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EFFECT OF MAGNETIZED IRRIGATION WATER LEVELS AND COMPOST ON VEGETATIVE GROWTH, LEAF MINERAL CONTENT AND WATER USE EFFICINECY OF WASHINGTON NAVEL ORANGE TREES

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ABSTRACT

This investigation was carried out during two successive seasons of 2014 and 2015 on 6 years old, Washington Navel orange trees (*Citrus sinensis* L.) budded on sour orange rootstock. Tree spaced at 5 x 5 meter and grown on sandy soil and irrigated with saline water (EC was 4 ds/m) under drip irrigation system in private orchard located at El-Behera Governorate, Egypt. The objection to study the impact of different levels of magnetized irrigation water and compost on growth, leaf mineral content and water use efficiency (WUE) of Washington Navel orange tree growing on sandy soil under drip irrigation saline water. Three levels of magnetized irrigation water 3658.5, 2743.8 and 1829 m3/fed. with and without compost at 4kg/tree along with control (non-magnetic water).

Results indicated that, the highest values of vegetative growth parameters i.e., shoot length, shoot thickness, number of leaves/shoot, leaf area/leaf, as well as chemical constituents of leaves (N, P, K, Ca, Mg) obtained by trees irrigated with magnetized water levels combined with or without compost. Leaf Na content were increased under control treatment(non-magnetic water). The best results of both vegetative growth parameters and chemical constituents of leaves were recorded when trees irrigated with magnetized water at level 1(3658.5m3/fed/season) + 4kg compost followed by level 2(2743.8 m3/fed/season) + 4kg compost, while the highest yield efficiency (YE) and WUE obtained from irrigation treatment at level3(1829 m3/fed/season) + 4kg compost in both seasons .Therefore, magnetizing water at level 1+ 4kg compost or level 2+ 4kg compost treatment could be recommended for improving citrus trees performance under saline water conditions.

Keywords: water salinity, magnetized water, growth, orange trees.

INTRODUCTION

Citrus is one of the most important world fruit crops. However, citrus in Egypt is ranked the first in this respect. The area of citrus trees has increased rapidly through the last few years and reached about 518694 feddans (According to the yearly Bull. Agric. Economic and Statistics, Ministry of Agriculture and Land Reclamation of Egypt, 2014). Navel orange is a popular fresh fruit due to its seedless ness, large sized, characterized flavor and aroma, also is an important source of early season income for citrus growers in each commercial citrus areas of the world (Wardowski *et al.*1985). In Egypt agriculture is the main consumed than 80% the available water for irrigation and crop production. An additional water may expected in future than the present to face the population increase and food production (Mohamed, 2013). Saline water of may represent a possible water supply, but its salinily is one of the most problems may a negative affect plants through three limited components: osmotic, nutrition's and toxic stresses (Munns, 1993). When exposed to salinity, growth and development tend to decline, with consequent reduction in their economic value. The use of saline water for agricultural production in water insufficiency regions requires innovative and sustainable research, and an appropriate transfer of technologies. There is a pressing need for a system (technology role e.g. magnetic water). The water treated by passing through a magnetic device called magnetized water. Magnetized water was shown to have three main effects: increasing the leaching of excess soluble salts, lowering soil alkalinity and dissolving slightly soluble salts such carbonates, phosphates and sulfates. However, the degree of effectiveness of magnetized water on soil salinity and ionic balance in soil solution depended greatly on the traveling distance of magnetized water along the drip irrigation lines (Hilal and Hilal, 2000). Magnetic water may improv the plant growth characteristics and nutrients uptake (Radhakrishnan and Kumari, 2012), root function (Aladjadjiyan, 2010), influenced the chemical composition of plants, activate plant enzymes (Alikamanoglu and Sen, 2011). New strategy of fertilization depends on using recycled animal manure and farm residues to produce compost for enhancing biological cycles, improving soil fertility and counter attack against all forms of pollution that may result from conventional agriculture techniques (Shiralipour et al., 1992). The application of compost also improving the soil characteristics; increasing soil fertility and organic matter content. Compost application can compensate use of chemical fertilizers, which have adverse environmental effects. Also the use of organic fertilizers increasing the crop productivity, increasing the soil fertility and the water requirements was decreasing with using compost (saving water) (Natsheh and Mousa, 2014).

The objective of the current study is to evaluate the effect of different levels of magnetized irrigation water and compost on vegetative growth, leaf mineral contents and water use efficiency of Washington Navel orange trees growing on sandy soil under drip irrigation with saline water.

MATERIALS AND METHODS

This investigation was carried out during two successive seasons of 2014 and 2015 on 6 years old, Washington Navel orange trees (*Citrus sinensis* L.) budded on sour orange rootstock, spaced at 5 x 5 meter and grown on sandy soil and irrigated with saline

water(EC was 4 ds/m)under drip irrigation system in private orchard located at El-Behera governorate, Egypt. The trees were subjected to normal cultural practices which usually done in this area.The mean values of some physical and chemical properties of the experimental soil are presented in Table (1).

Table (1): physical and chemical and properties of experimental soil .

O.M (%)	Clay (%)	Silt (%)	Sand (%)	Texture class	E.C (ds\m)	pH	Available(Mg\Kg soil) N	P	K
0.45	2.40	9.50	89.20	Sandy	2.20	7.60	8.10	5.10	11.5

The selected trees were grouped under seven treatments in each season. Each treatment was represented by three replicates, thus each replicate contained three trees. The recommended rate of nitrogen fertilization was added according to ministry of agriculture. The seven treatments involved in this study were summarized as follows:

1. Control (non-magnetizing) normal ordinary saline irrigation water pumped from a well at 3658.5m^3/fed/season (16 drippers / tree).
2. Magnetized irrigation water at 3658.5m3/fed/season (level1=16 drippers / tree).
3. Magnetized irrigation water at 2743.8 m^3/fed/season (level2=12 drippers / tree).
4. Magnetized irrigation water at 1829 m^3/fed/season (level3=8 drippers /tree).
5. Magnetized irrigation water at 3658.5m3/fed/season + 4kg compost/tree (level1+ compost).
6. Magnetized irrigation water at 3658.5m3/fed/season + 4kg compost/tree (level2+compost).
7. Magnetized irrigation water at 1829 m^3/fed/season + 4kg compost / tree (level3+compost).

The quantity of compost was added one time at the last week of January in both seasons. The chemical composition of the used compost was shown in Table (2)

Table (2). Chemical analysis of compost used in the experiment.

Properties	Values
Weight of dry m^3 (kg)	590
Weight of wet m^3 (kg)	730
Humidity (%)	24
pH(1-10) extract	6.6
EC (1-10) (ds/m)	1.6
Total nitrogen (%)	1.4
Ammonium nitrogen (ppm)	550
Nitrogen nitrate (ppm)	315
Organic matter (%)	58
Organic carbon (%)	52.2
Ash (%)	42
C/N ratio	18:1
Total phosphorus (%)	0.6
Total potassium (%)	0.79

Table (3): The irrigation program and amount of irrigation water applied (m^3/fed) in the different irrigation treatments during both growing seasons.

Months	Number of days	water applied l/day 2014	2015	Treatments T1 2014	T1 2015	T2 2014	T2 2015	T3 2014	T3 2015	T4 2014	T4 2015	T5 2014	T5 2015	T6 2014	T6 2015	T7 2014	T7 2015
January	31	37	33	1147	1023	860.3	767.3	573.5	511.5	1147	1023	860.3	767.3	573.5	511.5	1147	1023
February	28	46	42	1288	1176	966	882	644	588	1288	1176	966	882	644	588	1288	1176
March	31	53	51	1643	1581	1232.3	1185.3	821.5	790.5	1643	1581	1232.3	1185.3	821.5	790.5	1643	1581
April	30	65	60	1950	1800	1462.5	1350	975	900	1950	1800	1462.5	1350	975	900	1950	1800
May	31	80	75	2480	2325	1860	1743.3	1240	1162.5	2480	2325	1860	1743.3	1240	1162.5	2480	2325
June	30	85	80	2550	2400	1912.5	1800	1275	1200	2550	2400	1912.5	1800	1275	1200	2550	2400
July	31	92	88	2852	2728	2139	2046	1426	1364	2852	2728	2139	2046	1426	1364	2852	2728
August	31	76	72	2356	2232	1767	1674	1178	1116	2356	2232	1767	1674	1178	1116	2356	2232
September	30	75	71	2250	2130	1687.5	1597.5	1125	1065	2250	2130	1687.5	1597.5	1125	1065	2250	2130
October	31	62	58	1922	1798	1441.5	1348.5	961	899	1922	1798	1441.5	1348.5	961	899	1922	1798
November	30	40	36	1200	1080	900	810	600	540	1200	1080	900	810	600	540	1200	1080
December	31	28	25	868	778	650	581	434	387.5	868	778	650	581	434	387.5	868	778
m^3/tree/ year		-	-	22,506	21,048	16,879	15,786	11,253	10,524	22,506	21,048	16,879	15,786	11,253	10,524	22,506	21,048
m^3/fed./year		-	-	3781	3536	2835.6	2652	1890	1768	3781	3536	2835.6	2652	1890	1768	3781	3536

Vegetative growth parameters:

Four branches on each direction were chosen and labeled in each tree for measuring and determination the vegetative parameters,i.e shoot length, shoot thickness, number of leaves/ shoot, leaf area/leaf (cm^2) was calculated according to the equation of (Chou, 1966). Leaf area = ⅔ length × width, leaf dry weight (g) and leaf specific weight (mg/ cm^2) It was calculated according to Ferre and Forshey (1988) as follows SLW = leaf dry weight (mg) / leaf area (cm^2).

Water use efficiency (kg/m^3)

Water use efficiency (WUE) was used to evaluate the comparative benefits of the different irrigation treatments. It was calculated according to Hansen *et al.* (1980) by the following equation:

$$WUE(kg/m^3) = \frac{Yield(kg/\ fed)}{Water(m^3/fed/season)}$$

Leaf mineral content

The leaves sample were taken at September and washed with tap water followed by distilled water. Leaves fresh weight was calculated then the leaves were oven dried at 70oC to a constant weight. Dry weight was calculated then the dry leaves were ground and digested according to Chapman and Pratt (1961) and Jackson (1967) by using the mixture of concentrated Sulfuric acid (H_2SO_4) + per chloric ($HCLO_4$) (5: 1) to determine the elements . N, P, K, Ca, Mg and Na. Total nitrogen % was determined by using the micro-kjheldahl method as described by Pregle (1945), Phosphorus % was determined colorimetric ally as described by Murphy and Riley (1962) while, Potassium %e was estimated by using flame photometer as described by Brown and Lille land (1974) also, Calcium, Magnesium and Sodium were determined using atomic absorption spectrophotometer Perkin Elmer model 2380 according to Wilde *et al.* (1985) and Chloride it was estimated by titration method according to Jackson (1958).

Statistical analysis

The obtained data were statistically analyzed as randomized complete block design according to (Snedecor and Cochran, 1977) and treatment means were compared using Duncan Multiple Range Test (DMRT) (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of magnetizing irrigation water levels and compost on vegetative growth, fruit set, yield, water use efficiency, fruit quality and chemical composition of Washington Navel orange trees are included in this study.

1-Vegetative growth:

Shoot length, thickness and number of leaves /shoot

Data in Table (4) showed that the vegetative growth parameters like as shoot length, shoot thickness and number of leaves /shoot significantly increased with levels all magnetizing irrigation water + compost treatments during two seasons of the study comparing to control (non-magnetic water).Also, previous vegetative growth parameters were significant increased when used magnetic irrigation water at 3658.5m3/fed/season + 4kg compost/tree followed by magnetic irrigation water at 2743.8 m3/fed/season + 4kg compost/tree compared with magnetic water levels and control(non-magnetic water) This increment was statistically significant in both seasons.. Our results were in harmony with the conclusion given by Wassel *et al*. (2007) on Balady mandarin trees, El-Sayed and Ennab (2013) worked on Valencia orange trees, Hussien *et al*. (2013) on Washington Navel orange trees and Júnior *et al.*, (2011) on acid lime. They reported that plant height, shoot length and number of leaves was increased by raising the amount of water.However, Aly *et al*. (2015). They showed that application of magnetic water improved growth of Valencia oranges trees compared to non-magnetic treatment. Also, Zhou *et al*. (2001), Mansour and Shaaban (2007) and Zalat (2014) who revealed that growth of citrus trees significantly affected by compost application.

Table (4): Effect of magnetic irrigation water levels and compost on shoot length, thickness and number of leaves per shoot of spring cycle of Washington Navel orange trees in 2014 and 2015 seasons.

Treatments	Shoot length (cm)		Shoot thickness (mm)		No. of leaves/shoot	
	2014 season	2015 season	2014 season	2015 season	2014 season	2015 season
Control (non magnetic water)	4.967	4.300	2.367	2.367	4.267	4.300
Level 1*	8.333	8.700	3.433	3.667	5.533	5.633
Level 2	7.600	7.833	3.267	3.467	5.233	5.367
Level 3	6.900	7.100	2.833	3.133	5.133	5.267
Level 1 + 4 kg compost	11.56	12.200	4.117	4.500	6.720	6.733
Level 2 + 4 kg compost	10.26	10.53	3.767	3.933	6.300	6.367
Level 3 + 4 kg compost	9.700	10.20	3.533	3.700	5.867	5.867
LSD at 5%	0.409	0.389	0.182	0.183	0.280	0.297

*** Leavel 1 Magnetic water 3658.5, Leavel 2 Magnetic water 2743.8 and Leavel 3 Magnetic water 1829 m^3 /fed/season.**

Leaf surface area, leaf dry weight and leaf specific weight:

Data presented in Table (5) showed leaf area/leaf (cm^2), leaf dry weight (g) and specific leaf weight (mg/cm^2) recorded significant increase when irrigated with all magnetic water plus 4kg compost as compared with magnetic water alone and control (non-magnetic) in both seasons. In addition, level 1+ 4kg compost had significant increase on same characteristics than another studied treatments in two seasons of the study. These results are in agreement with those of Ibrahim (2001) on Cleopatra mandarin, Balaganvi and Kumathe (2004) on

Kagzi Lime trees and El-Abd (2005) on Washington Navel orange trees. They found that there were positive relation between irrigation amounts and leaf area. However, EL-Sayed (2014) showed that the stimulatory impact of magnetic water may be ascribed to the improving the growth parameters (plant height, leaves fresh and dry weight and leaf surface area) which increased absorption and assimilation of nutrients and also increased chemical constituents (chlorophyll a and b). Also, Saied (2004) and Hegazi *et al.* (2007). Concluded that there were positive relation between compost application and leaf area. Such findings are in harmony with those reported by Hussien *et al*. (2013), Zalat (2014) on Washington Navel orange trees and EL-Sayed (2014), El-Abd (2005) on Washington Navel orange trees and Fiorella *et al.* (2015) on mature orange trees cv. "Tarocco Meli" who found that irrigated trees with magnetic water increased leaf dry weight and specific leaf weight,.

Table (5): Effect of magnetic irrigation water levels and compost on leaf area, leaf dry and leaf specific weight of Washington Navel orange trees in 2014 and 2015 seasons.

Treatments	Leaf area/leaf (cm^2)		LSW (mg/cm^2)		Leaf dry weight(g)	
	2014 season	2015 season	2014 season	2015 season	2014 season	2015 season
Control(non- magnetic water)	19.07	20.59	0.640	0.643	0.162	0.159
Level 1*	25.30	26.36	0.667	0.667	0.165	0.168
Level 2	24.56	24.50	0.620	0.627	0.152	0.154
Level 3	23.43	23.86	0.603	0.613	0.141	0.142
Level 1 + 4 kg compost	30.52	30.46	0.847	0.837	0.194	0.195
Level 2 + 4 kg compost	27.68	26.07	0.670	0.677	0.185	0.187
Level 3 + 4 kg compost	26.24	26.53	0.653	0.677	0.174	0.176
LSD at 5%	3.56	2.40	0.08	0.07	0.008	0.008

*** Level 1 magnetic water 3658.5, level 2 magnetic water 2743.8 and level 3 magnetic water 1829 m^3 /fed. Season .**

1.3.Yield efficiency and water use efficiency:

As shown in Table (6) data cleared that yield efficiency (YE) which determined as $kg/cm^3$of canopy volume, kg/cm^2 of trunk cross section area (TCSA) and water use efficiency (kg/cm^3). As for yield efficiency as kg/cm^3 of canopy volume data indicated that there was an inverse relationship among studied magnetic of irrigation water either with compost or without it and yield efficiency in term of Kg/m^3 of tree canopy and Kg/m^3 of TCAS of tree during both season of the study. Also, data of water use efficiency (Kg/m^3) was in line with the same previous results of yield efficiency components in terms of Kg/m3 of tree canopy and Kg/m^3 of TCSA in 2014 and 2015 season in this work. In vein control treatment (non-magnetic) gave significant decrease on both tested attributes of yield efficiency in terms of (Kg/m^3 of canopy and $Kg/m^3$of TCSA) and water use efficiency (Kg/m^3). These findings supported with those previously reported by Pérez-Pérez *et al.* (2008) on mature "Lan late" sweet orange trees and Ennab and El-Sayed (2014) on Balady mandarin trees. With respect to water use efficiency (WUE) values, are used to evaluate the effectiveness of irrigation treatments for maximum utilization of water supplies. The highest significant values of WUE were obtained from irrigation treatment at level 3 + 4kg compost (4.907 and 5.514 kg/m^3) compared to the control which gave the lowest values (1.671 and 1.802) in both seasons, respectively. All differences found were statistically significant. As for water use efficiency values results were in agreement with those obtained by Abo El-Enin (2012) on Washington Navel trees, Panigrahi *et al.* (2014) on 'Kinnow' mandarin trees, Fiorella *et al.* (2015) on Orange trees cv. "Tarocco Meli" and Stagno *et al.* (2015) Orange trees cv. "Tarocco Meli". They mentioned that a gradual decrease in WUE values due to increase the amount of applied irrigation water.

Tabel (6): Effect of magnetic irrigation water levels and compost on yield efficiency and water use efficiency of Washington Navel orange trees in 2014 and 2015 seasons.

Treatments	Yield efficiency (YE) Kg/m^3 of canopy		Yield efficiency (YE) Kg/m^2 of TCSA		Water ues effcieney WUE (kg/m^3)	
	2014 season	2015 season	2014 season	2015 season	2014 season	2015 season
Control(non-magnetic)	4.114	4.034	0.432	0.385	1.671	1.802
Level 1*	4.657	4.829	0.487	0.433	2.247	2.680
Level 2	5.085	5.315	0.519	0.436	2.877	3.492
Level 3	5.360	5.634	0.549	0.492	4.107	5.053
Level 1 + 4 kg compost	4.821	4.730	0.552	0.457	3.204	3.546
Level 2 + 4 kg compost	5.438	5.301	0.674	0.468	4.064	4.514
Level 3 + 4 kg compost	5.555	5.410	0.735	0.559	4.907	5.514
LSD at 5%	0.81	0.80	0.09	0.07	0.05	0.04

*** Level 1 magnetic water 3658.5, level 2 magnetic water 2743.8 and level 3 magnetic water 1829 m^3/fed/season.**

3. Leaf mineral content:

In this concern, leaf N, P, K, Ca, Mg and Na contents of Washington Navel orange were investigated pertaining the response to effect of irrigation levels and compost treatments Tables (7 and 8).

Nitrogen, phosphorus and potassium (N, P and K):

Table (7) displayed that leaf N, P and K responded by treatments. Hence, irrigated Washington Navel trees with level 2 + compost had statistically the higher constant leaves in N, P and K of leaves followed by irrigation treatment at level 1 + compost , while the reverse was true with control in both seasons. A similar observation has been reported by El-Sabrout and Kassam (2002), Wassel *et al*. (2007a) on Balady mandarin trees, Abo El-Enin (2012) worked on Washington navel orange trees and Panigrahi (2014) on mandarin trees, they showed that the percentage of nitrogen, phosphorus and potassium in the leaves were increased by moderate irrigation levels. In addition, Abd EL-Latif *et al*. (2014) on Pear seeding and Aly *et al*. (2015) cleared that application of magnetic water increased (N, P and K) in Valencia orange leaves when compared to trees which irrigated with non-magnetic water (control). Also, Mansour and Shaaban (2007) found that, fertilized Washington Navel orange trees with compost El-Neel at 11.63 kg/tree increased N, P and K contents in the leaves compared to untreated trees.

Calcium, magnesium and sodium:

As for Ca, Mg and Na contents, data in Table (8) revealed that, irrigation treatment at level 3 gave the highest Ca content (2.47 and 2.49%) and Mg (0.386 and 0.386%) compared to the lowest values of Ca (1.55 and 1.56%) and Mg (0.29 and 0.29%) obtained by irrigation treatment at level 1 + compost in both seasons. The differences between all treatments were statistically significant. Looking for Na content, data showed that control, irrigation treatment at level 1 and level 2 gave the highest Na content in leaves without significant differences between them in the first season, but in the second one control treatment increased Na content followed irrigation at level1 compared to the lowest values (0.166 and 0.166%) recorded by irrigation at level 1 + compost in both seasons, respectively. These results are in line with those obtained by Ismail (2007) on sweet orange trees and Abo El-Enin (2012) worked on Washington navel orange trees and found that trees irrigated at 70% of field capacity (FC) had higher Ca and Mg in then levels. However, EL-Sayed (2014) indicated that the irrigation of broad bean plant with magnetic water exhibited an increase in Ca contents and decreased Na in then leaves compared with control. Generally, increasing leaf N,P,K,Ca and Mg contents and decreasing Na content may indicate the role of magnetic water in reducing the harmful effects of salinity through solubilizing NaCl salt and leaching it out of the soil. Therefore, the plants do not uptake higher amounts of either Na or Cl. Also, the magnetic water improved dissolving of fertilizers in the soil irrigated with magnetized water and increase in the rate of water absorption, and explained the results by the variations induced by magnetic fields in the ionic currents across the cellular membrane with leads to change in the osmotic pressure. (Carbonell *et al* 2004).

Table (7): Effect of magnetic irrigation water levels and compost on leaf N, P and K contents of Washington Navel orange trees in 2014 and 2015 seasons.

Treatments	N (%)		P (%)		K (%)	
	2014 season	2015 season	2014 season	2015 season	2014 season	2015 season
Control (nonmagnetic water)	2.617	2.630	0.190	0.190	1.240	1.240
Level 1*	2.750	2.807	0.217	0.210	1.363	1.247
Level 2	2.310	2.370	0.167	0.167	1.070	1.060
Level 3	2.217	2.193	0.150	0.147	0.903	0.923
Level 1 + 4 kg compost	3.240	3.287	0.257	0.243	1.573	1.570
Level 2 + 4 kg compost	3.443	3.427	0.270	0.257	1.773	1.773
Level 3 + 4 kg compost	3.020	2.990	0.243	0.230	1.467	1.467
LSD at 5%	0.161	0.074	0.024	0.007	0.093	0.141

*** Level 1 magnetic water 3658.5, level 2 magnetic water 2743.8 and level 3 magnetic water 1829 m^3 /fed/season.**

Table (8): Effect of magnetic irrigation water levels and compost on leaf Ca, Mg and Na contents of Washington Navel orange trees in 2014 and 2015 seasons.

Treatments	Ca (%)		Mg(%)		Na(%)	
	2014 season	2015 season	2014 season	2015 season	2014 season	2015 season
Control(non-magnetic)	2.200	2.200	0.356	0.358	0.239	0.239
Level 1*	2.070	2.070	0.347	0.344	0.230	0.229
Level 2	2.327	2.337	0.363	0.360	0.204	0.218
Level 3	2.470	2.490	0.386	0.386	0.182	0.204
Level 1 + 4 kg compost	1.550	1.563	0.298	0.299	0.166	0.166
Level 2 + 4 kg compost	1.693	1.707	0.314	0.310	0.178	0.179
Level 3 + 4 kg compost	1.840	1.867	0.328	0.327	0.191	0.182
LSD at 5%	0.093	0.076	0.012	0.013	0.038	0.009

*** Level 1 magnetic water 3658.5, level 2 magnetic water 2743.8 and level 3 magnetic water 1829 m^3 /fed/season.**

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تـأثير مستويات مـاء الـرى الممغنط والكمبوست علـى النموالخضـري والمحتـوى المعدنى لـلاوراق وكفـاءة اسـتخدام المـاء لأشجار البرتقال ابو سرة

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اجريت هذه الدراسة خلال موسمي ٢٠١٤و٢٠١٥ عل اشجار البرتقال ابو سرة عمر ٦ سنوات المطعومه على اصل النارنج والمنزرعه على مسافة ٥*٥ م في ارض رملية تحت نظام الري بالتنقيط (EC=4dslm) في مزرعة خاصة بمحافظة البحيرة مصر للدراسة تاثير مستويات الري بالماء الممغنط و الكمبوست على النمو الخضري والمحتوى المعدني و كفاءة استخدام الماء للاشجار البرتقال ابو سره حيث تم الري بثلاث مستويات (٣٦٥٨.٥ و ٢٧٤٣.٩ و ١٨٢٩ م٣ /فدان/سنة) مختلطة مع او بدون الكمبوست ٥ كجم/شجرة . أوضحت النتائج ان أعلى القيم لقياسات النمو الخضري (طول وسمك الفرع وعدد الاوراق/الفرع ومساحة سطح الورقة والوزن النوعي للورقة) ومحتوى الاوراق من العناصر(نتروجين وفسفور وبوتاسيوم والكالسيوم ومغنسيوم) سجلت مع ري الاشجار بالماء الممغنط مع او بدون الكمبوست في حين اعطت معاملة الكنترول (بدون ماء ممغنط) اعلى محتوى للاوراق من الصوديوم وكانت افضل المعاملات ري الاشجار بالماء الممغنط عند المستوى الاول (٣٦٥٨.٥م٣/فدان/سنة) + ٤كجم كمبوست اما بالنسبة لكفاءة المحصول وكفاءة استخدام الماء فقد سجلت معاملة الري الممغنطة عند المستوى الثالث (١٨٢٩م٣/فدان/سنة) في كلا موسمي من هذه الدراسة.

نوصي انه لتحسين نمو اشجار البرتقال ابو سرة تحت ظروف الري بالماء المالح يمكن الري بالماء الممغنط عند مستوى (٣٦٥٨.٥م٣ او ٢٧٤٣.٨م٣/فدان+٤كجم كمبوست/شجرة) خلال الموسم .