IMPROVEMENT OF SOME PROPERTIES OF SALT AFFECTED SOILS USING COMPOST, PROLINE, BIOFERTILIZER AND RODUCTIVITY

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ABSRACT

A field experiment was conducted on salt affected soil at Kasr El-Basel village, south district of Etsa, El-Fayoum Governorate, Egypt, during winter season 2013/2014. This study was conducted to identify the effect applied compost at the rate of 20 m^3 fed^{-1} in combination with amino acid (proline sprayed at rate of 3 mg/L fed^{-1} during 20, 45, and 60 days after sowing) and biofertilizer (salinity durable bacteria) as either solely or combined treatments to improving some salt affected soil characteristics as well as the vegetative growth, nutritional status and yield of sugar beet (Beta vulgaris, c.v. Galorya).

The obtained results indicated that, in the soil have good drainge, the values of EC, SAR, ESP, $CaCO_3$ and pH, decreased with applications of compost, proline and biofertilizer. These decrease varied from treatment to another, the best treatment was found to be compost + proline+ biofertilizer. However, its effect on OM and CEC were opposite trend since their combination caused the highest of OM and CEC. Also, application of compost+ proline + biofertilizer with were more pronounced in decreasing soil bulk density, while increasing hydraulic conductivity , total porosity and soil moisture content . In addition, the obtained data emphasized that the achieved amelioration in soil properties were positively reflected on the studied plant parameters (root height, root diameter, root and top yields, sucrose%, TSS%, purity% and sugar yield). The best and achieved greatest values were associated with pants subjected to the triple combined treatment (compost + proline + biofertilizer) as compared to the other combined or solely ones. Further, the applied treatments display an effective role on increasing growth plant characters and nutrient contents of plant tissues.

So that, it could be recommended that compost, proline and biofertilizer (salinity durable bacteria) should be used to alleviate the hazardous effects of either a saline soil. In addition, such favourable conditions should be enhance continuous biological activity and nutrients slow release along the growth stages of sugar beet plants, and in turn to minimize their possible losses by either leaching process or volatilization and rationalize use of mineral fertilizers, which represents surplus point for sustainable agriculture system. This approach represents a best strategy in agriculture field that has a long-term positive agronomic value and an effective practice of fertilization management on long-term.

Keywords: Compost, Amino acids, Proline, Biofertilizer, Salinity durable bacteria, Sugar beet, plant growth and quality parameters.

INTRODUCTION

Salinity is one of the major constrains on crop production in numerous parts of the world, It leads to metabolic alterations and graded reduction in the plant growth and consequently yield and quality, especially in arid and semi-arid regions, where soil and water-borne salts become concentrated due to inputs of irrigation water and high rates of evapotranspiration **(Munns and Tester, 2008).** Plants vary in their ability to cope with salinity and differences in salt tolerance exist not only between species but also amongst genotypes of certain species **(Munns, 2002).** This latter aspect attracts increasing studies on the impact of salt tolerance and applied research such as adaptation of crop species to saline soils **(Deinlein *et al.*, 2014).** Salinity adversely affecting physiological and metabolic processes, finally diminishing growth and yield **(Ashraf and Harris, 2004).** Excessive salts injure plants by disturbing the uptake of water into roots and interfering with the uptake of competitive nutrients **(David, 2007).** The inhibitory effect of salinity on plant growth and yield has been ascribed to osmotic effect on water availability, ion toxicity, nutritional imbalance, reduction in enzymatic and photosynthetic efficiency and other physiological disorders **(Khan *et al.*, 1995).** Salinity is considered as a global environmental challenge, affecting crop production on over 800 million hectares, or a quarter to third of all agricultural land on earth **(Rengasamy, 2010).**

Although sugar beet is considered a salt tolerant crop, it is important to evaluate its behavior under more favorable soil conditions. Sugar beet is an important crop for manufacturing sugar for complementary national provisions of sugar in Egyptian market. Sugar beet provides about 40% of the world's sugar production **(Abd El-Hadi *et al.*, 2002).** Sugar beet in Egypt has a considerably higher sugar content and short growth period compared with sugar cane. Furthermore, consumed water by sugar beet to produce one ton of sucrose is about 1300 m^3, whereas sugar cane needs about 4000 m^3 of water to produce the same quantity of sucrose. Sugar beet is widely grown in areas with salinity problems **(Moukhtar *et al.*, 2010).**

Many investigation studies the effect of some treatments on decreasing soil salinity such as compost, Proline and bio-fertilizers(salinity durable bacteria). **Sunjeong *et al.*, (2010)** concluded that compost tea has been used to improve the properties of the soil and reduce salinity problems, as well as to improve plant growth. **Khaled *et al.*, (2011)** reported that the role of compost in salt-affected soils is very vital because the organic source is ultimate opportunity to improve the physical properties of such soils, which have been deteriorated to the extent that water and air passage become extremely difficult in such soils. Also, Proline amino acid plays an adaptive role in the tolerance of plant cells to salinity by increasing the concentration of cultural osmotic components in order to equalize the osmotic potential of the cytoplasm. **(Wareing and Phillips, 1978, and Wated *et al.*, 1983).**The increase in proline content in plant tissues with the increase in salinity retards protein synthesis, and consequently accumulates free amino acids, including proline **(Ouerghi *et al.*, 1991, Zidan and Malibari, 1993, Barakat and Abdel-Latif, 1995, Yurekli *et al.*1996, and El-Leboudi *et al.*, 1997)**.

For bio-fertilizers, **Oken, (1982)** stated that inoculated plants with biofertilizers exhibited about 30-50 % greater uptake of nitrogen, phosphorous and potassium than non- inoculated plants. He suggested that associative nitrogen fixing enhanced the mineral absorption by cell cortex, which is reflected on the plant growth and yield increase. Although many management practices have been recommended to render salt affected soil suitable for crop production, the alternative biological approach has been considered an economical, feasible and efficient means of overcoming salinity problems **Sudhir *et al.*, (2012)** reported that agricultural crops and soil microorganisms are affected with salinity. Beneficial soil microorganisms such as PGPR (Plant Growth Promoting Rhizobacteria) have been reported for the plant growth under saline condition, so that the osmotolerance mechanisms of these PGPR are quite important to hyper osmotic injury. Under salt stress, the PGPR showed positive effects in plants, particularly on parameters such as the rate of germination, tolerance to drought and salinity, the weight of stems and roots.

The interaction of inoculants with plants under salinity conditions revealed that, in most cases, inoculation with salt-tolerant strains could improve the plant growth as compared with the effect of salt-sensitive strains as showed with ampliceps. **Zou *et al.*, (1995)**.

Therefore, the aim of this study is to determine the effect of application some treatments (compost, proiline, and salinity durable bacteria and combination of them with drains) on improving some soil properties and sugar beet plants grown on salt affected soil.

MATERIALS AND METHODS

A filed experiment was carried out on salt affected soil at kasr El-Basel village, south district of Etsa, El-Fayoum Governorate, Egypt, during winter season 2013/2014. Using The applied compost at a rate of 20 m^3 fed^{-1}, as individual or combined with porline sprayed at rate of 3 mg/L fed^{-1} during 20, 45, and 60 days after sowing. Salinity durable bacteria was provided by Bio-fertilizer Production Unit, Department of Microbiology, Soils, Water and Environment Research Institute, Agric. Res. Center, Giza. The seeds were soaked with Azospirillum and Azotobacter at rate 400 gm/fed.

Irrigation water of these soil was done from Bahr El-Ghark (Mixed between Nile water and agriculture drainage water). According to calculations of crop water requirements and soil leaching requirement, irrigation was done 8-10 days to avoid the detrimental effects of high osmotic potential of saline soil solution. Some chemical analysis of this water is presented in Table (1).

Also, the chemical analysis of compost used were presented in Table (2). The experimental design was the split plot with three replicates. The area of each soil plot was 10.5 m^2 (3.0 m width x 3.5 m length). Soil plots were ploughed twice in two ways after received super phosphate fertilizer (15 % P_2O_5) at a rate of 200 kg fed^{-1}. All treatments received a uniform fertilization with recommended dose of nitrogen in the form of ammonium nitrate (33.5 % N) which was applied to soil plots at the rate of 134kg N/fed for sugar beet in to equal doses during the growing period, i. e., after 15 & 40 days from planting. Also, potassium sulphate (48 % K_2O) was added at a rate of 50 kg fed-1 in two equal doses, i.e., after 15 and 40 days from planting.

The applied treatments were as follows:

1. Control (c)
2. Compost (Com) at rate of 20 m^3/fed.
3. Proline sprayed (Pro) at rate of 3 mg/L during 20, 45, and 60 days after sowing.
4. Biofertilizer (Bio) (salinity durable bacteria): the seeds were soaked with Azospirillum and Azotobacter at rate 400 gm/fed.
5. Com+ Pro
6. Com+ Bio
7. Pro+ Bio
8. Com+ Pro + Bio

Table (1): Chemical properties of the irrigation water in Baher El-Ghark (El- Fayoum Governorate)

pH	EC (dS/m)	Dissolved ions (mq/l)							SAR
		Ca^{2+}	Mg^{2+}	Na^+	K^+	HCO_3^-	Cl^-	SO_4^{2-}	
8.40	1.66	3.07	4.29	8.16	0.41	3.83	6.74	5.36	4.25

Table (2): Physical and chemical properties of the compost used.

pH (1:10)	EC dSm^{-1} (1:10)	Total NPK(%)			C/N ratio	Organic matter (%)	Organic carbon (%)	Moisture %	Ash %
		N	P	K					
7.6	2.45	2.28	0.85	3.70	16/1	31.75	18.14	28.4	72

Sugar beet was sown on 20 September 2013 and harvested on 10th Abril, 2014. The normal cultural treatments of growing sugar beet were practiced. Plant samples were taken after 25 weeks from planting (Harvest) and transferred to the laboratory, washed with tab water then by distilled water, air dried and separated into leaves and roots and weighed to determined the fresh weighed of roots.The samples was oven-dried at 70°C till constant weight to determine total dry of leaves according to **A.O.A.C. (1995)**. Also, at harvest the following parameters were recorded: Root weight (g/plant), Root yield (ton/fed). Total soluble solids percentage (TSS%) was determined using hand refractometer method according to **A.O.A.C. (1995)**. Sucrose percentage was determined by using Sacchrimeter according the procedure out line by Sachle Docke as described by **Eck, *et al.*, (1990)**. Purity% was calculated according to the following equation: Purity% = (Sucrose % × 100)/TSS%. Sugar yield (ton/fed) was calculated according to the following equation: Sugar yield (ton/fed) = {Root yield (ton/fed) × Sucrose%}/(Purity%).

Soil samples were collected from the surface layer (0-30 cm) before applying the treatments and after harvest, then dried, crushed and sieved through a 2 mm screen. These samples were physico – chemical analyzed to measure the electrical conductivity (ECe) and pH **(Page, *et* al., 1982)**. Particle size distribution and calcium carbonate were determined according to **(Klute, 1986)**. Soil organic matter was determined according to **(Klute, 1986)**. Cation exchange capacity was determined by using method of **(Page, *et al.*, 1982)**. The physical and chemical analyses of the studied soil before cultivation are shown in Table (3). Also, The obtained results were subjected to statistical analysis according to **Barbara and Brain (1994)** to define the least significant difference test (L.S.D. at p=0.05 level), which was used to verify the differences between the tested treatments.

Table (3):Some physical and chemical characteristics of the experimental soil

Soil characteristics	Value	Soil characteristics.	Value
Particle size distribution %		ESP %	12.46
Coarse sand	5.80		
Fine sand	14.80	Soluble ions in soil paste extract (m molc L^{-1}):	
Silt	30.10	Ca^{++}	31.24
Clay	49.30	Mg^{++}	22.17
Soil texture class	Clayey	Na^{+}	57.47
$CaCO_3$ %	2.48	K^{+}	1.60
Organic matter %	0.86	CO_3^{--}	0.00
ECe in dSm^{-1} (Soil paste extract):	11.33	HCO_3^{-}	2.78
		Cl^{-}	61.81
pH (Soil paste):	7.87	SO_4^{--}	47.89

Available macro and micronutrients (mg/kg soil)						
N	P	K	Fe	Mn	Zn	Cu
80.00	4.50	152	4.32	0.92	1.46	0.43

RESULTS AND DISCUSSION

1. Effect of Com, Pro and Bio treatments on some chemical properties of salt affected soil.

Effect of Com, Pro and biofertilizer and their combination treatments, on improving salt affected soil characteristics (EC, SAR, ESP, pH, $CaCO_3$, O.M and CEC), cultivated with sugar beet are presented in Table (4). Data represent the values of EC, SAR, ESP, pH and $CaCO_3$ in salt affected soil treated with different treatments (Com, Pro, Bio and their combination) were decreased with applications of these treatments. These decrease varied from treatment to another.

Concerning the effect of applied these treatments on OM and CEC, data revealed that there were an increase in these parameters when applied different treatments. On the Other hand, application of (Pro) was slightly affected on all parameters.

Also, data showed a pronounced decrease in the values of EC, SAR, ESP, pH and $CaCO_3$in the studied soil application of(Com + Pro + Bio), where these parameters at this treatment reached 34.12, 40.55, 45.26, 4.62 and 11.07% compared to control treatment, respectively. This effect mainly attributed to the improvement of some characteristics of salt affected soil. Whereas, the corresponding values when the soil treated with (Com + Bio) the values were 33.81, 40.23, 44.87, 4.36 and 10.66% compared to control treatment, respectively. It showed that application of proline did not show any significant. **Doaa Mohamed (2012)**, and **Fatma Abualamaim (2012)** found that addition of compost at salt affected soil reduced the electrical conductivity EC, SAR, ESP and pH compared to the control.

Concerning the effect of applied these treatments on OM and CEC, data revealed that there was an increase in these parameters when the applied different treatments to salt affected soil where the relative increase percentages of this treatment reached 172.73 and 29.19% compared to control treatment, respectively, especially soil treated with (Com + Bio). It showed that application of proline did not any significant. This may be due to improving the chemical properties of the studied salt affected soil. **Fatma Abualamaim (2012)** observed that OM and CEC of salt affected soil treated with compost and grown with Sudan grass increased.

In fact, compost + Bio may be applied to correct and improve some chemical properties of the salt affected soils and this consequently encourage the plant to have good growth. Moreover, addition of compost and biofertilizer led to decreased value of EC, SAR, ESP and pH in soil. The decreases in EC was attributed to the improving action of the used treatments on the total porosity (Table 5), which enhance increase the leaching out of nutrients through improving soil structure which contributes to decrease in salts concentration as well as decrease osmotic potential of the root zone. **Ahmed (2011)** reported that addition of organic manures decreased soil salinity and they attributed that to improving chemical properties of the soil which in turn facilitate the leaching of salts outside from the root zone. **Sudhir *et al.*, (2012)** showed that this trend could be interpreted on the base of produce several phytohormones, such as indole acetic acid, glutamate, proline, glycine, and cytokinins, by Azosprillium strain (biofertilizer) and organic acid which had an effect to reduce the salinity stress.

Table (4): Effect of Com, Pro and Bio treatments on some chemicals of salt affected soil after sugar beet plants.

Treatments	EC (dS/m)	SAR	ESP (%)	pH (1:2.5)	$CaCO_3$ (%)	O.M (%)	CEC (meq/100g soil)
C	9.73	9.52	10.23	7.80	2.44	0.88	40.35
Com	7.32	6.74	6.94	7.58	2.25	2.15	46.34
Pro	9.70	9.49	10.19	7.79	2.43	0.90	40.38
Bio	9.61	9.43	10.12	7.75	2.39	1.15	42.15
Com+Pro	7.29	6.71	6.90	7.57	2.23	2.19	46.85
Com+ Bio.	6.44	5.69	5.64	7.46	2.18	2.40	51.95
Pro+ Bio	9.58	9.39	10.08	7.73	2.37	1.17	42.41
Com +Pro+ Bio	6.41	5.66	5.60	7.44	2.17	2.40	52.13
Mean	8.26	7.83	8.21	7.64	2.30	1.65	45.32
L.S.D at (0.05)	0.68	0.70	0.82	0.10	3.34	0.10	0.06

2. Effect of Com, Pro and Bio treatments on available macro and micronutrients of salt affected soil.

Data presented in Table (°) represented available nitrogen, phosphorus and potassium amount in the soil after sugar beet cultivation. Results revealed that available nitrogen, potassium and phosphorus amount in salt affected soils were increased significantly. The compost application made available nitrogen, potassium and phosphorus amount higher. Among application treatments, the (Com + Pro + Bio) was significantly higher than others. The percentage of increase for (Com + Pro + Bio) compared with control amounted to about 74.58, 43.27 and 149.41% comparing to control treatment, respectively.

The presented data in Table (5) show that available Fe, Mn and Zn of the studied soil were increased with the compost and biofertilizer compared with the control. Significant increases in available Fe, Mn and Zn were obtained from treatments received (Com + Pro + Bio), the percentage of increase in the soil 190.11, 238.24 and 66.44%, respectively.

Application of compost treatment at $20m^3$/fed with biofertilizer at 400 g/fed, gave significant increases in available macro and micronutrients due to compost addition is a direct consequence of compost and biofertilizer addition. Applying compost proved high contents of essential macro and micronutrients, beside its beneficial effects on soil fertility through lowering soil pH and maintaining a suitable air-moisture regime, as discussed previously. The latter conditions led to enhance the microbial activity in soil, which accelerate the decomposition of organic matter and maximize soil content of nutrients, especially for those of macronutrient deficient in the soil. Many investigators evaluate the effects of integrated use of some natural organic manures and chemical fertilizers on soil fertility in field experiments. **Mekail, *et al.* (2006)** reported that treating sandy soils with poultry manure compost had a direct and residual positive effect on NPK content of post harvest soils of wheat as compared to NPK fertilizers treatments. The application of FYM and increasing N rates increased soil organic carbon. **Mazaherinia *et al*,. (2010)** showed that the application of both types of iron oxides increased Fe, Zn and Cu concentrations in soil. **Ibrahim, *et al.* (2011)** found that application compost in soil increased acid pH. Therefore, since creating increases the ability to absorb some nutrient elements such as phosphorus, iron, zinc, copper and manganese are increased.

Table (5): Effect of Com, Pro and Bio treatments on available macro and micronutrients of salt affected soil after sugar beet plants.

Treatments	Available macro and micronutrients (mg kg^{-1} soil)					
	N	K	P	Fe	Mn	Zn
C	118	171	5.12	4.55	1.02	1.49
Com	171	201	10.20	11.56	2.34	2.10
Pro	120	173	5.13	4.56	1.04	1.52
Bio	131	180	5.53	5.24	1.19	1.60
Com+Pro	173	204	10.23	11.58	2.36	2.13
Com + Bio.	206	245	12.75	13.20	3.45	2.48
Pro + Bio	133	183	5.55	5.26	1.21	1.63
Com +Pro+ Bio	206	245	12.77	13.20	3.45	2.48
Mean	157.25	200.25	8.41	8.64	2.00	1.93
L.S.D, at 0.05	5.36	0.67	5.52	0.68	0.10	0.06

3. Effect of Com, Pro and Bio treatments on some physical characteristic of salt affected soil.

Data presented in Table (6) showed a pronounced increase in the values of H.C, T.P, F.C, W.P and A.W in the studied soil with application of (Com + Pro + Bio), where these parameters at this treatment reached 258.18, 11.76, 14.06, 13.30 and 14.72% compared to control treatment, respectively. This effect mainly attributed to the improvement of some characteristics of salt affected soil. Whereas, the corresponding values when the soil treated with (Com + Bio) were only 258.18, 11.76, 14.00, 13.18 and 14.72% compared to control treatment, respectively. This increase was not-significant.

Concerning the effect of applied these treatments on bulk density (BD), data revealed that there was a decrease when the applied with application of (Com + Pro + Bio) to salt affected soil where the relative decrease percentages of this parameter (BD) reached 10.77% over that of control. Whereas, the corresponding value when the soil treated with (Com + Bio) the value was 10.77% compared to control treatment. This increase was not-significant.

This may be due to improving the physical properties of the studied salt affected soil. **Fatma Abualamaim (2012)** found that some physical properties such as bulk density of the salt affected soils after application of compost at rate 20 m^3/fed reduced by about 18% lowest than controls. Application of compost gave increases in hydraulic conductivity compared with the control. It was found that values of hydraulic conductivity ranged from 0.45 to 1.77 cm/hr in salt affected soils revealed that the total porosity was increased as a result of compost application. It was increased by 26% compare the control. **Nashwa El-Sheikh (2013)** found that the soil moisture characteristics (Field capacity, wilting point, and available water) were increased in a clear trend with compost application in salt affected soil. This reflects the ability of organic manure soils to retained more water in available from **(El-Kholi *et al.*, 2000).**

Table (6): Effect of Com, Pro and Bio treatments on some physical characteristic of salt affected soil after sugar beet planting.

Treatments	Bulk density (g/cm^3)	Hydraulic conductivity (cm/hr)	Total porosity (%)	F.C (%)	W.P (%)	A.W (%)
C	1.30	0.55	50.68	37.78	17.60	20.18
Com	1.21	1.43	54.50	40.04	18.57	21.47
Pro	1.29	0.52	51.15	37.78	17.58	20.20
Bio	1.28	0.76	51.64	38.07	17.81	20.26
Com+Pro	1.20	1.46	55.53	40.07	18.60	21.47
Com + Bio.	1.16	1.97	56.64	43.07	19.92	23.15
Pro + Bio	1.27	0.78	52.09	38.10	17.83	20.27
Com +Pro+ Bio	1.16	1.97	56.64	43.09	19.94	23.15
Mean	1.23	1.18	53.61	39.75	18.48	21.27
L.S.D at (0.05)	0.02	0.08	0.82	1.04	0.77	1.51

4. Effect of Com, Pro and Bio treatments on growth parameters and yield of sugar beet grown in salt affected soil.

The effect of different treatments along with different combination on the growth parameters and yieldof sugar beet plants grown in salt affected soil is presented in Table (7). The results showed that plots that received the combination of Com + Pro + Bio produced higher growth parameters *i.e.,* root height (cm), root diameter (cm), root weight g/plant than the control and the previous treatments with corresponding values 18.95 cm, 11.10 cm and 1314.20 g/plant. The percentage of these values reached to 84.52, 99.64 and 42.65% for root height, root diameter and root weight, respectively, compared with that of control.

This is due to the effect of these combination on ready availability of nutrients during the initial growth stage. However, significantly differences in plant growth characters in sugar beet plants was observed with other treatments compared to control. The improvement in growth parameters of sugar beet plants by Com + Pro + Bio may be attributed to its effect on soil salinity, where application of Bio can alter the composition of root secretion and plasticity, application of Com led to decrease soil salinity and Pro increasing the osmoregulation of plants .**Wareing and Phillips, (1978)**, and **Wated *et al.*, (1983)** reported that proline amino acid plays an adaptive role in the tolerance of plant cells to salinity by increasing the concentration of cultural osmotic components in order to equalize the osmotic potential of the cytoplasm.

Also, results presented in Table (7) showed that root and top yields of sugar beet plant were significantly affected by application of different treatments as single or in combination. The highest amounts of root and top yields of sugar beet were taken from Com + Bio + Pro. The corresponding values were 20.16 and 9.48 ton/fed, respectively compared with that of control. The percentage of these values when comparing with control were 62.32 and 84.08%, respectively.

The results are in accordance with those obtained by **Abd El-Razik (2005)** who found that results of using the applied organic matter the increased values of root length, root diameter and root yield of sugar beet grown is saline soil. Such behaviour may be attributed to the efficient and ameliorative role of the used soil and water agro-management practices. Also, the used soil and water management reduced the hazard effect of soil salinity on the root elongation, extension and development and this considered as beneficial effects of such management techniques in the tested soils. **Stocker *et al.*, (2008)** found that the increase of plant growth and yield depends mainly upon the role of plant growth promoting bacteria present in the rhizosphere, which when applied to seeds or crops enhance the growth of the plant and reduce the damage from soil plant pathogens and consequently increase the yield components. These bacteria could enhance the growth of the plant by phosphate solubilization, nitrogen fixation and exopolyacharrides production.

Table (7): Effect of Com, Pro and Bio treatments on plant growth parameters and yield of sugar beet grown on salt affected soil.

Treatments	Root height (cm)	Root diameter (cm)	Root weight (g/plant)	Root yield (ton/fed)	Top yield (ton/fed)
C	10.27	5.56	921.30	12.42	5.15
Com	13.87	9.49	1115.90	15.13	6.68
Pro	11.29	7.72	995.30	13.47	5.83
Bio	12.78	8.42	1101.30	14.19	6.55
Com +Pro	15.67	9.74	1165.40	16.31	7.81
Com + Bio.	17.35	10.03	1212.20	18.32	8.79
Pro + Bio	13.13	9.00	1112.80	15.32	6.71
Com +Pro+ Bio	18.95	11.10	1314.20	20.16	9.48
Mean	14.16	8.88	1113.60	15.67	7.15
L.S.D, at 0.05	0.80	0.77	81.80	0.99	0.93

5. Effect of Com, Pro and Bio treatments on proline content and K/Na ratio in sugar beet plants grown on salt affected soil.

Data presented in Table (8) showed that a pronounced decrease in the value of proline content and total sodium in sugar beet leaves with application of Com + Pro + Bio, where these parameters at this treatment reached 27.39 and 58.99%, respectively, over that of control.

Concerning the effect of applied treatments on K/Na ratio data revealed that there was an increase in these parameters when the applied different treatments to sugar beet where the relative increase percentages of this treatment reached 217.86% over that of control. . **El leboudi *et al.* (1997)** showed that free proline increased with increasing salinity, particularly in the salt tolerant cultivar, with NaCl beaing the greatest effect.

Sudhir *et al.*, (2012) found that beneficial soil microorganisms such as PGPR (Plant Growth Promoting Rhizobacteria) have been reported for the plant growth under saline condition, so that the osmo tolerance mechanisms of these PGPR are quite important to hyper osmotic injury. In Azospirillum sp., there is an accumulation of compatible solutes such as glutamate, proline, glycine betaine and trehalose in response to salinity / osmolarity, proline plays a major role in osmo adaptation through increase in osmotic stress that shifts the dominant osmolyte from glutamate to proline in A. brasilense.The potential role of N_2– fixers for increasing plant K and Ca uptake more than Na under salinity stress may be deu to the role of K and Ca in salt adaptation. According to **Parida and Das, (2005),** who found that under salt stress plants maintain high concentrations of K and low concentrations of Na in the cytosol. They also found that N_2– fixers may regulate the exportation and activity of K and Na trace porters and H pumps that generate the driving force for transport. Porter and **Marek, (2006)** pointed out that organic matter offers chemical and physical benefits to mitigate effects of salts. Organic matter can contribute to a higher cation exchange capacity (CEC) and therefore lower the exchangeable sodium percentage, thereby helping to mitigate negative effects of sodium.

Table (8): Effect of Com, Pro and Bio treatments on proline content and K/Na Ratio in sugar beet grown on salt affected soil.

Treatments	Proline content (mg/g dry eight)	K (%)	Na (%)	K/Na Ratio (%)
C	23.04	1.56	1.39	1.12
Com	19.58	1.77	1.03	1.72
Pro	19.91	1.66	1.14	1.46
Bio.	18.90	1.69	1.10	1.54
Com +Pro	19.21	1.85	1.83	2.23
Com + Bio.	17.75	1.95	0.69	2.83
Pro + Bio	18.22	1.75	0.96	1.82
Com +Pro+ Bio	16.73	2.03	0.57	3.56
Mean	19.17	178	0.97	2.04
L.S.D, at 0.05	0.53	0.11	0.09	0.79

6. Effect of Com, Pro and Bio treatments on yield components of sugar beet grown on salt affected soil.

Data presented in Table (9) showed that represent the values of sucrose , TSS , Purity and sugar yield for sugar beet crop in salt affected soil treated with different treatments (Com, Pro, Bio and their combination) were increased with applications of these treatments. These increases varied from treatment to another. **El-Geddawy *et al.* (2003), EL-Kouny *et al.* (2004)** and **EL-Kouny *et al.* (2005)** stated that addition of compost to soil increased sugar yield, sucrose%, and sugar quality.

Concerning the interactive effects of combination, data showed that the application of two treatments was more effective than single one, while the tri combinations had the most effect on enhancing the plant growth components. The effect of different treatments along with different combination on the growth components of sugar beet plants grown in salt affected soil is presented in Table (9). The results showed that plots that received the combination of Com + Pro + Bio produced higher growth components (Sucrose , TSS , Purity and sugar yield) than the control. The percentage of these values reached to 50.41, 26.72, 18.69 and 115.52% for Sucrose , TSS , Purity and Sugar yield, respectively, compared with that of control. The results are in accordance with those obtained by **Abd El-Razik (2005)** who found that results of using the applied organic matter the increased values of sucrose, TSS, purity and sugar yield of sugar beet grown is saline soil. Such behaviour may be attributed to the efficient and ameliorative role of the used soil and water agro-management practices. Also, the used soil and water management reduced the hazard effect of soil salinity on the root elongation, extension and development and this considered as beneficial effects of such management techniques in the tested soils.

Table (9): Effect Com, Pro and Bio treatments on yield components of sugar beet grown on salt affected soil.

Treatments	Sucrose (%)	T.S.S (%)	Juice Purity (%)	Sugar yield (ton/fed)
C	13.55	18.04	75.11	2.32
Com	17.92	21.00	85.33	3.40
Pro	15.83	19.02	83.23	2.71
Bio	16.61	19.92	83.38	3.00
Com+Pro	18.48	21.36	86.52	3.73
Com + Bio.	19.75	22.33	88.45	4.45
Pro + Bio	17.19	20.40	84.26	3.31
Com +Pro+ Bio	20.38	22.86	89.15	5.00
Mean	17.46	20.62	84.43	3.49
L.S.D at (0.05)	0.79	0.81	4.84	0.25

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تحسين بعض خواص الأراضي المتأثرة بالأملاح وإنتاجيتها باستخدام الكمبوست ، البرولين والسماد الحيوي

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اجريت تجربة حقلية على الأراضي المتأثرة بالأملاح في قرية قصر الباسل جنوب منطقة اطسا. محافظة الفيوم. مصر. خلال الموسم الشتوي ٢٠١٣/٢٠١٤ بهدف التعرف علي التأثير الإيجابي لإضافه محسن تربة محلي (كمبوست بمعدل ٢٠م^{٣}/فدان)، حمض اميني (برولين رش بمعدل 3 مجم/لتر للفدان عند ٢٠،٤٥،٦٠ يوم من الزراعة) وسماد حيوي (بكتريا متحملة الملوحة) إما منفردة او بالجمع بينها على تحسين بعض خواص الأراضي المتأثرة بالأملاح ونمو وقياسات بنجر السكر (صنف جالوريا).

تشير النتائج الى ان قيم التوصيل الكهربائي ونسبة الصوديوم المتبادل وكربونات الكالسيوم ورقم الحموضة تتناقص بإضافة الكمبوست والبرولين والسماد الحيوي ويختلف هذا النقص من معاملة لأخرى حيث افضل معاملة كانت الكمبوست + برولين + السماد الحيوي. في حين كان تأثيرها على المادة العضوية والسعة التبادلية والكاتيونية بالزيادة حيث ادى الجمع بينهما الى اعطاء اعلى قيمة للمادة العضوية والسعة التبادلية الكاتيونية. ايضا اضافة الكمبوست + برولين + سماد حيوي كان اكثر وضوحا في تقليل الكثافة الظاهرية للتربة، وزيادة التوصيل الهيدروليكي، والمسامية الكلية ومحتوى رطوبة التربة، كذلك اكدت النتائج ان التحسين المتحقق في خواص التربة كان له انعكاس ايجابي على القياسات المحصولية (طول الجذر، قطر الجذر، محصول الجذر، ونسبة السكروز، نقاوة السكر، محصول السكر). افضل نتيجة تم تحقيقها كانت بإضافة المعاملة الثلاثية مجتمعة (كمبوست + برولين + سماد حيوي) وذلك بالمقارنة بالإضافات الأخرى مجتمعة او منفردة علاوة على ذلك فإن إضافة المعاملات كان لها دور فعال في زيادة نمو النبات ومحتواها من العناصر الغذائية .

لذا يمكن التوصية باستخدام اضافة الكمبوست، برولين، السماد الحيوي (بكتريا محتملة الملوحة) لتخفيف الأثر الضار للأراضي المالحية والتي تؤثر سلب على نوعية وكمية محصول بنجر السكر بالإضافة الى ذلك فان مثل هذه الظروف المواتية تعزز النشاط البيولوجي المستمر والعناصر بطيئة التيسير طول مراحل النمو النباتات بنجر السكر هذا بدوره يقلل الفقد المحتمل اما عن طريق الرشح او التطاير وترشيد استخدام الأسمدة المعدنية وهو ما يمثل نقطة منفصلة لنظام الزراعة المستدامة. ويمثل هذا النهج افضل استراتيجية في مجال الزراعة التي لديها قيمة محصوليه ايجابية طويلة الأجل واداء فعال لأداره التسميد العضوي الحيوي على المدى الطويل.