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PHYSIOLOGICAL STUDIES ON FLOWERING AND FRUITING OF OLIVE TREES BY

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ABSTRACT

The experiment was carried out on Picual olive cultivar grown in new reclaimed soil in a private farm at Wady-El-Natron area, EL-Behira Governorate during two successive seasons 2004 and 2005 to study the response of two sources of potassium, phosphorous fertilization and application methods (soil and foliar application), either solely or in combination. The annual rates were 155, 344, 516, 688 cm³ P/tree/year as soil application of orthophosphoric acid, 688, 1032, 1376, 516 cm³ as foliar application of P/tree/year in the form of orthophosphoric acid, 480 gm K_2O of potassin /tree/year as foliar application and 480, 720, 960 K_2O gm /tree/year in form of potassium sulphate as soil application. All considered P and K rates were divided into 5 doses during February, March, April, May and June.

The control trees received 330, 155 and 480 gm N, P and K/tree/year respectively. The different treatments were used in this study were as following

1- Control (Normal program).
2- 410.0 gm $(NH_4)_2SO_4$ soil application + 155.0 gm P_2O_5 (1.0 kg supper phosphate) soil application+ 480.0 K_2O(1600 cm³ potassin foliar spray) / tree /year .
3- 410.0 gm $(NH_4)_2SO_4$ soil application + 344.0 cm³ $H_3P_2O_5$ soil application+688.0 cm³ $H_3P_2O_5$ foliar spray + 480.0 gm K_2O (K_2SO_4 soil application) / tree /year
4- 410.0 gm $(NH_4)_2SO_4$ soil application + 516.0 cm³ $H_3P_2O_5$ soil application +1032.0 cm³ $H_3P_2O_5$ foliar spray + 720.0 gm K_2O (K_2SO_4 soil application) / tree /year.
5- 410.0 gm $(NH_4)_2SO_4$ soil application+688.0 cm³ $H_3P_2O_5$ soil application+ 1376.0 cm³ $H_3P_2O_5$ foliar spray + 960.0 gm K_2O (K_2SO_4 soil application) / tree /year.
6- 410.0 gm $(NH_4)_2SO_4$ soil application+516.0 cm³ $H_3P_2O_5$ foliar spray + 480.0 gm K_2O (K_2SO_4 soil application) + 240 K_2O (potasin foliar spray) / tree /year.
7- 410.0 gm $(NH_4)_2SO_4$ soil application+ 516.0 cm³ $H_3P_2O_5$ foliar spray +240.0 K_2O (potasine foliar spray) +720.0 gm K_2O (K_2SO_4 soil application) /tree /year.

The results indicated that increasing level of P or K significantly enhanced shoot length, meanwhile raising level of P or K increased number of flowers/inflorcences, sex expression%, pollen grains germination% and all fruit quality. The best treatment is (5) 410.0 gm $(NH_4)_2SO_4$ soil application+688.0 cm³ $H_3P_2O_5$ soil application+ 1376.0 cm³ $H_3P_2O_5$ foliar spray + 960.0 gm K_2O (K_2SO_4 soil application) / tree /year.

INTRODUCTION

Olive tree (*Olea europeae. L*) is a major agricultural crop in the Mediterranean Basin. In Egypt, it is widely distributed and grown successfully under the prevailing condition. The planted area of olive is stretched to reach about 125369 feddans in Egypt according to the statistics of the Ministry of Agriculture 2006.

The newly reclaimed desert regions are generally, characterized with sandy soil of low water holding capacity and lack of potential fertility under such conditions, it is necessary to use the improved irrigation fertilization method (fertigation). Fertilization with NPK are the most widely applied nutrients (Sharaf *et al.*, 1984, Abbas 1999). Potassium is essential for the synthesis of amino acids, thus plants don't grow well in the absence of potassium (Bob, 2001).

Application of K. fertilization exerted a marked effect on olive growth (Sharaf *et al.*, 1984), Jasrotia *et al.* (1997) and Abbas (1999) and Emtithal *et al.* (2002). The foliar application of potassium sulphate either combined with urea or diammonium phosphate increased fruit set in Leccino olive cultivar (Frega *et al.*, 1995). Abbas (2005) mentioned that k and EM increased fruit weight. All soil nutrient elements improved both initial and final fruit set (Abbas 2005). Farid (1979) found that P-soil application was more effective than foliar application under the condition of sandy soil while under the condition of both calcareous and clay Lome soil P-foliar surpassed the P-soil treatment.

Abbas, (1999) reported that rising phosphorous fertilization increased the average stem length and diameter, number of shoots and leaves per plant and leaf area of Manzanillo olive seedling. Also, phosphorous caused increasing in capturing and converting the sun's energy into useful plant compounds as mentioned by (Bill 2001).

This experiment was conducted during the two successive seasons of 2004 and 2005 to study the response of two sources of potassium phosphorous, fertilization and application methods (soil and foliar application either solely or in combination on picual olive cultivar).

MATERIALS AND METHODS

The present investigation was conducted during two successive, (2004) and (2005) seasons, on 8-years old Picual olive trees. The trees have been grown in a private farm at Wady-ELNatroun area, El- Behira Governorate. The trees were planted at 6x6 meters apart. All trees under taken in this investigation were similar in growth vigour, healthy, apparently free from diseases and received the recommended amounts of irrigation water (80 to 100 L/tree/day in average according to environmental conditions) using drip irrigation system of sewage water. Sewage water analysis as presented in Table (1-a) declares that the quality of water is suitable to olive cultivation according to Benlloch *et al.* (1991).

The soil of the experimental orchard was classified as sandy in texture with a water table level over two meters deep. Before experiments had been conducted in 1st season, mechanical and chemical analysis of orchard soil from the successive depths of one profile: (60 cm) was determined according to the methods described by Piper, (1947) and Jackson (1967) as shown in Table (1- a & b).

Physical analysis (b):

Table (1-a): analysis of sewage water of Waddy EL-Natroun area.

Anions (mq / L)						
EC (mmhos/Cm)	**PH**	**CO_3**	**HCO_3**	**Cl**	**SO_4**	—
1.6	7.3	-	3.2	4.9	6.9	—
Cations (mq /L)	**NH_4N**	**PO_4-P**	**K+**	**Ca++**	**Mg++**	**Na+**
	20.6	7.0	11.3	139.0	28.3	146.0
Micro. elements (Mg / L)	**Fe**	**Mn**	**Zn**	**Pb**	**Co**	—
	3.84	40.0	135.0	« 2	« 2	

Table (1-b): Physical and chemical analysis of orchard soil from the successive depth of one profile (0-60 cm^3)

$CaCO_3$	Gravel %	Coarse sand %	Fine sand %	Total sand %	Silt %	Clay %	Soil Tixture
0.56	0.9	-	-	86.0	8.4	5.6	sandy

Table (2): Chemical analysis

Ec mmhos/ cm.	pH	O.C.%	O.M.%	Total N ppm	C/N Ratio	Cations mg / L				Anions mg / L			
						Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-}	HC_3^{-}	Cl^{-}	SO_4^{-}
7.1	7.5	2.07	0.21	54.3		83.0	50.1	99.1	3.8	---	5.3	91.0	139.7

O. C.: Organic Carbon. O. M.: Organic matter.

The annual fertilization program for this farm was as recommended by the Ministry of Agriculture are 0.06 Cubic meters of dairy manure, 410 grams of ammonium nitrate plus 600 grams of super phosphate (15.5 % P_2O_5) and 2 kg potassium sulphate (48.0 % K_2O) per tree /year added through drip irrigation system during January. This combination of fertilizers was considered as control in this study.

This experiment was conducted during the two successive seasons of 2004 and 2005.

According by the different treatments used in this concern were as Table (3).

The following parameters were determined in the two successive seasons.

1- **Vegetative growth measurement (shoot length):**

Four similar branches well distributed around the tree canopy were labeled in each season, fifteen shoots on each branch were selected and tagged. Average shoot length (cm) was calculated on both late April and October 30th.

Table (3): The applied treatments of the experiment conducted on picual olive trees during 2004 and 2005 seasons.

No. of Treatment	N Soil appli. gm /tree /year	P_2O_5 Cm³/tree /year		K_2O gm / tree /year	
		Soil appli.	Foliar appli.	Soil appli.	Foliar appli.
	$(NH_4)_2SO_4$ sources 20.5% N	$H_3P_2O_5$ 85% sources P_2O_5 cm³	$H_3P_2O_5$ 85% sources P_2O_5 cm³	K_2SO_4 48% sources K_2O gm	(Potasin) 30% sources K_2O cm³
*1	410.0	155.0	--	480.0	--
2	410.0	155.0	--	--	480.0
3	410.0	344.0	688.0	480.0	--
4	410.0	516.0	1032.0	720.0	--
5	410.0	688.0	1376.0	960.0	--
6	410.0	--	516.0	480.0	240.0
7	410.0	--	516.0	720.0	240.0

*1 Control. (Normal program).

2- **Flowering characteristics:**

The following parameters were estimated.

A) **Numbers of flowers / inflorescence:**

Numbers of flowers were estimated at full bloom according to treatments.

B) **Sex expression:**

Sex expression was calculated as a percentage of perfect flower to total number of flowers according to the following equation used by Fouad *et al.* (1992) as follows:

$$\text{Sex ratio percentage} = \frac{\text{No. of perfect flowers}}{\text{Total No. of flowers}} x100$$

C) Germinability of pollen grains:

Germination of pollen grains was evaluated after incubation for 24 hours at 25°C in Petri dishes vital liquid medium of 10 % sucrose, 0.01% boric acid and 10 ppm tetracycline.

The germination percentage was calculated (Escobar and Martin) (1987). 3- Yield and fruit characteristics:

A) Fruit set percentage:

Fruit set was recorded after 75% of petal fall. Data were tabulated as fruit set percentage of perfect flowers according to the following equation used by Fouad *et al.* (1992).

$$\text{Fruit set \%} = \frac{\text{No. of fruit set}}{\text{No. of perfect flowers}} x100$$

B) Yield:

Yield (Kg/tree) was recorded at the harvest date; this was carried out at mature stage for each tree and the average yield per treatment was calculated.

4-Fruit characteristics:

20 fruits from each tree were taken at random to determine the following characters: fruit length (cm), fruit diameter (cm), fruit weight (gm), flesh weight (gm) and the oil content (%) in dry weight were also determined according to the A.O.A.C. (1975).

5- Leaf mineral determination:

Representative samples of the 4th and 5th leaves from the base of twigs were collected from each replicate in midi July. The samples were thoroughly washed in the tap water, and oven dried at 70°C to a constant weight and finally ground for the following determinations:

A) Total nitrogen: It was determined by micro Kjeldahl Gunning method as described by Pregl (1945).

B) Phosphorus: It is determined calorimetrically by ascorbic acid (Murphy and Riely, 1962).

C) Potassium: It was measured against a standard using air propane flame Photometer. (Brown and Lilleland, 1946).

Statistical analysis of the data:

All data of the present investigation were subjected to analysis of variance and significant differences among means were determined according to (Snedecor and Cochran, 1977). In addition; significant differences among means were distinguished according to the Duncans, multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

1-Vegetative growth (shoot length):

In this regard, data are presented in Table (4). show that all the different treatments resulted in a significantly increase in shoot length of Picual olive trees during the two seasons of study.

However, the T_5 was more effective and surpassed statistically the six other treatments during both seasons of study. Data also show that the T_7 came in the second class. In addition, both T_4 and T_6 came in the third class; meanwhile both T_3 and T_2 treatments appeared to be less effective than above mentioned ones.

Generally, nutrient ((P and K) treatments significantly increased shoot length as compared with control trees with Picual olive trees.

Concerning potassium, the obtained results agree with the Previous findings of Sharaf *et al.* (1984); Jasrotia *et al.* (1997); Abbas, (1999) and Emtithal *et al.* (2002) all showed that potassium fertilization significantly resulted in improving vegetative parameters.

Table (4): Shoot length in cm. as response to two potassium sources, Phosphorous fertilization and method application (soil and foliar) of Picual olive trees during two successive 2004 and 2005 seasons.

Treatments	2004	2005	Average
*1	15.90E	17. 60E	16.75
2	16.80D	19.20D	18.00
3	16.95D	19.60D	18.27
4	19.68C	19.80C	19.74
5	21.80A	21.40A	21.60
6	19.60C	19.90C	19.75
7	20.30B	20.70B	20.50

*1 (Control program)

2-Flowering characteristics:

A) Number of flowers per inflorescence:

Data presented in Table (5) revealed obviously that all the different fertilization treatments resulted in a significant increase as compared with control treatment of picual olive trees in both seasons of study. In this respect, the T_5 gave the highest number of flowers/ inflorescence, followed by T_6 in both seasons. Both the T_4 and T_7 came in the second class; meanwhile, the T_3 came in the third class. In addition, the T_2 appeared to be no effective as the above mentioned ones during 2004 and 2005 seasons.

These results are in the same line with those of Abbas, (2005) who found that treatments with nutrient of N, P, K, Mg and EM improved the flowering density of olive trees. Sourour (2003) in Picual and Chemlali olive found that the application of potassium sulphate caused increase in the number of flowers per inflorescence.

B) Sex expression percentage:

Regarding the effect of the different treatments, data are presented in Table (5). It is quite evident that all the different treatments resulted in a significant increment in sex expression percentage of picual olive trees received any of the fertilization treatments as compared with the control during the two seasons of study.

Moreover, the T_5 had the highest value of sex expression percentage followed by the T_6 in both seasons. Both the T_4 and T_7 came in the third class; meanwhile the treatments T_3 and the T_1 were not effective as compared with control during the two seasons of study. These results are in general agreement with the findings of Abbas (2005) who found that treatments with N, P, K, Mg, and EM recorded the highest value of sex expression percentage.

C) Germination percentage of pollen grains:

Data presented in Table (5) disclose that picual olive trees treatments realized a significant increase in their germination (%) of pollen grains over the control treatment during 2004 and 2005 seasons as indicated in Table (5). The obtained data revealed that the T_5 resulted in the highest values followed by either the T_6 or the T_7 during the two seasons of study. The T_4 came in the third class, while the T_3 came in the fourth class, meanwhile the T_2 appeared to be not effective as compared with control in both seasons. These results agree with Okuse, (1994) on apple and Qin (1996) on orange mean and Abbas, (2005) on olive trees.

3-Fruit set percentage:

Obtained data in Table (6) showed that the picual olive trees were positively responded to the two potassium sources (K_2SO_4 & potasin), phosphorous, method of application and their combinations as compared with the control treatment during the two seasons of study. Generally, it could be noticed that the T_5 surpassed all other treatments under study and gave the highest value of fruit set (%) followed by the T_6. In addition, both the T_4 and the T_7 came in the third class; meanwhile, the T_3 appeared to be less effective than the above mentioned ones. In addition, the T_7 was not effective as compared with control during the study. These results go in paralled with those of sex expression.

Sourour (2003), Abbas (2005) reported that the effect of potassium and nitrogen fertilization on production of Chemlali and Picual cultivars; was significant increase in fruit set of treated trees supplied

Table (5): Variation in number of flowers/inflorescences, sex expression (%) and pollen grain germination (%) as response to two potassium sources, Phosphorous fertilization and method application (soil &foliar) of picual olive trees during two successive 2004 and 2005 seasons.

Treatment	Total no of flowers / inflourcences			Sex expression (%)			Pollen grains germination (%)		
	2004	2005	Average	2004	2005	Average	2004	2005	Average
*1	29.60E	19.02F	**24.31**	30.67E	25.96E	**28.32**	30.61F	28.02F	**29.32**
2	29.40E	19.30E	**24.35**	30.60E	25.80E	**28.20**	32.30E	30.05E	**31.18**
3	30.50D	21.40D	**25.95**	31.60D	27.10D	**29.35**	34.40D	32.10D	**33.25**
4	33.40C	26.85C	**30.13**	32.85C	29.15C	**31.00**	36.60C	33.55C	**35.08**
5	37.20A	29.70A	**33.45**	36.20A	39.00A	**37.60**	41.30A	36.20A	**38.75**
6	34.60B	27.50B	**31.05**	34.28B	34.70B	**34.49**	39.60B	34.70B	**37.15**
7	33.70C	26.75C	**30.23**	32.85C	29.28C	**31.06**	38.48C	33.90C	**36.19**

***1(Control program)**

4- Fruit characteristics and yield:

4.1. Yield (kg/tree):

Generally, the yield as estimated in the two seasons of study, Table (6) indicates that all treatments under investigation significantly improved the yield as compared with control in the two seasons. In this concern, the T_5 , T_6 and the T_7 resulted in the significant highest yield in the two seasons, followed by the T_4.The T_3 came in the third in both seasons, meanwhile, the T_2 appeared to be less effective than the above mentioned ones during 2004 and 2005 seasons.

These results are in general agreement with the findings of Abbas (2005) indicated that all soil nutrients with N, P, K, Mg, and EM increased both of initial and final fruit set.

Regarding to potassium, the results are in parallel with the finding of Jasrotia *et al.*, (1997) and Emtithal *et al.*, (2002) they noted that potassium fertilization improved the yield of olive trees

4.2. Oil content (%):

Data are presented in Table (6) disclosed that picual olive trees realized a significant increase in their fruit oil content over the control as they were fertilized with two sources of potassium, phosphorous, application methods and their combinations treatments. Such increase was significant during both seasons of study.

The T_4, T_5 and T_6 treatments, respectively resulted in increasing the fruit oil content (%). However, the differences, were negligible during both seasons. In addition, both T_3 and T_7 treatments came in the second class; meanwhile the T_2 appeared to be less effective than the above mentioned ones in both seasons.

The obtained results are supported by those previously mentioned by (Abbas 2005).

4.3. Flesh percentage:

The effect of the different treatments used on flesh (%) are presented in Table (6). It is obvious that the highest values were those of the T_4, T_5 and T_6 treatments during two seasons of study. On the other hand, the T_7 came in the second class; meanwhile, both the T_2 and T_3 appeared to be less effective than the above mentioned ones in both seasons. In this concern, Abbas (2005) found that, control trees or NF (Nil fertile) treatments recorded the lowest flesh (%) meanwhile, the highest flesh (%) in all cultivars under study were recorded in trees of either EM or phosphorous and magnesium treatments.

Table (6): Variation in Yield (kg) /tree and oil content (%) as response to two potassium sources, Phosphorous fertilization and method application (soil & foliar) of picual olive trees during two successive2004 and 2005 seasons

Treatment	Yield (kg) /tree			Oil content (%)			Flesh (%)		
	2004	2005	Average	2004	2005	Average	2004	2005	Average
*1	21.54E	14.26E	17.9	20.03D	20.06D	20.04	72.89E	78.94E	75.91
2	23.70D	16.50D	20.10	21.64C	21.90C	21.77	76.00C	81.80C	78.90
3	24.50C	18.70C	21.60	22.70B	22.10B	22.40	75.00D	80.80D	77.90
4	27.78B	20.40B	24.09	23.90A	23.89A	23.90	83.96A	86.50A	85.23
5	29.40A	22.00A	25.70	23.83A	23.90A	23.87	84.30A	85.40A	84.85
6	29.96A	22.10A	26.03	23.75A	23.95A	23.85	83.60A	85.90A	84.75
7	30.00A	22.00A	26.00	22.80B	22.60B	22.70	80.10B	83.43B	81.77

***1(control program)**

5. Fruit quality:

5. 1. Fruit length and diameter (cm):

Obtained data in Table (7) showed that all treatments gained a significant increase in their fruit dimensions (length & diameter) of picual olive trees over control in both 2004 and 2005 seasons. Moreover, the T_2 and T_5, as well as the T_6 treatments responded positively and had the highest values for fruit dimensions during the two seasons of study. In addition, the T_3 and the T_4 as well as the T_7 treatments appeared to be less effective than the above mentioned ones during the two seasons of study. In this respect, Abbas (2005) reported that potassium treatments significantly increased the elongation of Aggizi, Manzanillo and Kalamata olive cultivars.

5.2. Fruit weight (gm):

From the data presented in Table (7), it is clear that all the different fertilization treatments used resulted in an increase in fruit weight of picual olive trees over the control treatment during the two seasons of study.

Regarding the effect of both T_4 and T_5 treatments obtained data revealed that the two treatments gave the highest values in fruit weight followed by the other treatments, T_2, T_3, T_6 and T_7 during 2004 and 2005 seasons.

6. Leaf mineral content:

6.1. Leaf nitrogen content:

From the data presented in Table (8) it is clear from the data obtained that all treatments under investigation showed a significant increase in leaf-N content as compared with the control during 2004 and 2005 seasons. In this concern, both the T_4 and T_5 treatments gave the highest value of leaf-N content, followed by the T_3, T_6 and the T_7 treatments came in the second class; meanwhile, The T_2 treatment appeared to be less effective than the above mentioned ones in both seasons. These results are in harmony with that reported by Sharaf *et al.* (1984) Jardao *et al.* (1993), (1994), Sourour. (2003)

6.2. Leaf phosphorous content:

The data concerning the phosphorous content of leaf of picual olive trees as influenced by the differential treatments are presented in Table (8). It is clear from results obtained that P or K- fertilization, application method and their combination treatments caused a significant increase in leaf P-content in picual olive trees during 2004 and 2005 seasons. In this respect, both the T_5 and the T_6 treatments caused a high value of leaf P–content as compared with other treatments in both seasons. Moreover, both the T_4 and the T_7 came in the 3rd class; meanwhile, both T_3 and the T_2 appeared to be less effective than the above mentioned ones in both seasons. These results are in conformity with the findings of Sharaf *et al.*,(1984) who stated that phosphorus foliar sprays increased leaf P, Ca, Mg and Fe contents in both studied species (olive and guava). Also, Emtithal *et al.*, (2002), and Sourour (2003) reported that increasing potassium level increased leaf potassium content significantly of Manzanillo olive trees, Picual and Chemlali olives, respectively.

Table (7): Variation in fruit set (%), Fruit length, Fruit diameter (cm) and Fruit weight (gm) as response to potassium sources, Phosphorous fertilization and method application of picual olive trees during successive 2004 and 2005 seasons.

Treatments	fruit set (%)			Fruit length (cm)			Fruit diameter (cm)			Fruit weight (gm)		
	2004	2005	Average	2004	2005	Average	2004	2005	Average	2004	2005	Average
*1	28.52E	22.48E	25.50	2.53C	2.68C	2.61	1.40C	1.43C	1.41	4.70D	4.80D	4.75
2	28.58E	21.90E	25.24	2.84A	2.87 A	2.86	1.76 A	1.91A	1.84	5.92 B	5.97B	5.95
3	29.13D	25.35D	27.24	2.80 B	2.77 B	2.79	1.70 B	1.81B	1.76	5.93 B	6.01A	5.97
4	30.70C	27.60C	29.15	2.80 B	2.77 B	2.84	1.69B	1.81B	1.75	6.02 A	6.04 A	6.03
5	35.45A	29.65A	32.55	2.85A	2.89 A	2.87	1.72 A	1.90A	1.81	6.02 A	6.03A	6.02
6	32.20B	28.75B	30.48	2.83A	2.87A	2.85	1.75 A	1.92A	1.84	5.92 B	5.97 B	5.95
7	30.55C	27.75C	29.15	2.80B	2.75B	2.78	1.65 B	1.82B	1.74	5.93 B	5.98B	5.96

*1(control program)

6.3. Leaf potassium content:

It is clear from data in Table (8) that all six treatments under investigation caused significantly increased leaf K-content in picual olive trees during the two seasons of study. In this respect, The T_4, T_5 and The T_6 gave the highest value of K- content, followed by the T_7 treatment; meanwhile, both the T_3 and the T_2 appeared to be less effective than the above mentioned ones, respectively in both seasons. The results were previously confirmed by the findings of Farid, (1979) on Mission olive seedlings concluded that the addition of phosphorous fertilizer as soil or foliar applications had increased markedly the total K-content per olive seedlings. Beside, the total P-content / plant was also increased as the p was applied

Also, Emtithal *et al.*, (2002), and Sourour (2003) reported that increasing potassium level increased leaf potassium content significantly of Manzanillo olive trees, Picual and Chemlali olives, respectively.

Table (8): Leaf N, P, and K content in response to two potassium sources, phosphorous fertilization and method application of picual olive trees during two successive 2004 and 2005 seasons.

Treatments	N (%)			P (%)			K (%)		
	2004	2005	Average	2004	2005	Average	2004	2005	Average
*1	1.15D	1.20D	1.18	0.15E	0.16E	0.16	0.93E	0.85E	0.89
2	1.41C	1.39C	1.40	0.16D	0.17D	0.17	0.78D	0.71D	0.74
3	1.51B	1.47B	1.49	0.18C	0.20C	0.19	0.88C	0.78C	0.83
4	1.64A	1.53 A	1.58	0.20B	0.21B	0.21	0.93A	0.88A	0.91
5	1.60A	1.55A	1.58	0.21A	0.24A	0.23	0.96A	0.90A	0.93
6	1.50B	1.44B	1.47	0.21A	0.23A	0.22	0.93A	0.89A	0.91
7	1.51B	1.45B	1.48	0.20B	0.21C	0.21	0.90 B	0.85B	0.87

*1 (Control program)

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دراسات فسيولوجية على الأزهار والإثمار فى أشجار الزيتون

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تم تنفيذ هذه التجربة على أشجار الزيتون صنف البيكوال والمنزرعة فى الأراضى الجديدة فى مزرعة خاصة فى منطقة وادى النطرون بمحافظة البحيرة أثناء موسمى النمو ٢٠٠٤ و٢٠٠٥ وذلك بهدف دراسة إستجابة الأشجار لمصدرين تسميد فوسفاتى وبوتاسى وطرق الإضافة الأرضية والرش إما منفردة أومتحدة . وكان معدل الإضافة السنوى ١٥٥و٣٤٤و٥١٦ و٦٨٨ سم٣ فو/ شجرة /سنة كإضافة أرضية فى صورة حمض الفوسفوريك. وكذا ٦٨٨ و١٠٣٢ و١٣٧٦ و٥١٦ سم٣ فو/شجرة /سنة رشا على الأشجار مع ٤٨٠ بوا٢ فى صورة بوتاسين/شجرة /سنة رشا على الأشجار وكذا ٢٤٠و٤٨٠ و٧٢٠ و٩٦٠ بوا٢ كإضافة أرضية فى صورة سلفات البوتاسيوم .

كل من معدلات الفوسفور والبوتاسيوم تم تقسيمها إلى ٥ جرعات أثناء الفترة من فبراير حتى يونيو. وقد أضيف إلى أشجار الكونترول ٣٣٠ و١٥٥و٤٨٠ جم /شجرة /سنة نيتروجين وفوسفور وبوتاسيوم على التوالى. وكانت المعاملات كالتالى:

١- الكونترول

٢- ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية + ١٥٥ جم فو٢ ا٥ من السوبر فوسفات إضافة أرضية + ١٦٠٠ سم٣ من البوتاسين رشاً على الأشجار / شجرة / سنة .

٣- ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية + ٣٤٤ سم ٣ حمض فوسفوريك كإضافة أرضية + ٦٨٨ سم٣ حمض فوسفوريك رشاً على الأوراق + ٤٨٠ جم بو٢ا من سلفات البوتاسيوم كإضافة أرضية /شجرة /سنة

٤- ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية + ٥١٦ سم ٣ حمض فوسفوريك كإضافة أرضية +١٠٣٢ سم ٣ حمض فوسفوريك رشاً على الأوراق + ٧٢٠ جم بو٢ا من سلفات البوتاسيوم كإضافة أرضية /شجرة /سنة .

٥- ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية +٦٨٨ سم٣ حمض فوسفوريك إضافة أرضية +١٣٧٦ سم ٣ حمض فوسفوريك رشاً على الأوراق + ٩٦٠ جم بو٢ا من سلفات البوتاسيوم كإضافة أرضية /شجرة /سنة .

٦- ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية + ٥١٦ سم٣ حمض فوسفوريك رشاً على الأوراق +٤٨٠ جم بو٢ا من سلفات البوتاسيوم كإضافة أرضية + ٢٤٠ سم٣ بو٢ا من البوتاسين رشاً على الأوراق / شجرة / سنة .

٧- ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية + ٥١٦ سم٣ حمض فوسفوريك رشاً على الأوراق + ٢٤٠ سم٣ بو٢ا من البوتاسين رشاً على الأوراق + ٧٢٠ جم بو٢ا من سلفات البوتاسيوم كإضافة أرضية /شجرة /سنة .

وأشارت النتائج إلى أن زيادة الفوسفور أو البوتاسيوم قد ساعد على سرعة نموطول الأفرع وعدد الأزهار فى النورة والنسبة الجنسية وكذلك النسبة المئوية لإنبات حبوب اللقاح وجودة الثمار بصورة معنوية .

وكانت أفضل معاملة هى رقم (٥) وهى عبارة عن ٤١٠ جم أزوت من سلفات الأمونيوم إضافة أرضية +٦٨٨ سم٣ حمض فوسفوريك إضافة أرضية +١٣٧٦ سم ٣ حمض فوسفوريك رشاً على الأوراق + ٩٦٠ جم بو٢ا من سلفات البوتاسيوم كإضافة أرضية /شجرة /سنة.