ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Response of Valencia Orange to Some Natural and Synthetic Soil Conditioners under North Sinai (Egypt) Conditions

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Manuscript Info

Manuscript History:

Received: 18 September 2014
Final Accepted: 29 October 2014
Published Online: November 2014

Key words
Valencia orange, humic acid, uni-sal.

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Abstract

During 2012 and 2013 seasons at El-Sheikh Zuwayid, North Sinai Governorate (Egypt) to examine the effect of humic acid and uni-sal applications as soil conditioners on leaf area, total chlorophylls, N, P, K, Fe, Zn and Mn in the leaves, yield as well as some physical and chemical characteristics of the Valencia orange fruits. Nine treatments were conducted as follows: control (untreated trees); humic acid (12, 18, 24 and 30 cm /tree) and uni-sal (12, 18, 24 and 30cm /tree). All treatments were applied at growth start, after full bloom, and at three weeks later after setting. The obtained results reveled that all treatments were very effective in stimulating growth parameters (total leaf area, chlorophyll, nitrogen, phosphorus, potassium, iron, zinc and manganese), yield and physical and chemical characteristics of the fruits. Generally, the best treatments were 30 cm uni-sal / tree in improving the leaf area, nutrients (N, P, K, Fe, Zn and Mn), fruit length, diameter, weight, volume, juice percentage, total sugar, reducing sugar and ascorbic acid 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.).

Introduction:

Citrus is one of the most cash crops in more than 140 countries occupying a special priority in the international trade. In addition, Citrus species and hybrids are of the most important promising crops especially in the new reclaimed areas of tropical and subtropical regions.

Citrus cultivation in Egypt had increased dramatically during the past ten years. Egypt is one of the important producers of orange and citrus, in spite of the rapid deterioration in the soils of citrus orchards.

Soil salinity is the major problem in widespread areas of the cultivated land in Egypt. Newly reclaimed sandy soil may also be affected at various degrees by some sorts of salinity. In order to achieve salt-tolerance, the foremost task is either to 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. **(Bravdo, 2000 ; Abd El-Hady, et al., 2003**). High salinity causes plant deterioration **(Yeo, 1998 ; Glenn, et al., 1999).** The most harmful effect of salinity is the increases 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 **Mervat, et al., (1996) Valia, and Potiel, 1997; Tal, 1977; Prior et al., 1992; Walker, 1994 ; Lio, 1996).** 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.

The organic matter is crucial for maintaining soil fertility, which have positive impact on biological, chemical and physical properties of the soils. Humic acid and fulvic acid are essential in soil organic matter**.** 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 **(Demir et al., 1999; Casierra-Posada et al., 2009).**

Humic acid (polymeric polyhydroxy acid) is the most significant component of organic substances in equates system. Humic substances function to buffer the hydrogen ion concentration (pH) of the soil, **(Mecan and Petrovic, 1995)**. **Liu and Cooper, (2002)** showed that humic acid enhanced root growth of salt stressed plants and improved salinity tolerance. Also, **Hartwigsen and Evans, (2000)** indicated that humic acid significantly increased root fresh weight and total length of lateral roots. It improved soil structure, organic matter, nutrient uptake, root development and microbial activity **(Davis and Ghabbour 1998).**

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 lead to diminution of water flow through root **(Pandey and Agarwal, 1998; Slama et al., 2007).** On the other hand, growth may be inhibited due to either a toxicity or nutrient deficiency. So it is necessary to decrease the effect by redirecting the activity to the positive action by using antioxidant (citric acid and salicylic acid) as non enzymatic antioxidant that chelating these free radicals and protecting plant from injury by in prolonging the shelf life of plant cells and improving growth characters **(Elad, 1992; Zhang and Klessig, 1997; Rao et al., 2000).** Also, **Kawasaki et al. (1983a, b),** indicated that polyethylene glycol has been successfully used as an osmotic for subjecting plant tissues. Application of uni-sal which contains amino acids (glutaric acid) makes activation by bio formation of proline, which is considered as one of the most important amino acids that helping in resisting salinity and drought stress **(Wareing and Phillips, 1973)**. Furthermore, spraying amino acids increased chlorophyll content due to its role in increasing protein biosynthesis essential for chlorophyll formation, and enhancing growth, yield and physical and chemical characteristics of the berries **(Wareing and Phillips 1973 ;Sabry, et al., 2009)**. 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 fruit quality as evidenced by application high rates of humic acid at 9litres /feddan and uni-sal at 6 litres/feddan. **EL-khawaga (2013)** found that uni-sal at 50 mL/palm twice improve growth, leaf area, yield and fruit quality of Sewy, Zaghloul and Hayany date palm cultivars.

This study aimed to examine the response of Valencia orange to humic acid and uni-sal applications as soil conditioners on leaf area, total chlorophylls, N, P, K, Fe, Zn and Mn in the leaves, yield as well as some physical and chemical characteristics of the fruits of Valencia orange trees.

Materials and Methods

This study was conducted during 2012 and 2013 seasons on 54 uniform in vigour 10- years old Valencia orange trees onto sour orange rootstock grown in sandy soil (Table1) under drip irrigation system (Table 2) at El-Sheikh Zuwayid, North Sinai Governorate, Egypt. Planting space was 5 × 5 m apart. This study included nine treatments. The treatments were established as follows: control (untreated trees), humic acid (contains 8% active humic acid, 1% active folic acid and 72.3% organic matter) at 12, 18, 24 and 30 cm /tree and uni-sal (contains 9% polyethylene glycol (PEG), 7.5% calcium, 7% glutaric acid, 5% nitrogen and 1% citric acid) at (12, 18, 24 and 30cm /tree). Each treatment was replicated three times (two trees per each), all treatments were applied three times, the first was at growth start, the second was after full bloom and the third was three weeks later after setting. The selected trees were uniform in vigor as possible. Fertilization program and other agricultural practices were the same for all trees. The experiments established in randomized complete block design.

The following parameters were measured for both seasons:

1- Leaf area: was measured using leaf area meter.

2- Average total chlorophyll content: leaves were tested at the end of august in field using Minolta meter SPAD-502.

3-Leaf proline content (mg/g) was colorimetrically estimated on fresh weight basis according to the method of **Batels et al., (1973).**

4- Macro and Micronutrients: ten tagged leaves from each main direction around every tree were collected carefully at random at the end of September in both seasons. As soon as macro and micronutrients analyzed in Valencia orange leaves that collected according to **Jones et al. (1991),** prepared as described by **Peterburgski (1968).** Total NPK are calorimetrically determined as described by **Cottenie, et al. (1982).** Fe, Zn and Mn were estimated by atomic absorption spectrophotometer as described by **Allan and prince, (1965).**

5- The total yield / tree (Kg) was recorded.

6- Number of fruits per tree was recorded at harvest time (first of March) for all treatments in both seasons.

7-Fruit parameters: fruits sample was taken at the harvest time to be used for determining the physical and chemical properties (i.e., fruit length (cm), fruit diameter (cm), fruit weight (g) and fruit volume (cm^3).

8- Fruit quality: a sample of 10 ripe fruits of each tree was taken at the harvest time to be used for determining the physical and chemical properties i.e., The total soluble solids percentage (T.S.S.%) was measured by using a hand refractometer and the acidity % as citric acid content using fresh juice with titration against 0.1 Na OH. The total sugars %, reducing sugars %, non-reducing sugars% and content of vitamin C according to **A.O.A.C (1985)** were determined.

Statistical analysis:

The data were subjected to analysis of variance and Duncan's multiple range tests was used to differentiate means as described by **Duncan (1955).**

Results and Discussion

Table 1: Some physical and chemical properties of the soil experimental orchard.

Particle size distribution (%)			Texture soil	Ec dsm^{-1}	pH	Available nutrients (Cation)				Available nutrients (Anion)			
Sand	Silt	Clay				Na %	K %	Ca meg/l	Mg meg/l	CO3	HCO3 meg/l	Cl^-	SO^{--}_4
92	7.17	2.28	sandy	2.13	8.01	21.33	0.57	4.1	1.6	-	2.9	20	4.7

Table 2: Irrigation water analysis

Characters		Values
PH		7.9
E.C. (ds /m)		4.84
Unit		ppm.
Soluble cations	Ca^{++}	6.21
	Mg^{++}	6.73
	Na^+	28.11
	K^+	0.21
Soluble anions	CO_3^{--}	0.0
	HCO_3^-	3.31
	SO^{--}_4	10.71
	Cl^-	27.24

Leaf area, total chlorophylls and leaf proline

Data presented in Table 3, show that application of humic acid and uni-sal were significantly effective on Valencia orange leaf area, total chlorophylls and leaf proline. However, application uni-sal (30cm /tree) increased leaf area (18.00 and 19.00(cm^2) in both seasons, respectively) and decrease leaf proline (0.05 in the 1st and 0.04 in the 2nd season). While, there is no significant effect between application uni-sal (30 and 24 cm/tree) in total chlorophylls (78.87 in the 1st and 80.33 in the 2nd season) and (77.67 and 79.33 in both seasons, respectively). In addition, the control was less in leaf area, total chlorophylls and increase in leaf proline in both seasons.

As regard, the effect of uni-sal was due to lowering the osmotic potential of nutrient solutions and increasing tolerance to osmotic stress **(Munir and Aftab 2009).** Moreover, **(Pandey and Agarwal, 1998; Slama et al., 2007; Mehanna et al., 2010)** said that the basic mechanism of PEG it's a primary factor contributing a decrease of water flow through roots and control water potentials.

The maximum value of proline treatment that recorded with untreated Valencia orange might be attributed to increasing of hydrolytic enzymes that caused by chloride salts and salinity **(Salisbury and Ross, 1992).** Furthermore, leaf proline content has been used as an evaluation parameter for selecting salinity **(Batels et al.,**

1973). In addition, plants build up proline in tissues to maintain osmotic balance with soil solution **(Salisbury and Ross, 1992)**.

These results are parallel with **Naik and Joshi (1983)** who reported that PEG (which is a main content of uni-sal) could not stimulate proline accumulation in sugar cane. In addition, **EL-khawaga (2013)** found that uni-sal at 50 mL/palm twice improve growth, leaf area, of Sewy, Zaghloul and Hayany date palm cultivars. While, **Mervat et al., (2013)** recorded that application of 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.

Table 3. Effect of humic acid and uni-sal on leaf area, leaf chlorophyll and leaf proline of Valencia orange trees during 2012 and 2013 seasons.

Treatments	Leaf area (cm^2)		Leaf chlorophyll		Leaf proline (mg/g FW)	
	2012	2013	2012	2013	2012	2013
Control	13.60g	13.73i	60.40g	61.33g	0.14i	0.15j
Humic (12cm/tree)	14.07f	14.80h	64.52f	65.92f	0.11g	0.10h
Humic (18cm/tree)	14.83de	16.07f	69.14de	70.05de	0.08d	0.08f
Humic (24cm/tree)	15.87c	17.17d	72.74c	75.00c	0.08d	0.07d
Humic (30cm/tree)	16.23c	18.00c	75.52b	77.67b	0.07 c	0.06 c
Uni-sal (12cm/tree)	14.43ef	15.60g	67.37e	68.00ef	0.10f	0.09g
Uni-sal (18cm/tree)	15.20d	16.67e	70.15d	72.19d	0.09e	0.08e
Uni-sal (24cm/tree)	17.27b	18.60b	77.67a	79.33ab	0.06 b	0.05b
Uni-sal (30cm/tree)	18.00a	19.00a	78.87a	80.33a	0.05a	0.04a

Means having the same letter (s) in each column is not significantly different at 5% level.

<u>Leaf Mineral Content:</u>

Concerning the results in Table 4 and 5, nitrogen, phosphorus, potassium, iron, zinc and manganese content in the leaves was significantly affected by all treatments in both seasons. However, application of uni-sal (30cm/tree) to the soil gave the best leaf nitrogen content (2.29 in the 1st and 2.34 in the 2nd season), phosphorus (0.34 in the 1st and 0.36 in the 2nd season), potassium (1.74 in the 1st and 1.76 in the 2nd season), iron(75.11 in the 1st and 76.96 in the 2nd season), zinc (60.00 in the 1st and 61.08 in the 2nd season) and manganese (63.60 in the 1st and 66.08 in the 2nd season) followed by application with uni-sal (24cm/tree) to the soil in Valencia orange in both seasons. On the other side, control was the lowest leaf nitrogen content (1.71 in the 1st and 1.70 in the 2nd season), phosphorus (0.13 in the 1st and 0.14 in the 2nd season), potassium (1.08 in the 1st and 1.17 in the 2nd season), iron (60.11 in the 1st and 61.55 in the 2nd season), zinc (42.74 in the 1st and 43.25 in the 2nd season) and manganese (48.96 in the 1st and 50.25 in the 2nd season) in both seasons.

Uni-sal had a positive effect on leaf mineral content. This may be due to its enrichment with polyethylene glycol, which lowered osmotic potential of nutrient solutions and increased nutrient availability**.**

Generally, these results are in agreement with **EL-khawaga (2013)** who found that uni-sal at 50 mL/palm twice improve leaf mineral content of Sewy, Zaghloul and Hayany date palm cultivars. While, **Mervat et al., (2013)** who recorded that application of uni-sal at 6 litres /feddan have profoundly alleviated salinity effects and improved vine performance by increasing leaf mineral content.

Table 4. Effect of humic acid and uni-sal on N, P and K inValencia orange leaves during 2012 and 2013 seasons.

Treatments	N %		P %		K %	
	2012	2013	2012	2013	2012	2013
Control	1.71f	1.70h	0.13h	0.14h	1.08i	1.17i
Humic (12cm/tree)	1.74ef	1.76g	0.16g	0.17g	1.19h	1.21h
Humic (18cm/tree)	1.76e	1.93e	0.18f	0.20f	1.32f	1.43f
Humic (24cm/tree)	1.84d	2.06c	0.24d	0.27d	1.55d	1.67d
Humic (30cm/tree)	2.00c	2.08c	0.27c	0.29c	1.67c	1.71c
Uni-sal (12cm/tree)	1.75ef	1.84f	0.16fg	0.17g	1.23g	1.37g
Uni-sal (18cm/tree)	1.77e	2.00d	0.21e	0.23e	1.44e	1.55e
Uni-sal (24cm/tree)	2.17b	2.22b	0.30b	0.34b	1.72b	1.74b
Uni-sal (30cm/tree)	2.29a	2.34a	0.34a	0.36a	1.74a	1.76a

Means having the same letter (s) in each column is not significantly different at 5% level.

Table 5. Effect of humic acid and uni-sal on Fe, Zn and Mn in Valencia orange leaves during 2012 and 2013 seasons.

Treatments	Fe%		Zn %		Mn %	
	2012	2013	2012	2013	2012	2013
Control	60.11h	61.55h	42.74f	43.25g	48.96g	50.25f
Humic (12cm/tree)	62.52g	63.11gh	44.66ef	45.44fg	50.74f	55.40e
Humic (18cm/tree)	65.21f	66.45f	46.38de	49.00de	52.96e	58.39d
Humic (24cm/tree)	69.26d	70.15d	52.12c	52.96c	57.51c	61.34c
Humic (30cm/tree)	71.15c	73.29c	53.11c	54.62c	60.26b	62.51c
Uni-sal (12cm/tree)	63.71g	64.23g	45.78de	47.37ef	51.10f	56.38e
Uni-sal (18cm/tree)	67.78e	68.48e	48.41d	50.59d	54.66d	59.44d
Uni-sal (24cm/tree)	73.74b	75.11b	56.56b	57.33b	61.85b	64.22b
Uni-sal (30cm/tree)	75.11a	76.96a	60.00a	61.08a	63.60a	66.08a

Means having the same letter (s) in each column is not significantly different at 5% level.

Yield (kg /tree) and Number of fruit /tree

It is evident from the data in Table (6) that yield and number of fruit/tree of Valencia orange was significantly affected by all treatments in both seasons. Moreover, application of uni-sal (30 and 24 cm/tree) to the soil gave the best yield (64.00 in the 1st and 67.00 kg/tree in the 2nd season) and (61.68 in the 1st and 64.25 kg/tree in the 2nd season) respectively and number of fruits (318.41 in the 1st and 323.44 in the 2nd season) and (310.46 in the 1st and 319.65 in the 2nd season) respectively. Results cleared that control gave the minimum values of yield (30.67 in the 1st and 31.65 kg/tree in the 2nd season) and its number (217.01 in the 1st and 218.28 in the 2nd season) on Valencia orange.

This result could be due to the important role of PEG in contributing a decrease of water flow through roots and control water potentials **(Pandey and Agarwal, 1998; Slama et al., 2007; Mehanna et al., 2010)**. Moreover, 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. Furthermore, salinity negative affect was on reducing roots feeder (NPK uptake) and reduction of its ability to with stand stress. On the other hand, the results revealed that all applications were effective in improving micronutrients availability in the soil, as well as, improving vegetative growth, consequently increasing yield characteristics of Valencia orange.

These results are parallel with **Mervat et al., (2013)** who found that application of humic acid, uni-sal, have profoundly alleviated salinity effects and improved vine 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. **EL-khawaga (2013)** who found that uni-sal at 50 mL/palm twice improve yield of Sewy, Zaghloul and Hayany date palm cultivars.

Table 6. Effect of humic acid and uni-sal on yield and number of fruits/ tree in Valencia orange orchard during 2012 and 2013 seasons.

Treatments	Yield (kg/tree)		Number of fruits/tree	
	2012	2013	2012	2013
Control	30.67f	31.65h	217.01 e	218.28 f
Humic (12cm/tree)	35.56e	37.67g	234.63d	245.12 e
Humic (18cm/tree)	43.00d	46.58e	257.10c	274.73 c
Humic (24cm/tree)	51.33b	56.00c	273.03b	297.30 b
Humic (30cm/tree)	53.60b	60.84b	285.61b	316.13a
Uni-sal (12cm/tree)	40.21d	42.33f	257.16c	263.62 dc
Uni-sal (18cm/tree)	48.34c	54.56d	281.57b	311.13 ab
Uni-sal (24cm/tree)	61.68a	64.25a	310.46a	319.65 a
Uni-sal (30cm/tree)	64.00a	67.00a	318.41 a	323.44 a

Means having the same letter (s) in each column is not significantly different at 5% level.

Fruit Physical Characteristics

Data in Table (7) revealed that fruit length, diameter, weight, volume and juice percentage of Valencia orange was significantly affected by all treatments in both seasons. It is cleared that adding uni-sal (30 cm/tree) to the soil gave the best fruit length (7.70 in the 1st and 7.83cm in the 2nd season), fruit diameter (7.40 in the 1st and 7.63cm in the 2nd season), fruit weight (201.00 in the 1st and 207.15g in the 2nd season), fruit volume (198.55in the 1st and 204.00 cm^3 in the 2nd season) and juice percentage (51.89 in the 1st and 52.86% in the 2nd season) respectively.

On the other side, unfavorable effects on fruit physical characteristics were observed when the Valencia orange grown under salinity and untreated with each material. Control gave the lowest fruit length (6.07 in the 1st and 6.28cm in the 2nd season), fruit diameter (5.99 in the 1st and 6.14 cm in the 2nd season), fruit weight (141.33 in the 1st and 145.00 g in the 2nd season), fruit volume (142.67 in the 1st and 146.67 cm^3 in the 2nd season) and juice percentage (33.56 in the 1st and 34.59% in the 2nd season) respectively.

The positive influence of these materials may be due to the increased total leaves area and the increase of the availability of micronutrients in the soil that leading to an increase in total chlorophyll that may result in accumulating more carbohydrates thereby enhancing fruit ripening. Many workers in this field supported the improving effect of these materials on Valencia orange.

Generally, these results are in agreement with **EL-khawaga (2013)** who found that uni-sal at 50 mL/palm twice improve fruit weight (g.) and pulp percentage of the fruits of Sewy, Zaghloul and Hayany date palm cultivars.

Table 7. Effect of humic acid and uni-sal on fruit length, fruit diameter, fruit weight, fruit volume and juice percentage of Valencia orange fruits during 2012 and 2013 seasons.

Treatments	Fruit length (cm)		Fruit diameter (cm)		Fruit weight (g)		Fruit volume (cm^3)		juice percentage%	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control	6.07 f	6.28 h	5.99 g	6.14 f	141.33 i	145.00 i	142.67 g	146.67 h	33.56 h	34.59 g
Humic (12cm/tree)	6.42 e	6.78 g	6.20 fg	6.66 e	151.56 h	153.68 h	152.34 f	157.00 g	35.48 g	37.21 f
Humic (18cm/tree)	6.63 de	6.92 e	6.44 ef	6.80 e	167.25 f	169.55 f	168.54 d	170.68 e	38.91 f	40.43 e
Humic (24cm/tree)	6.96 c	7.03 d	6.89 bcd	7.04 cd	188.00 d	188.36 d	180.48 c	187.25 c	44.33 d	47.99 c
Humic (30cm/tree)	7.00 c	7.67 c	6.93 bc	7.20 bc	187.67 c	192.45 c	184.78 c	188.89 c	48.00 c	47.96 c
Uni-sal (12cm/tree)	6.85 cd	6.84 f	6.59 de	6.74 e	156.34 g	160.57 g	157.67 e	163.33 f	36.54 g	37.73 f
Uni-sal (18cm/tree)	6.78 cd	6.93 c	6.69 cde	6.88 de	171.68 e	175.36 e	171.56 d	176.00 d	41.22 e	44.47 d
Uni-sal (24cm/tree)	7.37 b	7.73 b	7.10 ab	7.27 b	198.67 b	201.00 b	192.00 b	197.65 b	50.43 b	50.28 b
Uni-sal (30cm/tree)	7.70 a	7.83 a	7.40 a	7.63 a	201.00 a	207.15 a	198.55 a	204.00 a	51.89 a	52.86 a

Means having the same letter (s) in each column is not significantly different at 5% level.

Fruit Chemical Characteristics

Concerning the results in Table (8) data showed that all treatments had a significantly difference in T.S.S., total sugar, reducing sugar, Total acidity and vitamin C in both seasons. However, adding uni-sal (30 and 24 cm/tree) to the soil gave the best T.S.S. (14.17 in the 1st and 14.37 % in the 2nd season) and (13.90 in the 1st and 13.97 % in the 2nd season) respectively. While, adding uni-sal (30 cm/tree) to the soil gave the best total sugar content (9.37 in the 1st and 9.48 % in the 2nd season), reducing sugar content (5.30 in the 1st and 5.40% in the 2nd season) and vitamin C (51.38 in the 1st and 54.03 mg/100g in the 2nd season). On the other side, adding uni-sal (30cm/ tree) to the soil decreased total acidity (0.87 in the 1st and 0.83 in the 2nd season).

On the other side, unfavorable effects on fruit chemical characteristics were observed when the Valencia orange trees grown under salinity and untreated with each material. In general, salinity stress inhibited growth and development, also decreased translocation of photosynthetic products and nutrients uptake then the accumulation of total soluble solids %, total and reducing sugars form declined **(Nijjar, 1985; Gulser, 2005)**. These results agreed with those obtained by **(Al-Hammadi, 2006; El-Sharabasy et al., 2008; Al-Abdoulhadi et al., 2011). EL-khawaga (2013)** found that uni-sal at 50 mL/palm twice improve T.S.S., total sugar of the fruits of Sewy, Zaghloul and Hayany date palm cultivars.

Table 8. Effect of humic acid and uni-sal on T.S.S., total acidity, total sugar, reducing sugar and vitamin C on Valencia orange fruits during 2012 and 2013 seasons.

Treatments	T.S.S. %		Total acidity %		Total sugar %		Reducing sugar %		vitamin C mg/100g	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control	10.00f	10.41g	1.55a	1.53a	6.92i	7.00i	3.73g	3.92i	35.73g	36.62g
Humic (12cm/tree)	11.03e	11.84f	1.51a	1.48a	7.55g	7.33h	4.07f	4.29h	38.55f	39.89f
Humic (18cm/tree)	11.92cd	12.33ef	1.21c	1.10c	7.74f	8.31f	4.68d	4.67f	42.88d	43.06e
Humic (24cm/tree)	13.05b	13.17cd	0.95e	0.91e	8.86d	8.93d	4.95c	4.95d	46.93c	47.15c
Humic (30cm/tree)	13.38b	13.50bc	0.91ef	0.86e	9.04c	9.13c	5.00c	5.03c	47.91c	48.22c
Unisal (12cm/tree)	11.55d	12.32ef	1.41b	1.38b	7.41h	7.70g	4.37e	4.51g	40.15e	41.56e
Unisal (18cm/tree)	12.37c	12.81de	1.03d	0.99d	8.11e	8.75e	4.65d	4.76e	44.29d	45.19d
Unisal (24cm/tree)	13.90a	13.97ab	0.92ef	0.85e	9.27b	9.38b	5.10b	5.23b	49.85b	52.10b
Unisal (30cm/tree)	14.17a	14.37a	0.87f	0.83f	9.37a	9.48a	5.30a	5.40a	51.38a	54.03a

Means having the same letter (s) in each column is not significantly different at 5% level.

Conclusion

It can be concluding from the aforementioned results, that uni-sal (30 cm/tree) application to soil improving growth characters, leaf mineral content, yield and number of fruits/tree, physical and chemical characteristics of Valencia orange under salinity stress on El-Sheikh Zuwayid , North Sinai Governorate, Egypt.

References

A. O. A. C., 1985. Official methods of analysis. Association of Official Agricultural Chemists,14th ed: Benjamin Franklin station Washington, DC, USA, pp: 490-510.

Abd El-Hady, A. M.; Aly M. A. and El-Mogy M. M., 2003. Effect of some soil conditioners on counteracting the adverse effects of salinity on growth and fruiting of Flame Seedless vines. Minia J.Agric. Res. and Develop., 23(4): 699-726.

Al-Abdoulhadi, I. A.; Dinar H. A.; Ebert, G. and Buttner C., 2011. Effect of salinity on leaf growth, leaf injury and biomass production in date palm (Phoenix dactylifera L.) cultivars. Indian J. Sci. Technol., vol, 4, 1542-1546.

Al-Hammadi, M. S., 2006. Salt tolerance and current status of the date palms in the United Arab Emirates. Ph.D. Thesis, University of Arizona, Tucson, AZ., USA.

Allan, B. and prince, S. 1965. Asborption, spectrophotometery. Univ., of Hampshire, Durham, Hampshire.

Batels, L. S.; Waldern, R. P. and Teare, L. D. 1973. Rapid determination of free proline for water-stress studies. Plant and Soil, 939: 205-207.

Bravdo, B. A., 2000. Effect of mineral nutrition and salinity on grape production and wine quality. Acta Horticulture, 512: 23-30.

Casierra-Posada, F.; Rodriguez, C. A. and Fischer, G., 2009. Reducing negative effects of salinity in Tomato (Solanum lycopersicum L.) plants by adding leonardite to soil. Acta Hort., 821: 133-140.

Cottenie, A.; Verloo, M.; Velghe, G. and Comerlynk, R., 1982. Chemical analysis of plant and soil. Ghent, Belgium, Laboratory of Analytical and Agro-chemistry State University

Davis, G. and Ghabbour, E. A. 1998. Humic substances, structure properties and uses. Royal Soc. Of Chemistry, Cambridge, pp: 10-15.

Demir, K.; Gunes, A.; Inal, A. and Alpasan, M. 1999. Effects of humic acid on the yield and mineral nutrition of cucumber (Cucmis sativus L.) grown with different salinity levels. Acta Hort., 492: 95-104.

Duncan, D. B., 1955. Multiple range and multiple F Test. Biometrics, 11: 1-42.

Elad, Y., 1992. The use of antioxidant to control gray mould (Botrytic Cinera) and white mould (Selerotinia seletotiorum) in various crops. Plant Pathol., 41: 417-426.

El-khawaga, A. S. 2013. Effect of anti-salinity agents on growth and fruiting of different date palm cultivars. Asian journal of crop science 5(1): 65-80.

El-Sharabasy, S. F.; Wanas, W. H. and Al-Kerdany, A. Y. 2008. Effect of salinity stress on some date palm cultivars during proliferation stageIn vitro. Arab J. Biotechnol., 11: 273-280.

Glenn, E. P.; Brown, I. I. and Blumwald, E. 1999. Salt tolerance and crop potential of halophytes.Crit. Rev. Plant Sci., 18: 55-227.

Gulser, F., 2005. Effect of ammonium sulphate and urea on NO_3 - and NO_2 $^-$ accumulation nutrient contents and yield criteria in spinach. Scientia Hortic., 106: 330-340.

Hartwigsen, J. A. and Evans, M. R., 2000. Humic acid seed and substrate treatments promote seedling root development. HortScience, 35: 7-12.

Jones, J.R.; Wolf, B. J. and Mills, H. A. 1991. Plant analysis Handbook. Micro-Macro Publishing. Inc., Georgia, USA., Chapter, 7: 45-88.

Kawasaki, T.; Shimizu, G. and Moritsugu, M. 1983a. Effect of high concentrations of sodium chloride and polyethylene glycol on the growth and ion absorption in plants. Multi-compartment transport., box experiment with excised roots of barley. Plant and Soil, 75: 87-93.

Kawasaki, T.; Akiba, T. and Moritsugu, M. 1983b. Effect of high concentrations of sodium chloride and polyethelene glycol on the growth and ion absorption in plants. É. Water culture experiments in a greenhouse. Plant and Soil, 75: 75-85.

Lio, X., 1996. Injury of leaves of grapevine cuttings under NaCl stress. J. Fruit. Sci., 13: 211-214.

Liu, C. and Cooper, R. J., 2002. Humic acid application does not improve salt tolerance of hydroponically grown creeping bentgrass. J. Amer. Soc. Hort. Sci., 2: 127.

Mecan, M. K. and Petrovic, M. 1995. Competitive sorption of phosphate and, humic substances on suspended particulate matter. Water Sci. and Technology, 32: 349-355.

Mehanna, H.T.; Fayed, T. A. and Rashedy, A. A. 2010. Response of two grapevine rootstocks to some salt tolerance treatments under saline water conditions. J. Horticult. Sci. Ornamental Plants, 2: 93-106.

Mervat A. A.; Rafaat S. S. E. and Ahmed O. A. 2013. Minimizing Adverse Effects of Salinity in Vineyards Journal of Horticultural Science & Ornamental Plants 5 (1): 12-21, 2013

Mervat, A. A., 1996. Studies on tolerance of some grape vine cultivars to stress. Ph.D. Thesis, Fac. Agric., Cairo Univ., Egypt.

Munir, N. and Aftab, F. 2009. Role of Polyethylene.Glycol (PEG) in improving sugarcane's salt (NaCl) tolerance. Turkish Journal of Botany, 33: 407-415.

Naik, G. P. and Joshi, G.V. 1983. Effect of role of proline metabolism in salt stressed, sugar cane leaves. Proceeding of the India Academy of sciences (Plant sciences), 92(3): 265-269.

Nijjar, G. S., 1985. Nutrition of Fruit Trees. Kilyani Publisher, New Delhi, India, pp: 80-119.

Pandey, R. and Agarwal, R. M. 1998. Water stress-induced changes in prolin contents and nitrate reductase activity in rice under light and dark condition. Physiol. Mol. Biol. Plants, 4: 53-57.

Parida, A. K. and Das, A. B. 2005. Salt tolerance and salinity effects on plants: A review. Ecotoxicol. Environ. Saf., 60: 324-349.

Peterburgski, A.V. 1968. Handbook of agronomic chemistry. Kolop Publishing House, Moscow, Russia.

Prior, L. D.; Grieve A. M. and Cullis B. R., 1992. Sodium chloride and soil texture interaction in irrigated field grown Sultana grapevines. Ï. Plan mineral content, growth and physiology. Aust. J. Agric. Res., 43: 1067-1083.

Rao, M. V.; Koch, J. R. and Davis, K. R. 2000. Ozone: A tool for probing programmed cell death in plants. Plant Mol. Biol., 44: 345-358.

Rida, A. K. and Das, A. B. 2005. Salt tolerance and salinity effects on plants: A review. Ecotoxicol. Environ. Saf., 60: 324-349.

Sabry, G. H.; Rizk-Alla, M. S. and Abd El-Wahab, M. A. 2009. Influence of effective micro-organisms, seaweed extract and amino acids application on, growth, yield and bunch quality of Red globe grapevines. J. Agric. Sci. Mansoura Univ., 34(6): 5901-5921.

Salisbury, F. B. and Ross, C. W. 1992. Plant physiology. Pub. Wadsworth, Belmont, California, USA.

Slama, I.; Ghnaya, T. ;Hessini, K. ;Messedi, D. ;Savoure A. and Abdelly, C. 2007. Comparative study of manitol and PEG osmotic stress effects on growth, proline and soluble sugar accumulation in *Sesuvium portulacastrum*. Environ. Exp. Bot., 61: 10-17.

Tal, M., 1977. Physiology of polyploidy plants; DNA, RNA, protein and abscisic acid in auto tetraploid and diploid tomato under low and high salinity. Bot. Gaz., 138: 119-122.

Valia, R. Z. and Potiel, F. M. 1997.Growth, physiological parameters and nutritional status as influenced by soil salinity on Cashew. J. Plantation Crops, 25(1): 62.

Walker, R. R., 1994. Grapevine responses to salinity Bulletined, TOIV., 67: 761-762.

Wareing, P. F. and Phillips, I. D. J. 1973. The control of growth and differentiation in plants. Pergamon Press Ltd., UK.

Yeo, A. R., 1998. Molecular biology of salt tolerance in the context of whole-plant physiology. S. Exp. Bot., 49: 915-9 29.

Zhang, S. and Klessig, D. F. 1997. Salicylic acid activates a 48 kDa MAP kinase in tobacco. Plant Cell, 9: 809-824.