Effect of soil applications anti-salinity agent on growth, yield and fruit quality of superior seedless grapevines (*Vitis vinifera* L.)

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ABSTRACT

Grapes rank the top fruit crop all over the world and the second crop after citrus in Egypt. This study aims to elucidate the effect of some anti-salinity agents' application namely magnetic iron, humic acid and Uni-sal on overcome salt hazard that affect grapevines growth and production during the two successive seasons of 2017 and 2018. This study was applied in a private orchard located at Atfih, Giza Governorate, Egypt on five-years old superior seedless grapevines grown in sandy loam soil that irrigated using drip irrigation system. The vineyard was planted at 2 × 3 meters apart and supported to the gable trellis system. Winter pruning system was carried out at the end of December in both seasons using cane pruning system, leaving 112 buds (10 fruiting canes x 10 buds + 6 renewal spurs x two buds). Seven treatments were performed as follows: Control (untreated vines), magnetic iron application at concentration (200 and 250 g/vine), humic acid (7 and 10 L/feddan) and Uni-sal (5 and 7 L/feddan). The obtained results appeared that all treatments had improved all growth parameters. Yield, cluster weight, berry weight and size, total soluble solids, total soluble solids/total acidity were increased. Whereas total acidity was reduced affecting by all treatments as compared with control plants in the two studied seasons. In sum, magnetic iron, humic acid and Uni-sal soil applications alleviated the negative effects induced by salinity stress in Superior Seedless trees productivity, by modulation of distinct growth and yield responses.

Keywords: Magnetic iron; Humic acid; Uni-sal; Soil application; Vegetative growth; Yield.

INTRODUCTION

Grapes (*Vitis vinifera* L.) rank the top fruit crop all over the world and the second crop after citrus in Egypt. Vineyard have continuously increased especially in the new reclaimed land. Since the total area of grape in Egypt reached about 192934 feddan producing about 1686706 tons according to the statistics of the Ministry of Agriculture (2017). There are many varieties of table grapes produced in Egypt, like early sweet, Flame seedless Superior Seedless (under study), Thompson Seedless, Red globe and Crimson Seedless. Superior Seedless is a promising grapevine cultivar that grown successfully under Egypt environmental condition and one of the most popular cultivars of table grapes in Egypt. Grapevine is used as table, juice, wine and dried grape production, and is an economically important fruit crop. This crop is moderately sensitive to salinity (Saritha *et al.*, 2016). Grapevines cultivation area in Egypt has progressively developed in recent years. More than a great of this area is concentrated in the new reclaimed soils where grapes have recently become a key component of Egyptian horticultural exports (Ali *et al.*, 2013).

The agricultural production is one of the most basic elements contribute to the economic income and food security, despite the problems that accompanied such as lack of water, desertification, salinity and low yield. The horizontal expansion in agricultural land depends partially at least on the availability and quality of irrigation water and the level of soil salinity Soil salinity is becoming a major problem in widespread areas of the cultivated land in Egypt**.** Salinity of soil or irrigation water is a major factor limiting the growth of fruit trees (Shanker and Venkateswarlu, 2011). These problems may be mitigated by the use of some anti-salinity treatments that reduce the accumulation of these ions as compared to control plants. In recent years many different substances are playing important roles in which have a role in overcoming the salinity effects such as magnetic iron, humic acid and Uni-sal.

Magnetic iron ore including improving soil structure, increased soil organic matter, improved water properties and become more energy and vigor improving water holding capacity and cation exchange capacity, improved crop nutrition from macro and micro elements (Abd El-Monem *et al.*,2011). Likewise, humic acid is the main fractions of humic substances and considered the most active components of soil and compost organic matter. The functions of humic acid on plant growth can be divided into direct and indirect effects. The direct effects include various biochemical actions that provoke plant growth and consequently yield by acting on mechanisms such as cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, enzyme activities of the cell wall membrane or cytoplasm and mainly of hormonal nature. The indirect effects include enrichment in soil nutrients increase of microbial population, higher cation exchange capacity and improvement of soil structure. Uni-sal contains polyethylene glycol (PEG) some elements (especially Ca) and amino acids. Uni-sal is acting through lowering the osmotic potential of nutrient solutions and increasing tolerance to osmotic stress (Munir and Aftab, 2009). The objectives of this research are to minimize the hazard effects of salinity on the vegetative growth, yield, productivity and berries quality of Superior Seedless table through application of some deferent of soil salinity.

MATERIALS AND METHODS

This study was carried out during the two successive seasons of 2017 and 2018 on five-year old Superior Seedless grapevines (*Vitis vinifera* L.) grown in sandy loam soil in a private orchard located at Atfih, Giza Governorate, Egypt. To elucidate the effect of some anti-salinity agents on growth of Superior Seedless grapevines and their fruit production, the vineyard was planted 2 × 3 meters apart and supported to gable trellis system. Winter pruning system was carried out at the end of December in both seasons using cane pruning system leaving 112 buds (10 fruiting canes x 10 buds + 6 renewal spurs x two buds). All grapevines are irrigated using drip irrigation system. The experimentation was done on nine trees (3 replicates each has 3 trees) for each treatment similar in growth and receiving similar agricultural practices among the plants. A complete randomized block design was followed in analyzing the data. Chemical properties of the soil and water analysis were done according to the procedures of (Jackson, 1973), as shown in Tables (1 and 2).

The experiment was performed to study the effect of soil applications anti-salinity agents *i.e.* magnetic iron, humic acid and Uni-sal on growth, yield and fruit quality of Superior Seedless grapevines.

Therefore, the soil application as following:

1: Control (the grapevines were untreated).

2: Addition of magnetic iron at 200 g/vine one time after winter pruning.

3: Addition of magnetic iron at 250 g/vine one time after winter pruning.

4: Addition of humic acid (7 L/feddan) at 3 dates i.e. on March1st (bud burst stage), at fruit set stage and 21 days after fruit set.

5: Addition of humic acid (10 L/feddan) at 3 dates i.e. on March1st (bud burst stage), at fruit set stage and 21 days after fruit set.

6: Addition of Uni-sal (5 L/feddan) at 3 dates i.e. on March1st (bud burst stage), at fruit set stage and 21 days after fruit set.

7: Addition of Uni-sal (7 L/feddan) at 3 dates i.e. on March1st (bud burst stage), at fruit set stage and 21 days after fruit set.

Magnetic iron is a natural row rock that has very high iron content with black color and it has hardness about 6 on the Mohs hardness scale, it is contained 48.8% Fe_3O_4, 17.3% Fe O, 26.7% Fe_2O_3, 2.6% Mg O, 4.3% Si O_2 and 0.3% Ca O, obtained from (El- Ahram Company for Mining and Natural Fertilizers) Giza. Egypt. Humic acid as a liquid was obtained from Seed Outlet in Agricultural Research Center, Giza, Egypt, “Super Canada" produced by the Egyptian Canadian for Humate Trade and Agricultural Consultancies in Egypt. It contains active humic acid 8%-folic acid active 1%, other organic materials 72.3% and neutral pH). Uni-sal contains polyethylene glycol (PEG 9%) calcium 7.5%, nitrogen 5%, glutric acid 7%, citric acid 1% and total organic matter 17%.

Table 1. Some water chemical properties of the experimental site.

pH	EC dS/m	Ca^{++} (mg/L)	Na^{+} (mg/L)	Mg^{++} (mg/L)	Cl^{-} (mg/L)	CO_3- (mg/L)	HCO_3^{-} (mg/L)	$Caco_3$ (mg/L)
7.7	3	62.4	57.96	30.2	199.0	-	252.0	282.0

Table 2. Some soil chemical characteristics of the experimental site.

Soil Structure	EC (dS/m)	pH (1:2.5)	Soluble cations (meq/L)				Soluble anions (meq/L)			SAR*
			K^{+}	Ca^{++}	Mg^{++}	Na^{+}	Cl^{-}	HCO_3^{-}	SO_4^{-}	
Sandy loam	3.5	8.3	0.35	6.95	3.91	21.35	15.1	5.49	11.97	9.16

(*) SAR= is sodium adsorption ratio.

Measurements

Vegetative growth

Shoot length (cm): five shoots /vine were chosen randomly after bud burst and labeled to determine their maximum length (cm). The length was recorded at the beginning of growth and at the end of growth. Also Shoot growth rate was estimated by measuring the length of the shoot (cm) at beginning of shoot growth till cessation of shoot growth final shoot growth according to (Ruiz *et al.*,1997) as follows:

$$\text{Shoot growth rate} = \frac{\text{Shoot length}}{\text{Time period in day}}$$

Number of leaves/ shoot: Five shoots per a vine such that 5 shoots (among spring flush), nearly uniform in diameter and length were labeled on 1st March. Number of leaves/ shoot were recorded at cessation of growth of each season.

Leaf area (cm²): At full bloom a sample of twenty mature leaves replicated three times (3 trees) was abscised from the top of the growing shoot (6th or 7th leaf) to measure the average leaf area using the following equation: **Leaf area (cm²)** = 0.587 (L×W), where L = length of leaf blade and W = width of leaf blade according to Montero *et al.* (2000) and the average was expressed as (cm²).

Coefficient of wood ripening: The wood ripening amount was calculated by dividing length of the ripened part of the shoot by the total length of the shoot according to Bouard (1966).

Thickness of cane: After the harvest thickness cane measured using the Vernier caliper.

Yield characteristics

Total Yield: The yield per vine was individually weighed and the average yield per a vine was adjusted (in the second week of June).

Physical characteristics of the cluster: A representative sample of five clusters per each replicate was collected at harvest for determining: cluster weight (g), cluster width (cm), cluster length (cm) was measured.

Fruit physical characteristics: At harvest, 150 berries of each per each replicate were taken at random form basal, middle and apical portions of the representative clusters for determining the berry physical and biochemical characteristics. The physical characteristics involved: Berry weight (g) and Berry volume (cm³) were measured.

Fruit biochemical characteristics: (T.S.S): Total soluble solids percentage was determined in 10 ml. of filtrate of berry juice by using refract meter apparatus as described in (A.O.A.C., 2000).

Titratable acidity: Total acidity was determined in 10 ml. of berry juice. The berry sample mixed with 100 ml distilled water. Total acidity percentage was measured by titration using 0.1 N NaOH. The total acidity was expressed as tartaric acid (%) equivalent to g/100 ml. juice (A.O.A.C., 2000).

Statistical analysis

The results were statistically analyzed using F-value test, and the means were compared by the L.S.D at the level of 5% probability according to (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Vegetative growth

Shoot length (cm)

The results in Table (3) showed that soil application of magnetic iron, humic acid and Uni-sal under salinity conditions significantly increased all shoot parameters such as (shoot length at the beginning of growth cycle, shoot length at the end of growth cycle, shoot growth rate (cm/ day), in Superior Seedless grapevines as compared with control in the two studied seasons 2017 and 2018. These results are in harmony with those obtained by Abdel-Aziz *et al.* (2010) who mentioned that anti-salinity agents' application of Valencia orange trees had increased the vegetative growth parameters *i.e.* (shoot length and shoot growth rate). In the same line Mehanna *et al.* (2010) showed that Uni-sal at rate 5 cm per vine treatment had significant enhanced shoot length on vine of two grape rootstocks (Salt Creek and 1103 Paulsen) under saline water conditions. Data also cleared that increasing magnetic iron, humic acid and Uni-sal levels followed by a gradual increase in shoot length. The maximum significant value of shoot length at the beginning of growth cycle was obtained with vines received Uni-sal at concentration 7 L/feddan while control treatment gave the lowest value both two seasons. While the maximum significant values of shoot length at the end of growth cycle with canes received humic acid at rate 10 L/feddan in the first season and Uni-sal at concentration 7 L/feddan in the second season. In the same line canes that received humic acid treatment at rate 10 L/feddan followed by Uni-sal at concentration 7 L/feddan gave the best values in shoot growth rate in the two studied seasons.

The increase in shoot length (cm) may be due to the positive effect of anti-salinity agents such as humic acid and its role in the enhancement of plant growth the increase in nutrients uptake (like nitrogen) was the main reason of enhanced shoot growth and humic acids could be used as growth regulator such as gibberllic acid, to improve plant growth and enhance stress tolerance (Ismail *et al.*, 2010). Similarly, Abd El-Monem *et al.* (2011)

reported that many benefits to fruit trees growth resulted from addition magnetic iron ore including improved soil structure, increased soil organic matter, improving water holding capacity and cation exchange capacity, improved crop nutrition. Moreover, the magnetic process separates 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.

Leaf number per shoot and leaf area

Data in Table (3) showed that soil application of magnetic iron, humic acid and Uni-sal under salinity conditions significantly increased leaf number per shoot and leaf area of Superior Seedless grapevines as compared with control in the two studied seasons 2017 and 2018. These results are in harmony with those obtained by Soliman *et al.* (2017) found that application of anti-salinity agents magnetic iron added at concentration 1000 g / tree significantly increased the vegetative growth leaf area and number of leaves per shoot of (Florida Prince) peach trees compared to the control treatment. Also Fathy *et al.* (2010) who mentioned that application of anti-salinity agents (humic acid) soil applications at concentration (37.5 or 75.0 cm^3 / tree) increased the number of leaves per shoot and leaf area of 'Canino' apricot compared with control. In the same line El-Khawaga (2013) indicated that Uni-sal at concentration (50 $mL.palm.year^{-1}$) treatment significantly increased the leaf area compared to control of Date Palm cultivars Sewy, Zaghloul and Hayany. Also data showed that the maximum significant values of number of leaves/ shoot with vines received humic acid at rate 10 L /feddan and humic acid at rate 7l /feddan in the first season and Uni-sal at concentration 7 L /feddan followed by humic acid at rate 10 L/feddan and Uni-sal at concentration 5 L/feddan in the second season. Humic acid at rate 10 L/feddan followed by Uni-sal at concentration 7 L/feddan gave the best values in leaf area of Superior Seedless grapevines in the first season, while magnetic iron at concentration 250 g/vine followed by humic acid at rate 10 l /feddan and humic acid at rate 7 L/feddan gave the highest values in leaf area in the second season.

The increase in leaf number per shoot and leaf area may be due to the positive effect of anti-salinity agents such as magnetic iron included a change of the physiochemical characteristics of soil leading to improved dissolvability of different chemical elements, more salts out of the soil and at the same time oxygen concentration was increased and resulted in a better assimilation of nutrients and fertilizer in plants during the vegetation period (Mansour, 2007). In the same line, Chen *et al*. (2004) reported that the functions of humic acid on plant growth can be divided into direct and indirect effects. Indirect effects such as enrichment in soil nutrients, increase of microbial population, higher cation exchange capacity and improvement of soil structure whereas direct effects are various biochemical actions exerted at stimulate plant growth and consequently yield by acting on mechanisms involved in cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, enzyme activities of the cell wall membrane or cytoplasm and mainly of hormonal nature. Similarly, beneficial effects of Uni-sal application may be due its content of calcium which prevents the effects of alkalinity and salinity, beside Ca^{+2}, applying polyethylene glycol (PEG) to the root medium has been often used to submit higher plants to control negative water potentials.

Coefficient of wood ripening and thickness of cane

The results in Table (3) indicated that soil application of magnetic iron, humic acid and Uni-sal under salinity conditions statistically increased coefficient of wood ripening and thickness of cane of Superior Seedless grapevines as compared with control in the two studied seasons 2017 and 2018. These results are in agreement with those obtained by Ali *et al.*, (2013) who mentioned that application of anti-salinity agents such as (Uni-sal, magnetic iron and humic acid) under salinity conditions were significantly effective in increasing coefficient of wood ripening compared to control treatment in Thompson Seedless grapevines. In the same line Soliman *et al.*, (2017) found that magnetic iron treatment had significantly increased the vegetative growth of peach trees (shoot length) of peach trees grown in saline clay soil compared to the control treatment. Data also cleared that the maximum significant value of coefficient of wood ripening Uni-sal at concentration 7 L/feddan in the first season, but Uni-sal at concentration 5 L/feddan in the second season. In the same line canes received Uni-sal at concentration 7 L/feddan thickness of cane of Superior Seedless grapevines in the first and second seasons compared to other treatments and the control.

The increase in coefficient of wood ripening and thickness of cane (cm) may be due to the presence of iron in magnetic iron have a positive effect on the growth of various groups of microorganisms which may excrete a range of vitamins, growth substances and antibiotics and these may promote plant growth (Abobatta, 2015). Furthermore, Casierra-Posada *et al.* (2009) stated that humic substance may be ameliorated the negative effect of salt that would inhabit the plant growth and the uptake of nutrient elements. Moreover, Slama *et al.*

(2007) found that polyethylene glycol (PEG) playing an important role in plant responses to salt and water stress which increases the osmotic pressure in root cell lead to diminution of water flow through root and increased plant growth.

Thus one can come to the conclusion that some anti-salinity agents' treatments significantly increased the vegetative parameters such as (shoot length, leaf number per shoot, leaf area coefficient of wood ripening and thickness of cane) of superior grape in comparison to those of control.

Table 3. Effect of soil application anti-salinity agents on vegetative growth of Superior Seedless cultivar during 2017 and 2018 seasons.

Soil application	Vegetative growth Characteristics						
	Shoot length (cm)						
	At the beginning of growth cycle	At the end of growth cycle	Shoot growth rate (cm/ day)	Number of leaves/ shoot	Leaf area (cm^2)	Coefficient of wood ripening	Thickness of cane (mm)
	2017 season						
Control (untreated)	9.56 d	126.83 c	2.35 b	20.33 c	114.49 d	0.27 C	10.24 b
Magnetic iron at 200 g/vine	11.72 c	164.61 b	3.06 a	22.78 b	163.56 abc	0.33 ab	11.73 ab
Magnetic iron at 250 g/vine	14.56 b	170.00 ab	3.11 ab	23.39 ab	160.42 bc	0.32 abc	12.11 ab
Humic acid at 7 L/feddan	14.06 b	169.11 ab	3.10 ab	24.39 ab	157.12 bc	0.30 bc	11.75 ab
Humic acid at 10 L/feddan	14.67 b	176.33 a	3.23 a	24.67 ab	174.36 a	0.32 abc	11.64 ab
Uni-sal at 5 L/feddan	13.33 bc	166.78 ab	3.07 ab	24.22 ab	151.14 c	0.32 abc	12.01 a
Uni-sal at 7 L/feddan	16.94 a	174.94 ab	3.16 a	24.17 ab	169.82 ab	0.35 a	12.93 a
2018 season							
Control (untreated)	15.58 d	147.00 e	2.19 e	20.00 c	122.47 c	0.28 b	12.44 e
Magnetic iron at 200 g/vine	22.92 c	182.22 d	2.65 d	26.44 b	155.70 b	0.35 a	14.33 d
Magnetic iron at 250 g/vine	29.42 ab	208.33 bc	2.98 bc	29.44 a	191.75 a	0.36 a	16.78 bc
Humic acid at 7 L /feddan	27.50 b	200.56 c	2.87 c	29.33 a	170.70 ab	0.34 a	16.22 c
Humic acid at 10 L /feddan	29.33 ab	212.78 b	3.05 bc	29.89 a	185.41 ab	0.36 a	18.44 a
Uni-sal at 5 L/feddan	24.42 c	208.89 bc	3.08 b	29.44 a	156.73 b	0.37 a	17.89 ab
Uni-sal at 7 L/feddan	30.83 a	230.00 a	3.32 a	30.67 a	158.20 ab	0.36 a	19.22 a

Means in each column followed by the same letter (s) are not significantly different at 5 % level.

Yield characteristics

Yield per vine

The results in Figure (1) showed that soil application of magnetic iron, humic acid and Uni-sal under salinity conditions significantly increased yield of Superior Seedless grapevines as compared with control in the two studied seasons. Data also cleared that increasing magnetic iron, humic acid and Uni-sal levels followed by a gradual increase in yield. The maximum significant value of yield per vine was obtained with vines received Uni-sal at concentration 7 L/feddan followed by humic acid at rate 10 L/feddan both two seasons, while control treatment gave the lowest value both two seasons.

This result was in conformity with the report of Ali *et al*. (2013) who found that application of magnetic iron at concentrations (100 and 150 kg / feddan) significantly enhanced yield in comparison with control vines under salinity stress condition of Thompson Seedless grapevines. Many researchers who studied the effect of magnetic iron on chemical properties on many fruit trees such as Eman *et al.* (2010) and Shakweer (2017) of Le Conte Pear trees, Mohamed *et al.* (2013) and Abobatta (2015) of Valencia orange, and Abou-Baker *et al*. (2019) of "Murcott" mandarin trees. Also Ferrara and Brunetti (2008) who studied the effect of humic at two different concentrations 5 and 20 mg/L on Italia table grape increase of total yield per vine as comparison with control. In this respect several researchers studied effect of application humic on many fruit trees such as Abu Nuqta and Bat'ha, (2010) who noticed that potassium humate at concentration 1g/l increase yield of Helwany grape compared to the control and Hidayatullah *et al.* (2018) who reported that application of humic acid at rates (0, 50, 75, 100, 125 and 150g/tree) significantly affect fruit yield of red delicious apple trees compared to control. In addition, several researchers studied effect of application Uni-sal many fruit trees such as Abd El-Hamied (2014) on Valencia orange found that application of Uni-sal at concentrations (12, 18, 24 and 30cm /tree) increased yield compared to control.

The improvement in yield may be due to magnetic iron included a change of the physiochemical characteristics of soil leading to improved dissolvability of different chemical elements, more salts out of the soil and at the same time oxygen concentration was increased by 10 % and resulted in a better assimilation of nutrients and fertilizer in plants during the vegetation period. Moreover, magnetic iron application had increased ability of soil to get rid of salts. It was also resulted in a better assimilation of nutrients and fertilizer in plants during the vegetation period and increase crop production (Behrouz and Mojtaba, 2011). In the same line, the functions of humic acid on plant growth can be divided into direct and indirect effects. Indirect effects such as enrichment in soil nutrients, increase of microbial population, higher cation exchange capacity and improvement of soil structure whereas direct effects are various biochemical actions exerted at stimulate plant growth and consequently yield by acting on mechanisms involved in cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, enzyme activities of the cell wall membrane or cytoplasm and mainly of hormonal nature (Pizzeghello *et al.*, 2002).

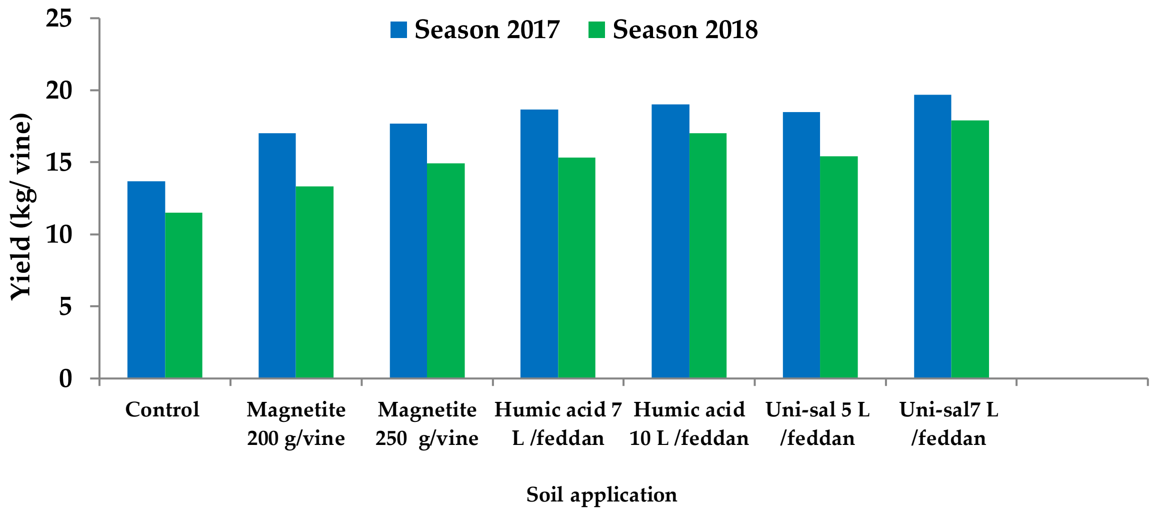

Figure 1. Effect of soil application anti-salinity agents on yield (kg/ vine) of Superior Seedless cultivar during 2017 and 2018 seasons.

Cluster characteristics and berry physical parameters

Data in Table (4) showed that soil application of magnetic iron, humic acid and Uni-sal under salinity conditions significantly increased some physical parameters such as (cluster weight (g), cluster length (cm), cluster width (cm), average weight of 100 berry (g) and average volume of 100 berry (cm^3)) of Superior Seedless grapevines as compared with control in the two studied seasons 2017 and 2018. Also the results showed that insignificantly increased number of clusters per vine, specific gravity (g/cm^3) in the two studied seasons while in the second season only in length / width ratio of Superior Seedless grapevines. These results are in conformity with the report of Ali *et al*. (2013) who found that application of anti-salinity agents such as magnetic iron at concentrations (100 and 150 kg/feddan) and Uni-sal at concentrations (4 and 6 L/feddan) were significantly enhanced weight cluster/ vine in comparison with control vines under salinity stress condition of Thompson Seedless grapevines. Also on Thompson Seedless grapevines Abd El-Monem *et al*. (2008) found that 50 % mineral nitrogen + humic acid at rate 1% + biofertilizers treatment increased cluster weight and weight of 50 berries.

The maximum significant values of cluster weight and average weight of 100 berry were obtained with vines received Uni-sal at concentration of 7 L/feddan while control treatment gave the lowest value in both two seasons. Humic acid treatment at rate 10 L/feddan gave the best values in cluster length and cluster width both two seasons. In same the line the maximum significant values of average volume of 100 berry were with canes received magnetic iron at 250 g/vine in the two studied seasons.

The increase in some physical parameters of Superior Seedless cultivar may be due to the positive effect of magnetic iron which plays an important role in cation uptake capacity and has a positive effect on immobile plant nutrient uptake and increase crop production (Esitken and Turan, 2003). In same line Varanini and Pinton, (2001) observed that humic acid may promote the growth and development of plants by improving the nutrient uptake. Moreover, Mehanna *et al.* (2010) reported that the Uni-sal positive effect on yield may be due to its enrichment with polyethylene glycol, which lowered osmotic potential of nutrient solutions and increased nutrient availability. However, one can come to the conclusion that some anti-salinity agents' treatments significantly increased the berry physical parameters such as (cluster weight, cluster length, cluster width, average weight of 100 berry and average volume of 100 berry) of superior grape in comparison to those of control.

Chemical parameters

As respect of soil applications of magnetic iron, humic acid and Uni-sal under salinity conditions data in table (5) showed that total soluble solids (T.S.S) and total soluble solids/ total acidity ratio (T.S.S./acid ratio) were increased significantly and decreased significantly total acidity of Superior Seedless grapevines as compared with the control in the two studied seasons. These results are in agreement with those obtained by Ali *et al*. (2013) who found that application of anti-salinity agents magnetic iron at concentrations (100 and 150 kg / feddan), humic acid at concentrations 6 and 9 L/feddan and Uni-sal at concentrations (4 and 6 L/feddan) were significantly enhanced total soluble solids and total soluble solids/acid ratio and significantly decreased total acidity in comparison with control vines under salinity stress condition of Thompson Seedless grapevines. Increasing treatments levels followed by a gradual increase in these parameters expected total acidity, also data clearly showed that the maximum significant values of total soluble solids (T.S.S.) and total soluble solids/ total acidity ratio were obtained with vines received Uni-sal at concentration 7 L/feddan in both two seasons while the control treatment gave the lowest value. Also and in the same line the control treatment gave the highest value of total acidity of Superior Seedless grapevines as compared with all treatments in the two studied seasons.

The enhancement in chemical parameters might be attributed to stimulating effect of anti-salinity agents such as magnetic iron which improved soil structure, increased soil organic matter, improved water properties, cation exchange capacity, improved crop nutrition from macro and micro elements, increased salt movement and solubility of nutrients increasing water retention by soil and this help on plant growth, moderation of soil temperature (Mohammed *et al.*, 2010). Moreover, reactions between metals, minerals, and humic substances can take place via one or more of the following mechanisms: formation of water soluble simple metal complexes, formation of water soluble mixed ligand complexes, sorption on and desorption from water insoluble humic acids and metal-humate complexes, dissolution of minerals adsorption on external mineral surfaces and adsorption in clay interlayers, these lead to many important things and increase the growth and productivity of different crops (Schnitzer, 1986). Uni-sal contains polyethylene glycol, Calcium and amino acids due to lowering the osmotic potential of nutrient solutions and increasing tolerance to osmotic stress (Munir and Aftab, 2009).

Thus, one can come to the conclusion that some anti-salinity agents' treatments significantly enhanced the berry chemical parameters such as (total soluble solids and total acidity) of superior grape in comparison to those of control.

Table 4. Effect of soil application anti-salinity agents on cluster characteristics and berry physical parameters of Superior Seedless cultivar during 2017 and 2018 seasons.

Soil application	Cluster characteristics					Berry physical parameters		
	Number of clusters per vine	Cluster weight(g)	Cluster length (cm)	Cluster width(cm)	length / width shape	Average weight of 100 berry(g)	Average volume of 100 berry (cm3)	Specific gravity (g/cm3)
	2017 season							
Control (untreated)	29.44 a	541.33 c	21.72 b	10.39 b	2.11 ab	383 c	363 c	1.06 a
Magnetic iron at 200 g/vine	30.33 a	723.89 b	25.11 a	12.00 ab	2.12 ab	530 b	532 ab	0.99 a
Magnetic iron at 250 g/vine	30.44 a	735.78 ab	25.44 a	12.56 a	2.04 ab	540 ab	567 a	0.96 a
Humic acid at 7 L/feddan	30.11 a	737 ab	24.06 a	12.78 a	1.90 b	534 b	543 ab	0.98 a
Humic acid at 10 L/feddan	30.22 a	746.44 ab	24.86 a	11.17 ab	2.26 a	543 ab	537 ab	1.01 a
Uni-sal at 5 L/feddan	29.78 a	725 b	23.67 ab	11.83 ab	2.01 ab	541 ab	501 b	1.08 a
Uni-sal at 7 L/feddan	30.33 a	755.44 a	23.56 ab	11.94 ab	1.99 ab	558 a	557 a	1.00 a
2018 season								
Control (untreated)	30.11 a	510.33 f	20.78 b	11.94 b	1.75 a	471 c	467.33 d	1.01 a
Magnetic iron at 200 g/vine	30.22 a	577.17 e	23.44 ab	13.33 ab	1.78 a	527.33 b	523.33 bc	1.01 a
Magnetic iron at 250 g/vine	30.33 a	672.42 c	25.06 a	13.50 ab	1.87 a	531.67 b	588.33 a	0.90 a
Humic acid at 7 L/feddan	30.78 a	624.17 d	23.17 ab	13.83 a	1.68 a	521.67 b	507.67 cd	1.03 a
Humic acid at 10 L /feddan	30.89 a	701.00 b	25.22 a	14.00 a	1.80 a	580.67 a	555.00 ab	1.05 a
Uni-sal at 5 L/feddan	30.67 a	704.36 b	24.22 a	13.06 ab	1.86 a	534.33 b	505.00 cd	1.06 a
Uni-sal at 7 L/feddan	30.89 a	735.17 a	25.17 a	13.33 ab	1.90 a	585.00 a	561.67 ab	1.04 a

Means in each column followed by the same letter (s) are not significantly different at 5 % level.

Table 5. Effect of soil application anti-salinity agents on some chemical characteristics of Superior Seedless cultivar during 2017 and 2018 seasons.

Soil application	Characteristics					
	T.S.S (%)		Total acidity (%)		T.S.S/acid ratio	
	Season					
	2017	2018	2017	2018	2017	2018
Control (untreated)	14.01 d	16.30 c	1.00 a	0.70 a	14.01 c	23.29 e
Magnetic iron at 200 g/vine	15.11 c	16.86 b	0.93 ab	0.64 b	16.25 bc	26.24 d
Magnetic iron at 250 g/vine	15.13 c	17.21 b	0.84 bc	0.59 d	18.01 ab	29.34 b
Humic acid at 7 L/feddan	15.61 b	17.22 b	0.88 abc	0.64 b	17.74 ab	26.91 cd
Humic acid at 10 L/feddan	15.92 ab	17.30 b	0.87 abc	0.59 cd	18.73 ab	29.32 b
Uni-sal at 5 L/feddan	15.11 c	17.08 b	0.88 abc	0.62 bc	17.17 ab	27.66 c
Uni-sal at 7 L/feddan	16.10 a	17.71 a	0.75 c	0.58 d	20.30 a	30.68 a

Means in each column followed by the same letter (s) are not significantly different at 5 % level.

CONCLUSION

This study showed that application of magnetic iron, humic acid and Uni-sal as anti-salinity agents have profoundly alleviated salinity effects and significantly increased vegetative growth, productivity and fruit quality at Superior Seedless. So, it is preferable to use the aforementioned application in salt stressed vineyards to get the best growth, yield and fruit quality of Superior Seedless.

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تأثير الإضافات الأرضية المضادة للملوحة على نمو وإنتاجية وجودة الحبات في العنب السوبيريور

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يصنف العنب كأعلى محصول فاكهة على مستوى العالم، والمحصول الثاني بعد الحمضيات في مصر. تهدف هذه الدراسة إلى توضيح تأثير بعض العوامل المضادة للملوحة وهي الحديد المغناطيسي وحمض الهيوميك وUni-sal على التغلب على مخاطر الأملاح التي تؤثر على نمو وإنتاج العنب خلال الموسمين المتتاليين لعامي 2017 و 2018. تم إجراء هذه التجربة في بستان خاص يقع في أطفيح، محافظة الجيزة، مصر على عنب متفوق عمره خمس سنوات ينمو في تربة طينية رملية مروية بإستخدام نظام الري بالتنقيط. تم زرع العنب على بعد 2 × 3 أمتار ودعمه بنظام تعريشة الجملون. تم تنفيذ نظام التقليم الشتوي في نهاية ديسمبر في كلا الموسمين بإستخدام نظام تقليم القصب، تاركًا 112 براعم (10 قصب مثمر × 10 براعم + 6 توترات تجديد × براعم اثنين). تم تنفيذ سبعة معالجات على النحو والتالي: التحكم (الكروم غير المعالج)، وتطبيق الحديد المغناطيسي بتركيز (200 و250 جم / نبتة)، وحمض الهيوميك (7 و10 لتر / فدأن) وUni-sal (5 و7 لتر / فدأن). أظهرت النتائج التي تم الحصول عليها أن جميع المعاملات قد حسنت جميع معايير النمو. تم زيادة العائد، وزن الكتلة، وزن وحجم حبات العنب، إجمالي المواد الصلبة القابلة للذوبان، إجمالي المواد الصلبة القابلة للذوبان/الحموضة الكلية. في حين تم تقليل الحموضة الكلية التي تؤثر على جميع المعالجات مقارنة بمحطات التحكم في الموسمين المدروسين. وعمومًا، خففت تطبيقات الحديد المغناطيسي وحمض الهيوميك وتربة يوني-سال من الآثار السلبية الناجمة عن الإجهاد الملحي في إنتاجية أشجار بدون بذور متفوقة، من خلال تعديل النم والمميز والإستجابات المحصولية.

الكلمات المفتاحية: الحديد المغناطيسي، حمض الهيوميك، Uni-sal، تطبيق التربة، النم والخضري، المحصول.