Reducing Adverse Effects of Salinity in Peach Trees Grown in Saline Clay Soil

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ABSTRACT

A field experiment was carried out during 2016 and 2017 seasons on heavy clay soil, somewhat affected by salinity located at Sidi Salem District , Kafr EL-Sheikh Governorate, Egypt, to study the effect of some treatments including; Uni-sal (U), Humic acid (H), Magnetic iron (Fe) and Mycorrhizae (M) on "Florda Prince " peach trees growth, productivity and fruit quality. The data indicated that the application of these treatments increased vegetative growth parameters, leaf chlorophyll content, leaf-macro and micronutrients content, fruit set percentage, yield/tree, total soluble solids (TSS), and fruit firmness, while decreased leaf-Na and proline content, pre-harvest fruit drop percentage and fruit acidity as compared to that of the control. Uni-sal treatment achieved the highest values of vegetative growth parameters, leaf-N, K, Ca, Mn and Zn contents, fruit set percentage, fruit weight, yield and fruit firmness and recorded the least pre-harvest fruit drop percentage and fruit acidity compared to that of the other treatments followed by humic treatment in this respect. Magnetic iron was most pronounced on rising leaf-chlorophyll content and reducing leaf-Na and proline more than H, U and M treatments. Micrrhyzae was superior to leaf-P and Mg contents.

The combined application of treatments were more effective as compared to the individual applications. Uni-sal and micrrhyzae (U+M) treatments gave significant increase over all treatments in vegetative growth parameters, leaf-N, P, K, Mg and Ca contents, fruit set percentage, fruit weight and yield and least pre-harvest fruit drop percentage and fruit acidity as compared to those of the other treatments, followed by (H+U) treatment. Uni-sal and magnetic iron was superior to other treatments in increasing leaf-chlorophyll content and total soluble solids (TSS) and decreasing leaf-Na and proline content more the other treatments.

Keywords: Florda Prince " peach, Uni-sal, Humic acid, Magnetic iron, Mycorrhizae, Saline Clay Soil.

INTRODUCTION

The cultivation of peach spreads in many areas in Egypt especially in the newly reclaimed lands which include many types of soil. Under saline soil conditions, fruit trees cultivation needs special treatments to improve the growth, productivity and fruit quality. Soil salinity is the major problem in widespread areas of the cultivated land in Egypt. In order to achieve salt-tolerance, the foremost task is either prevent or alleviate the damage, or to re-establish homeostatic conditions in the new stressful environment (Parida and Das, 2005).It is well known that salinity can impair the performance of production and growth of many horticultural plants especially fruit trees. The most harmful effect of salinity is the increase osmotic stress due to high salt concentration in soil solution. Consequently, the decrease in the soil water potential and imbalance in overall concentrations of the ions due to ion toxic effect on physiological processes such as growth regulation, photosynthesis, respiration and enzyme activity (Valia and Potiel, 1997). Recently, considerable attention has been paid to application of some organic material such as humic acid and synthetic agrochemical such as uni-sal to reduce salinity of the soil.

Humic acid is essential in soil organic matter which is crucial for maintaining soil fertility, which has positive impact on biological, chemical and physical properties of the soils. In addition, the nature stability of these substances affects carbon and nitrogen cycles and carbon sequestration. Moreover, it can ameliorate the negative effect of salt that would inhibit the plant growth and the uptake of nutrient elements (Casierra-Posada *et al*., 2009). Humic acid (polymeric polyhydroxy acid) is the most significant component of organic substances in equates system. Humic substances function is buffer the hydrogen ion concentration (pH) of the soil, (Mecan and Petrovic, 1995). Uni-sal contains polyethylene glycol (PEG), some elements and amino acids. Munir and Aftab (2009) reported that (PEG) decreased the osmotic potential of nutrient solutions and is not phytotoxic. To adverse effects of osmotic stress polyethylene glycol (PEG) playing an important role in plant responses to salt and water stress which increases the osmotic pressure in root cell which lead to diminution of water flow through root (Pandey and Agarwal, 1998 and Slama, et al,. 2007). Magnetic iron (Magnetite) is a natural row rock that has very high iron content, Magnetite has a black or brownish-red, and it has hardness, it is one of two natural row rocks in the world that is naturally magnetic (Mansour, 2007). Application of magnetic iron increased vegetative growth, yield of orange trees grow under saline conditions(Abobatta, 2014). Also, magnetic iron increased plant growth and leaf mineral content of pear trees (Attala, *et al*,. 2010).Arbuscular mycorrhizal (AM; *Glomusfa sciculatum)* fungi constitute an integral component of the natural ecosystem, and are known to exist in saline

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environments where they improve early plant growth and tolerance to salinity (Aliasgharzadeh *et al*,. 2001). Many researchers have reported that AM fungi could enhance the ability of plants to cope with salt stress by improving plant nutrient uptake (Asghari *et al*,.2005) and ion balance, protecting enzyme activity and facilitating water uptake (Ruiz-Lozano and Azcon, 1995). In salt-stressed soil, AM fungi are thought to improve the supply of mineral nutrients to the plants, especially the supply of P, as it tends to be precipitated by ions like Ca, Mg and Zn.

Generally, the main objective of this investigation was to evaluate the effect of some soil amendments (magnetic iron, Uni-sal, humic acid and arbuscular mycorrhizal fungi) on vegetative growth, yield and fruit quality of "Florida Prince "peach trees under salinity conditions.

MATERIALS AND METHODS

The present investigation was carried out at a private orchard located at Sidi Salem District, Kafr Elsheikh, Governorate, in Northren Middle Nile Delta, Egypt, during two successive growing seasons (2016 and 2017) on ten years old Florida Prince (*Prunus persica*, L. Batch). Peach trees budded on Nemaguard rootstock, planted at 5×5 meters apart (168 trees\fed.) on heavy clay soil somewhat affected by salinity under surface irrigation. Chemical characteristics of experimental soil was indicated in Table (1).

The used experimental design in the present study is randomized complete block design. Sixty six uniform trees were selected and divided randomly into eleven treatment groups. Each treatment replicated three time with two trees plot (3 replicates x2 trees). Besides guard trees were left to separate the plots). The selected trees were in a good health condition and uniform in vegetative growth and productivity.

Treatments used in this study were as follows:

1- Control (untreated trees). 2- Magnetic iron (Fe).

3- Humic acid (H)

4- Uni-sal(U). 5- Mycorrhizal fungi (M). 6- Humic acid + Uni-sal (H+U).

7- Humic acid + Magnetic iron (H+Fe). 8- Humic acid + Mycorrhizae (H+M).

9- Uni-sal + Magnetic iron (U+Fe). 10- Uni-sal + Mycorrhizae (U+M).

11- Magnetic iron + Mycorrhizae (M+Fe).

Magnetic iron added at 1000 g / tree once on the first week of January of both experimental seasons, meanwhile humic acid which contains 8% active humic acid, 1% active folic acid and 72.3% organic matter and uni-sal which contains 9% polyethylene glycol (PEG), 7.5% calcium, 7% glutaric acid, 5% nitrogen and 1% citric acid were applied with 30 cm^3/tree three times, the first was at growth start, the second was after full bloom and the third was three weeks later after setting. In addition mycorrhizal fungi with 20 ml spore suspension/tree (each ml. contains 50 spores) added once at two weeks after manure addition.

The following data were recorded in this study:

1. Vegetative growth parameters:

At the end of growing seasons, ten selected shoots were used for measured average shoot length (cm), number of leaves per shoot, shoot diameter (cm) and leaf area (cm^2).

2. Leaf chlorophyll:

For determination of leaf chlorophyll content, leaf samples (1cm^2) from fully expanded leaflets of each plant were collected and macerated in a mortar with 10 ml of 80% aqueous acetone (v/v). Then, extracts were used to measure the absorbance at 649 nm 665 nm. The leaf chlorophyll A, B and total content were estimated using equations based on the specific absorption coefficients as reported by Henry and Grime (1993):

$$\text{Chlorophyll A} = \{(12.7\times A663)-(2.69\times A645)\}/10$$

$$\text{Chlorophyll B} = \{(22.9\times A645)-(4.68\times A663)\}/10$$

$$\text{Total chlorophyll} = \{(8.02\times A663)+(20.2\times A645)\} /10$$

The chlorophyll content were expressed as µg/cm^2.

3. Leaf proline:

Proline was determined according to Bates et al., (1973). Approximately 0.5g of dry plant material was homogenized in 10 ml of3% aqueous sulfosalicyclic acid and filtered through Whatman's No. 2 filter paper. Two ml of filtrate was mixed with 2 ml acid-ninhydrin and 2 ml of glacialacetic acid in a test tube. The mixture was placed in a water bath for 1 hrat 100 ^oC. The reaction mixture was extracted with 4 ml toluene and the chromophore containing toluene was aspirated, cooled to room temperature, and the absorbance was measured at 520 mm with a Bausch and Lomb Spectrometer 710. Appropriate proline standard were included for calculation of proline in the sample.

4. Leaf mineral:

Macro and micro-nutrients were determined in dry leaf samples which collected at the second week of July in both seasons and taken from middle parts of the shoots. Total nitrogen was determined by micro-Kjeldahl method described by Pregl (1945).Phosphorus content was determined using spectrophotometer according to Watanabe and Olsen (1965). Potassium and sodium were determined by Flam photometer

Table 1. Some soil chemical characteristics of the experimental site

Soil depth(cm)	pH (1:2.5)	EC (dS/m)	SAR	Soluble cations (meq/L)				Soluble anions(meq/L)		
				Na^+	K^+	Ca^{++}	Mg^{++}	Cl^-	HCO_3^-	SO_4^{--}
0-30	8.3	3.27	9.52	21.17	0.37	6.86	3.95	14.54	5.68	12.10
30-60	8.0	2.83	9.23	19.20	0.30	5.95	3.45	13.30	5.20	10.30

Note: SO_4^{--} was determined by the difference between soluble cations and anions

E.E.L., Model (Jackson, 1967).Calcium, magnesium, iron, zinc and manganese were determined by using atomic absorption according to the procedure of Peach and Tracey (1968).

5. Fruit set and preharvest fruit drop percentage:

Four main branches (four year old)at different directions of each tree were chosen and tagged after dormant pruning of the two experimental seasons, the number of flowers were developed in the selected main branches, recorded and those set fruits were counted for calculating the percentage of fruit set according to the following equation:

Fruit set=100

The number of pre-harvest fruit dropped was recorded and the percentage of pre-harvest fruit drop was calculated in relation to the total number of fruits harvested per tree.

6. Yield and fruit quality:

Yield (kg/tree) were recorded at harvesting time. Samples consisting of twenty fruits were randomly taken from each replicate for measuring the following; average fruit weight (g), fruit volume (cm^3), fruit firmness (lb/in^2), total soluble solids % (TSS) and total acidity (%) according to A.O.A.C. (1990).

7. Statistical analysis:

The obtained data were subjected to the proper analysis of variance (ANOVA) according to Snedecor, and Cochran (1980). Least significant difference (LSD) at 0.05% level of significance was used to compare the treatment means.

RESULTS AND DISCUSSION

A.Vegetative growth parameters:

The vegetative growth of peach trees (shoot length and diameter, leaf area and No. of leaves/shoot) in 2016 and 2017 are shown in Table (2). predominatingly, application of all treatments significantly increased the studied vegetative growth parameters in both seasons. Among the individual application of each of the four treatments under investigation, Uni-sal and humic treatments gave the highest value compared to the other two treatments. Regarding the combined application of treatments, it was clear that there were a highest values than those of the individual application. Finally, the combined application of uni-sal and micrrhyza treatments gave significant increases over all treatment in vegetative growth parameters followed by (H+U) treatment. These results were in harmony with the finding of Mervat, *et al.*, (2013) on vine, El-Khawaga (2013) on sewy, zaghloul and hayany date palm cultivars and sheren (2014)on Valencia orange, they found that application of humic acid and uni-sal have profoundly alleviated salinity effects and improve vegetative growth. Also, Yao *et al.*, (2005) on litchi and Wu *et al.*, (2011) on peach seedlings obtained very promising growth results after the use of arbuscular

Table 2.The effect of some soil chemical and bio- amendments on some vegetative growth of peach trees in 2016 and 2017 seasons

Treat.	Shoot length (cm)		Shoot diameter (cm)		Leaf area (cm^2)		No. of leaves/shoot	
	2016	2017	2016	2017	2016	2017	2016	2017
Cont.	33.2f	35.5h	0.60f	0.70d	27.12f	29.15f	11.33e	13.33e
H	37.1cde	41.5ef	0.67de	0.85c	30.63cd	34.69d	13.00cd	14.33c
U	39.5bc	43.1def	0.71cd	0.86c	32.27bc	35.55cd	13.00cd	14.67bc
Fe	34.7ef	38.0g	0.64ef	0.82c	28.07ef	30.55ef	12.33de	13.00de
M	36.2de	42.2ef	0.65ef	0.82c	29.88de	34.12d	12.67d	14.00cd
H+U	41.0ab	48.2ab	0.78b	0.98a	35.03a	39.66a	14.67a	16.67a
H+Fe	38.6bcd	43.9cde	0.71cd	0.92b	31.58bcd	36.09bcd	14.33ab	15.00bc
H+M	39.5bc	46.0bc	0.75bc	0.98a	32.60b	37.89ab	14.67a	16.33a
U+Fe	39.2bc	45.6cd	0.73bc	0.97ab	33.22b	36.95bc	14.00abc	16.00ab
U+M	43.4a	49.8a	0.84a	1.01a	35.78a	39.66a	15.00a	17.33a
Fe+M	36.2de	40.6f	0.71cd	0.98a	29.93de	31.96e	13.33bcd	15.00bc

H: Humic acid, U: Uni-sal, Fe: Magnetic iron, M: Micrrhyzae mycorrhizal fungi. Moreover, the magnetic process separate all chlorine,

toxic and harmful gases from soil hence increasing salt movement and solubility of nutrients (Hilal, 1999). Magnetic treatments may affect phyto- hormone production leading to improved cell activity and plant growth (Maheshwari, and Grewal 2009).

B-Leaf chlorophyll and proline content:

Data in Table (3) indicate the effect of applied treatments on leaf-chlorophyll and proline content as follows: the application of all treatments increased leaf-A, B chlorophyll and total chlorophyll content, while decreased proline content as compared to those of the control treatment. With respect to the individual application, the application of magnetic iron was most pronounced on rising leaf-chlorophyll content and reducing proline more than that of H, U and M treatments. Regarding the combined application of amendments, leaf-chlorophyll and proline content have been affected significantly by all combined treatments. The combined application of uni-sal and magnetic iron was superior to other treatments in increasing leaf-chlorophyll and decreasing proline and was followed in that respect by (H+Fe) and (Fe+M) respectively. These results are parallel with El-Khawaga (2013) who found that uni-sal at 50 ml/palm improve. growth, leaf area of date palm. In addition, Mervat *et al.,* (2013) on grapevines, found that uni-sal at 6 litres /feddan have profoundly alleviated salinity effects and improved vine performance by increasing leaf area, total chlorophylls and decreased leaf proline. While, Sheren (2014) on valencia orange recorded that, application of humic acid at 12, 18, 24 and 30 cm/tree and uni-sal at 12, 18, 24, and 30cm/tree enhanced total chlorophyll and decreased proline content. Also, the previous positive effect of magnetic iron, humic acid and their combinations on photosynthetic pigments in leaves due to magnetic iron and humic applications could be contributed to the nutritional regulation and adaptability of peach trees and enhancing photosynthesis and increase the uptake of nutrient elements and accumulation of nutrients in different plant origin. Accordingly, there was a positive effect by using these materials on reducing salinity, increasing total chlorophyll and decreasing proline in leaves (Abobatta, 2014). On the other hand, mycorrhiza fungi increase growth, photosynthetic pigments and photosynthesis of host plants by better mineral nutrition. They cause chlorophyll organs of plant to grow by absorbing required carbon, giving nutriments to plant and increasing efficiency of photosynthesis(Enteshari and Hajbagheri, 2011).

B-Leaf mineral contents:

The effect of treatments on leaf-N, P, K, Mg, Ca and Na contents of peach trees under investigation are presented in Table (4 & 5). Data indicated that mostly all treatments significantly increased leaf- N, P, K, Mg and Ca contents, while decreased leaf-Na as compared to the control treatment. With respect to the individual application of amendment, the application of uni-sal was superior to other single amendment application on leaf-N, K and Ca contents. However, the treated trees with micrrhyzae was superior to leaf-P and Mg contents. On the other hand, the application of magnetic iron in the first season and magnetic iron and humic acid in the second one was most pronounced on reduction of leaf-Na content, more than the other individual treatments. It is clear that combined application of any two amendments were higher effects on leaf macronutrients content under investigation as compared to the individual application of amendments. Generally, the trees that were treated with uni-sal+ miccrhyzae was superior to all other treatments as for leaf-N, P, K, Mg and Ca contents, while the application of uni-sal+magnetic iron had the least value of leaf-Na content, that is true in both seasons.

The effect of treatments under investigation on leaf micronutrients contents (leaf-Fe, Mn and Zn) of peach trees, as it is evident from Table (5) there is a significant effect in both growing seasons. The obtained results showed positive effects of treatments in enhancing Fe, Mn and Zn concentration as compared to the control treatment. With respect the individual application, magnetic iron treatment was superior in its effect as compared to the other treatments for leaf-Fe content, however that treatment gave the least values of leaf-Mn and Zn contents, while the uni-sal treatment recorded the highest values in leaf-Mn and Zn contents followed by humic acid treatment. On the other hand, the combined applications of amendments under investigation showed higher leaf micronutrient content than individual applications. Generally, the combined application magnetic iron and miccrhyzae was superior to the other treatments with respect to leaf-Fe content followed by (H+Fe) treatment, however the combination between uri-sal and humic treatments recorded the highest values as for leaf-Mn and Zn contents followed by (U+M) treatment.

These results are in the same line with those obtained by, Sharma *et al.,*(2003); Abada (2009); Mohammed *et al.,* (2010); Abd El-Monem *et al.,* (2011) , Aydin *et al.,* (2012) and Abobatta (2014) they indicated that there are many benefits to crop growth resulted from addition natural mineral product such as

Table 3.The effect of some soil chemical and bio- amendments on leaf chlorophyll and proline of peach trees in 2016 and 2017 seasons

Treat.	Chlorophyll pigments μg/cm^2						Prolineμ moles/g fresh weight	
	A		B		Total			
	2016	2017	2016	2017	2016	2017	2016	2017
Cont.	18.04e	17.08e	10.07e	11.04cd	28.11e	28.12h	0.305a	0.275a
H	18.55de	20.37c	11.77bcd	11.37cd	30.32d	31.74f	0.286ab	0.262a
U	19.56cd	20.62c	10.92de	11.74bcd	30.48d	32.36e	0.276ab	0.246abc
Fe	19.84bc	20.84c	12.36abc	12.32abc	32.20c	33.16d	0.231bc	0.202bcd
M	19.99bc	19.12d	10.66de	10.60d	30.65d	29.72g	0.265ab	0.254ab
H+U	21.07ab	22.06b	12.86ab	13.24a	33.93ab	35.30b	0.202cd	0.180d
H+Fe	21.79a	22.05b	12.95a	13.43a	34.74a	35.48b	0.207cd	0.190cd
H+M	20.50abc	22.41ab	12.37abc	10.93d	32.87bc	33.34d	0.166de	0.167d
U+Fe	21.60a	23.38a	13.23a	13.02ab	34.83a	36.40a	0.111e	0.107e
U+M	21.51a	22.99ab	11.51cd	11.69bcd	33.02bc	34.68c	0.156de	0.159de
Fe+M	21.36a	22.77ab	13.21a	11.77bcd	34.57a	34.54c	0.185cd	0.181d

H: Humic acid, U: Uni-sal, Fe: Magnetic iron, M: Micrrhyzae

magnetic iron ore including improved soil structure, increased soil organic matter, improved water properties and become more energy and vigor and this known as "Magneto biology',improving water holding capacity and cation exchange capacity, improved crop nutrition from macro and micro elements. Moreover, the magnetic process separate all chlorine, toxic and harmful gases from soil, increased salt movement and solubility of nutrients increasing water retention by soil and this help on plant growth, moderation of soil temperature. Improving plant nutrition by humic acid which stimulating the absorption of mineral elements through stimulating root growth and increases the rate of absorption of mineral ions on root surfaces and their penetration into the cells of the plant tissue, so plants show more active metabolism and increase respiratory activity. Some mechanisms have been suggested to explain effects of Uni-sal and humic acid such as improving salt tolerance through inducing osmotic adjustment, increased ability of soil to get rid of salts that resulted in a better assimilation of nutrients and fertilizer in plants. (Munir and Aftab, 2009). Overall, the positive action of repellant salinity agents on alleviating the adverse effects of salinity on growth and nutritional status of plants which might be attributed to their beneficial effect on lowering soil pH, increasing organic matter, enhancing the uptake of water and nutrients (Serenella *et al.,* 2002; Boehme *et al.,* 2005; Gulser *et al.,* 2010 and Pizzeghello *et al.,* 2013).On the other hand arbuscular mycorrhizal fungi symbiosis can increase plant growth and nutrient uptake, improve fruit quality and enhance several abiotic stresses such as low temperature stress, drought, salt stress, etc. (Mena-Violante*et al.,* 2006 and Miransari,2010) .

C-Yield data:

Table (6) illustrates the effect of treatments under investigation on fruit set and pre-harvest drop percentage, fruit weight and yield per tree in 2016 and 2017 seasons. All treatments were mostly significantly in increasing fruit set, fruit weight and yield/tree, while decreasing pre-harvest fruit drop percentage as compared to the control treatment in the two growing seasons. Among to the individual application of each of the four treatments, the treated trees with uni-sal gave the highest fruit set percentage, fruit weight and yield and recorded the least pre-harvest fruit drop percentage followed by (H) treatment as compared to the other two treatments. On the other hand, the combined application of treatments gave higher fruit set percentage, fruit weight and yield and lowest pre-harvest fruit drop percentage as compared to the individual application of the treatments. It is very clear that (U+M) treatment followed by (H+U) gave higher fruit set percentage, fruit weight and yield and least pre-harvest fruit drop percentage as compared to the other treatments. That is true in both seasons.

These results are parallel with Mervat *et al.,* (2013) on vine and Sheren (2014) on Valencia orange who found that application of humic acid, uni-sal, have profoundly alleviated salinity effects and improved tree performance by increasing yield and number of fruit/tree as evidenced by application high rates of humic acid at 9 liters /feddan and uni-sal at 6 litres/feddan. The increase in yield may be due to that humic acids enhance the absorbance capacity of nutrients of the roots by having carboxyllic and phenolic groups and increasing H+-ATP activity in the root cells (Canellas *et al.,* 2002).

Table 4.The effect of some soil chemical and bio- amendments on Leaf-N,P, K and Mg contents of peach trees in 2016 and 2017 seasons

Treat.	Leaf-N content (%)		Leaf-P content (%)		Leaf-K content(%)		Leaf-Mg content (%)	
	2016	2017	2016	2017	2016	2017	2016	2017
Cont.	2.60g	2.64f	0.127c	0.132e	2.36f	2.40g	0.60fg	0.64fg
H	2.77e	2.84de	0.132bc	0.134e	2.52cd	2.55d	0.66de	0.69def
U	2.81de	2.89cd	0.135abc	0.140cd	2.52cd	2.74b	0.73c	0.71cde
Fe	2.70f	2.83e	0.130bc	0.132e	2.38f	2.43fg	0.57g	0.60g
M	2.67f	2.65f	0.139abc	0.143bc	2.45e	2.45fg	0.74bc	0.78ab
H+U	2.90c	2.93c	0.146abc	0.142bc	2.61b	2.68c	0.70cd	0.75abc
H+Fe	2.83d	2.90c	0.135abc	0.136de	2.47de	2.48ef	0.79ab	0.77ab
H+M	2.96b	3.09ab	0.149ab	0.146ab	2.63ab	2.79b	0.71cd	0.73bcd
U+Fe	2.93bc	3.05b	0.142abc	0.140cd	2.55c	2.53de	0.79ab	0.65fg
U+M	3.04a	3.12a	0.153a	0.150a	2.68a	2.89a	0.83a	0.80a
Fe+M	2.89c	2.92c	0.146abc	0.144bc	2.54c	2.77b	0.63ef	0.66ef

H: Humic acid, U: Uni-sal, Fe: Magnetic iron, M: Micrrhyza

Table 5. The effect of some soil chemical and bio- amendments on Leaf-Ca,Na,Fe,Mn and Zn contents of peach trees in 2016 and 2017 seasons

Treat.	Leaf-Ca (%)		Leaf-Na (%)		Leaf-Fe (ppm)		Leaf-Mn (ppm)		Leaf-Zn (ppm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Cont.	1.66g	1.52h	0.150a	0.139a	105f	120j	48g	50i	33g	38e
H	1.73ef	1.65fg	0.136c	0.112c	111de	130h	61d	65e	36de	41d
U	1.77de	1.69ef	0.146ab	0.123b	108ef	123i	65c	73d	41b	41d
Fe	1.70fg	1.61g	0.132ef	o.112c	128b	162d	42h	53h	34fg	37e
M	1.76de	1.65fg	0.148ab	0.137a	113d	136g	55f	59g	35ef	40d
H+U	1.96a	1.86b	0.132cd	0.121b	113d	131h	78a	84a	43a	48a
H+Fe	1.81cd	1.81bc	0.130de	0.105d	136a	172b	62d	64e	37cd	44c
H+M	1.85bc	1.73de	0.132cd	0.110cd	119c	146e	55f	74d	37cd	45bc
U+Fe	1.89b	1.74de	0.120f	0.096e	131b	165c	59e	76c	38c	44c
U+M	2.00a	1.92a	0.144b	0.110cd	118c	139f	72b	82b	42ab	46b
Fe+M	1.89b	1.78cd	0.134cd	0.108cd	139a	178a	49g	62f	36de	40d

H: Humic acid, U: Uni-sal, Fe: Magnetic iron, M: Micrrhyza

Dorneanu *et al.* (2008) reported that humic acid enhances the penetration of nutritive ions in leaves, stimulates the formation of some physiological active metabolite compounds and enlarge the capacity of plants for root absorption of elements from soil. On the other hand, the mycorrhiza fungi can be benefit to plants by enhancing the availability of soil water and nutrients (Smith, and Read,1997). The inoculation may improve crop yield by increasing the capacity of plant to obtain nutrients that are relatively immobile in the soil such as phosphorus (Rhodes, ,1980 and Jansa, *et al.*,2003) . Also, magnetic iron increased ability of soil to get rid of salts which resulting in increases in vegetative growth and fruit yields, also, better supply of soil nutrients and organic matter contributes to improvement of vegetative growth, leaf quality and fruit yield of many fruit trees (Abobatta, 2014).

D-Fruit physical and chemical characters:

Data concerning TSS, acidity, anthocyanin and firmness of peach fruits as affected by treatments under investigation are presented in Table (7). It is clear that, TSS significantly affected by different treatments in the two seasons, whereas the higher values of TSS were achieved by (U+Fe) treatment followed by (H+U) and (U+M) respectively in the first season, while in the second one (H+U) treatment recorded the highest values of TSS followed by (U+Fe) and (U+M) treatments, however the lowest values came from fruits of trees under control. As for acidity, it can be noticed that, the highest acidity associated with the control in the two growing seasons and (M) treatment in the second one, while the least acidity belonged to (U+Fe) and (H+U) treatments respectively. As regard to the effect of investigation treatments on anthocyanin the results didn't show significant differences among the different application of treatments as compared to the control except (H+U) treatment in the two growing seasons and (H+M), (U+M) treatments respectively in the second one recorded significant increase of anthocyanin of peach fruits compared to the control. As for fruit firmness, among the individual application of the four treatments, the treated trees with uni-sal achieved a significant increase in the two growing seasons as compared to the control, while the other treatments had no significant difference compared to the control. As regard the combined applications of treatments, it is noted that there was no significant differences between (H+Fe), (H+M) and (Fe+M) treatments and control but there was significant increase belonged to (H+U) followed by (U+Fe) and (U+M) treatments respectively as compared to the control in the first season, while in the second one, all combined application of treatments achieved a significant increase in fruit firmness compared to the control and can be arranged in descending order from (H+U), (U+Fe), (H+M), (U+M), (Fe+M) to (H+Fe).

These findings are in agreement with those of Abobatta, (2014) who reported that, humic acid improved chemical properties due to increasing soil microorganism activity which enhance nutrient cycling that induce growth and enhance fruit quality, moreover, humic substances decreased acidity in different fruit, whereas, Magnetic field and Magnetite treatments increased TSS and reduced acidity in Valencia orange fruit juice content. In addition, Mervat *et al.*, (2013) found that application of humic acid, uni-sal, have profoundly alleviated salinity effects and improved vine performance by increasing productivity and fruitquality as evidenced by application high rates of humic acid at 9litres /feddan and uni-sal at 6 litres/feddan. ELkhawaga (2013) found that uni-sal at 50 mL/palm

Table 6. The effect of some soil chemical and bio- amendments on fruit set, pre-harvest fruit drop and yield of peach trees in 2016 and 2017 seasons

Treat.	Fruit set (%)		Pre-harvest fruit drop (%)		Fruit weight (g)		Yield/tree (kgm)	
	2016	2017	2016	2017	2016	2017	2016	2017
Cont.	71.10e	74.80i	3.05a	3.40a	92.26i	94.91i	26.30i	28.90h
H	77.82c	84.41f	2.45c	3.10ab	99.23g	104.53f	36.03e	38.40e
U	78.83c	86.71e	2.33cd	2.91abc	101.12f	104.94ef	38.60c	39.92d
Fe	75.31d	82.69g	2.87ab	3.33a	94.12i	99.48h	27.85h	36.41f
M	74.53d	78.40h	2.74b	3.23ab	96.71h	101.13g	27.57h	30.29g
H+U	82.26a	91.02a	1.61hi	1.53e	108.09b	120.04b	40.15b	45.66b
H+Fe	81.00b	87.61d	2.01ef	2.76abc	102.15e	109.51d	29.96f	37.32ef
H+M	81.25b	86.29e	1.73gh	2.27cd	98.57g	105.70e	37.30d	39.79d
U+Fe	80.73b	89.23c	2.17de	1.71de	105.57c	114.56c	39.87b	41.31c
U+M	82.56a	91.60a	1.45i	1.50e	119.07a	124.68a	42.16a	47.43a
Fe+M	78.74c	90.31b	1.93fg	2.59bc	103.68d	109.10d	29.12g	37.80e

H: Humic acid, U: Uni-sal, Fe: Magnetic iron, M: Micrrhyza

Table 7. The effect of some soil chemical and bio- amendments on some physical and chemical characteristics of peach fruits in 2016 and2017 seasons

Treat.	TSS (%)		Acidity (%)		Anthocyanin (mg/g F. W.)		Fruit firmness (lb/in2)	
	2016	2017	2016	2017	2016	2017	2016	2017
Cont.	9.85g	9.95e	0.90a	0.87a	0.175ab	0.185cd	12.30d	12.34e
H	10.39efg	10.07e	0.81c	0.78b	0.169b	0.180d	12.47cd	13.03cde
U	11.66bcd	10.76bcd	0.73de	0.73bc	0.183ab	0.175d	13.30abc	13.50b-e
Fe	10.78ef	10.17de	0.85abc	0.76bc	0.172ab	0.179d	12.57cd	13.26cde
M	9.93fg	10.03e	0.89ab	0.86a	0.175ab	0.180d	12.53cd	12.57de
H+U	12.45ab	12.40a	0.69de	0.67de	0.190a	0.224a	14.12a	14.79a
H+Fe	10.95cde	10.37b-e	0.74d	0.75bc	0.171ab	0.177d	12.82bcd	13.72a-d
H+M	10.47efg	10.15de	0.80c	0.77bc	0.169b	0.208ab	12.70bcd	14.56ab
U+Fe	12.59a	10.98b	0.68e	0.62e	0.180ab	0.202bc	13.57ab	14.72ab
U+M	11.74abc	10.84bc	0.72de	0.72cd	0.183ab	0.203b	13.53ab	14.18abc
Fe+M	10.86de	10.25cde	0.84bc	0.75bc	0.172ab	0.174d	12.80bcd	13.73a-d

H: Humic acid, U: Uni-sal, Fe: Magnetic iron, M: Micrrhyzae twice improve growth, leaf area, yield and fruit quality of Sewy, Zaghloul and Hayany date palm cultivars.Sheren (2014) on Valencia Orange, found that uni-sal at 30 ml/ tree / tree improved the leaf area, nutrients (N, P, K, Fe, Zn and Mn), and fruit weight, in addition decreasing total acidity. In the same sequence, 30 cm uni-sal / tree and 24 cm uni-sal / tree enhanced total chlorophyll, yield, number of fruits/tree and (T.S.S.). on the other hand, Merwad, (2014) concluded that fertilization of Valancia orange trees with high Mycorrhizal fungi (VAM) rate improved tree growth, increased leaf mineral contents and fruit yield with high quality.

CONCLUSION AND RECOMMENDATION

It could be concluded that, combined applications of uni-sal and micrrohyazae (U+M) which considered the best treatment under the condition of this study. This treatment not only stimulated vegetative growth , but also improved tree nutritional status and produced maximum yield as kg\tree with high fruit quality particularly fruit weight, firmness, TSS and anthocyanin contents of "Florida Prince" peach trees grown on heavy clay soil somewhat affected by salinity.

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الملخص العربي

التقليل من الآثار الضارة للملوحة على أشجار الخوخ المنزرعة في ارض طينية ملحية

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في تجربة حقلية نفذت خلال موسمى٢٠١٦ و٢٠١٧ على ارض طينية ثقيلة متأثرة بالملوحة بناحية سيدي سالم محافظة كفر الشيخ لدراسة تأثير بعض مصلحات التربة وتشمل: اليونيسال وحامض الهيوميك وخام الحديد المغناطيسي وفطر الميكروهيزا على نمو وإنتاجية وجودة الثمار لأشجار الخوخ صنف فلوريدا برنس. أشارت النتائج إلى إن هذه المعاملات أدت إلي زيادة النمو الخضري ومحتوى الأوراق من الكلوروفيل والعناصر الغذائية الكبرى والصغرى وزيادة محصول الشجرة ، كما أدت إلى زيادة نسبة المواد الصلبة الذائبة الكلية وصلابة الثمار كما خفضت محتوى الورقة من الصوديوم والبرولين ونسبة تساقط الثمار قبل الجمع وحموضة الثمار مقارنة بالكنترول. معاملةاليونيسال حققت أعلى القيم لقياسات النمو الخضري ومحتوى الورقة من النيتروجين والبوتاسيوم والكالسيوم والمنجنيز والزنك بالإضافة الى زيادة نسبة العقد والمحصول / شجرة كما زادت صلابة الثمار وفي المقابل سجلت اقل نسبة التساقط للثمار ماقبل الجمع واقل نسبة حموضة الثمار مقارنة بالمعاملات الأخرى تلتها مباشرة معاملة حامض الهيوميك ، أما معاملة خام الحديد المغناطيسي فقد حققت زيادة واضحة في محتوى الورقة من الكلوروفيل واقل نسبة في محتوى الورقة من الصوديوم والبرولين مقارنة بمعاملات اليونيسال والهيوميك والميكروهيزا ومن ناحية أخرى فقد سجلت المعاملة بالميكروهيزا أعلى نسبة من محتوى الورقة من الفوسفور والماغنسيوم.

كانت الإضافات المشتركة للمصلحات التربة أكثر فاعلية من الإضافات المنفردة. حيث أعطت معاملة اليونيسال مع الميكروهيزا زيادة معنوية عن باقي المعاملات في القياسات الخضرية ومحتوى الورقة من النيتروجين والفوسفور والبوتاسيوم والمغنسيوم والكالسيوم كما أعطت أعلى نسبة عقد وأعلى وزن للثمرة وأعلى محصول للشجرة كما سجلت هذه المعاملة اقل نسبة تساقط للثمار قبل العقد واقل نسبة حموضة في الثمار مقارنة بباقي المعاملات تلتها مباشرة المعاملة باليونيسال مع الهيوميك. في حين سجلت المعاملة باليونيسال مع خام الحديد المغناطيسي أعلى زيادة في محتوى الورقة من الكلوروفيل وأعلى زيادة من المواد الصلبة الذائبة الكلية في الثمار بينما أعطت اقل نسبة من الصوديوم بالورقة وكذلك البرولين مقارنة بالمعاملات الأخرى.