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EFFECT OF SOIL AMENDMENTS AND NITROGEN FERTILIZER SOURCES ON SUGAR BEET PRODUCTIVITY GROWN UNDER SALT AFFECTED SOIL CONDITIONS

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ABSTRACT

A field experiment was carried out during the successful winter season of 2012/2013 on sugar beet (*Bete vulgaris L*) c.v Gloria, on newly reclaimed salt affected soil at the experimental farm of El-Hosinia Station, Agriculture Research Center, Shrakia Governorate, Egypt. The main objectives of the study were to examine the use of soil amendments, (ferrous sulfate 7Mg/fed, gypsum 5Mg/fed and aluminum sulfate 6.5Mg/fed) and different nitrogen sources, (Ammonium Nitrate 33.5%N, Ammonium Sulfate 20.5% N and Ureaformaldhyde 38%N) on sugar beet productivity and its quality, root content of NPK, soil fertility and some chemical soil properties after harvest. The experimental layout was spilt plot design with three replicates, soil amendments were the main plots while nitrogen sources were the sup plots. The obtained results indicate that the combined application of either the soil amendments or different nitrogen sources markedly increased most of sugar beet yield and its quality parameters i.e. root yield, sugar yield, TSS %, sucrose % and purity % significantly. Interaction between soil amendment ferrous sulfate and N source ureaformaldhyde recorded the highest values of root yield (8.883t/fed), sugar yield (1.430t/fed), TSS% (23.10%) and sucrose % (16.73%), respectively. Also, the highest value of N, P and K concentration in roots were obtained by application of ureaformaldhyde as nitrogen fertilizer combined with ferrous sulfate or aluminum sulfate or gypsum. Also, results showed that application of soil amendments in combination with nitrogen sources improved soil fertility, which reflected on the increases of available N, P and K values. Moreover, results revealed also that application of soil amendments combined with different nitrogen sources significantly reduced the values of soil EC, ESP and pH.

Keywords*:* salt affected soils, soil amendments, nitrogen sources (slow and fast release) and sugar beet**.**

INTRODUCTION

Sugar beet (*Bete vulgaris L*) is one of the most important sugar crops in the world and also in Egypt. It considered the second source for sugar production after sugar cane in Egypt, and it has the ability to grown on newly reclaimed soils which suffer from salinity. Sugar beets are salt-tolerant crops that are grown frequently in salt-affected fields. Yield declines above an EC_e of approximately 7 dSm^{-1} but plants are more sensitive as seedlings (Maas, 1990). Recently, the use of salt tolerant crops has been recognized as a successful method to overcome salinity problem (Meiri and Plaut, 1985).

Salt affected soils are adversely affecting soil physical and chemical properties, as well as microbiological processes (Lakhdar *et al*., 2009). 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 had been ascribed to osmotic effect on water availability, ion toxicity, nutritional imbalance, and reduction in enzymatic and photosynthetic efficiency and other physiological disorders (Khan *et al.,* 1995). Ashry, *et al.,* (2007) found that increasing soil salinity level from 4.00 dSm^{-1} to 9.8 and 13.5 dSm^{-1} decreased sugar beet root yield from 20.14 t/fed to 18.15 and 12.30 t/fed, sucrose % decreased from 19.72 % to 17.85 and 16.86%, TSS % decreased from 20.53 to 20.16 and 19.36%, sugar yield decreased from 3.98 t/fed to 3.27 and 2.08 t/fed.

Reclamation of saline-sodic soils, however, cannot be achieved by simple leaching, also reclamation of these soils is difficult, time consuming and more expensive than that of saline soils due to replacement of exchangeable sodium with calcium. Hence, it requires the addition of chemical amendments along with leaching. Ahmed *et al.,* (1986) reported that the native insoluble Ca^{+2} can be solubilized by addition of H_2SO_4, HCl, S, FeS_2 and $Fe_2SO_4.7H_2O$ and $Al_2(SO_4)_3.18H_2O$. Gypsum is the most common amendment and its application for ameliorative sodic soils. The effectiveness of gypsum depends upon (i) the degree of fineness (ii) the way in which it is incorporated in the soil and (iii) the efficiency of the drainage system. Gypsum has a calcium content of 23% and sulfur content of 19%. It is usually used for treating sodium affected soils on farm. The calcium in the applied gypsum enables sodium displacement on the cation exchange capacity of the soil. Qureshi and Barrett-Lennard (1998) found that application of gypsum to sodic soils improves the infiltration rate and helps in leaching the salts into the lower layers. Prapagar *et al.,* (2012) found that gypsum application in combination with organic amendments improved the soil chemical properties by reducing the EC, SAR and pH, than the applying gypsum alone. Hussain *et al.*, (2001) reported that simple leaching can reclaim saline soils whereas black alkali soils need proper amount of gypsum, sulfur, iron sulfate and aluminum sulfate along with leaching. In newly reclaimed clay saline–sodic soils, Farag, *et al.,* (2013) found that application of soil amendments i.e. gypsum, sand and aluminum sulfate combined with mole drain under rotations leaching processes led to significant decrease in the values of EC, pH and ESP, whereas aluminum sulphate was more effective in decreasing values of EC, pH and ESP followed by gypsum and sand.

Nitrogen fertilizer levels and forms are important factors affecting yield and quality of sugar beet. Nitrogen requirements of this crop have received considerable research attention. Sugar Beet grown was responded to N fertilization (El-Harriri and Gobarh, 2001), however in recent years was found that a decline in beet quality in most growing areas. This problem was reportedly related to improper N fertilization practices. Purity and concentration of sucrose in the root are generally reduced when excessive N is present in the soil, particularly late in the season. Therefore, N must be managed with regard to sucrose content as well as root yield. Increasing nitrogen fertilizer rate up to 120 kg N fed^{-1} or 240 kg N ha^{-1} significantly increased top, root and gross sugar yields per feddan and or hectare but decrease sucrose % (El-Sarag, 2008 and Nasr *et al.,* 2011). Nemeat-Alla (2001) found that nitrogen fertilizer sources showed insignificant effect on total soluble solids, sucrose and juice purity percentages, and also found that ammonium nitrate as nitrogen source surpassed other nitrogen fertilizer sources or urea and produced the highest values of root length and diameter and root top fresh weight, root and top sugar yields as well as TSS%. It was found that the highest values of sucrose and purity % were produced from using ammonium nitrate compared with other source urea, whereas the differences between ammonium nitrate and urea were insignificant, (Fadel, 2002 and Mousa, 2004). Kafaga, *et al.,* (2007) showed that there is no significant effect was found between nitrogen forms urea and nitrate on root and sugar yields, TSS%, sucrose % and purity %, while there is highly significant effect of using urea on sugar beet fresh weight, whereas the superiority was for urea.

Although information is available concerning both optimum soil salinity condition and N fertilization for growing beets, the relationship between these two variables should be taken into consideration when beet gown on salt affected soils. Slow release commercial fertilizers behave somewhat like organic materials in that the rate of release is highest initially and decreases with time. The big difference is that the rate of release is much greater than the mineralization rate of most organic materials, and essentially all the N is released during the growth period of a crop. Slow release fertilizers have greater utility for crops that have fairly gradual uniform N uptake demand over the production period rather than for a crop with a very high peak demand.

Therefore, the objective of this study is to investigate the effect of some soil amendments combination with some nitrogen sources on sugar beet productivity grown on newly reclaimed salt affected soil.

MATERIALS AND METHODS

A field experiment was conducted at the Experimental Station Farm in El-Hosinia Agriculture Research Center, Shrakia Governorate, Egypt during winter season of 2012/2013 to evaluate the effect of different nitrogen sources and soil amendments and their interaction on yield and components and chemical constituents of sugar beet (c.v Gloria) and some soil properties after harvest of crop (sugar beet was the first crop sown in this soil after processes of reclamation). Some physical and chemical soil properties are shown in Table (1).

Nitrogen application sources were as follow: Ammonium nitrate (33.5%N), Ammonium sulfate (20.5%N) and Ureaformaldhyde (38%N), all nitrogen sources were applied at rate of recommended dose (100 kg fed^{-1}). The two nitrogen sources (ammonium nitrate and ammonium sulfate) were added in two equal doses, the first dose at 45 days from sowing and the second dose at 75 days from sowing. For slow release, N (ureaformaldhyde) it was added before sowing. Potassium was applied as potassium sulphate 48% K_2O, and phosphorus as calcium superphosphate 15.5% P_2O_5 at rates of 100 and 50 kg fed^{-1}, respectively before sowing for all plots of the experimental soil.

Table 1:Some Physical and chemical properties of the studied soil before sowing.

Soil depth	**Particle size distribution**				**Soil Texture**	**$CaCO_3$ %**	**pH**	**ESP %**	**SAR %**	**EC (dSm^{-1})**	**OM %**
	Coarse sand %	**Fine sand %**	**Silt %**	**Clay %**							
0- 30 cm	1.6	11.3	30.7	56.4	Clay	5.3	8.90	17.6	12.55	7.35	0.45
Soil depth	**Soluble cations ($mmol_cL^{-1}$)**				**Soluble anions ($mmol_cL^{-1}$)**				**Available NPK (mg/kg)**		
	Ca^{++}	Mg^{++}	K^+	Na^+	$CO^=_3$	HCO^-_3	Cl^-	So_4^{--}	N	P	K
0- 30 cm	16.4	13.7	3.6	40.4	0.8	1.9	42.0	29.4	29	6.3	225

Soil amendments were used as follow: ferrous sulfate (7Mg/fed), gypsum (5Mg/fed) and aluminum sulfate (6.5Mg/fed) were added to soil at rate of gypsum to reduced ESP to 10% as an acceptable level according to Richard, (1954). The amendments were applied to soil and mixed thoroughly with the upper 20 cm layer. The experiment was laid out in a split plot design with three replicates.

Sugar beet seeds were sown on 15 October, 2012. Plants were thinned to one plant/hill after 35 days from sowing. Other cultivation practices were carried out according to the traditional cultivation in the region. At maturity stage (15 May, 2013) three plants were chosen at random from the each plot to measure yield and yield components as follow, root fresh yield (t/fed), sugar yield (t/fed), total soluble solids (TSS %) in roots using hand refractometer, sucrose % it was determined polarimetrically on lead acetate extract of fresh macerated roots according to method of Carruthers and Oldfield, (1960). Juice purity was calculated as follows:

Purity % = (sucrose %/TSS %)*100

N, P and K % were determined after the wet digestion of dry root samples at harvest. Nitrogen was determined by microkjeldahl methods (Jackson, 1967). Phosphorous was determined by the methods described by Cooper (1977) using ammonium molybdate and ascorbic acid. Potassium was determined using flame photometer as described by Peterburgski, (1968). Surface soil samples (0–30 cm) were collected, air dried, ground, good mixed, sieved through a 2mm sieve and analyzed for some chemical properties and also its content of some macronutrients. Available ammonium and nitrate were extracted from the soil samples using 2M KCl, followed by steam distillation method (Keeney and Nelson, 1982). Available K was extracted with 1N ammonium acetate at pH 7.0. Potassium was determined using flame photometer. Available P was determined by Bray and Kurtz procedure (Bray and Kurtz, 1945).

RESULTS AND DISCUSSION

Sugar beet yield and its quality:

Data in Table (2) indicate that the root yield (t/fed), sugar yield (t/fed), TSS %, sucrose % and purity % were significantly increased by application of soil amendments compared to the control treatment. Ferrous sulfate was most effective in increasing the above mentioned parameters, also the differences between soil amendments were significant for root yield, sugar yield and purity %. These results may be due to application of soil amendment e.g., gypsum or some acids or acid formers due to application of iron sulfate and aluminum sulfate, which can solubilize the native $CaCO_3$ of the soil. These results were harmony with those obtained by Sabir *et al.,* (2007).

Application nitrogen in different sources, significantly affect the root and sugar yields, TSS%, sucrose% and purity %, whereas the superiority was for ureaformaldhyde. But the differences between ammonium sulfate and ammonium nitrate were insignificant. The increase in sugar yield due to ureaformaldhyde as a nitrogen source might be attributed to its increased the nutrients availability and improved efficiency uptake, thus increased crop growth rate resulted in raising root yield/fed which led to increasing sugar yield/fed, also the increase in root and sugar yield might be attributed to the main role of nitrogen in stimulating and raising plant growth and productivity, therefore increased yields of root and sugar per feddan. These results are in a agreement with recorded by El-Sarag (2008) and El-Hawary *et al.,* (2013).

Table 2: Effect of soil amendments, nitrogen sources and their interactions on root yield, sugar yield, TSS %, sucrose % and purity % of sugar beet.

Treatments		**Root Yield (t/fed)**	**Sugar Yield (t/fed)**	**TSS %**	**Sucrose %**	**Purity %**
Soil Amendments						
Control		3.453	0.582	17.87	12.81	71.78
Ferrous Sulfate		7.850	1.215	22.07	16.06	72.77
Gypsum		7.484	1.091	20.83	15.17	72.79
Aluminum Sulfate		7.750	1.173	21.83	15.72	72.03
LSD at 5%		0.038	0.002	0.007	0.165	0.793
Nitrogen Sources						
UF		7.459	1.187	21.23	15.41	72.51
$(NH_4)_2SO_4$		6.221	0.945	21.10	15.06	71.38
NH_4NO_3		6.223	0.913	19.63	14.34	73.15
LSD at 5%		0.029	0.002	0.004	0.088	0.501
Interaction (Soil Amendments*Nitrogen Sources)						
Control	UF	3.486	0.595	17.61	12.47	70.82
	$(NH_4)_2SO_4$	3.433	0.582	19.50	13.62	69.83
	NH_4NO_3	3.440	0.569	16.51	12.33	74.70
Ferrous Sulfate	UF	8.883	1.430	23.10	16.73	72.42
	$(NH_4)_2SO_4$	7.484	1.156	22.10	16.05	72.63
	NH_4NO_3	7.183	1.059	21.00	15.39	73.28
Gypsum	UF	8.684	1.321	21.50	15.84	73.66
	$(NH_4)_2SO_4$	6.783	0.984	20.50	15.17	73.99
	NH_4NO_3	6.984	0.968	20.50	14.50	70.72
Aluminum Sulfate	UF	8.784	1.404	22.70	16.61	73.15
	$(NH4)_2SO_4$	7.183	1.059	22.30	15.40	69.05
	NH_4NO_3	7.283	1.056	20.50	15.15	73.89
LSD at 5%		0.058	0.004	0.007	0.177	1.003

Concerning the interaction effect between nitrogen fertilizers at different sources and soil amendments on root yield, sugar yield, TSS % sucrose % and purity %, obtained results show significant effect. The maximum increase in this concern was recorded at ureaformaldhyde combined with ferrous sulfate (8.883t/fed root yield, 1.430t/fed sugar yield, 23.10%TSS and 16.73% sucrose). But the lowest values of these characters were detected from application of ammonium nitrate under control amendments. These results are in agreement with those obtained by Ghazy (2013).

N, P and K concentrations (%) in sugar beet roots:

Data in Table (3) reveal that application of soil amendments significantly increased N, P and K concentrations in roots of sugar beet. The obtained data show that applied aluminum sulfate was more pronounced effect on N %, while ferrous sulfate was more effective for P % and gypsum for K %. These results may be due to the role of aluminum sulfate enhancing some physical and chemical properties of soil, Daneshvar, *et al.,* (2013) found that the lowest amount of dispersible clay was measured in treatment with 75 kg ha^{-1} water soluble polymer + 75 kg ha^{-1} modified starch + 2% nano clay and along with aluminum sulfate equivalent to gypsum requirement of the soil. Also, in saline soil, high pH decreased availability and absorption other essential elements for growth, addition of sulfate in soil reduces pH that increased availability of other elements (Farmarzi *et al.,* 2006).

Table 3: Effect of soil amendments, nitrogen sources and their interactions on N, P and K concentrations at sugar beet roots.

Treatments		**N %**	**P %**	**K %**
Soil Amendments				
Control		2.48	0.334	2.75
Ferrous Sulfate		4.24	0.515	4.47
Gypsum		4.24	0.421	4.77
Aluminum Sulfate		4.73	0.482	4.27
LSD at 5%		0.121	0.038	0.018
Nitrogen Sources				
UF		4.21	0.481	4.05
$(NH_4)_2SO_4$		3.75	0.450	4.26
NH_4NO_3		3.82	0.383	3.87
LSD at 5%		0.074	0.014	0.012
Interaction (Soil Amendments*Nitrogen Sources)				
Control	UF	2.70	0.338	2.92
	$(NH_4)_2SO_4$	2.33	0.345	2.82
	NH_4NO_3	2.41	0.318	2.50
Ferrous Sulfate	UF	4.78	0.545	4.37
	$(NH_4)_2SO_4$	3.97	0.525	4.57
	NH_4NO_3	3.99	0.475	4.47
Gypsum	UF	4.48	0.475	4.77
	$(NH_4)_2SO_4$	4.10	0.433	5.27
	NH_4NO_3	4.15	0.355	4.27
Aluminum Sulfate	UF	4.88	0.565	4.17
	$(NH4)_2SO_4$	4.59	0.495	4.37
	NH_4NO_3	4.72	0.385	4.27
LSD at 5%		0.149	0.029	0.024

Application nitrogen in different sources significantly affect N, P and K % at sugar beet roots, where the superiority was for ureaformaldhyde. Also, data in Table 3 showed that application of soil amendments combination with different nitrogen sources increasing N, P and K % at sugar beet roots. Maximum N and P % were observed at interaction between aluminum sulfate as soil amendments and ureaformaldhyde as nitrogen fertilizer, while the highest K % was found at interaction between gypsum and ureaformaldhyde. These increases in N, P and K % could be attributed to enhanced availability of these nutrients due to improved soil structure and increased microbial activity. On the other hand, though quick release of nitrogen fertilizer is lost easily from salt affected soils, and hence can pollute the environment, so the controlled-release nitrogen fertilizer (N) is hard to be lost because of its slow release characteristics. Therefore, the utilization of this fertilizer is a significant means in establishing fertilization techniques preservative to the environment. Ureaform as Controlled-release nitrogen fertilizer has many advantages over conventional fertilizer, including reduction in labor with a single basal application and higher nitrogen uptake efficiency by crops (Shoji and Gandeza, 1992). It is also environment friendly in terms of reduction of fertilizer, N losses associated with leaching and denitrification (Ueno and Yamamuro, 1996).

Soil chemical properties:

The changes in EC values are shown in Table (4).The results indicated that a slight decrease occurred when different soil amendments applied individually or combined with different nitrogen sources in comparison to control and this decrease was significant. The best treatment was the combination of soil amendment, aluminum sulfate with nitrogen fertilizer, ammonium sulfate that recorded the lowest values of PH and ESP 7.62 and 10.07%, respectively. These results may be due to the improvement in porosity and hydraulic conductivity, which resulted in enhancing the leaching of salts, (Sharma *et al.,* 1982).

Data in Table (4) indicated that soil pH was significant decreased slightly in all the treatments as compared to the control. The maximum value reduction in soil pH was observed in the treatment, aluminum sulfate combined with ammonium sulfate. This result may be attributed to the removal of carbonates and bicarbonates of sodium to a greater extent after reclamation. The results are in agreement with those of Hussain *et al.,* (2001). Abdel-Fattah and Abd-El-Khader (2004) stated that the effect of sulfur application on decreasing soil pH is direct result of its oxidation to sulfuric acid and hence reducing soil alkalinity.

Also, data in Table (4) reveal the effect of soil amendments individually or combined with nitrogen sources on ESP. The data showed that the ESP values of soil decreased when compared with initial value before sowing. Whereas, interactions among soil amendments Ferrous sulfate, gypsum and aluminum sulfate with N fertilizer ureaformaldhyde significantly decreased the values of ESP by 31.25, 35.73 and 42.04%, respectively. This reduction could be due to replacement of Na as monovalent on the exchange complex by Ca^{+2} from the soil solution (Gharaibeh *et al*., 2009).

Table 4: Effect of soil amendments, nitrogen sources and their interactions on some soil chemical properties (EC, pH, ESP, $SO_4^=$ and Cl^-) after harvesting of sugar beet.

Treatments		**EC (dSm^{-1})**	**pH**	**ESP (%)**	**$SO_4^=$ (cmol/kg)**	**Cl^- (cmol/kg)**
Soil Amendments						
Control		7.12	7.98	13.86	25.50	36.71
Ferrous Sulfate		5.97	7.87	11.60	47.98	21.12
Gypsum		5.97	7.82	10.98	49.72	20.74
Aluminum Sulfate		5.99	7.69	10.12	52.34	17.86
LSD at 5%		0.077	0.007	0.096	0.002	0.734
Nitrogen Sources						
UF		6.04	7.89	11.89	40.03	21.25
$(NH_4)_2SO_4$		6.60	7.81	11.58	49.68	27.68
NH_4NO_3		6.15	7.83	11.45	41.96	23.39
LSD at 5%		0.054	0.005	0.038	0.001	0.408
Interaction (Soil Amendments*Nitrogen Sources)						
Control	UF	7.00	8.03	13.96	25.76	29.37
	$(NH_4)_2SO_4$	7.40	8.02	13.75	26.25	45.95
	NH_4NO_3	6.97	7.90	13.86	24.48	34.81
Ferrous Sulfate	UF	5.95	7.87	12.10	44.50	19.95
	$(NH_4)_2SO_4$	6.07	7.82	11.50	58.35	22.45
	NH_4NO_3	5.90	7.92	11.19	41.10	20.97
Gypsum	UF	5.55	7.87	11.31	46.83	19.28
	$(NH_4)_2SO_4$	6.70	7.76	10.98	56.15	22.98
	NH_4NO_3	5.65	7.82	10.66	46.17	19.95
Aluminum Sulfate	UF	5.65	7.77	10.20	43.01	16.38
	$(NH4)_2SO_4$	6.25	7.62	10.07	57.95	19.35
	NH_4NO_3	6.08	7.67	10.08	56.07	17.85
LSD at 5%		0.109	0.010	0.076	0.003	0.816

As shown in Table (4), application of amendments combination with nitrogen fertilizers to the soil significantly decreased Cl^- ions compared to the control. The treatment aluminum sulfate combined with ureaform caused the highest decrease in Cl^- concentration. Contrary, SO_4^{-2} was significantly increased with application of the same treatment to the soil.

Available N, P and K (ppm) in soil after sugar beet harvest:

Data presented in Table (5) indicate that the values of available macronutrients N, P and K were affected by application of different treatments. The application of soil amendments combinations with different nitrogen sources significantly increased availability of N, P and K compared with the control treatment. The highest values of available N, P and K were 95.8, 40.4 and 585 mg kg^{-1} due to application of ferrous sulfate + ureaform, gypsum + ureaform and gypsum + ammonium sulfate, respectively.

These results may be attributed to the application of soil amendments which have the source of SO_4^{-2} in an alkaline soil increased the availability of anions and cations and enhanced its content in soil comparison with soils without SO_4^{-2} application. Jose *et al.,* (2007) reported that sulphur application in soil increases anions and cations solubilization. Sulfate was found to have produced a stronger effect on soil pH than elementary sulfur (Jaggi *et al*., 1999). The presence of free sulphur acid in sulphur- rich soils creates favorable conditions for the release of phosphorus from compounds that are hardly soluble (Gądor and Motowicka-Terelak 1986).

Table 5: Effect of soil amendments, nitrogen sources and their interactions on availability N, P and K (ppm) in soil after harvesting of sugar beet.

Treatments		**Available Macronutrients (ppm)**		
		N	**P**	**K**
Soil Amendments				
Control		45.7	16.1	364
Ferrous Sulfate		82.8	20.7	554
Gypsum		69.6	32.8	578
Aluminum Sulfate		85.8	29.2	552
LSD at 5%		0.10	0.077	0.961
Nitrogen Sources				
UF		81.6	27.42	515
$(NH_4)_2SO_4$		70.4	25.28	513
NH_4NO_3		61.0	21.39	509
LSD at 5%		0.09	0.080	1.353
Interaction (Soil Amendments*Nitrogen Sources)				
Control	UF	43.4	15.4	364
	$(NH_4)_2SO_4$	47.8	16.2	367
	NH_4NO_3	46.0	16.7	360
Ferrous Sulfate	UF	95.8	22.4	564
	$(NH_4)_2SO_4$	82.8	20.4	551
	NH_4NO_3	69.8	19.2	546
Gypsum	UF	91.1	40.4	575
	$(NH_4)_2SO_4$	61.1	33.1	585
	NH_4NO_3	56.4	24.8	575
Aluminum Sulfate	UF	95.8	31.4	556
	$(NH4)_2SO_4$	89.8	31.3	548
	NH_4NO_3	71.8	24.8	553
LSD at 5%		0.19	0.161	2.706

conclusion

Finally, it can be concluded from the previous results that application of soil amendments (ferrous sulfate, gypsum and aluminum sulfate) with nitrogen sources (ureaformaldhyde, ammonium sulfate and ammonium nitrate) significantly affected on sugar beet yield and its contents, and improved some soil chemical properties that reflected on availability of nutrients. Whereas ferrous sulfate and ureaformaldhyde were more effective on sugar beet productivity in new reclaimed saline-sodic soils.

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تأثير محسنات التربة ومصادر السماد النيتروجيني على إنتاجية بنجر السكر النامي تحت ظروف الأراضي المتأثرة بالأملاح

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أجريت تجربة حقلية أثناء الموسم الشتوي لعام ٢٠١٢/٢٠١٣ على محصول بنجر السكر صنف جلوريا في ارض متأثرة بالأملاح مستصلحة حديثا، في مزرعة محطة بحوث الحسينية ، مركز البحوث الزراعية، محافظة الشرقية- مصر، لدراسة تأثير بعض محسنات التربة (الجبس ٥ميجاجرام/فدان ، سلفات الألومونيوم ٦.٥ميجاجرام/فدان وسلفات الحديدوز ٧ميجاجرام/فدان) وبعض مصادر السماد النيتروجيني (نترات الأمونيوم ٣٣.٥%ن، سلفات الأمونيوم ٢٠.٥%ن واليوريافورمالدهيد ٣٨%ن) على إنتاجية بنجر السكر وجودته ومحتوى الجذور من النيتروجين والفوسفور والبوتاسيوم وعلى خصوبة التربة وبعض خواصها الكيميائية بعد الحصاد، صممت التجربة كقطع منشقة فى ثلاث مكررات حيث كانت محسنات التربة القطع الرئيسية ومصادر النتروجين القطع المنشقة.

أشارت النتائج المتحصل عليها إلى ارتفاع كبير فى معظم قياسات محصول بنجر السكر وجودته (محصولي الجذر والسكر بالطن/فدان والنسب المئوية لكل من المواد الصلبة الكلية والسكر والنقاوة) مع إضافة محسنات التربة ومصادر التسميد النيتروجيني، حيث سجل التفاعل بين سلفات الحديدوز كمحسن تربة واليوريافورمالدهيد كمصدر نيتروجيني أعلى القيم لكل من محصول الجذر (8.883 طن/فدان) ومحصول السكر (1.430 طن/فدان) ونسبة المواد الصلبة (23.10%) ونسبة السكر (16.73%) فى الجذور على التوالي. وأيضا سجلت أعلي نسب لكل من النتروجين والفوسفور فى جذور بنجر السكر عند تفاعل اليوريافورمالدهيد مع سلفات الألومونيوم. كذلك توضح النتائج تحسن خصوبة التربة التى انعكست على زيادة الميسر من كل من النتروجين والفوسفور والبوتاسيوم مع الإضافة الفردية والمتداخلة لكل من محسنات التربة ومصادر السماد النيتروجيني، علاوة على ذلك توضح نتائج تحليل عينات التربة بعد الحصاد انخفاض معنوى فى قيم التوصيل الكهربائي و درجة الحموضة ونسبة الصوديوم المتبادل بالمقارنة مع القيم الأولية قبل الزراعة.

قام بتحكيم البحث

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