Effect of Different NPK Fertilization Sources on Vegetative Growth and Nutritional Status of fig (*ficus carica* l.) Transplants

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Abstract

This experiment was conducted throughout the two successive seasons of 2018 and 2019 at Fruit Nursery of Horticulture Department, Faculty of Agriculture at Moshtohor, Benha University Qalyubeia Governorate, Egypt., to study the effect of organic (compost) and NPK biofertilization application as partial replacement for chemical fertilization on vegetative growth, nutrient status of fig transplants "Sultani**" cv.** at one-year- old**.** Treatments were the combination of seven fertilization levels (full recommended dose of NPK only (100%NPK) T1, 75% NPK + 25% organic (compost) T2, 50% of NPK+ 50% organic (compost) T3, 25% of NPK+ 75% organic (compost) T4, T5 (T2+ Bio- NPK), T6 (T3+ Bio- NPK) and T7 (T4+ Bio- NPK). The result indicated that, application of T1 (100% of chemical NPK) caused a significant increasing in the rate of length, diameter, number of leaves, leaf area, transplant leaves area, fresh and dry weight of leaves, Leaf dry matter percentage. Likewise, T1 increased the nutrient status i.e. (N, P, K, Mg, Ca, Fe, Mn, Zn), as well as improved the leaf photosynthetic pigments. Followed by T5 75% NPK + 25% organic (compost) + Bio- NPK. By contrast, T4 25% of NPK+ 75% organic (compost) led to the lowest values compared other treatments in both season.

Keywords: fig, NPK, Fertilization, Vegetative Growth, Nutritional Status

Introduction

The common fig (*Ficus carica* L. 2n = 26), is a subtropical plant belonging to Ficus species of Moraceae family. Includes with over 1400 species classified into about 40 genera. The genus Ficus contains about 700 species **(Bailey, 1961 and Berg, 2003)**. It was perhaps first brought into cultivation in the southern parts of the Arabian Peninsula by at least 3000 BC. It later spread into Iran, Syria and Turkey and into all the Mediterranean countries. During the age of exploration following the discovery of America by Columbus, the fig was taken to most subtropical areas of the western hemisphere **(Tutin, 1964)** and according to **(El-Ray and Llacer, 1995)**. Turkey produces 26% of the world's figs and Egypt, Iran, Greece, Algeria, and Morocco together produces around 70% of the world's fig production **(FAO, 2006)**. The global production of figs is 106,212 tons **(FAO, 2013)**.

Figs have grown in Egypt since ancient times as a popular deciduous fruit and their fruits are one of the major fruits for local consumption. More than 50% of the total fig area is located along the north western coast of Alexandria as well as Sinai Governorates. Sultani variety is the most widely grown. It is also called Fayoumi, Ramadi, Barshoumy, Sidi Gaber and Hegazi. As such, Sultani fig cultivar could be considered the local standard variety in Egypt **(Afify, 2006)**. Other local cultivars such as Asuani, Kommathri, Adasi-Abiad, Adasi-Ahmer, Abboudi and Kahramani received much less attention in comparison with Sultani cv. **(Abo-El-Ez *et al*., 2013)**, and the national production of fig, attained about 172474 metric tons produced from 67433 Feddans as reported by the Ministry of Agriculture in Egypt (2014)*.

Fertilization is one of the important management tools in increasing growth and crop yield, especially with nitrogen. Nitrogen (N) is known to be one of the most major elements for plant nutrition and development. It plays an important role as a constituent of all proteins, nucleic acids and enzymes (**Nijjar, 1985**).

Biofertilizers are not usually used solitary to stimulate growth since they need organic matter to stimulate activity **(Garcia *et al*., 1994 and Pascual *et al*., 1997)**. Moreover, it is known that compost is required to improve the quality of soil organic matter **(Rivero *et al*., 2004)** by various ways. When composts are applied to soil, not only degradable substrates and nutrients are supplied, but also a wide range of microorganisms **(Ryckeboer *et al*., 2003)** including harmless heterotrophy but potentially also plant and human pathogens. Compost as an organic material influences agricultural sustainability by improving chemical, physical, biological properties of soils, the fertility and structure of the soil and the moisture holding capacity **(Follet *et al*., 1981; Frederickson *et al*., 1997 and Saha *et al*., 2008).** Organic and Bio N-fertilization are the most importance for plant production and soil as they play an important role in increasing vegetative growth, and nutrient status of Fig tree (*Ficus Carica*, L.). **(Osman and Abd El-Rhman, 2010)**.

Consequently, the present work is mainly directed towards investigating the possibility of replacing the expensive, highly dispersible soluble three major commercial concentrated mineral NPK fertilizers usually adopted by an alternative cheaper and environment friendly ones either those of organic (compost) as well as some bio-sources. Since, all alternative sources are characterized by their slow releasing ability of their nutrients content which representative as a continuous gradual supply along the growing season around for the trees or fruit seedling. So, the mineral NPK fertilization program adopted in the region after the recommendation of the Minis. of Agric. in comparison with twice other NPK sources i.e., organic fertilizer (compost), besides three NPK bio-fertilizers sources either as an amendment/addenda practical together with the towic alternate NPK fertilizers or alone as an independent treatment (a-Nitrobein, b-Phosphorene and c-Potassein).This research aims to measure the benefit of adding some organic and bio-fertilizers with the minimum doses of chemical fertilizers on growth, and nutrient status of fig transplants (*Ficus Carica*, L.) and reduce the chemical fertilizers consumed.

Materials and Methods

This investigation was carried out on potted one-year – old fig transplants (*Ficus Carica*, L.) Sultani cv. grown at nursery of Horticulture department, faculty of agriculture, Benha University, at Moshtohor, Touckh region Kalubia Governorate during two successive 2018 and 2019 experimental seasons. Fig transplants were planted individually in plastic pot of 35 cm in diameter, filled with about (10 Kg of culture mixture media of sand and clay at equal proportions by volume). Before the experiment had been conducted in the first season both physical and chemical analysis of the culture medium were done as shown in **Tables (A& B)** according to the methods described by **Jackson (1967)**. And analyses of used composted materials in Table (C). Thus, the following seven treatments were included in this experiment:-

1- (T1): Control; full dose of chemical fertilizer (100 % NPK).
2- (T2): 75% of NPK+ 25% organic (compost).
3- (T3). 50% of NPK+ 50% organic (compost).
4- (T4). 25% of NPK+ 75% organic (compost).
5- (T5). 75% of NPK+ 25% organic (compost) +Bio- NPK.
6- (T6). 50% of NPK+ 50% organic (compost) +Bio- NPK.
7- (T7). 25% of NPK+ 75% organic (compost) +Bio- NPK.

Table (A): The mechanical analysis of the culture medium:

Partial distribution		
Total sand %	**Silt %**	**Clay %**
60.00	10.00	30

Table (B): The chemical analysis of the culture medium:

Soluble cations meq/L				Soluble anions meq/L				CaCo3	PH	EC
Mg^{++}	Ca^{++}	K^{+}	Na^{+}	$HCO3^{-}$	$CO3^{--}$	$SO4^{--}$	Cl^{-}			
2.13	8.77	0.50	7.80	3.01	-	9.19	6.70	1.50	8.70	1.01

Table (C): Analysis of the used composted material:

Analysis	Value
M3 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 sources:

Ammonium sulphate 20.5% N was used as a source of nitrogen, calcium superphosphate 15% P_2O_5 was used as P source and potassium sulphate 48% K_2O was used as K source.

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*).

Rate of Different NPK Fertilization Sources:

Four rates of chemical fertilizers NPK were employed in this study. The first rate was 100% of chemical NPK (10, 8 and 6 g per transplant, respectively). The second rate was 75 % of chemical NPK 7.5, 6 and 4.5g per transplant). The third rate was 50% of chemical NPK (5, 4 and 3 g per transplant, respectively, the fourth was 25 % of chemical NPK 2.5, 2 and 1.5g per transplant) respectively. Three rates of organic (compost) were employed in this study. The first rate was 75 % of organic (compost) (300 g per transplant, respectively). The second rate was 50 % of organic (compost) (200 g per transplant). The third rate was 25% of organic (compost) (100 g per transplant, respectively, Moreover, one rate 10 ml per transplant of bio-fertilizers (Nitrobein, Phosphorene and Potassein (were also mixed at (1: 0.6: 0.4 by volume) for being soil drench applied.

Application time:

Herein, the corresponding fertilizations amount of every treatment was fractionated into three equal doses for being soil applied during each season at one month interval i.e,. mid of Feb., March and April for 1st, 2nd and 3rd portions, respectively **.**

Experiment layout:

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

Data recorded:

1- **Vegetative growth measurements:**

In this regard some growth measurements of fig (*Ficus carica*) transplants were carried out:

1- **Transplant height (cm)**
2- **Stem diameter (mm)**.at 10 above union zone.
3- **Number of leaves per transplant**.
4- **Leaf area .**Four mature leaves from the middle position of the stem/transplant were taken at the last week of September and then average leaf area (cm) on a weight basis was also determined. Hence, four mature leaves then four disks each of one cm. the area was taken and oven dried together with the rest leaves at 80°C till constant weight. Based on the known dry weight of a known surface area of leaves, i.e., four leaf discs from one hand and the total weight of four leaves from the other, then average leaf area in cm. was calculated.
5- Assimilation area = leaf area x No. of leaves per one shoot.
6- Leaves fresh weight (g).
7- Leaves dry weight (g).
8- Leaves dry matter percentage (%) = $\frac{\text{leaves dry weight}}{\text{leaves fresh weight}} \times 100$

2-Nutritional status:

a- **Leaf photosynthetic pigments content:**

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

b- **Leaf mineral contents:**

Leaf mineral contents (macro and microelements) of dried leaf samples (4-6th leaf from the base) which were collected at last week of May. Leaves were taken as previously described, dried at 70º 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 macroelements (N, P, K, Ca and Mg) and part per million (ppm) with micro nutrient elements (Fe, Zn and Mn).

Statistical Analysis:

All data obtained during both seasons were subjected to analysis of variance and significant differences among means were determined according to **(Snedecor and Cocharn, 1977).** In addition, significant differences among means were differentiated according to the Duncan's, multiple range **(Duncan, 1955).** Where capital letters were used for distinguishing means of different treatments for each investigated characteristic.

Results and Discussion

1-Effect of some chemical, organic and bio-fertilization treatments on vegetative growth of fig transplants:

Concerning the response of one- year – old fig transplants "Sultani" cv. growth measurements to the differential investigated NPK fertilization treatments, data obtained during both 2018& 2019 experimental seasons are presented in Tables (1) and (2). It was quite evident that all seven NPK fertilization treatments varied considerably, however the rate of their effectiveness differed obviously from one treatment to another. Anyhow, it could be generally observed that the response of all evaluated growth measurements to a given investigated fertilization treatment of such 7 studied ones followed approximately the same trend with a relative few exceptions differed slightly from one growth measurements to the other. Herein, investigated seven fertilization treatments could be generally classified according to their effectiveness for stimulating the one- year – old fig transplants "Sultani" cv. growth into the following three categories: -

1. The most effective treatments (superior category) by which the greatest values of all or most growth measurements were resulted. Both 1th and 5th fertilization treatments i.e., providing with alternative NPK sources [full dose of chemical fertilizer (100 % NPK) T1 and T5 75% of NPK+ 25% organic (compost) + Bio- NPK.
2. Second effective category included three fertilization treatments (2th, 6th and 3th ones), However 75% of NPK+ 25% organic(compost) (T2), 50% of NPK+ 50% organic (compost)+Bio-NPK (T6) or 50% of NPK+ 50% organic (compost)/ transplant (T3). Three treatments of such group having nearly the same efficiency in spite of T2 75% of NPK+ 25% organic (compost) /transplant) tended to be relatively more effective than to other members of this category.
3. The third category which included the least effective NPK fertilization treatments (T7 and T4). Herein, T7 (25% of NPK+ 75% organic (compost) +Bio-NPK), T4 (25% of NPK+ 75% organic (compost)/transplant) ranked generally the inferior one from one hand, differences in their efficiency were in most cases too few to be considered either data of each season or an average of two seasons were concerned. Such trend dealing with the response of the differential evaluated growth measurements of one- year – old fig transplants "Sultani" cv. to the investigated seven fertilization treatments was true to great extent during both seasons and differences between the aforesaid discussed three categories were so pronounced from one hand associated with too slight or absent variations as members of each category were statistically compared each other.

The present results regarding the great beneficence of NPK organic (compost) and bio-fertilizers application on stimulating different growth parameters of fig transplants go in parallel line with those found by several investigators i.e., **(Osman and Abd El-Rhman, 2010)** on fig tree, **(EL-Gioushy, 2016)** on young Manfalouty Pomegranate trees, **(El-Badawy and Ali, Maha, 2019)** on Banana Grande Naine Cultivar and **(Darwesh, 2012)** on costata persimmon trees. All pointed out the suitability of NPK organic (compost) and bio-fertilizers. Furthermore, preference of the investigated alternative NPK fertilizers mixture (granulated organic (compost) and biofertilization) above the ordinary highly soluble mineral NPK sources could be logically explained depending upon nature of either investigated NPK source or plant species under study. Herein, slow releasing nature of organic NPK fertilizer mixture keep the released NPK nutrients elements from quick leaching from one hand, and saves a real guaranty of gradual continuous supply for fig transplants with the required nutrient elements along the growing season (nearly the year around).

Table 1. Effect of mineral (NPK), organic (compost) and bio- fertilizers on some vegetative measurements (transplant height, stem diameter, number of leaves/transplant and leaf area) of fig transplants during 2018 and 2019 seasons.

Characteristics / Treatments	Transplant height (cm)		Stem diameter (mm)		Number of leaves/ transplant		Leaf Area (cm^2)	
	2018	2019	2018	2019	2018	2019	2018	2019
T1. 100% of chemical NPK	67.00 A	69.00 A	0.786 A	0.790 A	19.00 A	19.67 A	128.33 A	129.33 A
T2. 75% of NPK+ 25% organic (compost)	55.67 C	56.00 BC	0.570 B	0.573 B	15.33 B	15.67 BC	121.00 C	122.33 C
T3. 50% of NPK+ 50% organic (compost)	47.00 D	47.67 CD	0.433 CD	0.440 CD	10.67 D	11.33 DE	111.33 E	112.67 E
T4. 25% of NPK+ 75% organic (compost)	37.67 F	38.00 E	0.63 D	0.373 D	6.33 E	7.33 F	101.67 G	102.67 G
T5. 75% of NPK+ 25% organic(compost)+Bio-NPK	62.00 B	62.33 AB	0.680 A	0.687	17.67 A	18.00 AB	125.00 B	126.00 B
T6. 50% of NPK+ 50% organic (compost)+Bio-NPK	52.67 C	50.00 CD	0.487 BC	0.487 BC	12.67 C	13.33 CD	117.00 D	118.33 D
T7. 25% of NPK+ 75% organic (compost)+Bio-NPK	42.67 E	43.33 DE	0.393 CD	0.400 CD	7.33 E	8.00 EF	105.67 F	10.00 F

Means followed by the same letter/s within each column didn’t significantly differ at 5% level.

Table 2. Effect of mineral (NPK), organic (compost) and bio- fertilizers on some vegetative measurements (transplant leaves area, leaves fresh weight, leaves dry weight and leaf dry matter) of fig transplants during 2018 and 2019 seasons.

Characteristics / treatments	Transplant leaves area (cm^2)		leaves fresh weight (g)		leaves dry weight (g)		Leaf dry matter (%)	
	2018	2019	2018	2019	2018	2019	2018	2019
T1. 100% of chemical NPK	2450.3 A	2554.7 A	29.17 A	29.83 A	5.92 A	6.08 A	19.72 A	19.96 A
T2. 75% of NPK+ 25% organic (compost)	1870.3 B	1937.7 BC	25.00 A	25.50 B	4.71 AB	4.72 ABC	18.39 A	18.45 A
T3. 50% of NPK+ 50% organic (compost)	1201.7 C	1292.0 DE	20.17 C	20.83 C	3.50 BC	3.70 CDE	17.18 AB	17.98 AB
T4. 25% of NPK+ 75% organic (compost)	649.3 D	761.3 E	15.33D	17.17 D	2.23 C	2.53 E	14.35 B	14.54 B
T5. 75% of NPK+ 25% organic(compost)+Bio- NPK	2222.3 A	2289.7 AB	27.33 AB	28.33A	5.13 AB	5.62 AB	18.39 A	19.47 A
T6. 50% of NPK+ 50% organic (compost)+Bio-NPK	1495.0 C	1537.7 CD	21.83 C	22.50 C	3.78 BC	4.32 BCD	16.82 AB	18.84 A
T7. 25% of NPK+ 75% organic (compost)+Bio-NPK	785.0 D	864.0 E	17.17 D	17.83 D	2.85 C	2.97 DE	16.49 AB	16.46 AB

Means followed by the same letter/s within each column didn’t significantly differ at 5% level.

1-Effect of some chemical, organic and bio-fertilization treatments on chemical constituents of fig transplants leaf.

According to data in Tables (3, 4 and 5) showed that, all examined fertilization had positive effect on chemical composition of fig transplants leaves in both seasons. Anyway, T1 and T5 treatments showed to be the most effective ones for inducing the highest leaf photosynthetic pigments i.e., chlorophyll a, b, total chlorophyll and carotenoids in both seasons, with non-significant differences between them. In addition T2-fertilized seedlings induced high increases in this concern in both seasons. On the opposite, T4-fertilized seedlings followed in ascending order by T7 treatment resulted in the lowest values of these parameters in most cases. Likewise, the highest values of leaf N, P and K contents of fig seedlings were recorded by T1and T5 treatments, with no significant differences between them in the two seasons. Also, T2- fertilized seedlings led to 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 T4 and T7 in most cases in the two seasons. Meanwhile, the highest values of leaf Ca and Mg contents were accompanied with T1 and T5 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 T1 or T5-fertilized transplants in the two seasons. The differences between the above mentioned two treatments did not reach the level of significance in the two seasons. Besides, T2- fertilized transplants induced high increases in this concern in the two seasons.

The obtained results regarding leaf macro and micro nutrient contents of fig transplants "Sultani" cv. were supported by the findings of many investigators. **(Osman and Abd El-Rhman, 2010)** on fig tree, **(EL-Gioushy, 2016)** on young Manfalouty Pomegranate trees, **(El-Badawy and Ali, Maha, 2019)** on Banana Grande Naine Cultivar, **(Baiea, *et al.*, 2015)** on Banana cv. Grande Naine and **(Darwesh, 2012)** on costata persimmon trees.

The shift (no coincidence) in ranking of the investigated NPK fertilization treatments pertaining their influence on nutritional status measurements when compared to the analogous one previously discussed with growth measurements could be considered as a real reflection of the unparalleled rates of increase exhibited in measurements of both vegetative growth and nutritional status particularly those resulted by the more effective fertilization treatments. In other words, the rate of increase in most nutritional status measurements by the effective fertilization treatments was usually lower than the corresponding ones of the vegetative growth measurements. So, such trend could be logically explained as an expected dilution effect resulted by the relative higher accumulation rate of assimilated dry matter corresponding to the lower rate of increase in most nutrient elements.

Table 3. Effect of mineral (NPK), organic (compost) and bio- fertilizers on leaf photosynthetic pigments (chlorophyll a, b, total and carotenoids) of fig transplants during 2018 and 2019 seasons.

Characteristics / treatments	Chl. a (mg/g)		Chl. b (mg/g)		Total chl. (mg/g)		Carotenoids (mg/g)	
	2018	**2019**	**2018**	**2019**	**2018**	**2019**	**2018**	**2019**
T1. 100% of chemical NPK	10.917 A	10.963 A	6.427 A	6.440 A	17.343 A	17.357 A	5.453 A	5.463 A
T2. 75% of NPK+ 25% organic (compost)	10.517 C	10.537 BC	6.100 C	6.107 C	16.617 C	16.623 C	5.253 C	5.263 C
T3. 50% of NPK+ 50% organic (compost)	10.393 CD	10.430 CD	5.350 E	5.363 E	15.750 E	15.763 E	5.067 E	5.080 E
T4. 25% of NPK+ 75% organic (compost)	10.207 E	10.243 D	5.140 F	5.150 F	15.347 F	15.353 F	4.860 F	4.867 F
T5. 75% of NPK+ 25% organic (compost)+Bio-NPK	10.723 B	10.743 B	6.250 B	6.260 B	16.973 B	16.493 B	5.397 B	5.400 B
T6. 50% of NPK+ 50% organic (compost)+Bio-NPK	10.467 C	10.487 C	5.833 D	5.843 D	16.300 D	15.313 D	5.153 D	5.663 D
T7. 25% of NPK+ 75% organic (compost)+Bio-NPK	10.250 DE	10.270 D	5.100 F	5.11 F	15.350 F	15.363 F	4.690 G	4.703 G

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

Table 4. Effect of mineral (NPK), organic (compost) and bio- fertilizers on leaf mineral contents (N, P, K, Ca and Mg) of fig transplants during 2018 and 2019 seasons.

Characteristics / treatments	N%		P%		K%		Mg%		Ca%	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
T1. 100% of chemical NPK	3.01 A	3.01 A	0.246 A	0.250 A	2.670 A	2.673 A	1.390 A	1.393 A	2.790 A	2.793 A
T2. 75% of NPK+ 25% organic (compost)	2.60 C	2.61 C	0.217 BC	0.213 BC	2.513 B	2.517 B	1.297 C	1.300 C	2.660 C	2.660 B
T3. 50% of NPK+ 50% organic (compost)	2.36 E	2.36 D	0.236 AB	0.237 AB	2.457 B	2.463 B	1.240 D	1.243 D	2.520 E	2.523 C
T4. 25% of NPK+ 75% organic (compost)	2.01 F	2.01 E	0.176 D	0.187 C	2.200 D	2.210 D	1.133 F	1.133 F	2.293 G	2.300 E
T5. 75% of NPK+ 25% organic(compost)+Bio-NPK	2.77 A	2.75 B	0.243 A	0.247 A	2.613 A	2.620 A	1.353 B	1.600 B	2.740 B	2.743 A
T6. 50% of NPK+ 50% organic (compost)+Bio-NPK	2.48 D	2.48 CD	0.207 C	0.207 BC	2.360 C	2.360 C	1.257 D	1.260 D	2.0603 D	2.610 B
T7. 25% of NPK+ 75% organic (compost)+Bio-NPK	2.08 F	2.09 E	0.200 C	0.203 C	2.337 C	2.343 C	1.163 E	1.670 E	2.367 F	2.367 D

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

Table 5. Effect of mineral (NPK), organic (compost) and bio- fertilizers on leaf mineral contents (Fe, Zn and Mn) of fig transplants during 2018 and 2019 seasons.

Characteristics / treatment	Fe ppm		Mn ppm		Zn ppm	
	2018	2019	2018	2019	2018	2019

T1. 100% of chemical NPK	264.57 A	264.80 A	105.94 A	106.10 A	68.920 A	69.187 A
T2. 75% of NPK+ 25% organic (compost)	248.63 BC	248.47 A	98.83 C	98.91 C	59.790 C	62.807 C
T3. 50% of NPK+ 50% organic (compost)	244.47 CD	163.91 A	88.57 E	88.80 E	51.337 DE	51.367 E
T4. 25% of NPK+ 75% organic (compost)	234.77 D	235.13 A	77.32 G	77.47 G	44.447 F	61.117 F
T5. 75% of NPK+ 25% organic (compost)+Bio- NPK	258.20 AB	258.35 A	101.82 B	101.97 B	65.373 B	65.433 A
T6. 50% of NPK+ 50% organic (compost)+Bio-NPK	246.20 BCD	246.11 A	93.66 D	93.70 D	53.937 D	54.117 D
T7. 25% of NPK+ 75% organic (compost)+Bio-NPK	235.47 D	235.63 A	83.27 F	83.34 F	49.337 E	949.600 D

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

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تأثير المصادر المختلفة من الأسمدة النيتروجينية والفوسفاتية والبوتاسية على النمو الخضري والحالة الغذائية لشتلات التين

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أجريت هذه التجربة خلال الموسمين المتتاليين لعامي 2018 و 2019 في مشتل الفاكهة بقسم البساتين ، كلية الزراعة بمشتهر ، جامعة بنها ، محافظة القليوبية ، مصر ، لدراسة تأثير التسميد العضوى (كمبوست) والحيوى كبديل جزئي للتسميد المعدنى على النمو الخضري والحالة الغذائية لشتلات التين صنف "سلطاني". عمر عام واحد. وكانت المعاملات عبارة عن مزيج من سبعة مستويات للتسميد وهي كالتالي: T1(أضافة الجرعة الكاملة الموصى بها من التسميد المعدنى (100% NPK) ، T2 (أضافة 75% من التسميد المعدنى + 25 % سماد عضوى (كمبوست) T3 (50% من التسميد المعدنى + 50% سماد عضوى (كمبوست) T4 (25 % من التسميد المعدنى + 75% سماد عضوى (كمبوست) T5 (ضافة 75% من التسميد المعدنى + 25 % سماد عضوى (كمبوست) + تسميد حيوى، T6 (50% من التسميد المعدنى + 50% سماد عضوى (كمبوست) + تسيميد حيوى T7 (25 % من التسميد المعدنى + 75% سماد عضوى (كمبوست) + تسميد حيوى. . وأظهرت النتائج المتحصل عليها ان استخدام المعاملة الاولي (أضافة الجرعة الكاملة الموصى بها من التسميد المعدنى (100% NPK) أدي الي زيادة في معدل طول و قطر الساق للشتلات ، عدد الأوراق ، مساحة الورقة الواحدة ، المساحة الورقية للشتلة ، الوزن الطازج والجاف للأوراق ، نسبة المادة الجافة للأوراق ، وكذلك أدت نفس المعاملة الي زيادة محتوي الاوراق من نسب عناصر النيتروجين والفوسفور والبوتاسيوم والماغنسيوم والكالسيوم والحديد والمنجنيز والزنك ، بالإضافة إلى تحسين أصباغ التمثيل الضوئي للأوراق ، تليها T5 (أضافة 75% من التسميد المعدنى + 25 % سماد عضوى (كمبوست) + تسميد حيوى) فى حين ان المعاملة (25 % من التسميد المعدنى + 75% سماد عضوى (كمبوست)T4 اعطت اقل قم مقارنة بباقي المعاملات وذلك خلال موسمي الدراسة.