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Influence of Foliar Applied Mineral and Bio-fertilizers on the Yield Parameters of Eig and Olive Trees Grown in the Northwestern Coast of Egypt

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THIS STUDY was carried out through two sequences years in some valleys of the north-western coast, Matrouh Governorate, Egypt. Two farms were studied, the first farm was cultivated with figs trees in El Gabally valley located at 31º 54.97′ 26″ N and 26º 13.13′ 37″ E, while the other farm was cultivated with olives trees in Habes valley located at 31º 21.84′ 21″ N and 27º 34.81′ 02″ E. The chosen trees of both plants nearly are similar. The texture soils in both farms were sandy loam. The main source of irrigation water for the figs and olives trees is seasonal of water rain. Some additions of irrigation water were applied from the found wells. The area of figs trees 8 years old was (11x11m), i.e, 121m^2 (35 trees/fed), while the area of olive trees 10 years old was (10x10m), *i.e*, 100m^2 (42 trees/fed). The aim of this study is using the integration between foliar mineral and bio-fertilizers(*Azotobacter chroococcum,Bacillus megatherium and Sacchromyces cervisiae* to approach the maximum yield (quantity and quality) of fig and olive fruits by using different doses of the studied fertilizers to raise the efficiency of these fertilizers under the conditions of North Western Coast soils.

The results obtained assure that the foliar application of NPK, micronutrients and bio-fertilizer application increased the yield components, total antioxidants, total phenols and nutrients concentration of leaves and fruits of both figs and olive trees. The treatments arranged in the descending order according to the power effect on fruits yield of fig and olive trees as following; NPK fertilizer > micronutrients fertilizers > bio-fertilizers > control. The most effective treatment was Bio$_1$Fol$_4$ with Micro$_2$ which achieved 13.9 and 5.05 ton fruits/fed for figs and olive trees respectively. The foliar application of bio-fertilizers in the presence of mineral fertilizers recorded higher increases of yield parameters and nutrients content in leaves and fruits of both plants. The NPK fertilizers are the most influential on nutrients concentration, total phenols, total antioxidants activity, total sugar content (%) and oil content (%) of figs and olives fruits when compared with the other studied treatments and control. The foliar application of micronutrients fertilizers took the same trend of NPK fertilizers effect.

Keywords: Integration of foliar mineral and bio-fertilizers, Fig and olive fruits, Valleys in the North-Western Coast, Matrouh Governorate, Egypt

The main source of irrigation water to fig and olive trees in the North-western Coast of Matrouh Province is rains water which is starting from October or November until February and March every year. In some areas, possible use supplementary irrigation water system from wells water after the rainy season is ens. The most soils of the Northwestern Coast are calcareous soils which are different in the calcium carbonate content from one region to another.

Regarding to the mineral fertilizers functions in plant; the macronutrients functions in plant such as; the photosynthetic processes in leaves and plant growth were remarkably improved by high nitrogen nutrition. Nitrogen contributes greatly in the formation of the following, protein synthesis, necessary component in cell structure, leafy growth and carbohydrate production (Cechin & Fumis, 2004 and Weisany *et al*., 2013). Phosphorus involved in the photosynthesis, energy and nutrient transport in plant, it can establish a strong root base and produce strong all through the growth plant stages (Ceulemans *et al*., 2011 and Lambers *et al*., 2014). Potassium is involved in many processes in plant such as photosynthesis, water retention and uptake of the plant, protects plant from frost, reduce it disease in root, shoots and leaves of the plant, has good characteristics quality such as producing of uniform size, color and maturity, with enhanced flavor, free of blemishes and devoid of any sign of diseases (Britto and Kronzucker, 2008 and Wang *et al*., 2013).

The micronutrients functions in plant such as; Iron (Fe) involves for many processes in plant such as the process of absorption from the soil through the roots, control transfers from the roots to the parts of the plant above soil surface, the intensification of the iron concentration in the mitochondria and chloroplasts and during seed germination and reduce the presence of iron in the wood (Conte and Walker, 2011). Iron deficiency leads to facilitate the transfer of heavy metal such as manganese, zinc, cobalt, and cadmium, while sufficient level or above of iron prevents it (Barberona *et al*., 2014). Plant's ability to withhold iron and redistribute within the plant for non-iron link the causes of infectious diseases to the presence of competing on the iron link between them and thus increase the plant's ability to cope with such infectious diseases (Expert *et al*., 2012). Manganese (Mn) plays an important role for many processes in plant such as oxidation and reduction processes in plants, such as the electron transport in photosynthesis, in chlorophyll production, as an activating for more 35 different enzymes and carbohydrates synthesis (Mousavi *et al*., 2011). Zn influences the activity of plant enzymes, hydrogenase, carbonic anhydrase and synthesis of cytochrome, Zn involves in plant carbohydrate metabolism, maintenance of the integrity of cellular membranes, protein synthesis, regulation of auxin synthesis and pollen formation, Zn has positive effect on water uptake and transport in plants and also reduces the adverse effects of short periods of heat and salt stress, Zn is required for the synthesis of growth hormone auxin, IAA and integrity of cellular membranes (Hafeez *et al*., 2013).

Regarding to the effect of mineral fertilization on fruits of figs and olive plants, Mimoun *et al*. (2008) stated that the foliar application of K increased the yield and oil yield of rainfed olive. Barranco *et al*. (2010) stated that the foliar mono-potassium phosphate (MKP) 3% plus urea was the most effective treatment for yield and oil content of olive fruits, and improved P and K nutritional state of olive. Yousef *et al*. (2011) stated that the most effective treatment for yield components and nutrients content of olive trees was when micro elements (Zn, Mn and Fe) foliar applied at 0.25% with amino acids at 0.5%. Hagagg *et al*. (2012) decided that the foliar application with 50g ($20N/20P_2O_5/20K_2O$) as (37.5g in soil+12.5g foliar application) improved percentage of leaves number, leaves dry weight and root length, while the highest number and weight of olive fruits achieved with adding (12.5g in soil + 37.5g as foliar application). Malek and Sanaa (2013) reported that the average weight of the fruit per tree, oil content and yield of olive fruits increased with increasing application of NPK fertilizer. Tekaya *et al*. (2013) reported that the foliar fertilizers showed as the following; T3 (rich in P and K), and T6 (rich in N, B, Mg, S, Mn, P, Ca and K) improved oil stability by increasing the content of antioxidants, while T2 (rich in B, Mg, S and Mn) and T4 (rich in P and Ca) affected negatively the antioxidant content in olive oils. Mujić *et al*.(2012) stated that the total phenolics content in fig fruits extracted by 70% methanol varied from 7.24 to 11.17 mg CAE/g of dry extract. Yaz *et al* (2012) reported that the average fig fruits weight ranged between 21.17-69.25 g, while fruit width ranged between 31.91-50.88 mm. Jagtap *et al*. (2012) stated that the application of $FeSO_4$, $ZnSO_4$ and B to fig trees recorded significantly higher yield parameters like number of fruits per plant (227), average fruit weight (62.58g) and yield (14.01kg/tree). Ercisli *et al.* (2012) reported that the total phenols ranged from 24 to 237 mg of gallic acid equivalent per 100 g fresh weight of fig fruits, while the total antioxidant ranged from 4.6 to 18.7 mmol Fe_2 (ferric reducing ability equivalent to 1 mmol/L $FeSO_4$) /kg FW of fig fruits. Sulaiman and Hassan (2011) reported that the total sugar of fig fruits ranged from 20 to 31%, generally the nutrients content in fig fruits were 572, 222, 152, 5.3, 0.38, 8.6, 44.7 and 7.5 mg/100g FW for K, Ca, P, Fe, Cu, Zn, Mg and Na respectively.

Concerning to the important role of bio-fertilizers and effect foliar application on fruits yield of fig and olive trees; Gajbhiye *et al*. (2003) reported that the foliar application of bio-fertilizers produced biological compounds in plants like hormones such as auxin, gibberellic acid, cytokinins acid and vitamins, which improved fruit yield and increase nutrient contents. Thuler *et al*. (2003) decided that the *Azospirillum* sp. ability to release plant growth regulators (PGR) such as polyamines, ethylene, indoleacetic acid and amino acids, the type and quantity of the released substances varied, depending on the presence of combined-N in the medium. Revillas *et al.* (2005) stated that the *Azotobacter* was not only fixed nitrogen but also produce amino acids, organic acids, vitamins, antimicrobial substances and increased microbial community and plant growth. The foliar application of plant growth promoting rhizobacteria (PGPR) such as *Azospirillium, Azotobacter, Bacillus* and *Rhizobium* improved yield increases of plants and product plant form fungal diseases (Basha *et al*., 2006 and Esitken *et al*., 2006). Bio-fertilization leads to the activation of photosynthetical processes and increased activity of peroxidase enzyme in plants (Winget and Gold, 2007). Vijayan et al. (2007) reported that the foliar application of *Azotobacter chroococcum* alleviated from harmful salinity effect to plant growth Spraying plants with effective microorganisms liquid can increase the leaf area, stem thickness and chlorophyll content (Xiaohou *et al*., 2008). Osman (2010) reported that the soil and foliar application of both bio and NPK fertilizers significantly increased amino acid content, mineral content and total carbohydrates of olive leaves. Eleiwa *et al*. (2012) reported that the foliar application of bio-fertilizers(*Azospirillum, Azotobacter or Bacillus*) in combination with micronutrients (Mn +Fe +Zn) can lead to highest yield components of plants. Maksoud *et al*. (2012) reported that the best treatment was superiority with adding compost 30% with bacterial suspension of *Azotobacter chroococcum* for vegetative growth, yield and flesh oil content of olive fruits. Jan *et al*. (2014) decided that the application of *Azotobacter* sp. with organic fertilizers (farmyard manure and liquid organic Fertilizer) improved morphology and growth characters and nutrients content of plants. Abd El-Gawad 2014 reported that microbial inoculants improved fertilization, increase the number and biological activity of desired microorganisms. The objective of this study is approaching the maximum yield of the fig and olive trees in some of the North Western Coast regions, by using mineral and bio fertilizers integration.

Material and Methods

Throughout two successive years, two completely randomized split-split blocks field experiments with three replications for each treatment were carried out. Two farms were used, the first farm was cultivated with fig trees in El Gabally valley located at 31º 54.97′ 26″ N and 26º 13.13′ 37″ E, while the other was cultivated with olive trees in Habes valley located at 31º 21.84′ 21″ N and 27º 34.81′ 02″ E, which selected to obtain the homogeneity or symmetry between trees. The texture farm soils was sandy loam, the main source of irrigation water for the plants is the seasonal rain water. Some additions of irrigation water from wells in valley. The area of figs trees 8 years old was (11x11m), *i.e*, 121m^2 (35 trees/fed), while area of olive trees 10 years old was (10x10m), *i.e*, 100 m^2 (42 trees/fed). Analytical data of the studied soils are presented in table (1). Analyses were accomplished according to Page *et al*. (1984) and Klute (1986).

The foliar application of bio-fertilizers was plant growth promoting rhizobacteria (PGPR) as fresh liquid culture mixed from *Azotobacter chroococcum ,Bacillus megatherium and Sacchromyces cervisiae* concentrated at 10^{8}colony forming unit (cfu/ml) and foliar application at two rate (0 and 2L/600L) for both fig and olive trees at the same time of mineral application. The previous bio-fertilizers were subjected to different biochemical tests for screening their hormonal and enzymatic activity and identified (Table 3). Microbiological analysis for count and density in plant were determination according to Nautiyal (1999) and modified Ashby's media (Hill, 2000). Table 3 shows the biochemical activities of the *Azotobacter chroococcum* and *Bacillus megatherium* characterizes in Laboratory which used in the field experiment to produce of hormones, enzymes. The selected isolates (*Azotobacter chroococcum* and *Bacillus megatherium*) were subjected to different biochemical tests for screening their hormonal (Rizzolo *et al*. 1993) and enzymatic activity (Barrow and Veltham 1993). Selected *Azotobacter* and PDB isolates were purified and identified according to Bergy´s manual of determinative bacteriology (1994). Hormonal activities and enzyme production are common features of all the tested microorganisms (El- Saidy and Abd El-Hai, 2011).

TABLE 1. Some of chemical and physical properties of the studied soils.

Depth Cm	**pH 1:1**	**EC dS/m**	**OM**	**$CaCO_3$**	**Sand**	**Silt**	**Clay**	**CEC me/100g**	**Texture**
			%						
El Gabally Valley (Figs farm)									
0 – 30	8.04	1.70	4.56	16.62	61.11	20.57	18.32	16.80	S.L
30 - 60	7.96	1.21	1.55	17.52	59.01	21.24	19.75	18.20	S.L
Habes Valley (olives farm)									
0 – 30	8.22	1.76	3.89	12.34	71.14	11.50	17.36	11.89	S.L
30 - 60	7.95	1.65	1.19	12.43	70.92	11.35	17.73	12.15	S.L
Soluble cations and anions (me/L) and Total antioxidants and phenol acids in soil									
El Gabally Valley (Figs farm)									
	Na	K	Ca	Mg	HCO_3^{-1}	Cl^{-1}	SO_4^{-2}	T. phenol	T.A.A
0-30	8.70	0.22	4.50	3.70	0.80	11.30	5.02	695	182
30-60	4.50	0.40	4.00	3.00	0.80	8.10	3.00	325	92
Habes Valley (olives farm)									
0-30	5.10	0.58	6.40	5.50	0.60	12.00	4.98	514	167
30-60	4.65	0.54	6.00	5.30	0.60	11.20	4.69	296	84

Available nutrients (mg/kg) in soil							
	N	P	K	Fe	Mn	Zn	Cu
El Gabally Valley (Figs farm)							
0-30	49.5	2.84	169	11.4	5.24	2.89	0.98
30-60	27.8	1.56	187	12.1	6.69	3.11	1.03
Habes Valley (olives farm)							
0-30	39.6	1.95	136	8.3	3.82	1.54	0.63
30-60	20.5	1.14	147	9.5	4.16	1.72	0.76

Initial nutrients and biochemical contents of leaves before applied any fertilizers (mg/kg)									
Farms	N	P	K	Fe	Mn	Zn	Cu	T. phenol	T.A.A
	mg/kg							µg /ml	
Figs	0.87	0.09	0.73	48.6	44.6	26.5	1.78	324	167
Olives	0.76	0.07	0.67	39.8	36.2	18.3	1.68	491	245

SL=Sandy Loam soil, T.ph (Total phenol antioxidants) =µmol of Gallic acid/ml extract, T.A.A (Total antioxidants activity)=µg of Ascorbic acid/ml extract.

TABLE 2. The foliar mineral and bio-fertilizers for fig and olive trees of the studied soils

Foliar Treatments	Figs			Olive		
	N	P	K	N	P	K
Equal doses of the three fertilizers treatments applied during three growth stages (ppm/600L)						
Foliar1	917	181	625	750	362	556
Foliar2	1000	254	903	833	435	625
Foliar3	1167	290	1042	1083	652	764
Different doses of the one fertilizers treatment (Fol_4) applied during three growth stages (ppm/600L)						
Dose A	1017	196	799	933	471	694
Dose B	833	217	903	750	580	799
Dose C	675	254	1042	583	725	903
Micronutrients treatments (ppm/600L)						
Micro 1	200 ppm of Fe, Mn and Zn					
Micro 2	400 ppm of Fe, Mn and Zn					
Bio-fertilizers						
Bio	2L of bio-fertilizer/600L applied at the same times of mineral fertilizers					

TABLE 3. Biochemical activity of bio-fertilizers .

Isolate microorganisms	Hormonal activity Quantitative (µg/ml)			Enzyme activity				Total N (ppm)
	IAA	GA_3	Cytokinin	Amy -lase	Cellulase	Protease	Pectinase	
Azotobacter chrococcum	0.18	3.4	27	+++	-	+	+	132
B. megatherium	0.24	1.32	12	+	+	++	++	.

positive = +, negative= -

The foliar application of mineral and bio-fertilizers added during the different stages of fig and olive growth as following: the first dose of mineral fertilizers was added during vegetative growth stage before flowering growth stage, second dose was added after the flowering stage and the beginning of the fruit composition stage during May and July months, while third dose was added during the June and August months.

The equal three doses of the three mineral fertilizers treatments applied three times during three stages were (foliar 1, 2 and 3) while the different three doses (one integration treatment) applied one time during three stages were (dose A, B and C)(Fol_4), the above information described in Table (2). The equation to calculation the nutrients concentration in foliar solutions as following:

Nutrient concentration (%) in foliar solution = 100 x (Q of fertilizer (kg) X % of nutrient in fertilizers/100) / water volume (600L). To convert from % to ppm by multiplied x 10000. To convert P_2O_5 to P divide /2.3 and K_2O to K divide /1.2 while N divide /1.

Plant samples collected at harvesting stage in the end of each experiment. The fruits yield, numbers and weight of fruits of both fig and olive plants recorded during the studied two seasons. Plant samples were analyzed for N, P and K according to Cottenie *et al*. (1982). The official Lane-Eynon method described in AOAC was used to measure the fruits total sugar (TS %) (James, 2004 and Horowitz, 2000), while the oil was extracted from the olive fruits samples using chloroform: methanol mixture (2:1,V/V) and SOXHLET extraction method according to the method described by Kates (1972) and Petrakis (2006). Measurements of total antioxidants and total phenolic acids in both soils and plants were done according to Rimmer (2009). Statistical analysis was carried out using spilt-split design with three replications for each treatment. The obtained data were statistically analyzed according to Gomez and Gomez (1984).

Results and Discussion

Effect mineral and bio-fertilizers on fruits yield of figs and olive plants

The nutrition status of fig and olive leaves grown at El Gabally and Habes valleys respectively before applied any fertilizers besides the available nutrients in the two studied farms are presented in Table 1, these nutrients were available for trees at rain season only (three months) but, in the other months the soil will be dried, must be added supplemental irrigation water with nutrients to continue plant life, complete plant growth and fruits production of both fig and olive plants.

Concerning the effect of foliar NPK fertilizers and bio-fertilizer treatments on the yield components of figs and olive trees, data in Table 4 showed that the yield parameters of both fig and olive plants increased with increasing application rates of NPK treatments (Fol_1, Fol_2 and Fol_3). The fertilizer treatment which integrated with growth stages of plants (Fol_4) recorded higher fruits yield of both fig and olive trees than other NPK foliar treatments by about 7.9, 5.5 and 14.9% for number branches, number fruits and weight of one fruit (g)/fig tree respectively, while being 10.1, 2.9 and 15.3% of olive tree.

Bio-fertilizer application with mineral fertilizers indicated higher increase of the fruits yield for both fig and olives trees than single application and control by about 9, 3.4 and 5.7% for branches number, number and weight of fruits (g)/fig tree respectively, while being 11.9, 7.3 and 10.2% of olive trees. These results were due to important roles of bio-fertilizers in plant where regular growth plant and improved yield parameter of fig and olive fruits, these facts reported by Mehmet *et al*., (2008), Nourali *et al*. (2011), Jagtap *et al*. (2012), Hagagg *et al.* (2012) and Tekaya *et al.* (2013).

Regarding to the effect of foliar application of micronutrients and bio-fertilizers on fruits yield components, the foliar applied of micronutrients increased the fruits yields of both fig and olive trees with increasing micronutrients rate by about 7.9, 5.5 and 14.9% for number of branches, number of fruits and weight of one fruit (g)/fig trees respectively, while being 10.1, 2.9 and 15.3% in olive plants. The foliar application of micronutrients and bio-fertilizers recorded higher increase of yield parameters with adding the highest rates of them.

Interaction effect among the studied three factors achieved the highest fruits yield of both fig and olive plants. Therefore the superior treatment was Bio_1Fol_4 with $Micro_2$ which achieved 13.9 and 5.05 ton fruits /fed for fig (35 trees/fed) and olive (42 trees/fed) respectively, and increased all the studied yield parameters than control treatment by about 29.1, 20.2 and 25.6%, for branches number, fruits number and weight of fruits (g) of fig plants respectively, while being 25.0, 15.4 and 20.5%, for olive plants. The highest yield components of both fig and olive fruits were achieved by superior treatment $Bio_1Fol_4Micro_2$ when compensation with other studied treatments.

TABLE 4. Effect of foliar mineral and bio-fertilizers applications on the yield components of both fig and olive trees (average of the two seasons).

Treatments		Fruits No. /branch	Fruits No. /tree	one Fruit W. (g)	Fruits W. ton/fed	Fruits No. /branch	Fruits No. /tree	one Fruit W. (g)	Fruits W. ton/fed
		Figs trees				Olive trees			
Control		44	1540	29.2	1.6	135	4050	2.95	0.50
$Micro_1$	Bio_0Fol_1	58	2668	38.4	3.6	156	6396	4.18	1.12
	Bio_0Fol_2	64	3392	45.6	5.4	179	8413	4.95	1.75
	Bio_0Fol_3	69	4071	52.5	7.5	191	10314	5.89	2.55
	Bio_0Fol_4	74	4736	58.3	9.7	208	12480	6.76	3.54
	Bio_1Fol_0	49	1862	31.3	2.0	127	3556	3.57	0.53
	Bio_1Fol_1	61	2989	42.2	4.4	162	7452	4.57	1.43
	Bio_1Fol_2	67	3819	48.5	6.5	185	9805	5.38	2.22
	Bio_1Fol_3	73	4599	55.6	8.9	198	11682	6.35	3.12
	Bio_1Fol_4	78	5382	62.4	11.8	212	13780	7.19	4.16
$Micro_2$	Bio_0Fol_1	63	3213	43.1	4.8	167	7515	5.13	1.62
	Bio_0Fol_2	69	4002	49.3	6.9	189	9639	5.82	2.36
	Bio_0Fol_3	75	4800	55.5	9.3	204	11832	6.69	3.32
	Bio_0Fol_4	79	5451	61.8	11.8	214	13696	7.41	4.26
	Bio_1Fol_0	53	2279	36.5	2.9	128	4224	4.13	0.73
	Bio_1Fol_1	67	3685	46.3	6.0	175	8575	5.57	2.01
	Bio_1Fol_2	73	4526	52.6	8.3	203	11165	6.37	2.99
	Bio_1Fol_3	78	5304	57.7	10.7	211	13082	7.27	3.99
	Bio_1Fol_4	83	6059	65.4	13.9	222	15318	7.85	5.05
$LSD_{0.05}$ Fol.		0.5	58	0.49	0.16	1.67	173	0.06	0.06
$LSD_{0.05}$ Bio.		0.47	56	0.39	0.14	1.30	155	0.06	0.06
$LSD_{0.05}$ Micro.		1.23	152	0.87	0.39	2.48	292	0.19	0.15
$LSD_{0.05}$ FxB		0.86	101	0.84	0.27	2.89	300	0.11	0.11
$LSD_{0.05}$ FxM		0.71	82	0.69	0.22	2.36	245	0.09	0.09
$LSD_{0.05}$ BxM		0.66	79	0.55	0.2	1.84	150	0.09	0.08
$LSD_{0.05}$ 3factors		1.22	142	1.19	0.39	3.05	317	0.15	0.11

No=number, W=weight, Fol=foliar NPK fertilizers, Bio=bio-fertilizer and Micro= micronutrients fertilizers.

The third interaction was significant most influential on yield components of fig and olive trees above the second interaction which was greater impact than single interaction. The previous results indicated that the macronutrients treatments are the most influential on the trees fruits production of both fig and olive plants, followed by micronutrients and the least was bio-fertilizers. These due to the macronutrients have an important role to increase the ability of olive and fig trees to form cells which reflected on growth and production of plants, these facts agreed with reports for N, P and K by Weisany *et al*. (2013), Lambers *et al.* (2014) and Wang *et al*. (2013) respectively.

Micronutrients take the same trend of macronutrients for yield parameters, micronutrients involved in many biological processes in the plant, especially the antioxidants formation processes in the plant where the micronutrients application increased the enzyme activity which formed the antioxidants. The micronutrients functions in plant for Fe, Mn, Zn, and B were reported by Barberona *et al*. (2014), Mousavi *et al.* (2011), Hafeez *et al*. (2013) and Ganie *et al*., (2013). The bio-fertilizer has important roles for growth plant regulars and plant nutrition were stated by Basha *et al*. (2006) and Esitken *et al*., (2006), Abd El-Gawad (2014) and. Jan *et al*. (2014) The above results agreed with those obtained by Mehmet *et al*., (2008), Nourali *et al*. (2011), Jagtap *et al*. (2012), Hagagg *et al.* (2012) and Tekaya *et al.* (2013).

Regarding to the soil fertility effect on fruits yield of fig and olive trees, the initial nutrients at Table 1 were sufficient for some nutrients and insufficient of other some nutrients, during the rainy season, the fig and olive trees were absorbing the nutrients from the soil into the trees, where part of these nutrients consumed in the vegetative growth stage and the other part stored in the trees (stem and branches). After the end of the rainy season, water absorption from the soil was less and also nutrients movement was less within the trees and show drought symptoms on trees. Therefore, the supplemental irrigation water must be adding to plants by use the foliar fertilizers application which increased the nutrients movement in plant and provides the nutrients of plant requirements in each stage of plant growth. This is reflected on the fruit productivity and quality of figs and olive trees, it is clear, the importance of soil fertility on the fruit productivity and quality. And also the importance of foliar fertilization in the completion stages of plant growth and fruit yield of fig and olive trees under the conditions of the North West Coast soils. The previous results agreed with those obtained by Hagagg *et al*. (2012), Tekaya *et al*. (2013) and Malek and Sanaa (2013).

Effect of mineral and bio-fertilizers on nutrients contents of fig and olive plants:

Data in Table 5 showed that the nutrients concentration in leaves of both fig and olive plants increased with increasing NPK, micronutrients and bio-fertilizers rates. The variations between the studied treatments were significant, about NPK fertilizers induced higher increases of nutrients concentration of fig leaves than control treatment by about 28.2, 16, 21.5, 21.6, 30.4, 21 and 36.4% for N, P, K, Fe, Mn, Zn and Cu of fig leaves respectively, while being 31.3, 9.8, 16.4, 19, 26.5, 21.7 and 24% of olive leaves. The micronutrients application increased the concentration of this studied nutrients above control treatment by about 25, 13.4, 16.2, 17.3, 24.5, 16.1 and 28.2% for N, P, K, Fe, Mn, Zn and Cu of fig leaves respectively, while being 29, 7.3, 11.4, 15.4, 21.5, 19.1 and 16.5 % of olive leaves. The bio-fertilizer achieved increases over control treatment by about 3.5, 11.4, 4.4, 8.6, 12.9, 4.6 and 7.7% for N, P, K, Fe, Mn, Zn and Cu of fig leaves respectively, and being 4.7, 4.9, 1.6, 8.2, 5.1, 7.1 and 5.5 % of olive leaves.

TABLE 5. Effect of the mineral and bio fertilizers applied on the nutrients content of figs leaves (average of the two seasons).

Treatments		Nutrients content in figs leaves							Nutrients content in olive leaves						
		N	P	K	Fe	Mn	Zn	Cu	N	P	K	Fe	Mn	Zn	Cu
		g/100g			mg/kg				g/100g			mg/kg			
Control		0.79	0.14	0.46	152	112	57	11	0.69	0.16	0.41	159	65	18	7
$Micro_1$	Bio_0Fol_1	1.40	0.27	1.02	288	196	100	19	1.22	0.32	0.85	265	101	32	12
	Bio_0Fol_2	1.53	0.31	1.11	312	214	109	21	1.33	0.37	0.98	289	111	35	13
	Bio_0Fol_3	1.65	0.33	1.2	336	232	118	22	1.44	0.41	1.05	312	120	38	14
	Bio_0Fol_4	1.84	0.37	1.33	372	258	131	25	1.60	0.45	1.15	346	131	42	16
	Bio_1Fol_0	1.04	0.21	0.72	214	139	78	15	0.89	0.23	0.6	188	79	23	8
	Bio_1Fol_1	1.48	0.28	1.07	300	206	105	20	1.28	0.34	0.89	279	106	34	13
	Bio_1Fol_2	1.61	0.33	1.17	328	226	115	22	1.40	0.39	1.03	302	116	37	14
	Bio_1Fol_3	1.73	0.35	1.26	352	244	124	23	1.51	0.43	1.11	329	126	40	15
	Bio_1Fol_4	1.92	0.39	1.4	392	270	137	26	1.68	0.46	1.21	363	137	44	17
$Micro_2$	Bio_0Fol_1	1.50	0.3	1.08	348	218	111	22	1.28	0.35	0.98	292	112	36	14
	Bio_0Fol_2	1.64	0.35	1.18	380	238	122	24	1.40	0.39	1.13	319	123	39	15
	Bio_0Fol_3	1.77	0.38	1.27	412	256	131	26	1.51	0.44	1.22	346	132	42	16
	Bio_0Fol_4	1.96	0.41	1.41	456	284	146	29	1.68	0.47	1.34	383	143	47	17
	Bio_1Fol_0	1.12	0.24	0.99	247	155	98	19	0.99	0.28	0.7	207	87	26	9
	Bio_1Fol_1	1.57	0.32	1.13	368	228	117	23	1.35	0.37	1.03	306	128	38	15
	Bio_1Fol_2	1.71	0.36	1.24	400	250	128	25	1.47	0.41	1.19	336	137	41	16
	Bio_1Fol_3	1.85	0.4	1.33	432	270	137	27	1.60	0.46	1.28	363	146	44	17
	Bio_1Fol_4	2.05	0.44	1.48	480	300	154	30	1.77	0.48	1.4	403	152	49	18
$LSD_{0.05}$ Fol.		0.019	0.003	0.012	3.8	2.3	0.60	0.26	0.016	0.004	0.012	3.1	1.1	0.38	0.15
$LSD_{0.05}$ Bio.		0.016	0.004	0.014	3.4	1.8	0.64	0.22	0.014	0.003	0.010	2.2	1.3	0.32	0.12
$LSD_{0.05}$ Micro.		0.030	0.009	0.022	16.5	5.6	1.78	0.84	0.022	0.007	0.037	7.4	3.5	0.97	0.39
$LSD_{0.05}$ FxB		0.032	0.006	0.021	6.5	4.1	1.04	0.37	0.028	0.007	0.021	5.3	1.9	0.66	0.26
$LSD_{0.05}$ FxM		0.026	0.005	0.017	5.3	3.3	0.85	0.31	0.017	0.006	0.017	4.4	1.5	0.54	0.21
$LSD_{0.05}$ BxM		0.015	0.005	0.020	4.7	2.6	0.91	0.32	0.020	0.005	0.014	3.2	1.8	0.45	0.17
$LSD_{0.05}$ 3factors		0.046	0.009	0.030	9.2	5.7	1.47	0.53	0.039	0.010	0.030	7.6	2.6	0.94	0.36

Data in Table 6 induced that the nutrients concentration in fruits of both fig and olive plants take the same trends of the nutrients behavior in leaves of both the studied plants.

The highest nutrients concentrations of leaves and fruits of the studied plants were achieved by superior treatment $Bio_1Fol_4Micro_2$ when compared with the other studied treatments. The triple interaction showed the higher significant increases of nutrients content of leaves and fruits of both fig and olive plants.

The effect of the studied treatments on nutrients content of leaves and fruits of both the fig and olive plants were arranged as following: NPK fertilizers treatments > micronutrients > bio-fertilizers. These results were due to the important role of macronutrients and micronutrients according to Weisany *et al*. (2013), Lambers *et al*. (2014) and Wang *et al*. (2013) for macronutrients functions in plant, Mousavi *et al*. (2011), Barberona *et al*. (2014) and Hafeez *et al*. (2013), for micronutrients functions in plant, while the bio-fertilizers roles in plant were stated by Basha *et al*., (2006) and Esitken *et al*. (2006), Abd El-Gawad (2014) and Jan *et al*. (2014). The above results agree with obtained by Sulaiman and Hassan (2011), Yousef *et al*. (2011) and Tekaya *et al*. (2013).

TABLE 6. Integration effect between mineral and bio fertilizers treatments on the nutrients contents of both figs and olive fruits (average of the two seasons).

Treatments		Nutrients content in figs fruits							Nutrients content in olive fruits						
		N	**P**	**K**	**Fe**	**Mn**	**Zn**	**Cu**	**N**	**P**	**K**	**Fe**	**Mn**	**Zn**	**Cu**
		g/100g			**mg/kg**				**g/100g**			**mg/kg**			
Control		0.55	0.12	0.36	131	65	33	12	0.64	0.21	0.37	161	67	22	10
$Micro_1$	Bio_0Fol_1	0.88	0.24	0.68	206	111	53	19	1.01	0.39	0.79	286	110	41	17
	Bio_0Fol_2	0.96	0.26	0.75	222	122	55	20	1.11	0.4	0.91	329	120	44	18
	Bio_0Fol_3	1.04	0.28	0.8	238	132	59	21	1.20	0.43	0.99	354	130	48	20
	Bio_0Fol_4	1.15	0.31	0.89	269	144	66	22	1.33	0.48	1.07	388	144	53	22
	Bio_1Fol_0	0.63	0.17	0.48	160	97	45	16	0.72	0.28	0.58	203	78	29	12
	Bio_1Fol_1	0.93	0.25	0.72	206	115	54	21	1.06	0.4	0.83	301	116	43	18
	Bio_1Fol_2	1.00	0.27	0.78	238	128	57	22	1.16	0.42	0.95	344	126	46	19
	Bio_1Fol_3	1.09	0.30	0.85	253	138	62	23	1.26	0.45	1.03	372	136	50	21
	Bio_1Fol_4	1.21	0.32	0.94	285	151	69	24	1.39	0.5	1.12	408	150	56	23
$Micro_2$	Bio_0Fol_1	1.02	0.26	0.77	222	121	56	20	1.12	0.42	0.89	314	122	45	18
	Bio_0Fol_2	1.11	0.27	0.84	238	132	59	21	1.23	0.44	1.03	362	132	49	20
	Bio_0Fol_3	1.19	0.30	0.9	253	143	63	22	1.33	0.47	1.11	390	142	53	22
	Bio_0Fol_4	1.33	0.33	1	285	156	70	23	1.47	0.52	1.21	428	158	58	24
	Bio_1Fol_0	0.72	0.20	0.55	173	112	50	18	0.83	0.32	0.74	223	87	32	13
	Bio_1Fol_1	1.07	0.26	0.81	233	132	58	21	1.18	0.43	0.94	332	128	47	19
	Bio_1Fol_2	1.16	0.29	0.88	253	139	61	22	1.29	0.46	1.08	380	138	51	21
	Bio_1Fol_3	1.26	0.31	0.95	269	150	66	23	1.39	0.5	1.16	411	150	55	23
	Bio_1Fol_4	1.39	0.35	1.05	285	164	74	24	1.54	0.55	1.24	449	166	61	25
$LSD_{0.05}$ Fol.		0.012	0.003	0.008	2.4	1.1	0.47	0.17	0.014	0.004	0.011	4.4	1.25	0.49	0.20
$LSD_{0.05}$ Bio.		0.009	0.003	0.007	2.0	1.5	0.54	0.20	0.010	0.004	0.010	3.2	0.91	0.38	0.14
$LSD_{0.05}$ Micro.		0.043	0.005	0.022	4.0	2.9	0.97	0.47	0.035	0.009	0.030	9.3	2.96	1.07	0.39
$LSD_{0.05}$ FxB		0.021	0.005	0.015	4.1	2.0	0.81	0.30	0.023	0.007	0.018	7.6	2.17	0.84	0.34
$LSD_{0.05}$ FxM		0.017	0.004	0.012	3.3	1.6	0.66	0.24	0.019	0.006	0.015	6.2	1.77	0.69	0.28
$LSD_{0.05}$ BxM		0.012	0.004	0.010	1.9	2.1	0.76	0.28	0.014	0.005	0.015	4.5	1.29	0.54	0.14
$LSD_{0.05}$ 3factors		0.030	0.007	0.021	5.8	2.8	1.14	0.42	0.033	0.010	0.026	10.7	3.07	1.19	0.48

Effect mineral and bio-fertilizers on nutrients uptake by fruits of figs and olive trees

Data at Table 7 showed that nutrients uptake by fruits of fig and olive trees increased with increasing application of NPK, micronutrients and bio-fertilizers rates. The variations among these studied treatments were significant. NPK fertilizers increased the nutrients uptake of fig and olive fruits above control treatment by about 27.4, 17, 18.8, 18, 21.2, 33.8 and 30.8% for N, P, K, Fe, Mn, Zn and Cu of fig fruits respectively, while being 28.3, 15.5, 18.3, 16, 24.1, 23.6 and 29.2% of olive fruits. Micronutrients treatments recorded increases of these nutrients uptake of fig fruits above control treatment by about 25.2, 12.8, 15.2, 13.7, 15.9, 30.4 and 22.6% for N, P, K, Fe, Mn, Zn and Cu respectively, and being 24.9, 11.7, 14.4, 12.3, 19.2, 19.3 and 21.8 % of olive fruits.

Bio-fertilizers achieved increases of nutrients uptake over control treatment by about 7.6, 5.6, 8.3, 10.4, 8.7, 16.4 and 3.2% for N, P, K, Fe, Mn, Zn and Cu of figs fruits respectively, and 0.8, 7.8, 8, 6.5, 13, 8.7 and 9.2 % of olive fruits.

The studied treatments were sort descending to order nutrients uptake as following: NPK > micronutrients > bio-fertilizers. The highest nutrients uptake of figs and olive fruits were achieved these with superior treatment $Bio_1Fol_4Micro_2$ when compared with the other studied treatments. The triple interaction showed the highest significant increases of nutrients uptake of both figs and olive fruits than the other interactions. This result may be due to the job role of bio-fertilizers, it is regular plant growth and fruits production of the figs and olive plants. The previous results agree with obtained by Yousef *et al.* (2011) Barranco *et al.* (2010) and Sulaiman and Hassan (2011).

TABLE 7. Effect of the mineral and bio fertilizers applied on the nutrients uptake of both fig and olive fruits (average of the two seasons).

Treatments		Nutrients uptake in figs fruits							Nutrients uptake in olive fruits						
		N	P	K	Fe	Mn	Zn	Cu	N	P	K	Fe	Mn	Zn	Cu
		kg/fed			100g/fed				kg/fed			100g/fed			
Control		9	1.9	6	2.1	1.0	0.53	0.19	3.2	1.1	1.9	0.8	0.3	0.11	0.05
$Micro_1$	Bio_0Fol_1	32	8.6	24	7.4	4.0	1.91	0.68	11.3	4.4	8.8	3.2	1.2	0.46	0.19
	Bio_0Fol_2	52	14.0	41	12.0	6.6	2.97	1.08	19.4	7.0	15.9	5.8	2.1	0.77	0.32
	Bio_0Fol_3	78	21.0	60	17.9	9.9	4.43	1.58	30.6	11.0	25.2	9.0	3.3	1.22	0.51
	Bio_0Fol_4	112	30.1	86	26.1	14.0	6.40	2.13	47.1	17.0	37.9	13.7	5.1	1.88	0.78
	Bio_1Fol_0	13	3.4	10	3.2	1.9	0.90	0.32	3.8	1.5	3.1	1.1	0.4	0.15	0.06
	Bio_1Fol_1	41	11.0	32	9.1	5.1	2.38	0.92	15.2	5.7	11.9	4.3	1.7	0.61	0.26
	Bio_1Fol_2	65	17.6	51	15.5	8.3	3.71	1.43	25.8	9.3	21.1	7.6	2.8	1.02	0.42
	Bio_1Fol_3	97	26.7	76	22.5	12.3	5.52	2.05	39.3	14.0	32.1	11.6	4.2	1.56	0.66
	Bio_1Fol_4	143	37.8	111	33.6	17.8	8.14	2.83	57.8	20.8	46.6	17.0	6.2	2.33	0.96
$Micro_2$	Bio_0Fol_1	49	12.5	37	10.7	5.8	2.69	0.96	18.1	6.8	14.4	5.1	2.0	0.73	0.29
	Bio_0Fol_2	77	18.6	58	16.4	9.1	4.07	1.45	29.0	10.4	24.3	8.5	3.1	1.16	0.47
	Bio_0Fol_3	111	27.9	84	23.5	13.3	5.86	2.05	44.2	15.6	36.9	12.9	4.7	1.76	0.73
	Bio_0Fol_4	157	38.9	118	33.6	18.4	8.26	2.71	62.6	22.2	51.5	18.2	6.7	2.47	1.02
	Bio_1Fol_0	21	5.8	16	5.0	3.2	1.45	0.52	6.1	2.3	5.4	1.6	0.6	0.23	0.09
	Bio_1Fol_1	64	15.6	49	14.0	7.9	3.48	1.26	23.7	8.6	18.9	6.7	2.6	0.94	0.38
	Bio_1Fol_2	96	24.1	73	21.0	11.5	5.06	1.83	38.6	13.8	32.3	11.4	4.1	1.52	0.63
	Bio_1Fol_3	135	33.2	102	28.8	16.1	7.06	2.46	55.5	20.0	46.3	16.4	6.0	2.19	0.92
	Bio_1Fol_4	193	48.7	146	39.6	22.8	10.3	3.34	77.8	27.8	62.6	22.7	8.4	3.08	1.26
$LSD_{0.05}$ Fol.		7.1	1.44	5.0	1.19	0.74	0.31	0.09	2.75	0.96	2.35	0.79	0.29	0.11	0.04
$LSD_{0.05}$ Bio.		1.4	0.37	1.1	0.31	0.18	0.08	0.03	0.58	0.21	0.48	0.17	0.06	0.02	0.01
$LSD_{0.05}$ Micro.		2.4	0.63	1.9	0.53	0.29	0.13	0.04	1.02	0.36	0.83	0.30	0.11	0.04	0.02
$LSD_{0.05}$ FxB		2.0	0.53	1.6	0.44	0.26	0.11	0.03	0.82	0.30	0.68	0.24	0.09	0.03	0.01
$LSD_{0.05}$ FxM		3.5	0.89	2.6	0.75	0.41	0.18	0.06	1.44	0.51	1.18	0.42	0.16	0.06	0.02
$LSD_{0.05}$ BxM		4.2	1.08	3.2	0.92	0.50	0.23	0.07	1.76	0.63	1.44	0.52	0.19	0.07	0.03
$LSD_{0.05}$ 3factors		4.5	1.15	3.4	1.29	0.53	0.24	0.11	1.86	0.66	1.53	0.55	0.20	0.07	0.03

Effect mineral and bio-fertilizers on the microbial in leaves of fig and olive trees:

The phyllosphere or plant leaf surface has many microorganisms. Microorganisms fixed nitrogen from atmospheric, produce plant growth regulators, sugars, amino acids, peptides, enzymes, vitamins, organic acids and nucleotides (Hirane and Upper, 2000).

Total microbial counts: Mixed bio-fertilization treatments recorded highest total microbial counts in phyllosphere of fig and olive compared with mineral fertilization treatments without bio-fertilizer foliar application. The foliar application of bio-fertilization treatments increased microbial counts by 30 % relative to control (Table 8). Abd El-Gawad (2014) reported that microbial inoculants improved fertilization, increase the number and biological activity of desired microorganisms.

Azotobacter density: Data in Table 8 showed that the foliar application of mineral and bio-fertilizers increased the growth of *Azotobacter* density in the phyllosphere (surface leaves) of fig and olive. *Azotobacter chrococcum* was not only fixed nitrogen but also produced amino acids, organic acids, vitamins, antimicrobial substances and increased microbial community and plant growth (Revillas *et al.* 2005). The superior treatment was (Bio_1Fol_4 with Micronutrients) the integration treatment between mineral fertilizer and bio-fertilizers which achieved highest fruits yield parameters, nutrients contents, biochemical contents total microbial contents and *Azotobacter* density contents. This result was due to the important role mineral and bio-fertilizers in plant and effect their on yield and quality of fig and olive fruits according to Weisany *et al*. (2013), Lambers *et al*. (2014) and Wang *et al*. (2013) for macronutrients roles in plant, Mousavi *et al*. (2011), Barberona *et al*. (2014), and Hafeez *et al*. (2013), for micronutrients roles in plant, while bio-fertilizers roles were decided by Basha *et al*. (2006) and Esitken *et al*. (2006), Abd El-Gawad (2014) and Jan *et al*. (2014).

TABLE 8. Effect mineral and bio-fertilizers on the microbial density in leaves of fig and olive trees.

Treatments		Figs trees		Olive trees	
		Total microbial counts×10^2cfu/g	**Azotobacter densities in phyllosphere ×10^2cells/g**	**Total microbial counts×10^2cfu/g**	**Azotobacter densities in phyllosphere ×10^2cells/g**
Control		15	0	19	0
$Micro_1$	Bio_0Fol_1	18	0	22	0
	Bio_0Fol_2	21	0	24	0
	Bio_0Fol_3	23	0	27	0
	Bio_0Fol_4	25	0	29	0
	Bio_1Fol_0	41	3.5	46	3.8
	Bio_1Fol_1	43	3.9	51	4.1
	Bio_1Fol_2	46	4	52	4.2
	Bio_1Fol_3	48	4.1	54	4.4
	Bio_1Fol_4	49	4.3	57	4.6
$Micro_2$	Bio_0Fol_1	23	0	26	0
	Bio_0Fol_2	26	0	29	0
	Bio_0Fol_3	28	0	31	0
	Bio_0Fol_4	29	0	34	0
	Bio_1Fol_0	41	4.7	49	4.8
	Bio_1Fol_1	46	4.9	53	5.3
	Bio_1Fol_2	49	5.2	55	6.2
	Bio_1Fol_3	52	5.6	57	6.3
	Bio_1Fol_4	55	5.8	58	6.4
$LSD_{0.05}$ Fol.		0.92	0.17	0.78	0.21
$LSD_{0.05}$ Bio.		1.89	0.36	2.08	0.39
$LSD_{0.05}$ Micro.		0.21	0.01	0.20	0.02
$LSD_{0.05}$ FxB		1.84	0.50	2.02	0.55
$LSD_{0.05}$ FxM		0.30	0.02	0.28	0.02
$LSD_{0.05}$ BxM		0.37	0.02	0.34	0.03
$LSD_{0.05}$ 3factors		0.52	0.03	0.49	0.04

Effect of mineral and bio-fertilizers applied on biochemical of figs and olive trees

Data in Table 9 showed that the foliar application of micronutrients and NPK fertilizers with bio-fertilizer increased total phenols and total antioxidant in leaves and fruits of both fig and olive plants when compared with the control treatment.

The sugar content % and oil content % of fig and olive fruits increased with increasing NPK, micronutrients and bio-fertilizer application rates. Moreover, the studied factors effect ascending in order to biochemical of fig and olive trees as following: bio-fertilizers < micronutrients < NPK fertilizers. The most effective treatment was Bio_1Fol_4 with Micronutrients. In the other side, the concentrations of total phenols and total antioxidant activity of leaves and fruits of olive plants were higher than of figs plants. The above results agreed with those obtained by Sulaiman and Hassan (2011), Mujić *et al*.(2012), Malek and Sanaa (2013) and El-Sayed *et al*. (2014).

In conclusion, the yield components, total antioxidants, total phenols, nutrients contents and uptake of fig and olive trees increased with increasing the foliar application of NPK, micronutrients and bio-fertilizers rates. The studied treatments can be descending by arranged in order for yield parameters, nutrients content and uptake of both fig and olive trees as follows; NPK fertilizer> micronutrients fertilizers > bio-fertilizers > control. The total phenols, total antioxidants, total sugar % and oil content % of both fig and olive trees were tating the same trend of yield parameters and nutrients contents. The most effective treatment was Bio_1Fol_4 with $Micro_2$ which achieved 17.33 ton fruits/fed (35trees/fed) and 7.94 ton fruits/fed (42 trees/fed) for fig and olive fruits, respectively. The triple interaction was the superior treatment for yield components, nutrients contents, nutrients uptake and biochemical of both fig and olive plants as well as increased total microbial counts and *Azotobacter* density in leaves of fig and olive trees.

TABLE 9. Effect of foliar mineral and bio-fertilizers applied on total antioxidants and total phenols of both figs and olive plants.

Treatments		Figs trees					Olive trees				
		T. Antioxidants		T. phenols		Sugar	T. Antioxidants		T. phenols		Oil
		µg ASA/ml		µmol GalA/ml		%FW	µg ASA/ml		µmol GalA/ml		%FW
		Leaf	Fruits	Leaf	Fruits	Fruits	Leaf	Fruits	Leaf	Fruits	Fruits
Control		116	65	225	147	16.9	156	88	298	195	9.2
$Micro_1$	Bio_0Fol_1	194	122	389	253	18.2	242	152	485	315	12.2
	Bio_0Fol_2	236	172	465	325	20.9	271	198	534	373	14.8
	Bio_0Fol_3	277	201	516	392	24.4	310	225	578	439	16.5
	Bio_0Fol_4	329	231	577	454	27.1	359	252	630	495	17.8
	Bio_1Fol_0	136	85	273	177	17.6	172	108	344	224	10.4
	Bio_1Fol_1	214	135	409	264	20.5	264	167	504	326	13.4
	Bio_1Fol_2	247	179	469	330	24.2	291	211	552	389	15.8
	Bio_1Fol_3	282	200	498	378	28.2	337	239	595	452	17.7
	Bio_1Fol_4	337	238	579	458	29.9	378	267	650	514	18.6
$Micro_2$	Bio_0Fol_1	208	137	417	269	21.9	254	167	509	329	13.5
	Bio_0Fol_2	249	180	479	333	25.1	289	209	556	386	15.8
	Bio_0Fol_3	288	204	517	391	28.9	333	236	598	452	17.5
	Bio_0Fol_4	348	241	582	461	31.3	389	269	651	515	18.6
	Bio_1Fol_0	149	103	302	195	18.55	180	125	366	235	11.3
	Bio_1Fol_1	225	153	427	274	25.9	278	189	527	339	14.6
	Bio_1Fol_2	259	179	480	337	28.7	312	216	578	406	16.5
	Bio_1Fol_3	297	200	519	388	31.8	359	242	627	469	18.3
	Bio_1Fol_4	349	232	564	440	34.7	418	278	676	527	19.7
$LSD_{0.05}$ Fol.		3.3	2.5	5.1	4.6	0.22	3.4	2.6	5.2	4.8	0.14
$LSD_{0.05}$ Bio.		1.5	0.9	1.4	0.7	0.31	2.5	1.7	3.1	2.0	0.12
$LSD_{0.05}$ Micro.		3.1	1.7	2.9	1.5	0.94	4.9	2.9	5.6	3.4	0.22
$LSD_{0.05}$ FxB		5.7	4.4	8.8	8.0	0.38	4.4	4.6	9.0	8.3	0.25
$LSD_{0.05}$ FxM		3.5	3.6	7.2	6.5	0.31	4.9	3.7	7.3	5.1	0.20
$LSD_{0.05}$ BxM		1.4	0.9	2.0	0.7	0.44	3.5	1.7	4.4	2.0	0.12
$LSD_{0.05}$ 3factors		8.1	6.2	12.4	11.3	0.54	6.3	6.5	9.5	8.8	0.35

µg ASA/ml= µg of Ascorbic acid/ml extract, µmol GalA/ml= µmol of Gallic acid/ml extract, T.=Total and FW=fresh weight

References

Abd El-Gawad (2014) Response of wheat (Triticum astivum) yield to mineral and bio-fertilization under soil surface mulching conditions in the affected saline area. *Egypt.J.of Appl.Sci.* **29** (2).

Barberona, M., Dubeauxb, G., Kolbc, C., Isonoc, E., Zelaznyb, E. and G. Vert (2014) Polarization of iron-regulated transporter 1 (IRT1) to the plant-soil interface plays crucial role in metal homeostasis. *PNAS*, **111**(22) , 8293–8298.

Barranco, D., Hicran, E., Concepción, M.D., Angjelina, B. and Arquero, O. (2010) Factors influencing the efficiency of foliar sprays of monopotassium phosphate in the olive. *International J. of Plant Production*, **4** (3), 235-240.

Barrow, G.L. and Velthan, R.K.A. (1993) Cown & Steel's , Mannual for the identification of medical bacteria. Cambridge Univ.Press.

Basha, S.A., Sarma, B.K., Singh, D.P., Annapurna, K. and Singh, U.P. (2006) Differential methods of plant growth-promoting rhizobacteria induce synthesis of phenylalanine ammonia-lyase and phenolic componts differentially in chickpea. *Folia Microbiol*. **51**, 463–468.

Bergey's Manual of Determinative Bacteriology (1994) John G Hol, Noel R. Kriey, Peter H.A. Sneath, James T. Staley T.Williams (Ed.) (9^{th} ed.) Williams and Wilkins, Baltimore London.

Britto, D.T. and Kronzucker, H.J. (2008) Cellular mechanisms of potassium transport in plants. Physiologia Plantarum, ISSN 0031-9317:1-14.

Cechin, I. and Fumis, T.d.F. (2004) Effect of nitrogen supply on growth and photosynthesis of sunflower plants grown in the greenhouse. *Plant Science* **166** (2004) 1379–1385.

Ceulemans,T., Merckx, R., Hens, M. and Honnay, O. (2011) A trait-based analysis of the role of phosphorus vs. nitrogen enrichment in plant species loss across North-west European grasslands. *Journal of Applied Ecology*, **48** (5), 1155–1163.

Conte, S.S. and Walker, E.L. (2011) Transporters contributing to iron trafficking in plants. *Molecular Plant*, 1–13.

Cottenie, A., Verlso, M., Kilkens, L., Velghe, G. and Camerlynck, R. (1982) *Chemical Analysis of Plants and Soils*. Lab. Agroch. State Univ. Gent, Belgium.

Eleiwa, M.E., Hamed, E.R. and Shehata, H.Sh. (2012) The role of biofertilizers and/or some micronutrients on wheat plant (*Triticum aestivum* L.) growth in newly reclaimed soil. *Journal of Medicinal Plants Research*, **6** (17) : 3359-3369.

El-Sayed, O.M., El-Gammal, O.H.M. and Salama, A.S.M. (2014) Effect of ascorbic acid, proline and jasmonic acid foliar spraying on fruit set and yield of Manzanillo olive trees under salt stress. *Scientia Horticulturae*, **176** (11), 32–37.

Ercisli, S., Tosun, M. Karlidag, H. Dzubur, A. Hadziabulic, S. and Aliman, Y. (2012) Color and antioxidant characteristics of some fresh fig (ficus carica l.) genotypes from northeastern turkey. *Plant Foods Hum Nutr*., **67**, 271-276.

Esitken, A., Pirlak, L., Turan, M., Sahin, F., (2006) Effects of floral and foliar application of plant growth promoting rhizobacteria (PGPR) on yield, growth and nutrition of sweet cherry. *Sci Hortic*. **110**, 324–327.

Expert, D., Franza, T. and Dellagi, A. (2012) Iron in Plant–Pathogen Interactions–Microbe Associations, Springer Briefs in Biometals, DOI: 10.1007/978-94-007-5267-5272.

Gajbhiye, R.P., Sharma, R.R. and Tewari, R.N. (2003) Effects of bio-fertilizers on the growth and yield parameters of tomato. *Indian J.Horti*., **60**(4), 368-371.

Gomez, K.A. and A.A. Gomez (1984) *Statistical Procedures for Agricultural Research*. 2*nd* ed., Wiley, New York.

Hafeez, B.; Khanif, Y. M. and M. Saleem (2013) Role of Zinc in Plant Nutrition- A Review. *American Journal of Experimental Agriculture*, **3**(2), 374-391.

Hagagg, L.F.; Abd-Alhamid, N.; Mustafa, N.S. ; Shahin, M.F.M. and S.E. El Hady (2012) Effect of different Nitrogen applications and organic matter on growth performance of Maraky olive seedlings. *J. of Applied Sci. Res*., **8** (4), 2071-2075.

Hill, G. Sawers, (2000) *Azotobacter*. *In Encyclopedia* of Microbiology 3*rd* ed, Academic Press, New York, 2000, pp. 359-371

Horowitz, W. (Ed.) (2000) *AOAC Official Methods of Analysis* (17*th* ed., sections 50.1.21 (992.05), 45.2.03 (944.12), and 45.2.01 (960.46). Gaithersburg, MD: Association of Official Analytical Chemists International.

Jagtap, P.B., Gaikwad, S.P. and Bhagat, A.A. (2012) Contribution of micronutrient fertilizers in improving yield and quality of fig (ficus carica) and economics of their application. *Ecology, Environment and Conservation*, **18** (2), 303-308

James, C.S. (2004) Analytical Chemistry of Food. Seale- Hayne Faculty of Agriculture, Food and Land use, Department of Agriculture and Food Studies, University of Polymouth, UK, **1**, 96-97.

Jan, K., Rather, A. M. ; Boswal, M.V. and Ganie, A.H. (2014) Effect of biofertilizer and organic fertilizer on morpho-physiological parameters associated with grain yield with emphasis for further improvement in wheat yield production (Bread wheat=*Triticum aestivum L.). International Journal of Agriculture and Crop Sciences* (IJACS),**7**(4),178-184.

Kates, M., (1972) Techniques of Lipidology, Isolation, Analysis and Identification of Lipids. North Holland Publishing Company, Amsterdam, London.

Klute, A.A (1986) Methods of Soil Analysis. Part 1 2nd ed. American Society of Agronomy .Inc. Publishes, *Madison, Wisconsin*, USA.

Lambers, H., Hayes, P.E., Laliberte, E., Oliveira, R.S. and Zemunik, G. (2014) The role of phosphorus in explaining plant biodiversity patterns and processes in a global biodiversity hotspot. In: Mucina, L., Price, J.N. & Kalwij, J.M. (Eds.), Biodiversity and vegetation: patterns, processes, conservation, pp. 41-42. Kwongan Foundation, Perth, AU.

Maksoud, M.A., El-Shamma, M.S., Saleh, M.A., Zaied, N.S. and O.M. Hafez, (2012) Effect of Different Compost Sorts and Biofertilizers on Chemlali Olive Trees Grown in Calcareous Soil. *Middle-East J. of Scientific Research*, **12** (8), 1046-1049.

Maksoud, M.A., Saleh, M.A., El-Shamma, M.S. and Foua, A.A. (2009) The Beneficial Effect of Biofertilizers and Antioxidants on Olive Trees under Calcareous Soil Conditions. *World J. of Agric. Sci*., **5** (3), 350-352.

Malek, B. K. and Sanaa, M. (2013) Response of Arbequina olive tree to reasonable fertilization. *Afr. J. Agric. Res*., **8** (29), 3911-3920.

Mimoun, M. B., Ghrab, M., Ghanem, M. and Elloumi, O. (2008) Effects of potassium foliar spray on olive, peach and plum, Part 1: olive experiments. Optimizing Crop Nutrition No. 17, 14-17.

Mousavi, S.R., Shahsavari, M. and Rezaei, M. (2011) A general overview on manganese (mn) importance for crops production. *Australian Journal of Basic and Applied Sciences*, **5** (9), 1799-1803.

Mujić, I., Dudas, S., Skutin, H.M., Perusic, D., Zeković, Z., Lepojević, Z., Radojković, M., Vidović, S., Milošević, S. and Mesic, E.O. (2012) Determination of antioxidant properties of fig fruit extracts (ficus carica l.). *ISHS Acta Horticulturae*, **940**,1,100,7567-7572.

Nautiyal, C.S., (1999) An efficient microbiological growth medium for screening phosphate solubilizing microorganisms. FEMS Microbiology Letters, **170**, 265- 270.

Osman, S.M. (2010) Effect of mineral, bio-NPK soil application of young olive trees and foliar fertilization on leaf and shoot chemical composition. *Research Journal of Agriculture and Biological Sciences*, **6** (3), 311-318.

Page, A.L., Miller, R.H. and Keeney, D.R. (1984) Methods of soil analysis. Part 2: Chemical and Microbiological Properties. Second edition. *Agronomy* J. 9: 2, Am. Soc. Agron. Inc., *Soil Sci. Soc. Am. Inc. Pub*. Madison, Wisconsin, USA.

Petrakis, C. (2006) *Olive Oil Extraction*. Mediterranean Agronomic Institute of Chania, 1, 13: 191-223.

Revillas, J. J., Rodelas, B., Pozo, C., Martinez-Toledo, M.V. and Lopez, J.G. (2005) Production of amino acids by *Azotobacter vinelandii* and *Azotobacter chroococcum* with phenolic compounds as sole carbon source under diazotrophic and adiazotrophic conditions. *J. appl. Microbiology*, **4**, 421-425.

Rimmer; Smith (2009) Antioxidants in soil organic matter and in associated plant materials. European *J. of Soil Sci*. **60** (2), 170-175.

Rizzolo, A.C., Baldo, J. and Polesello, A. (1993) Application of high performance liquid chromatography to the analysis of niacin and biotin in Italian almond cultivars. *J. of Chromatoghraphy*, 553(1-2).

Sulaiman, G.M. and Hassan, S.H. (2011) Determination of Sugars and Mineral Salts in Fresh Figs of Iraqian Cultivars. *Tikrit Journal of Pure Science***, 16** (1), 48-50.

Tekaya, M., Beligh, M., Amani, B., Faouzi, A. ttia, Hechmi, C., Mohamed, D. and Hammami, M. (2013) Enhancement of Antioxidants in Olive Oil by Foliar Fertilization of Olive Trees. *J. of the American Oil Chemists' Society*, **90** (9), 1377-1386.

Thuler, D.S., Floh, E.I.S., Handro, W. and Barbosa, H.R. (2003) Plant growth regulators and amino acids released by Azospirillum sp. in chemically defined media. *Letters in Applied Microbiology*, **37**, 174–178.

Vijayan, K., Chakraborti, S.P. and Ghosh, P.D. (2007) Foliar application of *Azatobactor chroococcum* increases leaf yield under saline conditions in mulberry (Morus spp.). *Sci. Hortic*. **113**, 307–311.

Wang, M., Zheng, Q., Shen, Q. and S. Guo (2013) The critical role of potassium in plant stress response. *Int. J. Mol. Sci*.,**14**, 7370-7390.

Weisany, W., Raei, Y. and Allahverdipoor, K.H. (2013) Role of Some of Mineral Nutrients in Biological Nitrogen Fixation. *Bull. Env. Pharmacol. Life Sci*., **2** (4), 77-84.

Winget and Gold (2007) Effects of Effective Microorganisms™ on the Growth of (*Brassica Rapa)*, Brigham Young University of Hawaii, Bio 493 Yuka Nakano.

Xiaohou, S.T. Min, J. Ping and Weiling, C. (2008) Effect of EM-bokashi application on control of secondary soil salinization, Water Science and Engineering, **1**(4) (2008), 99-106.

Yaz, S., Comlekcioglu, S. and Kuden, A.B. (2012) Quality characteristics and parthenocarpic properties of fig genotypes selected from the mediterranean and southeastern anatolia region. *ISHS Acta Horticulturae* **940**, 1(100), 7567-7572.

Yousef, A.R.M., Mostafa, E.A.M. and Saleh, M.M.S. (2011) Response of olive seedlings to foliar sprays with amino acids and some micro elements. *Agric. Biol. J. N. Am*., **2** (7), 1108-1112.

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تاثير الاضافة الورقية للاسمدة المعدنية والحيويةعلى قياسات المحصول لاشجار التين والزيتون النامية فى الساحل الشمالى الغربى لمصر

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اقيمت هذة الدراسة خلال عامين متتالين فى بعض الوديان بالساحل الشمالى الغربى، محافظة مطروح، مصر. مزرعتين للدراسة، الاولى منزرعة باشجار التين فى وادى الجبالى والموجودة عند الاحداثيات (31º 21.84' 21" N and 27º 34.81' 02" E) والثانية (31º 54.97' 26" N and 26º 13.13' 37" E) فى وادى حابس كانت منزرعة باشجار الزيتون. الاشجار المختارة لكلا النباتين قريبة التشابة. قوام التربة فى كلا المزرعتين رملية طميية، المصدرالرئيسى لماء الرى لاشجار التين والزيتون هو ماء المطر الموسمى. بعض اضافات لماء الرى تتوقف على كميات المياة المخزونة فى ابار الوديان. مساحة شجرة التين 8 سنوات (11x11m) 121 م2 (35 شجرة / فدان) بينما مساحة شجرة الزيتون 10 سنوات (10x10 m)100 م2 (42 شجرة/ فدان). هدف هذا البحث هودراسة التكامل بين الاسمدة المعدنية والحيوية للوصول الى اقص محصول (كما ونوعا) من ثمار التين والزيتون باستخدام جرعات مختلفة من الاسمدة المضافة لرفع كفاءة التسميد تحت ظروف اراضى الساحل الشمالى الغربى.

النتائج المتحصل عليها تؤكد ان الاضافة الورقية لاسمدة العناصر الغذائية الكبرى، اسمدة العناصر الغذائية الصغرى والاسمدة الحيوية زادت من قياسات المحصول ومضادات الاكسدة الكلية والفينولات الكلية وتركيرات العناصر الغذائية فى اوراق وثمار كلا من اشجار التين والزيتون. معاملات الدراسة ترتبت تنازليا طبقا لقوة تاثيرها على محصول ثمار اشجار التين والزيتون كالاتى: اسمدة العناصر الغذائية الكبرى > العناصر الغذائية الصغرى > الاسمدة الحيوية > معاملة الكنترول. المعاملة الاكثر تاثيرا ($Bio1Fol_4$ with $Micro_2$) احرزت 13.9 و 5.05 طن ثمار/ فدان للتين والزيتون على التوالى. الاضافة الورقية للاسمدة الحيوية فى وجود الاسمدة المعدنية سجل اعلى زيادة فى قياسات المحصول ومحتوى العناصر الغذائية ومضادات الاكسدة الكلية والفينولات الكلية فى اوراق وثمار اشجار كلا النباتين. اسمدة العناصر الغذائية الكبرى كانت الاكثر تاثيرا على محتوى العناصر الغذائية والفينولات الكلية ومضادات الاكسدة الكلية النشطة، ومحتوى السكريات الكلية % و محتوى الزيت % فى ثمار اشجار التين والزيتون بالمقارنة بمعاملات الدراسة الاخرى والكنترول، الاضافة الورقية لاسمدة العناصر الغذائية الصغرى اخذت نفس الاتجاة لتاثير اضافة اسمدة العناصر الكبرى.