Minufiya J. Agric. Res. Vol.35 No.3:1111-1124(2010) "http://agri.menofia.edu.eg/megla.html"

INFLUENCE OF ORGANIC MANURE COMPOST ON SOIL PROPERTIES AND PERFORMANCE OF ROSELLE (*Hibiscus sabdariffa*, L.) IRRIGATED WITH DIFFERENT LEVELS OF SALINE WATER

H.M. El-Kouny, R.I. Fayed and A.M. Daoud
Soil Salinity Res. Lab., Alex.; Soil, water and Enviro. Res. Institute; Agric. Res. Center, Egypt.

(Received: Mar. 9, 2010)

ABSTRACT: ***A greenhouse pot experiments were conducted in 2008 and 2009 seasons to investigate the combination effects of saline irrigation water and organic compost on the performance, yield and quality of Roselle plants in addition to the nutritional status and some chemical properties of the experimental soil. Roselle seeds, c.v Sabahia 17 were sown on clay soil packed in plastic pots. Tap water (control), and diluted sea water of 2000, 4000 and 8000 mg/L salinity were used as source of irrigation till harvesting with an extra 30% over the soil field capacity to avoid salt accumulation. The soil pots were primarily mixed with organic compost at rates 0 (control), 8, 12 and 16 m^3/fed. The results revealed that increasing rates of compost at any given level of irrigation water salinity imposed considerable reduction in soil pH, EC and SAR. In contrary, soil available N, P, and K as well as sepals weight were progressively increased with increasing application rates of compost across salinity treatments. The highest increase in these traits were performed with the saline water level of 2000 mg/L along all compost treatments. Number of branches though showed insignificant increase with the interactive effect of compost and salinity, has shown to maximize upon adding compost rate of 16 m^3/fed along with 4000 mg/L salinity. The seed yield, however, showed inconsistent trend, but was increased by 60% over control in soil received 16 m^3/fed of compost at the 2000 mg/L salinity. The Anthocyanine pigment (being reflect the quality of Roselle) was gradually increased with increasing compost rates and optimized with saline water treatment of 2000 mg/L along with 12 m^3/fed of compost, and decreased as the salinity raised to 8000 mg/L.***

Key words*: Salinity, organic compost, Roselle plant, available nutrients, Anthocyanine pigment.*

INTRODUCTION

In arid and semi arid regions, salinity has been recognized as an important factor influencing crop production and agricultural sustainability. On the other hand, irrigation with saline water without proper management, such as mixing with fresh water, would produce adverse effects on crop yield and soil productivity due to deterioration of soil quality (Afifi *et al*., 1998 and

Morsy, 2003). In the last five decades, application of large quantities of mineral fertilizers to the saline affected soils was dominant, to compensate the reduction in crop yields. This practice, however, would cause environmental pollution, particularly when nitrogen fertilizers are used (Shaban and Helmy, 2006). Today, increasing costs of mineral fertilizers and a host of environmental concerns have caused farmers to consider alternative agricultural methods to reduce costs of crop production such as adding organic manure. The composted organic manure has been reported to stimulate soil microbial activity and improve the soil bulk density, aggregation, porosity, hydraulic conductivity, and water retention (El-Kouny, 2002 and El- Sharawy *et. al.,* 2003). Thus, it has been considered as an organic amendment for degraded and saline soils. Evidently, the practical substitution of N-mineral by N-biofertilizer would minimize yield cost and the hazard effect of chemical mineral pollution (Shaban and Helmy, 2006). The objectives of this study were 1) to elucidate the combination effect of organic manure compost and irrigation water salinity on growth, yield and quality of Roselle plant, and 2) to assess their effectiveness on some chemical properties and nutritional status of the used experimental clay soil.

MATERIALS AND METHODS

Greenhouse pot experiment was conducted in 2008 and 2009 seasons at Soil Salinity Laboratory, Alexandria, (MALR) in plastic pots (40cm diameter,50cm depth) fitted with drainage outlet at the bottom. Each pot was packed with 25Kg clay soil collected from Kafr-ELDawar district. Prior to packing, composite soil sample was air dried, crushed to pass a 2.0 mm sieve and used to determine some of the soil physical and chemical properties (Table 1). Electrical conductivity (EC) and soluble cations and anions were measured in the saturated paste extract. pH was measured in a 1:2.5 soil-water suspension. Total carbonate content as $CaCO_3$ using collin's calcimeter Page *et al*. (1982). The cation exchange capacity (CEC) was determined according to Richards (1954). Available-P (Av-P) was extracted by 0.5N $NaHCO_3$ at pH 8.5 (Olsen procedure) and determined calorimetrically using stannous chloride (Jackson,1958). Available nitrogen was extracted using 2M KCl and determined by the micro-kjeldahl method. Available potassium was carried out by flame photometer using the NH_4OAC method. Total–N (Kjeldahl method) and organic matter (Walkley and Black method) were measured as described by Jackson (1967). The soil field capacity (FC) was determined following the procedure of Black (1965). Mechanical analysis was determined using the pipette method. Sodium hexa-metaphosphate and sodium carbonate were used as dispersing agent, as cited by FAO (1970). Soil texture was determined using the texture triangle diagram, Soil Survey Staff (1962).

Table (1): The main chemical and physical properties of the used soil

Soil properties	The value
pH	8.10
EC (dS m^{-1})	2.75
CEC (cmol Kg^{-1})	45.00
O.M, %	1.85
Av-N (mg Kg^{-1})	21.50
Av-P (mg Kg^{-1})	11.50
Av-K (mg Kg^{-1})	77.50
Soluble cations:	
Ca^{2+} meq/L	5.30
Mg^{2+} meq/L	2.80
K^{+} meq/L	1.60
Na^{+} meq/L	17.80
Soluble anions:	
CO_3^{2-} meq/L	0.00
$H CO_3^{-}$ meq/L	3.20
Cl^{-} meq/L	17.20
SO_4^{2-} meq/L	4.10
Soil field capacity %	35.50
SAR	8.4
Total calcium carbonate,%	6.75
Particle size distribution	
Sand %	16.10
Silt %	23.70
Clay %	60.20
Soil texture class	Clay

The experimental treatments were consisted of four saline levels of irrigation water i.e. 200 (tap water as control) 2000, 4000 and 8000 mg/L, and four rates of organic manure compost i.e. 0 (control), 8, 12 and 16 m^3/fed. The saline irrigation water treatments were prepared by dilution of sea water with tap water to the required salt concentrations. The organic manure compost was prepared form animal wastes, plant residues and poultry manure at mixing ratio of 4 : 4 : 1, respectively which afterwards enriched with some biological activators (Azotobactrin, Mycronin and Phosphorin mixture) at a rate of 400 g/m^3 of the organic mixture (EL-Kouny,1999). The composted organic manure was characterized according to the methods reported by Mathur *et al*. (1993), Kaloosh (1994) and EL-Kouny (1999). The data obtained are given in Table (2). The composted organic manure was mixed thoroughly at the required rates with soil –pots prior to cultivation and arranged as main treatments, while the saline water treatments were randomly distributed as sub-treatments. All the experimental treatments were replicated 3 times with all their possible combinations. Roselle seeds, c v. "Sabahia 17" were planted in two successive summer seasons (June 2008 and June 2009) and thinned later to keep uniform density of 2 plants/ pot. Prior to cultivation, all pots had received a basal dose of P and K at 3g and 5g as superphospate and potassium sulfate fertilizers, respectively. While N was added as

ammonium sulfate in two equal portions each of 5g /pot after 30 and 60 days from sowing. Irrigation with the saline water treatments were performed according to the plant need with an extra 30% over the soil field capacity to prevent salt accumulation in soil rhizosphere. At maturity, the growth parameters; number of branches/ plant, number of flowers/ plant, fresh and dry weight of sepals/ plant as well as the yield of seeds; were recorded. The concentration of Anthocyanine pigment in the mature sepals was determined as described by Fahmy (1970). At the end of the experiment, soil samples were collected form each pot for chemical analysis (Table 3). All the data were statistically analyzed according to Gomez and Gomez (1984) to determine LSD to compare the differences between means of the different treatments.

Table (2): Characteristics of organic manure compost used in the study

Parameter	The value
pH(1:10.compost:water)	7.45
EC (dS/ m)	5.70
O.M (%)	74.99
Total N (%)	2.52
C/N ratio	18.26
Total P (%)	2.01
Total K (%)	1.75
Dry matter (%)	78.20
Bulk density,kg m^{-3}	630.00
CEC (cmol/ kg)	185.50
Humic substances (%)	18.50
Ash content,%	25.01
Moisture content (%)	21.80

RESULTS AND DISCUSSION

In this study the results obtained from the first and the second seasons were very similar. Thus, the average data were used during the course of this discussion.

The results illustrated in Tables 3-7 showed that the application rates of organic manure compost along with saline water irrigation treatments imposed variable significant variations on soil characteristics and Roselle growth parameters as well as Anthocyanine pigment.

Interaction effects of organic matter compost and salinity of irrigation water

1- Effects on EC, pH and SAR of soil

Results pertinent in table (3) revealed the combination effect of compost rates and water salinity levels on some soil chemical properties.

The data illustrates that at any level of water salinity (2000 - 8000 mg/L, range), the soil pH ,EC and SAR were significantly decreased with increasing compost rates (8-16 m^3/fed. ,range). The reduction in soil pH may be attributed to the formation of the organic acids during the decomposition of the organic manure (Afifi *et al*.,1998 and Shaban and Helmy,2006). At the highest salinity level (8000 mg/L), the relative decrease in soil salinity with increasing compost rates up to 8, 12 and 16 m^3/fed were 4.9, 23.7 and 30.6%, respectively as compared to control. This may be explained by the high ability of organic compost in absorption of soluble ions form a saline media and/or its physical effect to act as a soil conditioner with could improve the soil structure and hence perform better leaching and movement of soluble salts out of the rihizosphere.

Table(3): The means of some soil chemical properties as affected by organic compost rates under different levels of salinity of irrigation water (average of two seasons)

Compost rate, m^3/fed	Irrigation water salinity (mg/L)			
	Tap water, control	2000	4000	8000
pH				
0 (control)	8.10	8.10	8.20	8.30
8	7.85	8.15	8.10	8.20
12	7.70	7.80	7.90	7.90
16	7.60	7.70	7.70	7.70
L.S.D $_{0.05}$ 0.16				
EC (dSm^{-1})				
0 (control)	2.75	2.96	3.92	4.90
8	2.50	2.65	3.75	4.66
12	2.27	2.48	3.33	3.74
16	2.02	2.29	3.10	3.40
L.S.D $_{0.05}$ 0.26				
SAR				
0 (control)	8.96	9.65	12.77	15.97
8	8.15	8.63	12.22	15.19
12	7.40	8.08	10.85	12.19
16	6.58	7.46	10.10	11.04
L.S.D $_{0.05}$ 1.74				

Table (3) also revealed gradual decrease in SAR with increasing compost application rates at any given level of water salinity. The magnitudes of the

reduction of SAR at the compost rate of 16 m^3/fed. were 13.7%,17.3% and 27.3% with salinity levels 2000, 4000 and 8000 mg/L as compared to their counter parts of compost rate at 8 m^3/fed. The greater reduction in SAR at the highest compost rate clearly indicates the role played by the organic compost in controlling soil sodicity, via absorption of Na^+ ions from soil solution .These results are in agreement with those of Hwang and Yoon (1995), El-Kouny *et al*. (2004) and Ottai *et al*.(2006).

2- Effects on available nutrients

Table (4) shows slight decreases in the amounts of Av-N and Av-P with increasing water salinity at any given compost rate compared to the control (tap water). The magnitutes of reduction in Av-N and Av-P (for example) were 6.4% and 4.2%, respectively at the highest combination rate of compost (16 m^3/fed.) and water salinity (8000 mg/L) in comparison with control. In contrary, increasing rates of applied compost at any given level of water salinity increased the amounts of available N and P which were maximized at the highest combination rate of compost and salinity treatments by nearly 2.6 times over the control. The amount of available K was also increased but at a lesser extend by a value of 20.6% (Table 4).

Table (4): The mean values of the amounts of available N,P and K concentrations as affected by organic manure compost rates and different levels of salinity of irrigation water (average of two seasons)

Compost rate, $m^3 fed^{-1}$	Irrigation water salinity, mg/L			
	Tap water, control	2000	4000	8000
Av-N (mg Kg^{-1})				
0 (control)	21.5	19.05	16.95	14.75
8	31.85	30.95	29.35	28.30
12	43.50	42.00	40.50	39.20
16	55.50	54.45	53.25	51.90
$L.S.D_{0.05}$ 3.60				
Av-P (mg Kg^{-1})				
0 (control)	10.5	9.70	8.90	8.60
8	19.15	18.75	18.75	17.60
12	28.70	28.15	27.55	26.95
16	34.25	33.85	33.30	32.80
$L.S.D._{0.05}$ 1.05				
Av –K (mg Kg^{-1})				
0 (control)	76.85	82.30	89.25	97.1
8	81.40	87.75	94.75	102.5
12	85.80	93.25	102.50	109.8
16	89.40	98.85	106.05	117.10
$L.S.D._{0.05}$ 4.15				

The superior increases in the amounts of available N and K along all compost rates were greatly associated with application of saline irrigation

water at 2000 mg/L. On the other hand, Available K behaved similar to N and P , except its tendency to increase with increasing salinity levels at any given rate of applied compost. Increasing availability of N,P and K with compost application seems to be associated with the pH reduction (Table 3) and the formation of soluble metal organic matter complexes (Cole *et al*.,1994). These results agree with those of Wasif *et al*. (1995) and Awad (1994).

3- Effects on number of flowers

Table (5) revealed that the most remarkable and significant increase in number of flowers /plant was attained with saline water at 2000mg/L in combination with compost addition of either 12 or 16 m^3/fed. According to Table (4), the highest concentration of available N and P were only found at the 200 mg/L salinity level under all rates of compost applications. These results agreem with the finding of EL-Shafie (1979) who reported the necessity of high available N,P and K to Roselle for healthy growth and better flowers. However, at any rate of applied compost, increasing salinity levels to 4000 and 8000mg/L resulted in considerable depression of flowers number, though it is not significant. The observed reduction in the flowers number/plant at higher salinity levels (4000 and 8000mg/L) could be due to marked accumulation of Cl^- ion over the safe limits in Roselle tissue. Similar results were reported by Holcomb (1984) and Kandeel and Naglaa (2002). On basis of the above results, it seems likely that Sabahia 17-Roselle cultivar is not tolerant to high salinity stress.

4- Effects on fresh and dry weight of sepals

Table (5) proves once again the pronounced effect of the lower saline water level at 2000mg/L on improving Roselle yield at any rate of applied compost. At this salinity level, the weight of sepals per plant (fresh or dry) were always the higher at any compost rate, imposing considerable degree of variation in the response rate. Meanwhile, non-significant differences on fresh or dry weight of sepals were recorded with compost rate 12 or 16 m^3/fed, as compared to 8 m^3/fed. at the salinity level of 2000 mg/L. Although fresh and dry weight of sepals significantly decreased with increasing salinity from 4000 to 8000mg/L compared to 2000mg/L at any given compost rate, non-significant differences were recorded with increasing the compost rates from 12 to 16 m^3/Fed. These results indicate that application of organic compost at 12 m^3/Fed. along with irrigation water of 2000mg/L were effective to exhibit remarkable increases in fresh and dry weight of sepals. According to Abdel-Latif (1973), the function groups formed during the decomposition of organic manure may be responsible for complexation of elements generated form soil and organic manure compost, and thus impact as supplying power for more available nutrient elements. On the other hand, the lower response of sepals weight detected at the highest rate of compost addition (16 m^3/fed.) may be due to that organic N was not entirely

mineralizable in such short growing season of Roselle. As anticipated irrigation with the highest saline water (8000mg/L) in association with the highest compost rate (16 m^3/fed.) would produce poor plant growth with smaller sepals leading to greater reduction in both fresh and dry weight of sepals. These results agree with those of Harridy (2001) on Roselle, Dawh *et al*. (1985) on Chary Santhemum, Abdel-Kader (1992) on Fennel and Faid (1993) on carawya.

Table(5): Means of number of flowers/plant and fresh and dry weights of sepals/plant (gm) as affected by organic manure compost and different levels of salinity of irrigation water (average of two seasons).

Compost rate, $m^3 fed^{-1}$	Irrigation water salinity (mg/L)			
	Tap water, control	2000	4000	8000
		Number of flowers/plant		
0 (control)	7.25	10.00	7.75	6.25
8	13.25	17.75	15.10	12.10
12	13.75	22.00	16.25	12.00
16	12.25	23.00	16.20	12.25
$L.S.D_{0.05}$ 8.15				
		Fresh weight of sepals/plant (gm)		
0 (control)	27.00	42.75	37.15	33.90
8	51.25	73.20	45.50	43.75
12	52.00	78.00	55.90	54.90
16	65.10	81.00	54.20	52.75
$L.S.D._{0.05}$ 6.84				
		Dry weight of sepals/plant (gm)		
0 (control)	3.25	3.65	3.15	3.00
8	4.22	5.95	3.35	3.81
12	5.26	7.75	5.22	4.75
16	4.87	7.95	3.35	3.79
$L.S.D_{0.05}$ 0.75				

5- Effects on number of branches and yield of seeds

Table (6) show that, the number of branches per plant were gradually increased, however it was not significant with increasing compost application rates along all the saline water levels. On the other hand, irrigation with saline water of 4000 mg/L in combination with the compost rate of 16 m^3/fed. had induced an increase in the number of branches per plant as compared to the other treatments. This effect may be due to the enhancement of biosynthesis rate under such conditions. These results agree with the findings of Ahamed (1989), Osbrien and Barker (1996), Harridy *et al*, (2001) and Morsy (2003). The seed yield, however, showed inconsistent trend due to the interaction between salinity and compost treatments. The yield of seeds, for example, was generally equal at salinity treatments of 4000 and 8000 mg/L along all the organic compost applied rates. Meanwhile,

significan greater amount of seed yield was produced on soils receiving saline irrigation water at 2000 mg/L in combination with 16 m^3 of compost per fadden (Table 6). The magnitude of the increase was 60% over the control treatment (nonsaline water, non organic compost). However, this better yield was not statistically significant at the 0.05 level compared to that of compost rates at 8 or 12 m^3 /Fed. The observed reduction in seed yield at higher salinity levels (4000 and 8000 mg/L) may be due to higher accumulation of toxic ions such as Na^+ and Cl^- in plant tissues leading to a poor production of seeds. These results are in harmony with those reported by Holcomb (1984).

6- Effects on total Anthocyanine pigment concentration

Table (7) showed that the concentration of Anthocyanine pigment dried sepals increased significantly with increasing compost rates at any level of the saline irrigation water. However, the highest salinity treatment, (8000 mg/L) in combination with any of compost rates minimized the Anthocyanine content to the lowest degree as compared to the other saline water treatments. Along all the compost rates, however , the 2000 mg/L salinity was superior in enhancing the Anthocyanine pigment concentration to a greater degree which maximized upon adding the composted material at a rate of 12 m^3 /Fed (Table 7). Moore (2000) recorded an increase in the Anthocyanine of Salivia Splendens plant up to 2.39%, as a matter of increasing the availability and absorption of iron, magnesium, $N\text{-}NH_4$ and phosphorus which are necessary in synthesis of phosoholids of membrane, sugar as well as nucleotides and co-enzymes.

Table(6): Means of number of branches/plant and seed yield as affected by organic compost rates and different levels salinity of irrigation water (average of two seasons)

Compost rate, m^3fed^{-1}	Irrigation water salinity, mg/L			
	Tap water, control	2000	4000	8000
Number of branches/plant				
0 (control)	4.15	4.10	6.70	7.50
8	5.25	5.70	7.90	6.90
12	5.75	5.90	8.10	7.70
16	6.10	5.90	8.90	7.70
$L.S.D_{0.05}$ 3.75				
Seed yield (kg/Fed.)				
0 (control)	240.50	243.20	239.10	234.50
8	251.20	275.25	253.00	210.10
12	298.75	365.30	307.25	302.20
16	372.90	393.25	317.25	327.25
$L.S.D_{0.05}$ 5.25				

Table (7): Means of concentration of Anthocyanin as affected by organic manure compost rates under different levels of salinity of irrigation water (average of two seasons)

Compost rate, $m^3 fed^{-1}$	Irrigation water salinity, mg/L			
	Tap water, control	2000	4000	8000
Anthocyanine (%)				
0 (control)	1.11	1.71	1.31	1.17
8	1.29	1.89	1.80	1.65
12	1.38	2.15	1.88	1.75
16	1.52	2.39	1.89	1.76
L.S.D $_{0.05}$ 1.10				

CONCLUSION

Application of organic manure compost to clay soil irrigated with saline water up to 8000 mg/L, alleviated the hazard effect of salinity on Roselle plant. Remarkable contribution of the 2000 mg/L salinity in combination with organic manure compost at 12 or 16 m^3/fed was found to achieve optimum conditions for improving the Anthocyanine pigment and sepals weight as well as maintenance of soil NPK nutrients in plant available forms.

REFERENCES

Abdel-Latif, I.A. (1973). Studies on the chemistry of chelating compounds and their reaction in the soil.Ph.D.Thesis, Ain Shams Univ.

AbdEl-Kadar, M. (1992). Physiological studies on fennel plant. M.Sc. Thesis. Fac. Agric.Zagazig.

Afifi, M.Y., T.A. Ahmed and N.M. Alyia (1998). Effect of some management practices on salinity regime of soil under irrigation with diluted sea water. Egypt J. Soil Sci.38 : 413.

Ahamed, S.K. (1989). Physiological studies on geranium .Ph. D.Thesis ,Fac. Agric.Zagazig Univ.

Awad, A.M.A. (1994). Crop residues effects on soil organic matter ,wheat yield and nutrients dynamics. Ph.D. Thesis, Fac.of Agric. Alex. Univ. Egypt.

Black, C.A. (Ed.)(1965). Methods of Soil Analysis. Part II. Agron. ASA and SSSA, Madison, WI.

Dawh, K., A. Awad and H. Salam (1985). Effect of salinity ,some growth regulators and light intensity on Chrysanthemum leaf area and stomatal behavior. Zagazig J. Agric. Res.12 : 91.

Cole, M.A., X. Liu and L. Zhang (1994). Plant and Microbial Establishment with Compost In Bioremediation Through Rhizosphere Technology,edided by T.A. Anderson and J.R. Coats. pp: 210-222. Washington, DC:American Chemical Society.

EL-Kouny, H.M. (1999). Evaluation of Compost Production and its Properties with Special References Compost Extract. Ph.D. Thesis Fac. Agric. Alex. Univ., Egypt.

EL-Kouny, H. M. (2002). Effect of organic fertilizers (compost) at different rates of application under salinity stress condition on soil and Tomato plant. Minufiya J. Agric. Res. 27:355.

El- Kouny, H. M., A. I. Sharafe and A. H. El-Naggar (2004). Effect of compost application and saline irrigation water on the production of Roselle plants cultivated in lacustrine soil. J. Adv. Agric. Res. Fac. Agric. Saba Basha 4:909.

El-Shafie, S. A. (1979). Effect of different fertilization rates on the growth and yield of Roselle in Egypt. Ind. J. Agric. Sci. 49:118.

El-Sharaawy, M. A. O., M. A. Aziz and Laila, K. M. Ali (2003). Effect of the application plant residues compost on some soil properties and yield of wheat and corn plants. Egypt J. Soil Sci. 43:421.

Faid, A. M. (1993). Physiological studies on carway. M.Sc. thesis, Fac. Agric. Zagazig univ.

Fahmy, R. (1970). Different quantitave estimation of some organic compounds in plant. Soc. Hort.155 : 72-79 (in Arabic).

FAO (1970). Physical and chemical methods of soil and water analysis . Soils Bulletein No. 10, FAO, Rome.

Gomez, K. A. and A. A. Gomez. (1984). Statistical Procedures for the Agricultural. Research Jhon Wiley and stones, Inc.,New York.

Harridy, M.A., A. Mahassen, M. Sidky and S.G.I. Soliman (2001). Growth and yield of Roselle plants influenced by potassium fertilization level and harvest timing. J. Agric. Sci. Mansoura Univ. 26 : 2991.

Holcomb, J. (1984). growing in sewage sludge compost. Hort .Abst. 45: 4638.

Hwang, S. and H. Yoom (1995). The effect of salt concentration on the growth of chrysathenum, carnation and gerbera in green house soil. Hort. Abst. 58:10871.

Jackson, M. L. (1958). Soil Chemical Analysis .Prentices Hall, Englwood-cliffs, New Jersey.

Jackson, M. L. (1967). Soil Chemical Analysis. Prentices Hall, India, Private Limited, New Delhi.

Kaloosh, A. A. M. (1994). Changes in composition of compost prepared from different organic materials and its effect on Vicia Faba yield. J. Agric. Sci. Mansoura Univ. 19:829.

Kandeel and Naglaa Abou-Taleb (2002). Effect of some organic matter on the growth, yield and chemical composition of Ocimum basillicum,l. plant. Zagazig J. agric. Res. 29 : 1839.

Mathur, S. P., H. Dinal, D.G. Owen and M. Schnitzer (1993). Determination of compost biomaturity. П-.Optical density of water extracts of their maturity. Biological Agric. & Horticulture. 10 : 87.

Morsy, A. M. (2003). Effect of irrigation water quality on the soil physical and hydrological properties in Western Delta region .Alex. Sci. Exch. 24 : 458.

Moor, K. A. (2000). Comparison of Salvia growth in Seaweed compost and biosolids compost. Compost Sci. and Utilization 8:24.

Ottai, I.M.E.S., L.K.A. Aboud, L.T.M. Mahmoud and D.M. EL-Hariri (2006). Stability Analysis of Roselle cultivars (Hibiscus sabdraffia,L.) under different nitrogen fertilization. Enviro. world J. Agric. Sci. 2 : 333.

Osbrien, T. and A. Barker (1996). Growth of peppermint in compost .J. Herbs Spices and Medical plants 4:19.

Page, A. L., R.H. Miller and R. Keeney (1982). Methods of Soil Analysis. Part II microbiological properties. Agron. Monograph No. 9, ASA, Madison, WI, USA.

Richards, L. A. (1954). Diagnosis and Improvement of Saline and Alkaline Soils. U.S.A. Handbook.No.60 Washington ,D,C.,USA.

Shaban, K. H. A. and A. M. Helmy (2006). Response of wheat to mineral and Bio-fertilization under saline conditions .Zagazig J. Agric.Res.33 : 1189.

Soil Survey Staff. (1962). Soil Survey Manual. USDA. Hand book No. 18, Washington, DC.

Wasif, M. M., M.M.K. Shabuna, S.M. Sead, S. E. El-Maghraby and I. A. Ashour (1995). Influnce of some soil amendments on calcareous soil properties and its productivity of wheat under highly saline irrigation water. Egypt J. Soil Sci. 35.

تأثير كمبوست السماد العضوي علي خصائص التربة و الإنتاجية وجودة نبات الكركديه تحت تأثير مستويات مختلفة لملوحة مياه الري

حامد مبروك القونى – رجب إسماعيل فايد – عبد المنعم مبارك داود

معمل بحوث الأراضي الملحية والقلوية بالإسكندرية– معهد بحوث الأراضي والمياه والبيئة–مركز البحوث الزراعية– مصر

الملخص العربي

أقيمت تجربة في أصص بمعمل بحوث الأراضي الملحية و القلوية خلال موسمي ٢٠٠٨ و٢٠٠٩ لدراسة تأثير معدلات مختلفة من كمبوست السماد العضوي (صفر(كنترول)، ٨، ١٢، ١٦ متر^{٣} /فدان) مع الري بمياه ذات مستويات مختلفة من الملوحة (ماء حنفية (كنترول) ، ٢٠٠٠، ٤٠٠٠، ٨٠٠٠ ملليجرام/لتر) علي خصائص التربة ومحتواها من الكميات الصالحة لعناصر النتروجين، الفوسفور و البوتاسيوم وكذا إنتاجية و جودة نبات الكركديه "صباحية ١٧".

أوضحت النتائج أن زيادة معدلات إضافة الكمبوست أدت إلي انخفاض معنوي لل pH و ملوحة التربة (EC) و كذلك نسبة الصوديوم المدمص (SAR) مقارنة بالكنترول وذلك عند جميع مستويات ملوحة مياه الري. على عكس ذلك فقد زادت التركيزات المتاحة من عناصر النتروجين والفوسفور و البوتاسيوم بزيادة معدلات إضافة الكمبوست عند أي مستوى من الملوحة. وقد تحققت أعلى زيادة في تركيزات هذه العناصر عند الري بمستوى ملوحة ٢٠٠٠ ملليجرام/لتر وذلك عند جميع معدلات الكمبوست المضافة. أدى إضافة الكمبوست إلى زيادة معنوية في محصول البذور لكل فدان، و تحققت زيادة بنسبة ٦٠% مقارنة بالكنترول عند معدل إضافة ١٦ م^{٣}/ فدان من كمبوست السماد العضوي مرتبطا بمستوى ملوحة ٢٠٠٠ ملليجرام/لتر. كما أظهرت النتائج أن الزيادة في تركيز صبغة الانثيوسيانين (التي تعكس جودة محصول الكركديه) كانت مرتبطة بزيادة معدلات إضافة كمبوست السماد العضوي عند أي مستوى من ملوحة مياه الري. وقد تحققت أعلى زيادة عند مستوى ملوحة ٢٠٠٠ ملليجرام/لتر ومعدل إضافة ١٢أو١٦ م^{٣}/فدان كمبوست.

مما سبق يتضح أن إضافة كمبوست السماد العضوي إلى الأراضي الطينية التي تروى بمياه ذات مستويات ملوحة مرتفعة (تصل الى ٨٠٠ ملليجرام/لتر) تقلل خطر تأثير الملوحة على نبات الكركديه. الري بمياه ذات مستوى ملوحة ٢٠٠٠ ملليجرام/لتر مع إضافة الكمبوست بمعدل ١٢ أو ١٦ م^{٣}/فدان يمثل ظروفا مثالية لزيادة تركيز صبغة الانثيوسيانين وزيادة وزن البتلات وأيضا زيادة تركيزات عناصر النتروجين والفوسفور والبوتاسيوم المتاحة للنبات.