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EFFECT OF SOIL APPLICATION OF DIFFERENT MINERAL AND BIOFERTILIZER TREATMENTS ON GROWTH, FRUITING PARAMETERS, FRUIT PROPERTIES AND LEAF NUTRIENT CONTENT OF "CANINO" APRICOT TREES

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ABSTRACT

The influence of soil application of some biofertilizers (Nitrobein (Ni), Enciabein (En), Phosphorene (Ph)) and Rock Phosphate (RP) on some vegetative growth, fruiting parameters, fruit properties and leaf mineral contents were studied on "Canino" apricot trees budded on local apricot rootstock grown in sandy soils during the two successive seasons of 2002 and 2003.

The obtained results indicated that all biofertilizers treatments under study resulted in a positive effect and significant increase in all vegetative growth measurements, i.e. shoot length, number of leaves per shoot, leaf area, leaf chlorophyll content, shoot thickness and shoot diameter increment %. Moreover, all investigated treatments significantly increased both tree yield (either kg or No. of fruits per tree) and yield increment % compared to the control (OMF). Additionally, data revealed that fruit physical properties such as fruit weight, volume, firmness, No. of fruits per kg, dimensions and fruit shape index as well as fruit chemical properties as TSS %, total acidity % and TSS/acid ratio were improved by different treatments in most cases as compared to the control. Furthermore, leaf nutrient (N, P and K) contents were significantly improved by studied treatments in both seasons of study.

Generally, it could be concluded that all investigated treatments under study resulted in a positive and significant effect, since both (OMF + Ni + En + Ph) and (OMF+Ni +En) were the best and the most effective treatments for increasing and improving all studied vegetative and fruiting characteristics of "Canino" apricot trees.

Keywords: Vegetative growth, Fruiting parameters, Fruit properties, Biofertilizers, Apricot, Leaf nutritional status..

INTRODUCTION

There are a general agreement that many problems facing fruit trees growers, one of them is the high cost of chemical fertilizers needed for fruit trees. In addition to that, the use of chemical fertilizers have an increased role in the health problems of mankind however, these are considered as polluting agent led to disturbance in the natural biological balance in the soil and accumulate in food chain causing hazardous effects for man.

Therefore, in the last few decades, biofertilizers for fruit trees has drawn the great attention of investigators and it became a positive alternative to chemical fertilizers. Thus, it is preferred to reducing the environmental pollution, salinity and decreasing the amounts of mineral fertilizers, then it reduced the cost of fertilizers and keep the environment clean for coming generations. Additionally, it increasing both the availability of various nutrients by trees and resistance of tree for diseases.

It is worthy to state that biofertilizers do not replace mineral fertilizers, but significantly reduce their of application (Ishac, 1989 and Saber, 1993). Some biofertilizers, i.e. Nitrobein, Phosphorene, Enciabein and Rock Phosphate are a multi – strain biofertilizers mainly consist of beneficial micro – organisms that can release nutrient elements from rocks and plant residues in the soil and make them available for trees (Subba Rao, 1984).

Furthermore, many studies and numerous attempts were done by several researchers to replace partially of N, P and K chemical fertilizers, using some biofertilizers, however they pointed out that the use of bio-stimulants significantly improved tree growth, leaf nutritional status, fruit properties and increased tree yield, Ahmed *et al*., (1997) and Akl *et al*., (1997) on grapevine; Mansour (1998) and Fathi *et al*., (2002) on apple; Mahmoud and Mahmoud (1999) on peach; Boutros *et al*., (1987 a & b) on citrus; Haggag *et al.,* (1995) on guava; Eissa (2003) and Shddad *et al*., (2005) on apricot and Abou Grah (2004) on persimmon trees,

Consequently, this investigation was initiated to elucidate the beneficial effect of using some biofertilizers as a trial to replace partially mineral fertilizers.

MATERIAL AND METHODS

The present study has been undertaken throughout the two consecutive growing seasons of 2002 and 2003 on eight-year-old of “Canino” apricot trees budded on local apricot rootstock, planted at 6 meters apart and grown in sandy soil under drip irrigation system in a private farm located at Wady El-Natroun region, Behaira Governorate, Egypt.

Trees used in this experiment were carefully selected to be healthy and nearly uniform as possible in growth vigour and size and receiving regularly the same other common cultural practices adopted in the orchard.

The different biostimulants treatments used in this study were as follows:

1- Control (ordinary mineral fertilization “OMF”).
2- (O.M.F.) + Nitrobein. (Ni) at 5 gms./tree.
3- (O.M.F.) + Enciabein. (En) at one kg./tree.
4- (O.M.F.) + Phosphorene (Ph) at 5 gms./tree.
5- (O.M.F.) + Ni + En. at 5gm + one kg/tree, respectively.
6- (O.M.F.) + Ni + En + Ph. at 5gms + one kg + 5 gms./tree, respectively.
7- (O.M.F. – 25 % from the recommended elemental nitrogen fertilizer) + Nitrobein (Ni) at 5 gms/tree.
8- (O.M.F. – 25 % from the recommended elemental phosphorus fertilizer) + Phosphorene (Ph) at 5 gms/tree.
9- (O.M.F. – 25 % from the recommended elemental phosphorus fertilizer) + Ph + (RP) Rock Phosphate at 5 gms + 3 gms/tree, respectively.

All biofertilizers treatments were added to soil inoculation however, Nitrobein was applied weekly from fruit set till harvest, while Enciabein, Phosphorene and Rock Phosphate were added once time after fruit set.

Four main branches well distributed on the tree (one on each direction) were tagged and the following parameters were determined:

(1) Vegetative growth characteristics: data were recorded and evaluated through determining the average of shoot length (cm), number of leaves per shoot, leaf area (cm^2) by using the planimeter, leaf chlorophyll content as SPAD reading using a chlorophyll meter model SPAD 502 USA, shoot thickness (cm) and net increase in shoot diameter % which calculated as the following equation:

$$\text{Net increase in shoot diameter (\%)} = \frac{2^{nd}\text{ reading (in Oct.)} - 1^{st}\text{ reading (in Apr.)}+}{1^{st}\text{ reading (in Apr.)}} \times 100$$

(2) Productivity of tree: the average yield/tree expressed either as kg/tree or number of fruits for each treatment was determined at the harvesting time, then yield increment percentage per treatment in relation to the control was estimated as the following equation:

$$\text{Yield increment (\%)} = \frac{\text{Yield /treatment} - \text{Yield / control}}{\text{Yield / control}} \times 100$$

(3) Fruit quality: samples of ten fruits at harvesting time from each replicate were collected and the following characters were measured: fruit physical characters including average fruit weight (gm), average fruit volume (ml), fruit firmness ($Ib/inch^2$) was determined using Magness and Tylor pressure tester with 7/18 inch plunger, number of fruits per kg, fruit dimensions (fruit height and diameter in mm) and fruit shape index (fruit height/diameter ratio). In addition, fruit chemical characters were determined including fruit juice TSS % by hand refractometer and fruit juice titratable acidity (%) as malic acid/100ml juice according to A O A C (1985) and Vogel (1968). Also, TSS/acid ratio was calculated.

(4) Leaf nutrient content: leaf contents of some macro-elements, i. e. (N, P and K) were determined. Total N was determined by micro-Kjeldahl method described by Pregl (1945), while total P determination was carried out colormeterically according to Murphy and Riely (1962).K was determined using the atomic absorption Spectrophotometer (3300) according to Jackson and Ulrich (1959) and Chapman and Pratt (1961).

Treatments were arranged in a complete randomized block design with three replicates for each treatment however, each replicate was represented by a single tree. All the obtained data in both seasons were statistically analyzed using the analysis of variance method according to Snedecor and Cochran (1990), whereas means were distinguished using the Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

1- Vegetative growth measurements:

Data presented in Table (1) revealed clearly that all studied vegetative growth parameters i.e. shoot length (cm), number of leaves per shoot, leaf area, leaf total chlorophyll content, shoot thickness and shoot diameter increment percentage responded significantly to the all investigated treatments as compared to the control in both 2002 and 2003 seasons of study in most cases. Moreover, data disclosed that the (OMF + Ni + En + Ph); (OMF + Ni + En) and (OMF + Ni) treatments had more stimulating effect as

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compared to the other biofertilizers treatments on vegetative growth measurements via producing longer and thicker shoots with higher number of leaves per shoot. Also, the same treatments resulted in the larger leaf area (cm^2) and highest values of leaf chlorophyll content as compared with the other biofertilizers treatments during the two seasons. In spite of differences in all growth parameters between tested treatments were significant, but the rate of response was greatly varied from one parameter to another, whereas the rate was more pronounced with shoot length, leaf area and leaf chlorophyll content, while with other parameters, i.e., number of leaves per shoot, shoot thickness and shoot diameter increment % the response was less pronounced. These findings are generally in accordance with that mentioned by Ahmed *et at*., (1997) on grapevines; Mansour (1998) on apple; Mahmoud and Mahmoud (1999) on peach; Abou Grah (2004) on persimmon and both Eissa (2003) and Shddad *et al*., (2005) on apricot trees.

2- Fruiting parameters: tree yield (as kg or No. of fruits/tree) and yield increment % in relation to the control.

Considering the tree yield as kg or number of fruits per tree in response to the investigated biofertilizers treatments, data in Table (2) indicated clearly that all studied treatments were used exhibited a significant increases in yield/tree in both 2002 and 2003 seasons as compared with the control treatment which was statistically the inferior as exhibited the least values of yield either kg or No. of fruits/tree. On the other hand, data showed that the (OMF + Ni + En + Ph) treatment induced statistically the greatest values of yield followed by (OMF + Ni + En) treatment. Moreover, the other treatments fell in between the two treatments abovementioned and control in descending order. Such trend was detected in the two seasons of study.

Table (2): Yield (kg or No. of fruits per tree) and yield increment % of "Canino" apricot trees in response to soil application with some biofertilizers treatments during both 2002 and 2003 seasons.

Treatments	Yield (Kg/tree)		Yield (No. of fruits /tree)		Yield increment % in relation to the control	
	2002	2003	2002	2003	2002	2003
Control "OMF"	36.60H	39.48G	1264D	1012D	00.00H	00.00H
OMF + Ni	48.19C	59.92C	1285D	1319B	31.68C	51.77C
OMF + En	45.53D	56.34D	1258D	1270BC	24.36D	42.65D
OMF + Ph	43.39E	48.63E	1162E	1101C	18.56E	23.13E
OMF + Ni + En	53.56B	62.83B	1407B	1386B	46.20B	59.10B
OMF + Ni + En + Ph	59.42A	67.64A	1512A	1449A	62.37A	71.28A
(OMF - 25 % N) + Ni	41.26F	45.37F	1133E	1058C	12.65F	14.88F
(OMF - 25 % P) + Ph	39.47G	44.07F	1305C	1023CD	7.81G	11.65G
(OMF - 25% P) + Ph+ RP	40.72FG	45.20F	1196E	1066C	11.25F	14.50F

Means followed by the same letter`s within each column are not significantly different from each other at 0.05 level.
(OMF) = Ordinary mineral fertilization . (Ni) = Nitrobein.
(En) = Enciabein. (Ph) = Phosphorene. (RP) = Rock. Phosphate

With respect to the yield increment % in relation to the control, results in the same Table indicated obviously that the response typically followed the same trend previously detected with aforesaid tested two fruiting measurements during both 2002 and 2003 seasons. Furthermore, the differences between all biofertilizers investigated treatments were significant in most cases as they were compared to each other pertaining their effectiveness on the abovementioned studied three fruiting parameters. This trend was true in the first and second seasons. These results are in harmony with that mentioned by several investigators, Akl *et at*., (1997), Mansour (1998), Fathi *et al*., (2002), Eissa (2003), Abou Grah (2004) and Shddad *et al*., (2005) on different deciduous fruit trees.

3- Fruit properties:

Tabulated data in Tables (3, 4 & 5) show the effect of different investigated biofertilizers treatments on both physical and chemical fruit properties of “Canino” apricot during 2002 and 2003 seasons of study.

3-1- Fruit physical properties:

3-1-a- Fruit weight and volume:

Referring the response of both fruit weight (gm) and fruit volume (ml) to the effect of biofertilizers treatments under study, data in Table (3) demonstrated that both studied fruit characters were affected significantly by all investigated biofertilizers treatments in the two seasons of study as compared to the control treatment, which resulted statistically the lightest weight and the smallest volume of apricot fruits. On the other hand, the heaviest fruit weight and biggest fruit volume were statistically exhibited with the (OMF + Ni + En + Ph) treatment, which was superior. However, the other treatments recorded in between values with tendency of variability in their effectiveness compared to the aforesaid two extents. Such trends were detected in the first and second seasons of study. The obtained data are in agreement with those mentioned by Mansour (1998) on apple; Fathi *et al*., (2002) on apple and peach; Eissa (2003) on apricot; Abou Grah (2004) on persimmon and Shddad (2005) on apricot fruits.

3-1-b- Fruit firmness (Ib/inch^2):

Data in Table (3) indicated clearly that an obvious decrease in fruit flesh firmness was generally exhibited with adding Nitrobein (Ni), since the (OMF + Ni) treatment induced significantly the most softened fruits as compared to those of the other treatments including the control. The opposite trend was detected with the (OMF + En) treatment, however induced fruits having firmer flesh texture than the other treatments. Furthermore, the other studied treatments including the control produced not only an intermediate values but also similar effect from the statistical standpoint between most treatments in this respect. Such trend was true throughout both 2002 and 2003 seasons. These results are in a complete agreement with those reported by Ahmed *et al*., (1997) and Akl *et al*., (1997) on grapevines; Abou Grah (2004) on persimmon and Shddad *et al*., (2005) on apricot.

3-1-c- Number of fruits per kg.:

Regarding the number of fruits per kg as influenced by the differential treatments used, data in Table (3) shows obviously that all investigated treatments in both 2002 and 2003 seasons resulted in a significant decrease in number of fruits/kg, except with the (OMF – 25 % P + Ph) treatment as compared to the control trees. Moreover the lowest number of fruits per kg were noticed with the (OMF + Ni + En + Ph), (OMF + Ni + En) and (OMF + Ni) treatments in the first season while, with treatment of (OMF + Ni + En + Ph) in the second one, respectively. On the contrary, control treatment had the highest number of fruits per kg. in both seasons. The remained treatments were in between the two mentioned categories however, the differences between the rest treatments were absent from the standpoint of statistical analysis in most cases. The present data are in accordance with the findings of Fathi *et al*., (2002) and Shddad *et al*., (2005) on apple, peach and apricot fruits.

3-1-d- Fruit dimensions:

Concerning the fruit dimensions (fruit height and diameter in mm) in response to the different investigated treatments under study. It is evident from data in Table (4) that both fruit height and fruit diameter were increased by all tested treatments in both seasons. Differences were significant as compared to the control. Since, the highest values of fruit height (40.00 and 42.03 mm.) were always in concomitant to such fruits produced by trees treated with (OMF + Ni + En) and (OMF + Ni + En + Ph) treatments in both seasons, respectively.

With regard to fruit diameter, data in the same Table revealed that both (OMF + Ni) and (OMF + Ni + En) treatments exhibited statistically the highest values of fruit diameter, i.e. (42.17 and 41.67 mm) in the first season, whereas in the second one treatment of (OMF + Ni) was significantly the superior. Moreover, the control treatment resulted statistically in the least values of both fruit height and diameter during both 2002 and 2003 seasons. In addition to that, other treatments were in between the abovementioned two extents with various tendency of response during the two seasons of study.

The obtained data are in conformity with those previously reported by Mansour *et al*. (1998); Fathi *et al*., (2002); Eissa (2003) and Shddad *et al*., (2005) on apple, peach and apricot trees.

3-1-e- Fruit shape index:

Referring fruit shape index (fruit height/fruit diameter ratio as influenced by the different biofertilizers treatments were used, data in Table (4) displayed clearly that the trend was not so firm to be the same during the two seasons. It could be noticed that trees subjected to the (OMF + Ph) and control (OMF) treatments induced fruits with the highest values of fruit shape index as compared to the other investigated treatments in both 2002 and 2003 seasons, respectively. On the contrary, apricot trees received the (OMF + En) in the first season and both (OMF + Ni) and (OMF + En) in the second one significantly exhibited the least value in this concern. In addition, other studied treatments produced an intermediate values from standpoint of statistically. These results go in line with that mentioned by Fathi *et al*., (2002) on apple and peach; Eissa (2003) on apricot and Abou Grah (2004) on persimmon.

Table (3): Fruit weight, volume, firmness and No. of fruits/kg. of "Canino" apricot fruits in response to the various soil application of biofertilizers treatments during both 2002 and 2003 seasons.

Treatments	Fruit weight (gms.)		Fruit volume (ml.)		Fruit firmness (lb/inch2)		Number of fruits/kg.	
	2002	2003	2002	2003	2002	2003	2002	2003
Control "OMF"	28.87D	38.97E	25.53C	35.83D	9.17BC	8.85B	34.63A	25.57A
OMF + Ni	37.67AB	45.47AB	35.57A	43.87A	8.20E	8.04C	26.70AC	22.06C
OMF + En	36.47B	44.17B-D	33.30A	40.33BC	10.17A	9.33A	27.57BC	22.70C
OMF + Ph	37.07AB	45.10A-C	33.67A	39.33AB	8.40DE	8.89AB	27.09BC	22.64C
OMF + Ni + En	38.40AB	45.53AB	35.77A	42.13A-C	9.27BC	9.12AB	26.23C	22.01C
OMF + Ni + En + Ph	39.17A	46.87A	33.30A	44.23A	8.90CD	8.21C	25.52C	21.42D
(OMF - 25 % N) + Ni	35.90BC	43.33B-D	32.20AB	41.00A-C	8.07E	8.11C	27.53BC	23.32B
(OMF - 25 % P) + Ph	30.47D	42.40D	25.67C	39.57BC	8.90CD	8.97AB	32.93A	23.26B
(OMF - 25% P) + Ph+ RP	33.67C	42.60CD	29.00BC	38.87C	9.63AB	9.16AB	29.47B	23.58B

Means followed by the same letter`s within each column are not significantly different from each other at 0.05 level.
(OMF) = Ordinary mineral fertilization .
(Ni) = Nitrobein. **(En) = Enciabein.**
(Ph) = Phosphorene. **(RP) = Rock. Phosphate**

Table (4): Fruit dimensions and fruit shape index of "Canino" apricot fruits in response to soil application with the different biofertilizers treatments during both 2002 and 2003 seasons.

Treatments	Fruit height (mm.)		Fruit diameter (mm.)		Fruit shape index	
	2002	2003	2002	2003	2002	2003
Control "OMF"	37.00D	39.37D	38.33e	38.63D	0.97BC	1.02A
OMF + Ni	39.33AB	41.00A-C	42.17a	42.67A	0.93E	0.96D
OMF + En	38.33BC	39.67CD	40.43bc	41.20BC	0.94D	0.96D
OMF + Ph	39.33AB	40.70B-D	39.17de	40.77C	1.00A	1.00B
OMF + Ni + En	40.00A	41.50AB	41.67a	42.00AB	0.96C	0.99BC
OMF + Ni + En + Ph	39.10A-C	42.03A	39.80cd	42.00AB	0.98B	1.00B
(OMF - 25 % N) + Ni	39.33AB	40.47B-D	40.80b	41.67A-C	0.96C	0.97CD
(OMF - 25 % P) + Ph	38.00CD	40.13cd	39.33D	40.60C	0.97BC	1.00B
(OMF - 25% P) + Ph+ RP	38.67BC	39.70cd	40.33BC	41.67A-C	0.95CD	0.94E

Means followed by the same letter`s within each column are not significantly different from each other at 0.05 level.
(OMF) = Ordinary mineral fertilization .
(Ni) = Nitrobein. **(En) = Enciabein.**
(Ph) = Phosphorene. **(RP) = Rock. Phosphate**
Fruit shape index = Fruit height/fruit diameter.

3-2- Fruit chemical properties:

3-2-a- Fruit juice TSS %:

It could be observed from data in Table (5) that fruit juice TSS % was responded significantly to the various treatments as compared with the control under study. Since, the greatest values of fruit juice TSS % (14.70 and 15.07 %) were always in concomitant to these trees subjected to the (OMF + Ni + En + Ph) treatment. The opposite trend was detected with trees received the control (OMF) treatment which exhibited the poorest fruits in their content of TSS % and the least values (9.50 and 9.87 %) in this respect. On the other hand, the remained treatments came in between the abovementioned two extents. Such trend was true during both 2002 and 2003 seasons.

3-2-b- Fruit juice total acidity %:

Data in Table (5) declared obviously that all investigated biofertilizers treatments produced fruits had significantly the lowest values in juice acidity % as compared to the control treatment in both seasons, except with the (OMF+Ni) treatment in the first season only, this treatment resulted in an insignificant differences than the control. However, both (OMF+ En) and (OMF+Ni+En+ Ph) treatments were the most effective in reducing percentage of total acidity, whereas the least values of fruit juice acidity % were recorded. Additionally, the other rest treatments were in between with tendency of variability in their effectiveness.This trend was detected throughout the two seasons of study.

3-2-c- TSS / acid ratio:

Data in Table (5) displayed clearly that TSS/acid ratio was greatly affected by different tested biofertilizers treatments which exhibited a significant increases in TSS/acid ratio in both seasons as compared to the control treatment. Furthermore, data showed that providing apricot trees with (OMF + En) treatment induced statistically the greatest value of TSS/acid ratio in apricot fruits, followed by the (OMF + Ni + En + Ph) treatment. However, the opposite trend was found with trees subjected to the control treatment which showed statistically the least value in this concern. Moreover, other tested treatments recorded intermediate values. Such trend was true during both 2002 and 2003 seasons.

Data obtained regarding the response of fruit juice TSS %, acidity % and TSS/acid ratio to tested biofertilizers treatments under study are in accordance with those previously reported by Akl *et al*., (1997) on grapevine; Fathi *et al*., (2002) on peach and apple; Abou Grah (2004) on persimmon; Eissa (2003) and Shddad *et al*., (2005) on apricot fruits.

4- Nutritional status (leaf mineral content):

With respect to leaf N, P and K contents in response to the investigated treatments of the different biofertilizer treatments during both 2002 and 2003 seasons, it is quite evident from the data tabulated in Table (6) that all tested treatments significantly increased the leaf contents of N, P and K as compared with the control treatment in the two considered seasons. Data pointed out that the highest values of leaf N content was closely related to trees treated with both (OMF + Ni) and (OMF + Ni + En) treatments,

Table (5): Fruit juice TSS %, total acidity % and TSS/acid ratio of "Canino" apricot cv. As influenced by the different soil applications of biofertilizers treatments during both 2002 and 2003 seasons.

Treatments	TSS (%)		Total acidity (%)		TSS/acid ratio	
	2002	2003	2002	2003	2002	2003
Control "OMF"	9.50E	9.87H	0.79A	0.76A	12.12F	13.08G
OMF + Ni	11.33D	11.63F	0.77A	0.70B	14.59E	16.54E
OMF + En	13.67B	13.27C	0.58C	0.57G	23.55B	23.33B
OMF + Ph	13.33B	13.30C	0.70B	0.68C	18.97C	19.47D
OMF + Ni + En	13.67B	14.13B	0.70B	0.69BC	19.51C	20.39C
OMF + Ni + En + Ph	14.70A	15.07A	0.59C	0.61F	24.88A	24.74A
(OMF - 25 % N) + Ni	10.67D	10.93G	0.70B	0.69BC	15.21D	15.78F
(OMF - 25 % P) + Ph	12.60C	12.70E	0.68B	0.66D	18.60CD	19.15D
(OMF - 25% P) + Ph+ RP	13.00BC	12.90D	0.68B	0.64E	19.07C	20.19C

Means followed by the same letter`s within each column are not significantly different from each other at 0.05 level.
(OMF) = Ordinary mineral fertilization . (Ni) = Nitrobein.
(En) = Enciabein. (Ph) = Phosphorene. (RP) = Rock. Phosphate
Fruit shape index = Fruit height/fruit diameter.

Table (6): Leaf N, P and K contents of "Canino" apricot trees in response to soil application with some biofertilizers treatments during both 2002 and 2003 seasons.

Treatments	N (%)		P (%)		K (%)	
	2002	2003	2002	2003	2002	2003
Control "OMF"	1.39G	1.57G	0.118D	0.131H	1.23E	1.28G
OMF + Ni	2.38A	2.58A	0.146BC	0.179DE	1.55B	1.64BC
OMF + En	1.93D	2.08D	0.131CD	0.143GH	1.59B	1.66BC
OMF + Ph	1.85E	1.95E	0.196A	0.234B	1.38D	1.46EF
OMF + Ni + En	2.17B	2.43B	0.137C	0.168EF	1.72A	1.78A
OMF + Ni + En + Ph	2.10C	2.33C	0.150BC	0.187D	1.67A	1.70B
(OMF - 25 % N) + Ni	2.03C	2.15D	0.138C	0.157FG	1.44C	1.58CD
(OMF - 25 % P) + Ph	1.70F	1.85F	0.159B	0.217C	1.37D	1.43F
(OMF - 25% P) + Ph+ RP	1.64F	1.78F	0.211A	0.262A	1.41CD	1.52DE

Means followed by the same letter`s within each column are not significantly different from each other at 0.05 level.
(OMF) = Ordinary mineral fertilization . (Ni) = Nitrobein.
(En) = Enciabein. (Ph) = Phosphorene. (RP) = Rock. Phosphate

meanwhile the richest leaves in their P contents were statistically exhibited from both (OMF+Ph+ PR) and (OMF + Ph) treatments. However, the highest values of leaf K content were recorded for apricot trees subjected to the (OMF + Ni + En), (OMF+ Ni + En + Ph) and (OMF + En) treatments.

On the other hand, the control (OMF) treatment showed the opposite trend which gave the poorest leaf content and least values of the studied macro-elements (N,P and K).In addition to that,the other biofertilizer treatments exerted statistically an intermediate values in this concern. Such trend was detected during the two seasons of study.The present results are generally supported by findings of Boutros *et al*.,(1987 a& b) and Izquierdo *et al*., (1993) on citrus; Haggag *et al*.,(1995) on guava; Ahmed *et al*., (1997) on grapevine; Abou Grah (2004) on persimmon; and Shddad *et al*., (2005) on apricot trees.

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تأثير الإضافة الأرضية للمعاملات المختلفة من التسميد المعدنى والحيوى على صفات النمو وقياسات الأثمار وخصائص الثمار ومحتوى الورقة من العناصر الغذائية لأشجار المشمش صنف "كانينو"

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أجريت هذه الدراسة خلال موسمى ٢٠٠٢، ٢٠٠٣ على أشجار المشمش صنف كانينو والمطعومة على أصل مشمش بلدى والنامية فى أرض رملية بهدف دراسة تأثير الإضافة الأرضية لبعض الأسمدة الحيوية وهى [النيتروبين (Ni) – الأنسيابين (En) – الفوسفورين (Ph)] و صخر الفوسفات (RP) على بعض صفات النمو الخضرى وقياسات الأثمار وجودة الثمار وكذلك محتوى الأوراق من العناصر الغذائية.

أشارت النتائج المتحصل عليها إلى أن كل معاملات التسميد الحيوي المدروسة كان لها تأثير إيجابى وأدت إلى زيادة معنوية لكل قياسات النمو الخضرى (طول الفرع – عدد الأوراق / الفرع - مساحة الورقة – محتوى الورقة من الكلوروفيل – سمك الفرع وكذلك النسبة المئوية للزيادة فى سمك الفرع).

كما أوضحت النتائج أيضاً أن كل المعاملات تحت الدراسة أدت إلى زيادة معنوية لمحصول الشجرة سواء كجم/شجرة أو عدد الثمار/شجرة وأيضاً الزيادة المئوية لمحصول كل معاملة مقارنة بالكنترول. أضافة إلى ذلك دلت النتائج أن كل من الصفات الطبيعية للثمار مثل (وزن الثمرة – الحجم – الصلابة – عدد الثمار/كجم – أبعاد الثمرة وكذلك معامل شكل الثمرة) والصفات الكيماوية مثل (النسبة المئوية للمواد الصلبة الذائبة الكلية والحموضة الكلية والنسبة بينهما) قد تحسنت نتيجة المعاملات المختلفة من التسميد الحيوى فى معظم الحالات مقارنة بمعاملة الكنترول. كما تحسن المحتوى الغذائى للأوراق معنوياً لعناصر (النيتروجين – الفوسفور – البوتاسيوم) نتيجة المعاملات المدروسة فى كلا موسمى الدراسة.

وبصفة عامة يمكن القول بأن كل معاملات التسميد المستخدمة أدت إلى تأثير ايجابى ومعنوى وأن كلا المعاملتين (التسميد المعدنى العادى + النيتروبين + الأنسيابين + الفوسفورين)، (التسميد المعدنى العادى + النيتروبين + الأنسيابين) كانتا أفضل وأكثر المعاملات فعالية فى تحسين وزيادة كل الصفات المدروسة سواء الصفات الخضرية أو الخصائص الثمرية لأشجار المشمش الكانينو.

Table (1):Some vegetative growth measurements of "Canino" apricot trees in response to the different soil application of different treatments during both 2002 and 2003 seasons.

Treatments	Shoot length (cm)		Number of leaves per shoot		Leaf area (cm²)		Total chlorophyll (SPAD) reading		Shoot thickness (cm)		Net increase in shoot diameter (%)	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Control "OMF"	34.63F	38.10G	51.50E	57.80G	37.3H	40.3F	37.4G	39.9H	1.61D	2.33F	17.83D	22.26D
OMF + Ni	53.80C	61.73B	92.00B	86.10C	46.8C	48.4B	43.5C	45.8C	1.79B	2.60C	24.63C	31.87B
OMF + En	42.97E	47.23F	61.30D	73.70F	38.4G	43.6E	41.0F	42.4G	1.67C	2.55E	18.40D	27.21C
OMF + Ph	46.27D	49.87E	62.00D	74.70E	44.7E	45.4D	42.0E	43.0F	1.66CD	2.59CD	18.83D	28.80C
OMF + Ni + En	58.33B	63.13B	92.50B	88.20B	48.5B	51.4A	46.4B	47.8B	1.88A	2.65B	26.33B	33.90B
OMF + Ni + En + Ph	64.57A	68.10A	96.60A	98.20A	52.6A	49.1B	47.8A	51.2A	1.77B	2.84A	28.53A	36.28A
(OMF - 25 % N) + Ni	51.50C	56.07C	66.50C	80.40D	45.7D	46.6C	41.2F	43.7E	1.68C	2.57DE	18.90D	29.32C
(OMF - 25 % P) + Ph	41.73E	45.60F	61.50D	72.90F	42.9F	44.0E	40.7F	42.9F	1.64CD	2.54E	18.47D	27.80C
(OMF - 25% P) + Ph+ RP	47.47D	52.39D	62.80D	75.20E	43.6F	45.6D	42.6D	44.9D	1.69C	2.57DE	19.27D	29.60C

Means followed by the same letter`s within each column are not significantly different from each other at 0.05 level.
(OMF) = Ordinary mineral fertilization . (Ni) = Nitrobein. (En) = Enciabein. (Ph) = Phosphorene (RP) = Rock Phosphate .