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Partial Substitution of Chemical Fertilization of Canino Apricot by Bio and Organic Fertilization

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ABSTRACT

The present study was carried out during two consecutive seasons (2013 and 2014) on ten years old "Canino" apricot trees (*Prunus armeniaca*, L) in a private orchard at El-Nubaria, Behaira Governorate, Egypt, to study the effect of mineral (NPK), organic (compost) and bio-fertilizer on vegetative growth, leaf chemical constituents, flowering, fruiting, yield and fruit quality of "Canino" apricot trees as a trial to minimize the use of chemical fertilizers. The obtained results showed that the highest values of trunk diameter increase, number of branches/tree, shoot length and shoot diameter were scored by control treatment, i.e. 100% of chemical NPK fertilization (F1). Also, F1 and 75% NPK + 10 ton compost + bio (F8) treatments showed to be the most effective ones for inducing the highest leaf photosynthetic pigments (chlorophyll a , b and carotenoids) in the two seasons. As for the number of leaves/shoot, leaf area (cm^2) and leaf dry weight (mg) were behaved as the same as the above mentioned growth aspects, since F1 and F8 were being the most pronounced treatments in this respect. Moreover, the highest values of leaf N, P and K contents of apricot trees were recorded by F1and F8 treatments. Meanwhile, the highest values of leaf Ca and Mg contents were accompanied with F8 and 75% NPK + 5 ton compost + bio (F7) treatments in the two seasons. Furthermore, the highest leaf Fe, Zn and Mn contents were scored by F1 or F8-fertilized trees in the two seasons. The highest records of flower number/spur, spurs number/branch and blooming spurs (%) were scored by F1-fertilized tree, whereas the highest values of fruit set (%) and fruit retained/tree (%) were registered by F8-fertilized tree. The highest values of fruits yield/tree, fruits number/tree, fruit weight and fruit size were recorded by F1 and F8 treatments in the two seasons. However, the highest values of fruit length, fruit diameter, fruit shape index, flesh thickness and seed weight were registered by F1-fertilized trees. In addition, fruit quality of apricot trees i.e., firmness, T.S.S, acidity, T.S.S/ acid ratio and total sugars (%) were greatly affected by the studied fertilization in both seasons.

Key words: Canino apricot, organic fertilizer, bio- and chemical fertilizers, growth, fruiting, yield and quality.

Introduction

Apricot (*Prunus armeniaca* L.) is one from the species of genus Prunus, classified with the Prunoidae Sub family of Rosaceae family. Fruits apricot are being not only consuming fresh but also produce dried apricot, frozen apricot, jam, jelly, marmalade, pulp, juice nectar dried and extrusion products etc. Also, apricot kernel is used in production of oil, benzaldhyde, cosmetics, active carbon and aroma perfume (Yildiz, 1994).

Continuous use of chemical fertilization leads to deterioration of soil characteristics and fertility, and accumulation of heavy metals in plant tissues, affecting the fruit nutritional value and edibility (Tamara *et al.,* 2005). There is a general agreement that nutrition is one of the most effective factors affecting tree growth, yield, and fruit quality, (Kassem and Marzouk, 2002), however the high cost of mineral fertilization is a big problem facing fruit tree growers. In addition, the recent research revealed that mineral fertilizers have a role in the health problems and environmental pollution. Moreover, agriculture lands are impoverished and it's necessary to apply high doses of agrichemicals, which in term pollute significantly the ecosystem. In order to make agriculture sustainable, it is necessary to implement a balanced and responsible use of organic agriculture and the other available natural resource, (Kabeel *et al*., 2005). In addition, most of the Egyptian soils are sandy and poor in organic matter which has low action exchange and low water holding capacity.

Organic agriculture is an ecological management system that promotes and enhances biodiversity, biological cycles and soil biological activates. It is based on the minimal use of off–farm and chemical inputs and management practices that restore maintain and enhance ecological harmony. Therefore, a great attention has been paid to using the natural source of nutrition as an alternative to the mineral fertilization, but organic fruit growers have little experience with stone fruits. However, (Zhou, *et al.,* 2001) out lined that one of the most important factor of organic fruit production is using the organic fertilization.

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Organic fertilizers improve the physical, chemical and biological properties of nearly all soil types, adjusting soil PH, increasing soil solubility and production of the plants. Adding organic fertilizers not only increase the organic matter in the soil but also increase the available phosphorus and the exchangeable potassium, calcium, and the other micro-elements, through its effect on soil pH, encourages proliferation of soil microorganisms, increases microbial population and activity of microbial enzymes, viz. dehydrogenase, urease and nitrogenase (Abou-Hussein *et al.,* 2002).

Bio fertilizers are the most importance for plant production and soil as they play an important role in increasing vegetative growth, yield and fruit quality of "Canino" apricot. (Kabeel *et al.,* 2005 and Shddad *et al.,* 2005). Therefore, the present study is undertaken to measure the usefulness of supplementing some organic and bio fertilizers with minimal chemical fertilizers doses on growth, chemical constituents, fruiting and quality of apricot trees and to minimize consuming chemical fertilizers.

Materials and Methods

This investigation was conducted during 2013 & 2014 seasons in a private orchard at El-Nubaria, Behaira Governorate, Egypt. Ten-year old "Canino" apricot trees (planted at 5×5 m apart and budded on local apricot rootstock), grown in a sandy soil under drip irrigation system and received the common cultural practices. Trees used in the experiment were selected to be healthy and as uniform as possible. Physical and chemical properties of the experimental soil are presented in Table (1) and analyses of used composted materials in Table (2). Thus, the following eight treatments were included in this experiment:-

1- (F1): Control; full dose of chemical fertilizer (100 % NPK).
2- (F2): 10 ton compost /fed.
3- (F3): 50% chemical NPK + bio-fertilizer.
4- (F4): 50% chemical NPK + 5 ton compost + bio-fertilizer.
5- (F5): 50% chemical NPK + 10 ton compost + bio-fertilizer.
6- (F6): 75% chemical NPK + bio-fertilizer.
7- (F7): 75% chemical NPK + 5 ton compost + bio-fertilizer.
8- (F8): 75% chemical NPK + 10 ton compost + bio-fertilizer.

Table 1: Physical and chemical properties of the investigated soil.

Mechanical analysis	Value	Chemical analysis	Value	Anion and Cation (Meq/I)	Value
Coarse sand%	48	$CaCO_3$%	3.21	Ca^{2++}	0.17
Fine sand%	37	Field capacity%	12.3	Na^{+}	0.28
Silt%	12.2	PH	8.14	K^{-}	0.23
Clay%	2.8	Organic matter%	0.34	Cl^{-}	0.49
Soil texture	sandy	EC (ds/m)	0.86		
		Total N%	0.14		

Table 2: Analysis of the used composted material.

Analysis	Value
M^3 weight	790 kg
Moisture %	30
PH (1:10)	9.3
EC (ds/m)	3.4
Organic matter	35.6
C/N ratio	17.6
Organic carbon %	26.4
Total N%	1.5
Total P%	0.6
Total K%	1.32
Total Ca%	1.93
Total Mg%	0.90
Total Fe (ppm)	1012
Total Mn(ppm)	116
Total Zn (ppm)	28
Total Cu (ppm)	18.3

Chemical fertilizer treatments:

Chemical fertilizers were added at 12 equal doses at one week interval starting at mid February through drip irrigation system during both seasons of study.

Ammonium nitrate (NH_4NO_3, 33.5%N), phosphoric acid (80% P_2O_4) and potassium sulfate (K_2SO_4- high soluble 50%K_2O) were used as a source of N, P and K at the rate of 60 Kg/fed., 24 L/fed. and 80 Kg/fed, respectively.

Organic fertilizer treatments:

Organic manure (compost) at the rate of 5 and 10 ton were added in start of December in the two seasons. One trench (100×50×50 cm) was excavated on one side of the tree, and then the given amount of compost as a part of surface soil was mixed together and added to the chuck hole followed by irrigation.

Bio-fertilizers treatments:

A mixture of three types of bio-fertilizer (equal amounts for each) were investigated through out of this study, these types namely.

1- Phosphorene: is a commercial phosphor bio-fertilizer which contains some active bacterial strains (*Arbuscalar mycorrhiza* and silicate bacteria).
2- Nitrobein: is a commercial nitrogen bio-fertilizer that contains special bacteria (*Azotobacter choroccocum*).
3- Potassein: is a commercial potassium bio-fertilizer contains special bacteria (*Bacillus pasteurii*).

The mixture of the three abovementioned bio-fertilizer was added as soil application with drip irrigation in three equal doses in February, March and April at the rate of 2Kg/fed.

Generally, all the previous treatments were arranged in complete randomized block design with three replicates for each treatment and each replicate was represented by ten trees.

Data recorded:

1- Vegetative growth measurements:

Vegetative growth measurements of "Canino" cv. Apricot trees as affected by the different investigated eight fertilization treatments were evaluated through determining the response of the following parameters:
Trunk diameter increase, number of shoots/tree, shoot length, shoot diameter, number of leaves/shoot, leaf area (cm^2) and leaf dry weight during August.

2-Nutritional status

a-Leaf photosynthetic pigments content:

Representative fresh leaf samples of the same physiological age and position (at the 4-6^{th} leaf from the base) were taken at the mid-April and photosynthetic pigments (chlorophyll a, b and carotenoides) were colormetrically determined according to (Saric *et al.,* 1967).

b-Leaf mineral contents:

Leaf mineral contents (macro and microelements) of dried leaf samples (4-6^{th} leaf from the base) which were collected at last week of May. Leaves were taken as previously described, dried at 70° until constant weight, then used for the following analysis:

1-Total nitrogen:

Total nitrogen content of dried leaves samples was determined by the modified micro-kyeldahl method as described by Pregl (1945).

2-Total phosphorus:

Total leaf phosphorus content was determined using a spectrophotometer at 882-OVV according to the method described by Murphy and Riely (1962).

3- Leaf K, Ca, Mg, Fe, Zn and Mn content:

Were determined by using the atomic absorption (3300) according to Jackson and Ulrich (1959) and Chapman and Pratt (1961)

Leaf nutrient elements content were expressed as a ratio of the leaf dry weight, i.e., percentage for the macro-elements (N,P,K,Ca and Mg) and part per million (ppm) with micro nutrient elements (Fe, Zn and Mn).

3-Flowering parameters:

Flowers number/spur, spurs number/branch, blooming spurs (%), fruit set (%) and fruit retention/tree (%) were determined at flowering stage.

4-Fruiting parameters:

Fruits yield per tree was weighted (Kg), number of fruits/tree and fruit weight (g).

5-Fruit quality:

Data of fruit quality were determined for fruit size (cm^3), fruit length (cm), fruit diameter (cm), fruit shape index, flesh thickness (cm), seed weight (g), fruit firmness ($Ib/Inch^2$), total soluble solids in fruit juice using a hand refractometer, fruit titratable acidity (malic acid (g)/ 100ml of juice) and TSS/acid ratio were estimated according

to A.O.A.C. (1985). Whereas, fruit total sugars (%) of fresh weight were determined according to Malik and Singh (1980).

Statistical analysis:

The obtained data in both seasons were statistically analyzed using analysis of variance method according to Snedecor and Cochran (1980). However, means were distinguished by the Duncan's multiple range tested Duncan (1955).

Results and Discussion

1-Effect of some chemical, organic and bio-fertilization treatments on vegetative growth of apricot trees

Data in Tables (3 & 4) revealed that all tested fertilization treatments affected the studied vegetative growth i.e., trunk diameter increase, number of branches/tree, shoot length and shoot diameter in both seasons. However, the highest values of trunk diameter increase, number of branches/tree, shoot length and shoot diameter were scored by control treatment; 100% of chemical NPK fertilization (F1), followed in descending order by 75%NPK+10 ton compos+bio (F8) in both seasons. The differences between the abovementioned two treatments were so small to reach the level of significant in both seasons.

Table 3: Effect of mineral (NPK), organic (compost) and bio- fertilizers on some vegetative measurements (trunk diameter increase, number of branches/tree, shoot length and shoot diameter) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	Trunk diameter increase (cm)		Number of branches/tree		Shoot length		Shoot diameter	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	1.99 A	2.28 A	62.14 A	68.67 A	38.23 A	42.06 A	0.47 A	0.54 A
F2-10 ton compost + bio	1.31 C	1.81 D	38.60 D	41.67 E	23.17 D	25.29 E	0.29 C	0.33 E
F3- 50 % NPK + bio	1.53 B	1.98 C	48.47 C	52.67 CD	28.17 BC	29.90 CD	0.36 B	0.40 CD
F4- 50 % NPK + 5 ton compost + bio	1.56 B	2.00 C	50.17 C	53.00 CD	28.60 BC	30.87 BCD	0.40 B	0.39 D
F5- 50 % NPK + 10 ton compost + bio	1.59 B	2.12 B	51.37 C	58.33 BC	30.37 BC	33.54 BC	0.38 B	0.45 BC
F6- 75 % NPK + bio	1.57 B	2.04 BC	48.37 C	50.33 D	26.67 CD	27.53 DE	0.35 BC	0.38 DE
F7- 75% NPK + 5 ton compost + bio	1.62 B	2.22 A	55.47 B	60.33 B	31.87 B	34.73 B	0.39 B	0.47 B
F8-75% NPK + 10 ton compost + bio	1.92 A	2.26 A	64.36 A	69.29 A	37.80 A	41.26 A	0.49 A	0.57 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

Table 4: Effect of mineral (NPK), organic (compost) and bio- fertilizers on some vegetative measurements (number of leaves/shoot, leaf area and leaf dry weight) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	No. of leaves/shoot		leaf area (cm^2)		leaf dry weight (mg)	
	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	38.00 A	43.33 A	35.97 A	40.61 A	451.7 A	454.0 A
F2-10 ton compost + bio	20.67 F	22.00 C	26.84 C	25.26 C	363.3 E	383.7 E
F3- 50 % NPK + bio	28.00 DE	33.33 B	30.71 B	32.84 B	409.0 CD	424.7 BC
F4- 50 % NPK + 5 ton compost + bio	29.67 BC	33.00 B	30.09 B	33.31 B	407.3 CD	416.3 CD
F5- 50 % NPK + 10 ton compost + bio	29.00 CD	33.00 B	31.61 B	35.52 B	415.0 BC	428.0 BC
F6- 75 % NPK + bio	27.00 E	30.33 B	30.43 B	29.17 C	398.0 D	405.3 D
F7- 75% NPK + 5 ton compost + bio	31.00 B	33.67 B	31.61 B	34.28 B	425.7 B	435.7 B
F8-75% NPK + 10 ton compost + bio	37.21 A	42.60 A	34.22 A	39.17 A	443.8 A	450.1 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

On contrary , the lowest values of these parameters were gained by 10 ton compost + bio-fertilizer treatment (F2), followed in ascending order by 50% NPK +bio (F3) in most cases .

The remained treatments occupied an intermediate position between the aforementioned treatments in both seasons. Additionally, F1 treatments have a strong effect upon leaf parameters i.e., number of leaves, leaf area and leaf dry weight as it registered the highest values in this concern in both seasons, followed in descending order by F8 treatments without significant differences between them in both seasons. Moreover, F7 resulted in highly significant increments in this respect in both seasons. On the contrary, the lowest values of these parameters were recorded by F2 and F6 in most cases in both seasons.

These results are confirmed by those obtained by Kabeel (2004) on peach , El-Shenawy and Fayed(2005) on grapevines, Fayed (2005a) on peach, Fayed (2005b) on apple, Rettke *et al*., (2006) on apricot "Moorpark" cv., Eissa *et al.,* (2007a) on pear, Eissa *et al.,* (2007b) on peach, El-Naggar (2009) on apricot "Canino" cv , Stino *et al.*, (2009) on apricot "Canino" cv, Milošević *et al.,* (2013) on apricot, Grzyb, *et al.,* (2012) on apple, Zhang *et al.,* (2013) on apple, Peralta-Antonio *et al*., (2014) on mango and Milošević and Milošević (2015) on apple.

2-Effect of some fertilization treatments on chemical constituents of apricot leaf.

Data presented in Tables (5, 6 and 7) showed that all examined fertilization had positive effect on chemical composition of apricot leaves in both seasons. Anyway, F1 and F8 treatments showed to be the most effective ones for inducing the highest leaf photosynthetic pigments i.e., chlorophyll a, b and carotenoids in both seasons, with non-significant differences between them. In addition F7-fertilized trees induced high increases in this concern in both seasons. On the opposite, F2-fertilized trees followed in ascending order by F6 treatment resulted in the lowest values of these parameters in most cases. Moreover, the highest values of leaf N, P and K contents of apricot trees were recorded by F1and F8 treatments, with no significant differences between them in the two seasons. Also, F7-fertilized trees gave high increments in this concern in the two seasons. On the reverse, the lowest values of these parameters were scored by using the treatments of F2 and F6 in most cases in the two seasons. Meanwhile, the highest values of leaf Ca and Mg contents were accompanied with F8 and F7 treatments in the two seasons. The differences between the aforementioned two treatments were not significant in both seasons. Furthermore, the highest leaf Fe, Zn and Mn contents were scored by F1 or F8-fertilized trees in the two seasons. The differences between the abovementioned two treatments did not reach the level of significance in the two seasons. Besides, F7-fertilized trees induced high increases in this concern in the two seasons.

The obtained results regarding leaf macro and micro nutrient contents of apricot trees "Canino" cv. were supported by the findings of many investigators. Joolka et *al.*, (1990) on apricot trees ,Kabeel *et al.,* (2005) on apricot trees, Shaddad *et al.*, (2005) on apricot leaf content , El- Naggar (2009) on "Canino" apricot trees, Stino *et al.*, (2009) on "Canino" apricot trees, Mohammed *et al.*, (2010) on Le- Conte" pear trees, Milošević *et al.,* (2013) on apricot, Zhang *et al.,* (2013) on apple, Peralta-Antonio *et al*., (2014) on mango and Milošević and Milošević (2015) on apple.

Table 5: Effect of mineral (NPK), organic (compost) and bio- fertilizers on leaf photosynthetic pigments (chlorophyll a, b and carotenoids) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	Chlorophyll a		Chlorophyll b		Carotenoids	
	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	1.66 A	1.51 A	0.90 A	0.99 A	0.46 A	0.49 A
F2-10 ton compost + bio	1.01 D	1.00 G	0.41 E	0.44 E	0.28 D	0.28 E
F3- 50 % NPK + bio	1.20 C	1.31 D	0.62 D	0.70 C	0.35 BC	0.36 C
F4- 50 % NPK + 5 ton compost + bio	1.23 C	1.25 E	0.70 C	0.74 BC	0.35 BC	0.37 C
F5- 50 % NPK + 10 ton compost + bio	1.31 B	1.34 C	0.70 C	0.73 BC	0.35 BC	0.37 C
F6- 75 % NPK + bio	1.18 C	1.21 F	0.57 D	0.63 D	0.33 C	0.33 D
F7- 75% NPK + 5 ton compost + bio	1.33 B	1.48 B	0.77 B	0.77 B	0.38 B	0.41 B
F8-75% NPK + 10 ton compost + bio	1.59 A	1.50 A	0.86 A	0.92 A	0.44 A	0.47 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

Table 6: Effect of mineral (NPK), organic (compost) and bio- fertilizers on leaf mineral contents (N, P, K, Ca and Mg) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	N (%)		P (%)		K (%)		Ca (%)		Mg (%)	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	2.77 A	2.87 A	0.313 A	0.321 A	2.02 A	2.07 A	1.74 B	1.75 B	0.657 CD	0.707 BC
F2-10 ton compost + bio	2.04 E	2.14 F	0.182 E	0.180 E	1.89 AB	1.30 E	1.40 C	1.54 C	0.377 E	0.410 D
F3- 50 % NPK + bio	2.38 CD	2.54 D	0.239 CD	0.245 CD	2.23 AB	1.69 C	1.75 B	1.77 AB	0.690 BC	0.733 B
F4- 50 % NPK + 5 ton compost + bio	2.44 C	2.58 CD	0.255 C	0.252 C	1.67 AB	1.67 C	1.65 B	1.76 AB	0.680 BCD	0.693 BC
F5- 50 % NPK + 10 ton compost + bio	2.52 BC	2.59 C	0.254 C	0.252 C	1.70 AB	1.77 B	1.71 B	1.80 AB	0.737 B	0.797 A
F6- 75 % NPK + bio	2.27 D	2.39 E	0.226 D	0.230 D	1.57 B	1.53 D	1.64 B	1.71 B	0.603 D	0.663 C
F7- 75% NPK + 5 ton compost + bio	2.63 AB	2.67 B	0.279 B	0.273 B	1.80 AB	1.79 B	1.88 A	1.87 A	0.833 A	0.847 A
F8-75% NPK + 10 ton compost + bio	2.71 A	2.79 A	0.301 A	0.311 A	1.96 A	2.93 A	1.91 A	1.89 A	0.839 A	0.851 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

Table 7: Effect of mineral (NPK), organic (compost) and bio-fertilizers on leaf mineral contents (Fe, Zn and Mn) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	Fe (ppm)		Zn (ppm)		Mn (ppm)	
	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	102.7 A	102.7 A	23.66 A	24.46 A	33.12 A	34.69 A
F2-10 ton compost + bio	58.97 D	62.84 F	16.48 E	17.42 E	23.85 E	25.43 G
F3- 50 % NPK + bio	86.97 B	93.79 C	20.43 C	21.49 C	27.20 D	29.77 D
F4- 50 % NPK + 5 ton compost + bio	87.54 B	89.65 D	20.16 C	21.43 C	27.56 D	28.88 E
F5- 50 % NPK + 10 ton compost + bio	91.58 B	97.05 B	22.25 B	22.59 B	29.29 C	30.56 C
F6- 75 % NPK + bio	80.97 C	84.74 E	19.02 D	20.02 D	27.48 D	27.72 F
F7- 75% NPK + 5 ton compost + bio	89.44 A	101.0 A	22.70 B	23.35 B	32.10 B	32.54 B
F8-75% NPK + 10 ton compost + bio	101.3 A	101.8 A	23.02 A	24.07 A	32.94 A	34.12 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

3-Effect of some fertilization treatments on flowering characteristics of apricot trees.

Data in Table (8) cleared that the highest flower number/spur, spurs number/branch and blooming spurs (%) were scored by F1-fertilized tree, followed in descending order by F8-fertilized trees, whereas the highest values of fruit set (%) and fruit retained/tree (%) were registered by F8-fertilized trees, followed in descending order by F1-fertilized trees, the differences between the abovementioned treatments were so small to reach the level of significance in the two seasons. Additionally, F7-fertilized trees resulted in high increments in this sphere in the two seasons. On contrast, the lowest values of flower number/tree, spurs number/branch, blooming spurs %, fruit set (%) and fruit retained/tree (%) were recorded by F2- fertilized trees in the two seasons . The remained treatments occupied an intermediate position between the aforementioned treatments in the two seasons.

These results go in parallel with those of Bussi *et al*., (2003) on apricot "Bergeron" cv. El-Shenawy and Fayed (2005) on apple, Shaddad *et al.,* (2005) on apricot "Canino" cv. , Eissa *et al.,* (2007a) on pear, Kabeel *et al.*, (2005) on apricot "Canino" cv. , El-Naggar (2009) on apricot "Canino" cv , Stino *et al.*, (2009) on apricot "Canino" cv., Darwesh (2012) on persimmon, Grzyb, *et al.,* (2012) on apple, Milošević *et al.,* (2013) on apricot, Zhang *et al.,* (2013) on apple , Peralta-Antonio *et al*., (2014) on mango and Milošević and Milošević (2015) on apple.

Table 8: Effect of mineral (NPK), organic (compost) and bio- fertilizers on some flowering characteristics of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	No. of flowers/spur		No. of spurs/branch		Blooming spurs (%)		Fruit set (%)		fruit retained /tree (%)	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	24.33 A	27.33 A	18.33 A	22.00 A	82.17 A	84.00 A	22.29 A	26.00 A	20.55 A	23.59 A
F2-10 ton compost + bio	13.00 D	16.33 C	11.33 E	12.67 E	71.50 C	73.01 D	14.62 E	15.77 F	12.21 D	12.91 F
F3- 50 % NPK + bio	18.00 C	19.67 B	12.67 D	14.67 CDE	76.76 B	78.29 BC	18.49 C	19.42 D	15.71 C	17.05 D
F4- 50 % NPK + 5 ton compost + bio	19.33 BC	20.00 B	13.67 C	17.00 BC	77.79 B	77.81 BC	18.30 C	20.54 C	15.50 C	18.19 C
F5- 50 % NPK + 10 ton compost + bio	19.00 BC	20.33 B	14.33 BC	15.67 CD	77.61 B	78.68 BC	17.96 CD	21.21 C	15.15 C	18.04 C
F6- 75 % NPK + bio	18.67 BC	18.67 BC	12.33 D	13.67 DE	77.01 B	76.34 C	16.44 D	18.09 E	13.16 D	15.18 E
F7- 75% NPK + 5 ton compost + bio	20.00 B	21.33 B	14.67 B	19.00 B	78.53 B	80.03 B	20.05 B	22.91 B	17.22 B	20.05 B
F8-75% NPK + 10 ton compost + bio	23.14 A	25.93 A	17.21 A	21.32 A	80.36 A	83.11 A	23.15 A	27.20 A	21.34 A	24.16 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels.

4-Effect of some fertilization treatments on fruiting characteristics of apricot trees.

Data in Table (9) declared that the highest values of fruit yield/tree, fruits number / tree, fruit weight and fruit size were recorded by F1 and F8 treatments, with non-significant differences between them in both seasons. Moreover, F7 and F5 treatments gave high increments in this concern in both seasons. On the reverse, the lowest values of these parameters were gained by F2-fertilized trees in most cases at the two seasons.

These results are confirmed by those obtained by Bussi *et al*., (2003) on apricot "Bergeron" cv.; Shaddad *et al.,* (2005) on apricot "Canino" cv. , Kabeel *et al.*, (2005) on apricot "Canino" cv. , El-Naggar (2009) on apricot "Canino" cv , Stino *et al.*, (2009) on apricot "Canino" cv, Milošević *et al.,* (2013) on apricot, EL-Gioushy (2012) on Navel orange trees , Grzyb, *et al.,* (2012) on apple, Zhang *et al.,* (2013) on apple Peralta-Antonio *et al*., (2014) on mango, and Milošević and Milošević (2015) on apple.

Table 9: Effect of mineral (NPK), organic (compost) and bio- fertilizers on some flowering characteristics (fruit yield/tree, number of fruits/tree, fruit weight and fruit size) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	fruit yield/tree (Kg)		No. of fruits/tree		fruit weight (g)		fruit size (cm^3)	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	48.02 A	54.22 A	1342.0 A	1445.0 A	36.22 A	37.52 A	39.70 A	41.11 A
F2-10 ton compost + bio	26.00 E	28.86 G	911.0 E	958.3 F	28.90 D	30.12 D	31.80 D	33.20 C
F3- 50 % NPK + bio	37. 00 C	41.03 A	1132.0 C	1199.0 D	34.69 AB	34.23 C	38.05 A	37.51 B
F4- 50 % NPK + 5 ton compost + bio	38.82 C	42.88 D	1148.0 C	1209.0 D	33.82 ABC	35.47 B	37.10 B	39.00 A
F5- 50 % NPK + 10 ton compost + bio	39.00 C	44.50 C	1172.0 C	1238.0 C	33.26 BC	35.95 B	36.60 B	39.52 A
F6- 75 % NPK + bio	34.02 D	37.00 F	1066.0 E	1093.0 E	31.92 C	33.86 C	35.02 C	37.20 B
F7- 75% NPK + 5 ton compost + bio	42.83 B	47.32 D	1252.0 B	1317.0 B	34.21 ABC	35.92 B	37.53 B	39.52 A
F8-75% NPK + 10 ton compost + bio	46.45 A	53.06 A	1321.0 A	1437.0 A	35.17 A	36.93 A	38.63 A	40.60 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

5-Effect of some fertilization treatments on fruit physical characteristics of apricot trees.

Data presented in Table (10) emphasized that fruit length, fruit diameter, fruit shape index, flesh thickness and seed weight were positively responded to the different fertilizer treatments during the two assigned seasons. However, the highest values of these parameters were registered by F1-fertilized trees, followed in descending order by F8-fertilized trees in both seasons. The differences between the above-mentioned two treatments were so small to reach the level of significant in both seasons. Additionally, F7 and F5-fertilized trees gave high significant

increments in most cases in the two seasons. On the contrast, the lowest values of these parameters were scored by F2-fertilized trees in the two seasons of this study. The rest treatments laid in- between the aforementioned treatments in the two seasons.

These results are confirmed by those obtained by , El-Naggar (2009) on apricot "Canino" cv , Stino *et al.*, (2009) on apricot "Canino" cv, Grzyb, *et al.,* (2012) on apple, Milošević *et al.,* (2013) on apricot, Zhang *et al.,* (2013) on apple, Peralta-Antonio *et al*., (2014) on mango, and Milošević and Milošević (2015) on apple.

Table 10: Effect of mineral (NPK), organic (compost) and bio- fertilizers on some fruit physical characteristics (fruit length, fruit diameter, fruit shape index, flesh thickness and seed weight) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	fruit length (cm)		fruit diameter (cm)		fruit shape index		flesh thickness (cm)		seed weight (g)	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	4.50 A	4.34 A	4.52 A	4.32 A	0.993 D	1.005 A	1.32 A	1.35 A	2.73 A	2.73 A
F2-10 ton compost + bio	3.80 D	3.74 E	3.81 C	3.74 E	0.997 CD	1.001 A	1.03 E	1.05 E	1.90 D	1.88 C
F3- 50 % NPK + bio	4.14 C	4.00 CD	4.22 B	4.01 CD	0.980 D	0.997 A	1.12 CD	1.16 CD	2.31 B	2.66 A
F4- 50 % NPK + 5 ton compost + bio	4.24 BC	4.12 BC	4.26 B	4.12 BC	0.997 CD	1.001 A	1. 15 BC	1.21 BC	2.34 B	2.35 AB
F5- 50 % NPK + 10 ton compost + bio	4.27 BC	4.17 B	4.21 B	4.17 B	1.01 BC	1.00 A	1.17 DC	1.23 BC	2.33 B	2.37 AB
F6- 75 % NPK + bio	4.32 AB	3.96 D	4.23 B	3.96 D	1.02 B	0.999 A	1.09 DC	1.12 DE	2.13 C	2.18 BC
F7- 75% NPK + 5 ton compost + bio	4.35 AB	4.22 AB	4.10 B	4.19 AB	1.06 A	1.007 A	1.21 B	1.27 B	2.41 B	2.50 AB
F8-75% NPK + 10 ton compost + bio	4.46 A	4.31 A	4.48 A	4.30 A	0.995 CD	1.00 A	1.34 A	1.37 A	2.69 A	2.66 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels

6-Effect of some fertilization treatments on fruit quality of apricot trees.

With regard to fruit quality i.e., firmness, T.S.S, acidity, T.S.S/ acidity ratio and total sugars (%), data in Table (11) clearly indicated that fruit quality of apricot trees were greatly affected by the studied fertilization in both seasons. However, F2-fertilized trees showed to be the most effective one for inducing the highest values of fruit firmness and fruit total sugars (%), whereas the highest values of T.S.S (%) and T.S.S/ acidity ratio were recorded by F4-fertilized trees. This trend was true only in the first season, while in the second one the picture was completely changed, where the greatest values of fruits firmness and total sugars (%) were registered by F7-fertilized trees. While, the highest values of T.S.S and T.S.S/ acidity ratio were scored by F8-fertilzed trees. In addition all tested fertilization treatments decreased the acidity of apricot fruits as compared with control treatment in both seasons.

Table 11: Effect of mineral (NPK), organic (compost) and bio- fertilizers on some fruit quality characteristics (fruit firmness, T.S.S%, acidity, T.S.S/acid ratio and total sugars) of "Canino" apricot trees during 2013 and 2014 seasons.

Characteristics / Treatments	Fruit firmness ($Ib/inch^2$)		T.S.S (%)		Acidity (%)		T.S.S/acid ratio		Total sugars (%)	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
F1-Control NPK as 100% of recommended dose	8.48 B	9.07 D	9.61 D	10.18 C	0.74 A	0.73 AB	12.99 E	13.93 D	7.96 D	8.33 E
F2-10 ton compost + bio	9.79 A	9.78 C	10.14 CD	10.18 C	0.73 AB	0.70 ABC	13.80 E	14.46 CD	10.08 A	8.26 E
F3- 50 % NPK + bio	8.04 B	9.95 BC	10.84 BC	11.51 A	0.68 BC	0.70 ABC	15.86 C	16.33 BC	9.66 B	9.83 BC
F4- 50 % NPK + 5 ton compost + bio	8.42 B	10.31 AB	11.62 A	11.39 AB	0.63 CD	0.69 BC	19.21 A	16.62 B	9.65 B	9.72 C
F5- 50 % NPK + 10 ton compost + bio	8.12 B	10.52 A	10.71 BC	11.56 A	0.69 AB	0.67 C	15.51 CD	17.26 B	9.90 AB	9.94 B
F6- 75 % NPK + bio	8.03 B	9.29 D	10.59 BC	10.99 B	0.74 A	0.74 A	14.24 DE	14.81 CD	9.18 C	9.25 D
F7- 75% NPK + 5 ton compost + bio	8.42 B	10.53 A	11.04 A	11.77 A	0.60 D	0.57 D	17.48 B	20.73 A	8.08 D	10.43 A
F8-75% NPK + 10 ton compost + bio	9.36 A	10.21 A	11.24 A	11.63 A	0.61 D	0.55 D	18.43 A	21.15 A	9.89 A	10.20 A

Means followed by the same letter (s) within each column during each season are not significantly different at 5% levels.

These results go in parallel with those of Bussi *et al*., (2003) on apricot "Bergeron" cv., Kabeel *et al.*, (2005) on apricot "Canino" cv. , Ibrahim, *et al.,* (2005) on apricot "Canino" cv., El-Naggar (2009) on apricot "Canino" cv., Stino *et al.*, (2009) on apricot "Canino" cv., Zhang *et al.,* (2013) on apple and Milošević and Milošević (2015) on apple.

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