.68	14.83	1.70	7.81	36.70
T_{12}		33.19	16.01	1.73	7.89	38.23
L.S.D 5%	N	0.75	0.27	N.S	0.33	0.48
	C	0.87	0.31	N.S	0.38	0.56
	Int.	1.50	0.53	N.S	0.66	0.96

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