J. Plant Production, Mansoura Univ., Vol. 2 (7): 891 - 905, 2011

Increasing salinity tolerance of eggplant under ras sudr conditions.

El-Hifny, I.M.M. and A.M. Almahdy
Plant Production Department, Desert Research Center

ABSTRACT

The field experiment was carried out during the two summer successive seasons of 2008 and 2009 at the Experimental Station of Desert Research Center, at Ras Sudr, South Sinai Government, on White Balady eggplant to compare between the effect of saline irrigation water at levels of 3500 and 4500 ppm, with the effect of some compound applications (Algreen and Mega pour were applied as foliar spray in concentration of 2.5 cm^3/h. and 0.75 cm^3/L. respectively) also, they were added as soil addition at rate of 1.5L. and 0.8L./Fed. respectively, after 3, 6 and 9 weeks from transplanting, while the Unisal was applied as soil addition before transplanting at rate of 4 L./Fed., as well as, control treatment compound.

The obtained results indicated that level saline irrigation water at 3500 ppm level showed increment in growth characters when compared to 4500 ppm saline irrigation water level. The same trend was observed with yield and its components (total yield, number and weight of fruits/plant, average fruit weight, diameter and length). Also, N, P, K and chlorophyll values showed the same line of previous characters, while, Fe (in fruits), Na and Cl (in leaves) contents were increased with saline irrigation water at 4500 than 3500 ppm level.

The application of the tested compounds enhanced plant growth, yield and its components, N, P, K and chlorophyll values in plant leaves than control treatment. On the other hand Na, Cl and Fe content were increased in plant leaves and Fe value in fruits were the highest in control treatment than compound treatments.

The best growth characters, heaviest yield and the best characters of yield components, as well as the highest values of N, P, K and chlorophyll content and the lowest values of Fe (in fruits), Na and Cl content (in plant leaves) were recorded with saline irrigation water at level 3500 ppm and Algreen compound followed by Mega pour both applied as foliar spray.

Keywords: Eggplant, Salinity, Algreen, Megapour, Unisal.

INTRODUCTION

Eggplant (*Solanum melogena*, L.) is enlisted as classical commodity vegetable for both local consumption and exportation. Efforts to improve its production and quality should be important because this crop might be expected with crops of such promising. Increasing eggplant production under calcareous and saline conditions faces an important problem that may find solution. Salinity conditions cause a decrease in availability of most nutrients to plants due to soil fixation (Hassan, 1994). In another study, Shannon *et al.* (1994) reported that salinity cause several problems for plant growth and development especially for glycophytes, by inducing physiological dysfunction. Also, Grattan and Grieve (1999) mentioned that salinity can directly affect nutrient uptake, such as increase Na^+ uptake, reduce K^+ uptake and Cl^- uptake reduce No^-_3 uptake. They added that salinity can also cause a

combination of complex interactions that affect plant metabolism, susceptibility to injury or internal nutrient requirement.

Plant scientists attempted to use natural selection compounds or bio engineering to increase plants' salt tolerance of saline environments frequently point to restricted ion accumulation and organic solute synthesis as major adaptations leading to salt resistance in glycophytes (Greenway and Munns, 1980; Dalton *et al.*, 2001). The use of some compounds like amino acids, glycols, nutrients, organic matter and natural extraction of sea herebis and algae, help plants to increase its tolerance and reduce the harmful effect of salinity, also, improve the properties of soils and reduce pH, as well as, increases the availability of most nutrients and compounds to plants (Hilal and Abd-El Fattah, 1987; Hegde, 1997; Mahmoud, 1999; Savvas and Lenz, 2000). Calcium has been shown to ameliorate adverse effects of salinity on plants, it is well known to have regulatory role in metabolism, also, sodium ions may complete with calcium ions for membrane-binding sites (Cramer *et al.,* 1986; Ehret *et al.,* 1990). In the same line, commercial humic acid application and some minerals or mixing of N, P and K fertilizers with organic manures or application of putrescine (one of poly amine group), yeast and vitamin C improved growth, yield, quality and increased uptake to N, P, K, Ca, Mg, Fe, Zn and Mn in tomato and eggplant (Erik *et al.,* 2000; Abd Elal, 2003; El-Tohamy *et al.,* 2008).

The aim of this work was to increase eggplant salt tolerance and reduce the harmful effect of salinity by studying the effect of saline irrigation water at two levels, of salinity also, the effect of some compound applications and the combinations between the two factors on growth, yield and its components, as well as chemical composition of White eggplant under South Sinai conditions.

MATERIALS AND METHODS

The field experiment was carried out during two successive summer growing seasons of 2008 and 2009 at Ras Sudr Experimental Station of D.R.C., South Sinai Governorate, to study the effect of 2 levels of saline irrigation water and application of some compounds on eggplant salt tolerance under Ras Sudr saline conditions. The factors of study were:

A: Irrigation water salinity

1- 3500 ppm 2- 4500 ppm.

The source of irrigation water were from wells in the experimental farm.

B: Application of some compounds:

1- Without any compound (control).
2- Algreen was applied as foliar spray at concentration of 2.5 cm^3/L. after 3, 6 and 9 weeks from transplanting.
3- Algreen was applied as soil addition at a rate of 1.5 L./Fed. after 3, 6 and 9 weeks after transplanting.
4- Mega pour was applied as foliar spray at concentration of 0.75 C^3/L after 3, 6 and 9 weeks from transplanting.
5- Mega pour was applied as soil addition at a rate of 0.8L./Fed., 3, 6 and 9 weeks after transplanting.

6- Unisal was added as soil addition at a rate of 4L./Fed., 72 hr. before trans planting.

The seeds of eggplant, White Balady cultivar, were sown on the 1st and 3rd of February respectively in the two growing seasons and 55 days old transplants were set up into the field. The experimental unit was 1/400/Fed. (10.5m^2). Drip irrigation system used, irrigation line long was 10.5m and the width between lines were 1 meter. The transplants were set up one side of the line 50 cm apart. The normal cultural practices commonly used in growing of eggplant were performed. The N, P, K fertilizers were added at the rate of 300, 300 and 200 kg/fed. as ammonium sulphate (20.5%N), calcium super phosphate (15% P_2O_5) and potassium sulphate (48% K_2O_5), respectively. Ammonium sulphate and potassium sulphate were divided and added weekly through irrigation lines, while calcium super phosphate and organic manure (20 m^3/Fed.) were added one month before transplanting as soil addition.

Eggplant fruits were harvested weekly after 60 days from transplanting and continued for 2.5 months.

A split plot design with 4 replicates was used. The main plots were occupied with 2 levels of saline irrigation water, while the subplots represented the 6 compound treatments randomly. The data values were subjected to analysis of variance according to Gomez and Gomez (1984).

The chemical analyses of compounds are presented in Table (A), physical and chemical analysis of soil are in Table (B), while analyses of irrigation water is in Table (C) according to Piper (1950) and Jackson (1958), respectively.

Table (A): Chemical analyses of the compounds which were used in experiment.

	Compounds					
	Algreen (Algae and Sea herbis		**Mega Pour**		**Unisal**	
Contents %	Nitrogen	5%	Humic acid	19%	Poly Ethylene Glycol	9%
	Magnesium	3%	Volvic acid	2%	Glotaric Acid	9%
	Boron	0.001%	Free Amino acid	5%	Calcium	7.5%
	Algenec A.	4%	Ferrus (EDTA)	0.025%	Nitrogen	5%
	Sulphur	12%	Manganese (EDTA)	0.05%	Citric acid	1%
	Molybdenum	0.13%	Potassium citrate	2%	Organic matt.	17%
	Growth reg. 300ppm					

Table (B): Physical properties and chemical analyses of the experimental soil.

Physical properties							
Depth (cm)	**$CaCO_3$%**	**Coarse sand (1-0.5%)**	**Fine sand (0.25-0.1)%**	**Silt (0.05-0.002)%**	**Total sand (0.1-1)%**	**Clay < (0.002) %**	**Class texture**
%							
0-30	55.85	54.51	25.88	8.24	80.39	11.15	Sandy loam
30-60	51.21	25.49	64.12	7.20	89.61	6.45	Sandy loam

Chemical analyses										
Depth (cm)	**pH**	**Ec dS/m^2**	**Saturation soluble extract**							
			Souble anions (meq/L.)				**Soluble cations (meq/L.)**			
			CO^-_3	**HCO^-_3**	**SO^-_4**	**Cl^-**	**Ca^{++}**	**Mg^{++}**	**Na^+**	**K^+**

0-30	7.7	4.77	0.00	6.00	10.50	31.20	24.00	11.00	10.52	2.18
30-60	7.4	4.16	0.00	3.00	16.10	22.50	16.83	6.00	17.80	0.097

Table (C): Chemical analysis of the irrigation water.

Salinity (ppm)	pH	Ec dS/m^2	Anions meq/L				Cations meq/L			
			CO^-_3	HCO^-_3	SO^-_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+
3500	8.4	5.47	0.00	2.50	81.23	16.22	23.65	19.18	56.66	0.51
4500	8.6	7.03	0.00	2.50	21.23	41.28	4.50	13.43	47.05	0.12

Data were recorded on the following characters:

I- Growth characters: were determined 60 days after transplanting. The parameters were: plant height, number of leaves and branches/plant, fresh and dry weight of leaves, branches and whole plant.

II- Yield and its components: total yield, number of fruits and weight/plant, the average length, diameter and weight of fruit were recorded.

III- Chemical composition of leaves: Total chlorophyll was estimated as described by A.O.A.C. (1995). Total nitrogen and phosphorus contents were analyzed according to the methods of Huphries (1965) and Frie *et al.* (1964), respectively. While, potassium and sodium contents were determined using flame photometer according to Brown and Lilliland (1964). Chloride was determined by method recorded by Richards (1954). Ferrus was determined in fruits using flame ionization atomic absorption spectrometer model 1100B of Perk in Elemer according to the method of Chapman and Pratt (1978).

RESULTS AND DISCUSSION

Growth Characters:

1- Effect of saline irrigation water levels:

The obtained results show that the plants which were irrigated with saline water at 3500 ppm surpassed in growth characters when compared to those irrigated with saline water at 4500 ppm (Tables 1 and 2). The increments were significant in plant height, fresh and dry weight of leaves and whole plant, also dry wt. of branches in both growing seasons, while No. of leaves increased significantly in the second season only. The obtained results agree with those obtained by Grattan and Grieve, (1999) on horticultural crops, Savvas and Lenz, (2000) on eggplant and Dalton *et al.*, 2001. They found that with increasing salinity, the values of growth characters decreased. Salinity reduce nutrient availability and uptake by plants which cause imbalance in solution culture ion, such as increase in Na^+ uptake reduce K^+ uptake and Cl^- uptake reduce No^-_3 uptake (Grattan and Grieve, 1999). The reduction in vegetative growth of plant as a result of increasing salinity levels might be due to the increase in osmotic pressure that affects the ability of the plant to absorb water for its growth processes from the soil solution and the toxicity of specific ions to various plant physiological processes (Ayers, 1952). In addition, the reduction in plant growth characters of control treatment may be due to increasing Na and Cl values and reducing P and K values in leaves (Table 3).

2- Effect of some compounds application:

The application of Algreen, Mega pour, Unisal showed significant increases in plant growth characters of eggplant when compared to control treatment as recorded in Tables (1, 2). The highest values of plant height, number of leaves/plant, fresh and dry weight of leaves, branches and whole plant were found with Algreeen spray treatment followed by Mega pour applied as foliar spray, followed by soil addition treatments (Algreen, Mega pour and Unisal) through the two growing seasons. The compounds used reduced the harmful effect of saline conditions, because these compounds contain minerals, vitamins, growth hermons, humic acid and algae with sea herbis (Table A). The results are in the same trend with those obtained by Jack and Evans, (2000), Abd El-Al (2003) on onion, El-Tohamy *et al.* (2008) on eggplant and Ghoname *et al.* (2010) on sweet pepper).

The obtained results may be due to the positive effect of biological organic and nutritional solutions to provide some amino compounds required for plant growth. The enhancement of growth characters could be due to simulatory effects on eggplant and increase endogenous promoting hormones of plant and increase plant growth (Gomaa *et al.*, 2005; El-Tohamy *et al.*, 2008 and Ghonam *et al.*, 2010). The superiority of Algreen and Mega Power compounds for stimulation of plant growth might be due to their effects on mineral content of leaves, i.e. reducing Na and Cl and increasing N, P and K in leaves (Table 3).

3- The effect of interaction:

Data presented in Tables (1, 2) show that plants which were irrigated with saline water at level 3500 ppm and were sprayed with Algreen compound followed by Mega pour as foliar spray gave the highest values of growth characters. The lowest values of growth characters occurred in plants which were irrigated with water having salinity of 4500 ppm and control treatment (without any compound).

The results obtained agree with those obtained by Shannon and Grieve, (1999) and Savvas and Lenz, (2000), they showed that increasing EC of nutrient solution expose eggplants gradually to a salt stress. The detrimental effects of salinity on plants may be due to in discriminate (osmotic) and cause extent of growth restriction. Application of some compounds to plants grown under salinity conditions could reduce the harmful effect of salinity and increase plant salt tolerance and improve plant growth by providing plant with vitamine, glycols, organic acid and growth hormones increase endogenous promoting hormons in plants (Abd El-Halim, 1995 on tomato; El-Tohamy *et al.*, 2008 on eggplant).

Chemical compositions:

Data presented in Table (3) show the effect of saline irrigation water levels and some compound applications on chlorophyll content, N, P, K, Na and Cl contents in eggplant leaves, as well as Fe^{++} content in plant fruits.

1- Effect of saline irrigation water levels:

Total chlorophyll, P and K contents in leaves showed significant increases in plants irrigated with 3500 ppm saline water when compared to those irrigated with 4500 ppm saline water in both growing seasons, while Na and Cl content in leaves gave significant increases; with 4500 than 3500 ppm saline water the significancy was obtained in the second growth season. The

increment of N content in leaves with lower saline irrigation water and Fe content in eggplant fruits with higher saline irrigation water were not significant.

The obtained results agree with those recorded by Green way and Munns, (1980) and Bohnert *et al.* (1995). It could be due to the complex effect of salinity on plants, the injurious effects are associated with water deficits, ionic imbalance, mineral nutrition, stomato behaviour, photosynthetic efficiency and carbon allocation and utilization. With salinity Cl^- uptake by plants increased which has antagonism of No_3 and Na^+ has antagonism of K^+ uptake (Grattan and Grieve, 1999).

2- Effect of some compound application:

Chlorophyll, N, P, K content in leaves were increased with the application of the tested compounds compared to control treatment. However, chlorophyll were insignificant in both seasons. The highest values were found with Algreen foliar spray through the two growing seasons. On the other hand, Na and Cl content in leaves and Fe content in fruits were higher in control treatment when compared to those the applied compounds treatments. While, Na and Cl content in leaves gave significant values with control treatment than other compounds through the two growing seasons. However, Fe^{++} values in fruits were not significant.

The obtained results are in the same line with those obtained by other workers. (Ohallorans *et al.*, 1993; Abou El-Magd *et al.*, 2008; Ghoname *et al.*, 2010). The results obtained may be due to the beneficial effects of minerals nutrition on Na^+ Cl^- stressed plants are associated with the maintenance of cell membrane integrity, reducing Na^+ and favoring K^+ absorption in salt-stressed plants (Epstein, 1998). Saleh *et al.* (2005) recorded that organic matter may enhance the availability of certain elements and their supply to the plant.

3- Effect of interaction:

The interaction between saline irrigation water levels and some compound applications show that the highest values of chlorophyll, N, P and K in eggplant leaves and the lowest values of Na and Cl in leaves, and Fe in fruits were observed with interaction 3500 ppm saline water and Algreen application as foliar spray compared to other treatment. On the opposite, Na^+ and Cl^- content in plant leaves and Fe^{++} content in plant fruits gave the highest values with interaction treatment of 4500 ppm saline water plus control treatment. However, the differences between all treatments were not significant.

The results agree with those obtained by *Abou El-Magd et al. (2008)*. They mentioned that organic manure enhanced the availability of NPK content of sweet fennel leaves and bulbs with saline irrigation water levels, but the results were not significant.

Yield and its components:

Yield and its components are expressed in Table (4) as, total yield (Fig. 1, 2), no. and weight of fruits/plant. and average weight, length and diameter of fruit.

1

3

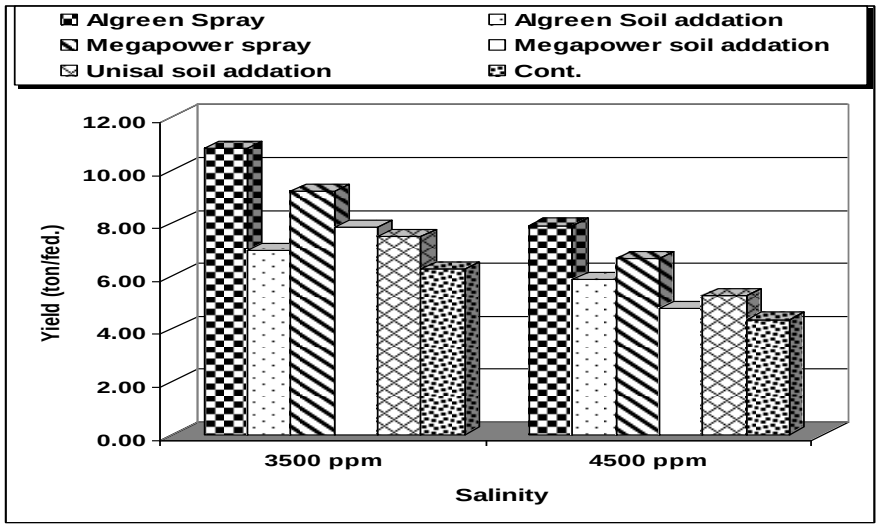

Fig. (1): Effect of saline irrigation water levels and some compounds application on total yield of Balady eggplant in summer of (2008) growth season

L.S.D at level of 0.5%
Salinity 0.57
Comp. 0.15
Inter. 0.21

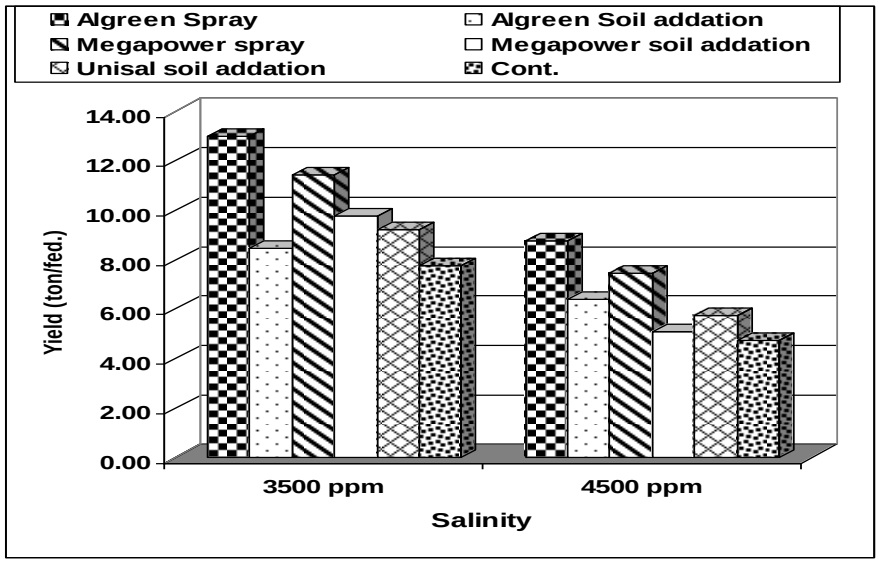

Fig. (1): Effect of saline irrigation water levels and some compounds application on total yield of Balady eggplant in summer of (2009) growth season

L.S.D at level of 0.5%
Salinity 0.42
Comp. 0.11
Inter. 0.16

3- The effect of interaction:

There were significant effects for the interaction between saline irrigation water levels and application of some compounds on increasing eggplant, yield and its components. The highest values of total yield and fruit number and weight/plant occurred with saline irrigation water at level of 3500 ppm and Algreen foliar spray treatment in the two growing seasons, while average weight of fruit showed the same previous trend in the first season only. While the other characters were not significantly affected by the interaction treatments. The obtained results agree with those obtained by Green way and Munns (1980) and Dalton *et al.* (2001).

Conclusion:

Under salinity contains, saline irrigation water at 3500 ppm level improved growth, yield and chemical composition of Balady eggplant than 4500 ppm level. Algreen compound (natural compound from algae and sea herbis, contain nutrients and growth regulators), when applied as foliar spray ($2.5C^3$/L.), three times after transplanting, surpassed than other compounds used and increased salt tolerance of eggplant and improved its growth, yield and chemical composition.

REFERENCES

Abdel Elal, F.S. (2003). Different nitrogen sources and magnetic iron addition as affected the productivity of eggplant (Solanum melogena L.) J. Agric. Sci. Mansoura Univ., 28(4): 2903-2916.

Abdel-Halim, S.m. (1995). Effect of some vitamins as growth regulators on growth, yield and endogenous hormones of tomato plants during Winter. Egypt. J. Appl. Sci., 10(2): 322-334.

Abou El-Magd, M.M.; M.F. Zaki and S.D. Abou-Hueesin (2008). Effect of organic manure and different levels of saline irrigation water on growth, green yield and chemical content of sweet fennel. Aust. J. of Basic and Appl. Sci., 2(1): 90-98.

Adams, P. (1991). Effects of increasing the salinity of the nutrient solution with major nutrients or sodium chloride on the yield, quality and composition of tomatoes grown in rock wool. J. Hort. Sci.: 66, 201-207.

A.O.A.C. (1995). Official Methods of Analysis, Association of Officinal Analytical Chemists. 16th Ed., Washington D.C., U.S.A.

Ayers, A.D. (1952). Seed germination as affected b soil moisture and salinity. Agron. J., 44: 82-84.

Bohnert, H.J.; D.E. Nelson and R.G. Jensen (1995). Adaptations to environmental stress. Plant Cell, 7: 1109-1111.

Brown, J.D. and Lilliland O. (1964). Rapid determination of potassium and sodium in plant material and soil extracts by flame photometer. Proc. Amer. Soc. Hort. Sci., 48: 341-346.

Chapman, H.D. and P.F. Pratt (1978). Methods of analysis for soils, plants and waters Univ. California, Div. Agric. Sci. Priced Pub. 4034.

Cramer, G.R.; A. Lauchli and E. Epstein (1986). Effect of NaCl and $CaCl_2$ on ion activities in complex nutrient solutions and root growth in Cotton. Plant Physiol. 81: 792-797.

Dalton, F.N., Maggio, A. and Piccinni, F.G. (2001). Assessing the effect of solar radiation on plant salt tolerance as defined by the static and dynamic indices. Plant Soil, 229: 189-195.

Ehret, D.L.; R.E. Remann; B.L. Harvey and A. Cipywnyk (1990). Salinity induced calcium deficiencies in wheat and barley. Plant Soil, 128: 143-151.

El-Missery, M.M.A. (2003). Effect of organic fertilization on yield and quality of some vegetable crops under saline conditions. M.Sc. Thesis, Fac. Agric., Ain Shams Univ., Cairo, Egypt.

El-Tohamy, W.A., H.M. El-Abagy and N.H.M. El-Greadly (2008). Aust. J. Basic and Appl. Sci., 2(2): 296-300.

Epstein, E. (1998). How calcium enhances salt tolerance. Sci., 40: 1906-1907.

Erik, B., G. Feibert; C. Clint and L.D. Saunders (2000). Evaluation of humic acid and other non-conventional fertilizer additives for onion production. Malheur Experiment Station Oregon State Univ.

Frie, E., K. Payer and E. Schultz (1964). Determination of phosphorus by ascorbic acid method. Schw-Landwirtsch-Fonshung. Heft. 3: 318-328.

Ghoname, A.A.; M.A. El-Nemr; A.M.R. Abdel-Mawoug and W.A. El-Tohamy (2010). Enhancement of sweet pepper crop growth and production by application of biological, organic and nutritional solutions. Res. J. Agric. Biological Sci., 6(3): 349-355.

Gomaa; A.M.; S.S. Meawad; I.M.A. Ebadah and H.A. Salim (2005). Application of bio-organic farming and its influence on certain pests infestation, growth and productivity of potato plants. J. Appl. Sci. Res., 1(2): 205-211.

Gomez, K.A. and A.A. Gomes (1984). Statistical procedures for Aric. Res. Second ed. Willey Inter Sci. Publ., P. 357-423.

Grattan, S.R. and C.M. Grieve (1999). Salinity-mineral nutrient relations in horticultural crops. Dept. Land, Air and Water Resources, Univ. of Calif., Davis, USA, Sci. Hort. 78: 127-157.

Greenway, H., Munns, R., (1980). Mechanisms of salt tolerance in nonhalophytes. Ann. Rev. Plant Physiol. 31: 149-190.

Hassan, F.A. (1994). Factors affecting boron status under saline and calcareous soil conditions. Ph.D. Thesis, Fac. Of Agric. Zagazig Univ. (214).

Hegde, D.M. (1997). Nutrient requirements of solanaceous vegetable crops. Food and Techn. Center, Bulletin 441, P. 9-37.

Hilal, M.H. and Abd-El-Faatah, A. (1987). Effect of $CaCo_3$ and clay content of alkaline soils on their response to added sulphur. Sulphur in Agric. 11: 15-19.

Huphries, E.C., (1965). Mineral components and ash analysis. In Modern Methods of Plant Analysis. Edited by K. Paech and M.V. Tracey, Vol. 1, Suringerverlag, Berlin, P. 468.

Jack, A. H. and M. R. Evans (2000). Humic acid seed and substrate treatments promote seedling roat development. Hort. Sci. 35(7): 1231-1233.

Jackson, M.L. (1958). Soil chemical analysis. Prentice-Hall. Inc. Englewood Cliffs N.J. Library of Congress U.S.A.

Mahmoud, H.A.F. (1999). Effect of sulphur and phosphorus on some eggplant cultivars under calcareous soil conditions. Bull. Fac. Agric., Cairo Univ., 51: 209-226.

Ohallorans, J.M., M.A. Munoz and O. Colberlry (1993). Effect of chicken manure on chemical properties of tomato production. J. Agric. Univ., Puerto Rico, 77: 181-191.

Piper, C.S. (1950). Soil and Plant Analysis. Inter. Sci. Publ. Inc., New York.

Richards, L.F. (1954). Diagnosis and improvement of saline and alkaline soils. Agric. Hand Book, U.S.A.

Saleh, A.L., A.A. Abd El-Kader and S.A.M. Hegab (2005). Response of onion to organic fertilizer under irrigation with saline water. Egypt. J. Appl. Sci., 18(12B): 707-716.

Savvas, D. and F. Lenz (2000). Effects of NaCl or nutrient induced salinity on growth, yield and composition of eggplants grown in rockwool. Scientia Hort. 84: 37-47.

Shannon, M.C.; C.M. Grieve and L.E. Frar ł). Whole plant response to salinity. In: Wilkinson, R.E. (Eu.), ۲.-Envir. Interactions. Mercel Dekker. New York, PP. 199-244.

زيادة تحمل الباذنجان للملوحة تحت ظروف رأس سدر

إصلاح محمد محمد الحفني و أحمد محمد المهدي
قسم الإنتاج النباتي – مركز بحوث الصحراء

أقيمت تجربتان حقليتان في موسمي الزراعة الصيفي ٢٠٠٨، ٢٠٠٩ في محطة تجارب مركز بحوث الصحراء برأس سدر، محافظة جنوب سيناء، للمقارنة بين تأثير الري بالماء الملحي ٣٥٠٠ جزء في المليون، ٤٥٠٠ جزء في المليون. كما درست أيضًا تأثير إضافة بعض المركبات وهي ألجرين وميجاباور يستخدما رشًا على الأوراق بتركيز ٢٠٥ سم٣/ اللتر، ٠.٧٥سم٣/ اللتر على التوالي بعد ٣، ٦، ٩ أسبوع من الشتل، وأيضًا يتم إضافتهم للتربة بتركيز ١.٥، ٠.٨ لتر/ الفدان على التوالي بعد ٣، ٦، ٩ أسبوع من الشتل. واليوني سال يتم إضافته أرضيًا قبل الشتل بمعدل ٤ لتر للفدان، هذا بالإضافة لمعاملة المقارنة بدون إضافة.

وأوضحت النتائج

١- أن الري بالماء المالح بتركيز ٣٥٠٠ جزء في المليون أدى إلى زيادة صفات النمو معنويًا عن الري بالماء المالح بتركيز ٤٥٠٠ جزء في المليون، كما لوحظ نفس الاتجاه بالنسبة للإنتاج وعدد ووزن الثمار/ النبات وأيضًا وزن وقُطر وطول الثمرة. وبالنسبة للمحتوى الكيماوي فقد زاد محتوى الكلورفيل، النتروجين، الفوسفور، البوتاسيوم في أوراق النباتات التي تم ريها بالتركيز المنخفض من الملوحة معنويًا عن التركيز المرتفع، وعلى العكس فإن محتوى الأوراق من الصوديوم والكلوريد ومحتوى الثمار من الحديد زادت مع التركيز المرتفع من الملوحة بالمقارنة بالتركيز المنخفض.

٢- استخدام مركبات ألجرين ويمجابور واليوني سال أدى إلى زيادة صفات النمو معنويًا عن معاملة المقارنة، وأيضًا زاد الإنتاج ومكوناته. كما زاد المحتوى الكيماوي من الكلورفيل، ن، فو، بو في الأوراق بإضافة هذه المركبات عند مقارنتها بمعاملة المقارنة، وعلى العكس فقد زاد محتوى ص$^{+}$، كل$^{-}$ في الأوراق ومحتوى الحديد في ثمار الباذنجان في معاملة المقارنة عن باقي المعاملات.

٣- أعطى تركيز الملوحة ٣٥٠٠ جزء في المليون في ماء الري زيادة في صفات النمو والإنتاج والمحتوى الكيماوي للكلورفيل والنتروجين والفوسفور والبوتاسيوم وأقل محتوى من الصوديوم والكلوريد وذلك مع استخدام ألجرين رشًا على الأوراق بتركيز ٢.٥ سم٣/ اللتر بعد ٣، ٦، ٩ أسبوع من الشتل، فقد أعطت أفضل النتائج لنبات الباذنجان النامي تحت ظروف رأس سدر الملحية.

الخلاصــة:

تحققت أفضل النتائج بالنسبة للنمو والإنتاج والتركيب الكيماوي بالنسبة للباذنجان البلدي الأبيض النامي تحت ظروف رأس سدر باستخدام مستوى الملوحة في ماء الري بالتنقيط ٣٥٠٠ جزء في المليون ورش النباتات بمكون الجرين بعد ٣، ٦، ٩ أسبوع من الشتل.

قام بتحكيم البحث

أ.د / سمير طه محمود العفيفي — كلية الزراعة – جامعة المنصورة

أ.د / فاطمة أحمد رزق — المركز القومي للبحوث

Table (1): Effect of saline irrigation water levels and some compound applicatios on growth characters of Balady eggplant in summer (2008) growth season.

Saline levels	Comp.	Plant Height (cm.)	No./ Plant		Fresh wt. (g.)			Dry wt. (g.)		
			Leaves	branches	Leaves	branches	Total	Leaves	branches	Total
S_1 (3500) ppm	Alg. Spr.	84.17	133.30	6.90	120.20	88.40	208.60	37.50	29.50	67.00
	Alg. S.add.	75.67	119.00	5.60	105.50	70.80	176.30	32.50	23.90	56.40
	Mega. Spr.	75.40	130.60	6.50	114.80	83.40	198.20	35.80	27.80	63.60
	Mega. S.add.	24.93	128.30	6.20	110.60	79.60	190.20	34.90	26.20	61.10
	Unis. S.add.	73.30	123.50	5.90	108.20	76.23	184.43	33.90	24.80	58.70
	Cont.	62.67	111.60	5.30	98.30	66.27	164.57	31.00	22.13	53.13
Mean		74.36	124.38	6.07	109.60	77.54	187.05	34.27	25.72	59.99
S_2 (4500) ppm	Alg. Spr.	70.40	140.30	6.10	112.57	74.30	186.87	33.00	23.00	56.00
	Alg. S.add.	64.00	124.90	5.60	104.50	67.00	171.50	29.50	19.00	48.50
	Mega. Spr.	64.97	137.00	5.90	108.60	71.30	179.90	31.20	21.00	52.20
	Mega. S.add.	66.03	134.80	4.90	92.90	60.00	152.90	26.50	17.10	43.60
	Unis. S.add.	63.50	129.30	5.20	98.30	64.10	162.40	28.20	17.80	46.00
	Cont.	54.80	118.10	4.60	88.30	55.50	143.80	25.00	16.00	41.00
Mean		63.95	130.73	5.38		65.37		28.90	18.98	47.88
Averages	Alg. Spr.	77.28	136.80	6.50	116.38	81.35	197.73	35.25	26.25	61.50
	Alg. S.add.	69.83	121.95	5.60	105.00	68.90	173.90	31.00	21.45	52.45
	Mega. Spr.	70.18	133.80	6.20	111.70	77.35	189.05	33.50	24.40	57.90
	Mega. S.add.	70.48	131.55	5.55	101.75	69.80	171.55	30.70	21.65	52.35
	Unis. S.add.	68.40	126.40	5.55	103.25	70.17	173.42	31.05	21.30	52.35
	Cont.	58.73	114.85	4.95	93.30	60.88	154.18	28.00	19.07	47.07
L.S.D at 5%	Salinity	8.56	N.S.	N.S.	4.12	N.S	6.07	2.73	3.11	5.84
	comp.	5.96	6.96	N.S.	5.96	3.92	12.83	1.35	2.82	1.26
	interactions	N.S.	N.S.	N.S.	1.33	5.41	3.91	1.87	N.S.	1.74

Alg. Spr. = Algreen spray Alg. S.add. = Alg. Soil addition Mega Spr. = Mega pour spray
Mega S. add. = Mega pour soil addition Unis. S.add. = Unisal soil addition

Table (2): Effect of saline irrigation water levels and some compound applications on growth characters of Balady eggplant in summer (2009) growth season.

Saline levels	Comp.	Plant Height (cm.)	No./ Plant			Fresh wt. (g.)			Dry wt. (g.)	
			Leaves	branches	Leaves	branches	Total	Leaves	branches	Total
S_1 (3500) ppm	Alg. Spr.	81.70	140.30	7.40	130.00	93.00	223.00	42.00	31.30	73.30
	Alg. S.add.	71.80	124.90	5.90	113.50	76.80	190.30	34.50	24.60	59.10
	Mega. Spr.	80.00	137.00	7.00	123.40	88.60	212.00	38.80	29.40	68.20
	Mega. S.add.	75.10	134.80	6.60	119.00	82.60	201.60	36.60	27.80	64.40
	Unis. S.add.	74.90	129.30	6.20	116.80	79.00	195.80	35.20	26.00	61.20
	Cont.	69.00	118.10	5.40	100.00	70.60	170.60	32.40	23.50	55.90
Mean		75.42	130.73	6.42	117.12	81.77	198.88	36.58	27.10	63.68
S_2 (4500) ppm	Alg. Spr.	72.40	123.90	6.50	118.20	76.50	194.70	33.60	25.50	59.10
	Alg. S.add.	66.30	115.10	5.80	108.30	70.70	179.00	30.00	21.00	51.00
	Mega. Spr.	71.00	119.50	6.10	113.80	73.20	187.00	32.00	22.80	54.80
	Mega. S.add.	63.20	105.30	5.00	96.20	65.00	161.20	27.20	18.70	45.90
	Unis. S.add.	65.50	111.20	5.30	102.80	68.20	171.00	29.00	19.60	48.60
	Cont.	61.00	100.90	4.80	89.10	58.00	147.10	25.20	17.00	42.20
Mean		66.57	112.65	5.58	104.73	68.60	173.33	29.50	20.77	50.27
Averages	Alg. Spr.	77.05	132.10	6.95	124.10	84.75	208.85	37.80	28.40	66.20
	Alg. S.add.	69.05	120.00	5.85	110..90	73.75	184.65	32.25	22.80	55.05
	Mega. Spr.	75.50	128.25	6.55	118.60	80.90	199.50	35.40	26.10	61.50
	Mega. S.add.	69.15	120.05	5.80	107.60	73.80	181.40	31.90	23.25	55.15
	Unis. S.add.	70.20	120.25	5.75	109.80	73.60	183.40	32.10	22.80	54.90
	Cont.	65.00	109.50	5.10	94.55	64.30	158.85	28.80	20.25	49.05
L.S.D at 5%	Salinity	8.73	14.77	N.S.	10.14	N.S.	19.13	4.76	4.91	5.67
	comp.	4.02	6.16	N.S.	6.26	N.S	20.61	1.21	2.54	1.48
	interactions	1.96	7.14	N.S.	1.71	N.S	N.S	1.67	N.S.	20.04

Alg. Spr. = Algreen spray Alg. S.add. = Alg. Soil addition Mega spr. = Mega pour spray
Mega S. add. = Mega pour soil addition Unis. S.add. = Unisal soil addition

Table (3): Effect of saline irrigation water levels and some compounds application on chemical compositions of Balady eggplant in summer of (2008 and 2009).

Saline Levels	Compound	2008 In Leaves						2008 In fruits	2009 In Leaves						2009 In fruits
		Chloro-phyll	N%	P%	K%	Na%	Cl%	Fe%	Chloro-phyll	N%	P%	K%	Na%	Cl%	Fe%
S_1 (3500) ppm	Alg. Spr.	48.60	3.10	0.50	2.61	0.48	0.74	5.72	52.20	3.40	0.56	2.87	0.44	0.68	5.26
	Alg. S.add.	44.30	2.42	0.37	2.30	0.59	0.91	7.40	47.60	2.64	0.41	2.53	0.54	0.83	6.81
	Mega. Spr.	47.40	2.85	0.46	2.49	0.50	0.77	6.16	51.00	3.10	0.51	2.74	0.53	0.71	5.65
	Mega. S.add.	46.00	2.70	0.44	2.42	0.55	0.85	6.49	49.60	20.97	0.48	2.66	0.50	0.77	5.58
	Unis. S.add.	45.60	2.53	0.39	2.39	0.58	0.89	6.49	45.73	2.78	0.43	2.64	0.52	0.80	6.36
	Cont.	43.00	2.30	0.35	20.20	0.62	0.96	7.50	46.00	2.53	0.39	2.31	0.56	0.86	7.08
Mean		45.82	2.65	0.42	2.40	0.55	0.85	6.63	48.69	2.90	0.46	0.62	0.51	0.78	6.12
S_2 (3500) ppm	Alg. Spr.	45.27	2.45	0.45	2.28	0.55	0.85	6.71	47.70	2.68	0.48	2.41	0.50	0.76	6.12
	Alg. S.add.	43.30	2.22	0.37	2.07	0.65	1.00	7.59	45.00	2.42	0.39	2.19	0.59	0.90	6.91
	Mega. Spr.	44.50	2.38	040	2.12	0.61	0.94	7.26	46.37	2.58	0.43	2.24	0.56	0.86	7.42
	Mega. S.add.	41.00	2.01	0.29	1.98	0.76	1.17	7.72	72.90	2.19	0.31	1.99	0.71	1.08	7.42
	Unis. S.add.	42.50	2.10	0.32	2.03	0.71	1.06	7.78	44.00	2.29	0.35	2.07	0.64	0.99	7.14
	Cont.	40.70	1.98	0.28	1.85	0.77	1.19	7.80	42.30	2.16	0.30	1.90	0.73	1.12	7.70
Mean		42.88	2.19	0.35	2.06	0.68	1.03	7.48	44.71	2.39	0.38	2.13	0.62	0.95	6.98
Averages	Alg. Spr.	46.93	2.78	0.48	2.45	0.52	0.80	6.22	49.95	3.04	0.52	2.64	0.47	0.72	5.69
	Alg. S.add.	43.80	2.32	0.37	2.19	0.62	0.96	7.50	46.30	2.53	0.40	2.36	0.57	0.87	6.86
	Mega. Spr.	45.95	2.62	0.43	2.31	0.56	0.86	6.71	46.30	2.84	0.47	2.49	0.54	0.79	6.13
	Mega. S.add.	43.50	2.36	0.37	2.20	0.66	1.01	7.11	46.25	2.58	0.40	2.33	0.60	0.93	6.50
	Unis. S.add.	44.05	2.32	0.36	2.21	0.65	0.97	7.13	44.87	2.54	0.39	2.35	0.58	0.90	6.75
	Cont.	41.85	2.14	0.32	2.03	0.70	1.08	7.63	44.15	2.35	0.34	2.11	0.65	0.99	7.39
L.S.D at 5%	Salinity	0..87	N.S.	0.03	2.03	N.S.	N.S.	N.S.	3.07	N.S.	0.05	0.09	0.06	0.02	N.S.
	comp.	N.S.	N.S.	0.09	0.17	0.11	0.10	N.S.	N.S.	0.22	N.S.	0.21	0.08	0.14	N.S.
	interactions	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Alg. Spr. = Algreen spray Alg. S.add. = Alg. Soil addition Mega spr. = Mega pour spray
Mega S. add. = Mega pour soil addition Unis. S.add. = Unisal soil addition

Table (4): Effect of saline irrigation water levels and some compounds applications on yield and its components of Balady eggplant in summer of (2008 and 2009) growth seasons.

Saline levels	comp.	2008 Averages of fruit			2008 Fruits/ plant		2008 Yield (ton/ fed.)	2009 Averages of fruit			2009 Averages of fruit/ plant		2009 Yield (ton/ fed.)
		Length (cm.)	Diameter (cm.)	Weight (gm.)	No.	Wt (gm.)		Length (cm.)	Diameter (cm)	Weight (gm.)	No.	Wt. (gm.)	
S_1 (3500) ppm	Alg. Spr.	13.65	3.39	43.80	22.50	986	10.84	14.30	3.50	50.00	23.60	1180	12.98
	Alg. S.add.	10.80	3.15	35.50	17.40	618	6.97	11.10	3.25	40.00	18.90	769	8.46
	Mega. Spr.	12.50	3.30	41.10	20.40	384	9.22	13.20	3.40	47.00	22.10	1038	11.43
	Mega. S.add.	11.90	3.23	38.90	18.30	712	7.83	12.20	3.33	44.60	19.90	887	9.76
	Unis. S.add.	11.30	3.19	37.80	18.00	680	7.48	11.50	3.28	45.50	19.30	839	9.24
	Cont.	10.40	3.11	33.50	17.00	569	6.27	10.60	3.20	38.97	18.20	709	7.77
Mean		11.75	3.23	38.43	18.93	727	8.10	12.15	3.33	44.13	20.33	897	9.94
S_2 (4500) ppm	Alg. Spr.	11.60	3.17	34.00	21.30	724	7.91	12.00	3.27	36.20	22.00	796	8.76
	Alg. S.add.	10.50	3.05	30.00	17.80	534	5.87	11.00	3.14	31.50	18.50	583	6.41
	Mega. Spr.	11.00	3.10	31.60	19.20	607	6.67	11.70	3.19	34.00	19.90	677	7.44
	Mega. S.add.	9.40	2.92	26.80	16.20	434	4.78	10.33	3.00	27.40	16.90	463	5.09
	Unis. S.add.	9.90	3.00	28.00	17.00	476	5.25	10.50	3.08	29.60	17.70	524	5.76
	Cont.	9.00	2.81	25.00	15.80	395	4.35	9.60	2.87	25.94	16.50	429	4.72
Mean		10.23	3.01	29.23	17.88	523	5.81	10.86	3.09	30.78	18.58	572	6.36
Averages	Alg. Spr.	12.60	3.28	38.90	21.90	852	9.38	13.15	3.39	43.10	22.80	983	10.87
	Alg. S.add.	10.65	3.10	32.75	17.60	576	6.42	11.05	3.20	36.10	18.70	675	7.44
	Mega. Spr.	11.75	3.20	36.35	19.80	719	7.95	12.45	3.30	40.50	21.00	850	9.44
	Mega. S.add.	10.65	3.08	32.85	17.25	566	6.31	11.27	3.17	36.00	18.40	662	7.43
	Unis. S.add.	10.60	3.10	32.90	17.50	576	6.37	11.00	3.18	36.55	18.50	676	7.50
	Cont.	9.70	2.96	29.25	16.40	480	5.31	10.10	3.04	32.74	17.35	563	6.25
L.S.D at 5%	Salinity	0.08	N.S	2.57	N.S	N.S	0.57	N.S	N.S	3.44	N.S	N.S	0.42
	comp.	N.S	N.S	3.90	0.38	0.38	0.15	1.85	N.S	4.41	0.40	0.07	0.11
	interactions	N.S	N.S	0.56	0.53	0.54	0.21	N.S.	N.S.	N.S.	0.55	0.54	0.16

Alg. Spr. = Algreen spray Alg. S.add. = Alg. Soil addition Mega spr. = Mega pour spray
Mega S. add. = Mega pour soil addition Unis. S.add. = Unisal soil addition