J. Soil Sci. and Agric. Eng., Mansoura Univ., Vol. 2 (6): 701 - 716, 2011

EFFECT OF CHICKEN MANURE AND GYPSUM ON SUGAR BEET (*Beta vulgaris*, VAR. SACCHARIFORA, L.) UNDER SALINE CONDITION

El-Agrodi, M.W.M.; T.M. El-Zehery, and Hasnaa L. Issa
Soils Dept; Faculty of Agriculture, Mansoura University.

ABSTRACT

A plastic bags trial was conducted at the Agric. Experimental Station of Mansoura University using sandy soil to study the effect of chicken manure levels (0, 5, 10, 15 and 20 tons/fed) and gypsum rates (0, 2.5, 5, 7.5 and 10 tons/fed) on nutrients uptake and yield of sugar beet plant irrigated with saline water. The experiment was conducted in a spilt plot design with three replicates during the two successive seasons 2007-2008 and 2008-2009

The Obtained results indicated that the yield of sugar beet roots increased significantly by adding chicken manure over the control. The highest level (20 tons/fed) gave 289.9 and 327.1 g/plant during first and second season, respectively. Also, the highest gypsum rate increased significantly root yield to be 307.15 and 341.77 g/plant during first and second season, respectively. Also, elements uptake such as N,P,K and Na were increased significantly over control due to supplying with either chicken manure or gypsum to a sandy soil. The same trend was found with the interaction effect of both treatments. Also, It could be recognized that chicken manure gave relatively higher increase in some characters than gypsum treatments.

Data also revealed that root quality parameters such as SC%, TSS%, purity and sugar yield significantly increased with chicken manure over the control by 26.67% and 27.86 for TSS%, 18.96% and 18.74% for SC% and 77.39 and 79.98 g/plant for sugar yield in the 1st and 2nd season, respectively. Whereas, purity as a quality parameter significantly decreased with increasing chicken manure and gypsum treatments due to uneventually increasing for Sc% and TSS% which was not in a harmony which reflecting in decreasing purity.

Generally, the interaction between chicken manure and gypsum revealed that the high rate of both chicken manure and gypsum treatments gave the highest root yield, elements uptake (N,P,K and Na) and sugar yield.

Keywords: Sugar beet, Chicken manure, gypsum, N, P, K and Na uptake, sucrose%, TSS% and sugar yield.

INTRODUCTION

The last two decades of the twenty century showed that Egypt suffers from a gap between the consumption and production of sugar which reaches, nearly 750,000 tons due to the drastic growth of the population (2.5% annually) as well as the change of sugar consumption patterns. The annual consumption of sugar amount enhanced to about 1.6 million tons. Approximately 60% of that amount produced locally and the rest imported which costs Egypt about 300 million dollars annually (Badawi, 1996).

Sugar beet crop in Egypt have a considerably higher sugar content compared with sugar cane. Moreover, the growth period of sugar beet is about half that of sugar cane. Furthermore, consumed water by sugar beet to

produce one ton of sucrose is about 1300 m3, whereas sugar cane plant needs about 4000 m^3 of water to produce the same quantity of sucrose.

Sugar beet being, often, the most important cash crop in the rotation, it leaves the soil in good conditions for the benefit of the following cereal crops. Sugar beet is considered the second sugar crop for sugar production in Egypt after sugar cane.

Recently, sugar beet crop has an important position in Egyptian crop rotation as a winter crop not only in fertile soils, but also in poor, saline, alkaline and calcareous soils. (El-Hawary, 1999).

Sugar beet uptake of macronutrients (especially N, P and K) is considerable because it helps in following the natural cycle of the elements. Moreover, the plant N, P and K balanced and harmonized requirements of a sugar beet crop could be estimated from the N, P and K uptake and hence maximum sugar beet yield could be approached (Wendenburg and Koch, 1996).

Ostrowska and Kucinska (1995) confirmed that organic fertilizers increased sugar beet yield more than mineral fertilizers. Bogomazov et.al., (1996) showed that adding manure at the rate of 50 t/ha had great effect on sugar beet crop with accounts about 70-75% of the total effectiveness.

Abd El-Gawad *et al.*, (1997) found that fresh and dry yields/fed were higher at 60m3 organic manure/fed. Moreover Tian *et al.*, (1994) reported that studying some elements uptake (e.g. N, P and K) helps in determination of sugar purity. Total soluble solids percentage (TSS %) was increased in roots by decreasing organic manure from 60 to 20 m3 /fed.

Al-Labbody (1998) stated that increasing farmyard manure from 4.01 to 9.6 t/fed significantly increased sucrose% and sugar yields. Kopczynski *et al.*, (1999) found that application of vermicompost increased the yield of roots and sugar and enhanced the content of sugar in roots. Zalat and Nemeat Alla (2001) confirmed that adding 6 tons farmyard manure/fed gave the highest values of sucrose% (SC%) and total soluble solids (TSS%).

Gazia (2001) found that farmyard manure significantly affected the root and shoot yields. Also Sugar yield significantly increased due to FYM at a rate of 20 t/fed, while the application of 5 tons gypsum/fed had no significant effect on root yield of sugar beet but slightly increased the shoot yield. Neither sugar yield nor sucrose concentration had considerable response to the application of gypsum.

The objectives of the present study are to study the effect of chicken manure (O) and gypsum (G) on dry weight, sugar beet yield, N, P, K and Na uptake, TSS% and root quality parameters as SC% and purity.

MATERIALS AND METHODS

A plastic bags trail was conducted at the Agric. Experimental Station of Mansoura University using sandy soil to study the effect of five chicken manure levels (0, 5, 10, 15 and 20 tons/fed) and five gypsum rates (0, 2.5, 5, 7.5 and 10 tons/fed) on nutrients uptake and yield of sugar beet plant. The experiment was conducted in a spilt plot design with three replicates during the two successive seasons of 2007-2008 and 2008-2009

Each experiment was arranged as 5 levels of chicken manure (0, 5, 10, 15 and 20 tons/fed) as main plot and 5 levels of gypsum (0, 2.5, 5, 7.5 and 10 tons/fed) devoted as sub-plot as well as their interactions. 75 polyethylene plastic bags 60 cm in diameter and 90 cm in length were used. Each pot was filled with 50 kg air dried sandy soil which was brought from the surface layer of Faculty of Agric. farm, Kalabsho, Dakahlia province. The recommended dose of NPK fertilizers (46 kg N/fed as urea, 31 kg P_2O_5/fed as Calcium super phosphate and 25 kg k_2O/fed as Potassium sulphate) were applied as a basal dose for all treatments. All treatments were irrigated with artificial saline water (using 20 gm commercial sodium chloride salt in 10 liter of tap water) till 100% field capacity of soil.

Some chemical and physical properties of the experimental soil are illustrated in Table 1 which were determined according to Jackson (1967), Hesse (1971) and Richards (1954).

Table 1: Some physical and chemical properties of the experimental soil during 2007-2008 and 2008-2009 seasons.

Soil characteristics	First Season 2007-2008	Second Season 2008-2009
Sand%	88	92.37
Silt%	8.85	5.37
Clay%	3.15	2.26
Texture Class	Sandy	Sandy
pH in 1:2.5 suspension	9.78	8.3
EC dS.m^{-1} in 1:5 extract	0.74	0.87
$CaCO_3$ %	0.40	0.44
Sp%	8.3	9.2
OM%	0.42	0.68
Soluble Cations (meq L^{-1})		
Ca^{++}	1.40	1.30
Mg^{++}	0.84	0.46
Na^{+}	4.95	6.75
K^{+}	0.17	0.14
Soluble Anions (meq L^{-1})		
$CO3^{--}$	-	-
$HCO3^{-}$	1.43	1.65
Cl^{-}	3.78	4.01
SO_4^{--}	2.15	2.99
Available nutrients mg/kg soil		
Nitrogen (N)	30.8	42.35
Phosphorus (P)	10.7	12.9
Potassium (K)	89	82

The analysis of saline water is illustrated in Table 2 for both seasons according to Hesse (1971), Richards (1954) and the analysis of chicken manure is illustrated in Table 3 for both seasons according to Hesse (1971) and Richards (1954).

Table 2: Some chemical properties of the irrigation water

Properties / Seasons	EC dSm^{-1}	pH	Soluble Anions (meq L^{-1})							
			Cation				Anion			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO3^{--}$	$HCO3^{-}$	Cl^{-}	SO_4^{--}
both seasons	4.07	8.09	3.24	1.40	35.79	0.27	_	2.42	36.20	2.08

Table 3: Chemical analysis of chicken manure before application in the two seasons

Properties / Seasons	EC dSm^{-1}	pH	%			C/N	%		
			O.M	C	N		P	K	Na
1st	5.48	8.56	70.1	40.7	3.36	12.1	0.21	1.82	3.12
2nd	5.39	8.49	59.6	34.7	2.55	13.6	0.25	1.79	3.18

The yield was harvested after 7 months of sowing, root and shoot samples were cleaned with distilled water then dried at 70°C, then yield component such as dry weight of root/plant in gm was determined. To analyze macro nutrients in crop organs, plant samples were ground using stainless steel equipment, from each sample; 0.2 g was digested using mixture of (H_2SO_4) and ($HClO_4$) as described by Petrerburgski, (1968).

Total nitrogen (%) was determined by kjeldahl method as forementioned by (Hesse, 1971). Total phosphorus was determined calorimetrically at a wavelength of 882 nm using (Olsen, and Sommers. 1982). Total sodium and potassium was determined using a flame photometer as described by Jackson (1967).

Sucrose percentage (%)(as a parameter for root quality) was determined polarmetrically on lead acetate extract of fresh macerated of Lee-Docte (1927). Total soluble solids (TSS %) was measured in the fresh roots by using hand refractometer method according to A.O.A.C.(1990). Sugar yield was calculated by multiplying root yield ($gm.plant^{-1}$) by sucrose%. Purity% was calculated according to Carruthers *et al.*, (1962).Apparent purity% =(Sucrose% * TSS%)/100

Statistical analysis

Analysis of variance for the obtained data was carried out and significant differences among the means of treatments according to Steel & Torrie (1980) using CoState programmer

RESULTS AND DISCUSSION

Yield and nutrients uptake:

Data in Table 4 show that yield of sugar beet roots was high significantly responded to chicken manure in both seasons. The highest value was 289.9 and 327.1 gm/plant obtained as a result of adding 20 ton chicken manure in the 1st and 2nd seasons, respectively. The increasing percentages of dry weight due to applying 20 ton/fed were 40.27% and 50.38% compared to control. This may be due to the nutrients release so, increasing its availability, aggregate stability and increasing water holding capacity which significantly increased root yield, this result is in accordance with Yanagisawa *et al.*, (1988), Abou-Bakr and El-Maghraby (1994), Al-Labbody (1998) and Gazia (2001).

Data in Table 4 show also that gypsum treatments significantly increased sugar beet's root dry weight in both seasons. The highest value was 307.15 and 341.77 gm/plant with adding 10 ton gypsum in the 1st and 2nd season, respectively, the increase in dry weight due to adding 10 ton/fed of gypsum represent 68.22% and 94.55% compared to control (without

gypsum). These results may be due to that gypsum addition improved root growing conditions and subsequently gypsum may have indirect but positive effects on crop yields (Toma *et al.*, 1999 and Ritchey and Snuffer, 2002).

Table 4: Effect of gypsum and chicken manure on root dry weight (gm.plant^{-1}) ,N and P uptake mg/plant in root and shoot of sugar beet at harvesting stage in both seasons (2007-2008) and (2008-2009).

Characters / Treatments	root dry weight g/plant		N uptake mg/plant				P uptake mg/plant			
			1st season		2nd season		1st season		2nd season	
	1st seasson	2nd season	Shoot	Root	Shoot	Root	Shoot	Root	Shoot	Root
A- chicken manure levels										
Control	206.6 e	217.5 e	66.11 e	517.3 e	90.33 e	570.7 e	5.153 e	34.82 e	7.817 e	35.08 e
5 ton/fed	224.4 d	238.8 d	98.76 d	612.3 d	134.7 d	680.7 d	6.832 d	39.96 d	10.75 d	52.96 d
10 ton/fed	242.8 c	257.1 c	138.3 c	706.6 c	174.9 c	763.5 c	9.909 c	44.25 c	11.92 c	68.65 c
15 ton/fed	264.1 b	276.1 b	153.4 b	814.1 b	191.7 b	865.9 b	11.20 b	56.37 b	13.20 b	77.34 b
20 ton/fed	289.9 a	327.1 a	223.1 a	945.2 a	219.8 a	1134.6 a	14.49 a	65.53 a	15.45 a	98.22 a
F test	**	**	**	**	**	**	**	**	**	**
LSD at 5%	10.62	10.6	4.581	41.94	5.029	41.89	0.1894	2.048	0.211	3.626
B- gypsum rates										
Control	182.59 e	175.67 e	89.54 e	432.02 e	108.6 e	427.5 e	4.739 e	26.61 e	4.991 e	35.46 e
2.5 ton/fed	214.39 d	209.89 d	111.5 d	590.82 d	135.2 d	590.5 d	6.564 d	33.20 d	9.421 d	47.21 d
5 ton/fed	247.95 c	287.57c	130.2 c	722.63 c	159.1 c	872.9 c	9.728 c	43.99 c	11.07 c	71.52 c
7.5 ton/fed	275.73 b	301.74 b	161.2 b	850.28 b	189.4 b	964.8 b	12.022 b	59.63 b	15.22 b	80.06 b
10 ton/fed	307.15 a	341.77 a	187.1 a	999.71 a	218.9 a	1159 a	14.525 a	77.48 a	18.41 a	97.99 a
F test	**	**	**	**	**	**	**	**	**	**
LSD at 5%	19.67	14.33	3.149	63.96	6.413	39.46	0.1684	4.068	0.179	3.562

- N and P uptake

As shown from data presented in Table 4, organic manure had significant effect on N uptake in shoot and root of sugar beet at harvesting stage in both seasons, the highest value of N uptake by shoot was 223.1 and 219.8 mg/plant resulted from adding 20 ton chicken manure/fed in the 1st and 2nd season, respectively, the same trend was found with N uptake by root of sugar beet at harvesting stage in 1st and 2nd seasons, the highest value was 945.2 and 1134.6 mg/plant obtained with adding 20 ton chicken manure in per feddan in 1st and 2nd season, respectively. The increasing percent of N uptake in root with the highest level of organic treatments were 82.70% and 98.80% compared to control (without chicken manure).

P uptake also was increased significantly in shoot of sugar beet at harvesting stage in both seasons due to increasing the applied level of chicken manure. The highest value was 14.48 and 15.45 mg P/shoot plant with adding 20 ton chicken manure in the 1st and 2nd season, respectively, whereas the value of P uptake by root was 65.53 and 98.22 mg/plant with adding 20 ton chicken manure in the 1st and 2nd season, respectively, the increasing percent of P uptake in root were 88.19% and 179.9% compared to control. This increase in N and P uptake in sugar beet plants may be due to (1) higher available and mineralizable N in manure, and (2) the presence and availability of all plant nutrients in manure. . This result is in accordance with

Sharif and Eghbal (1994), Neeteson (1995), Covertini *et al.* (1995), Gazia (2001) and Valtcho *et al.*, (2006).

Data presented in Table 4 reveal also that increasing gypsum application increased rate to a sandy soil, led to significant increases in N and P uptake by sugar beet organs. Hence, it can be assumed that several direct and indirect effects of gypsum contributed to the increased N and P uptake relative to the control, it was found that the highest N uptake in shoot of sugar beet at harvesting stage was 187.1 and 218.9 mg/plant with adding 10 ton gypsum in the 1st and 2nd season, respectively. The increasing percent of N uptake in shoot with gypsum treatments are 109.04% and 101.5% compared to control G0 (without gypsum). In the case of N uptake by root of sugar beet at harvesting stage in both seasons, it was found that the highest value was 999.71 and 1159.0 mg/root plant due to the addition of 10 ton gypsum in the 1st and 2nd season, respectively, this increase in N uptake in root with gypsum treatments represented 131.41% and 171.19% compared to control G0 (without gypsum).

Data in Table 4 show that gypsum affected P uptake by shoot of sugar beet at harvesting stage in both seasons. The highest value were 14.53 and 18.41 mg/shoot plant with G4 (10 ton gypsum per feddan) in the 1st and 2nd season, respectively, The increase represented 206.46% and 268.89% compared to control G0 (without gypsum). Data in Table 4 reveal the significant effect of increasing gypsum rate on P uptake by sugar beet root at harvesting stage in both seasons. The highest values were 77.48 and 97.99 mg/plant root obtained under G4 treatment (10 ton gypsum) in the 1st and 2nd season, respectively. This increase in P uptake in root with gypsum treatments represented 191.18% - 176.33% compared to control G0 (without gypsum). These results may be attributed to that the gypsum improved the soil conditions to be more suitable for growing of sugar beet roots with increasing quality. This result is in agreement with those obtained Neeteson (1995), A probable explanation would be that gypsum improves overall soil chemical and biological properties (Sharif and Eghbal 1994; Simon 1994;, Bellido *et al.*, 1994; Covertini *et al.*, 1995; Toma *et al.*, 1999; Gazia, 2001 and Valtcho *et al.*, 2006).

The interactions between organic manure and gypsum treatments have a highly significant positive effect in root dry weight (Fig. 1 and 2) in both seasons. The highest values were 384.82 and 442.32 gm/plant with O4*G4 (20 ton chicken manure and 10 ton gypsum) in 1st and 2nd season, respectively. This result may be due to improving root growing conditions under sandy soil. This result is in accordance with Yanagisawa *et al.*, (1988), Abou-Bakr and El-Maghraby (1994), Al-Labbody (1998), Toma *et al.*, (1999), Gazia (2001) and Ritchey and Snuffer (2002).

Interactions between organic manure and gypsum treatments have a highly significant increasing in N uptake in root plant Figs 3 and 4 in both seasons the highest value was 1687.8 and 1997.3 mg/plant with O4*G4 (20 ton chicken manure with 10 ton gypsum) in 1st and 2nd seasons respectively.

The interactions between organic manure and gypsum treatments gave a highly significant increase in N uptake by root plant (Fig 3 and 4) in both seasons.

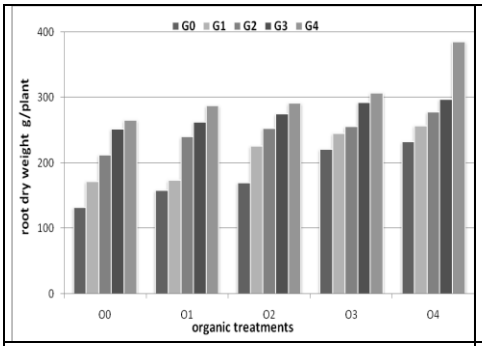

Fig (1): interaction Effect of organic manure and gypsum on root dry weight gm/plant of sugar beet at harvesting stage in first season (2007-2008).

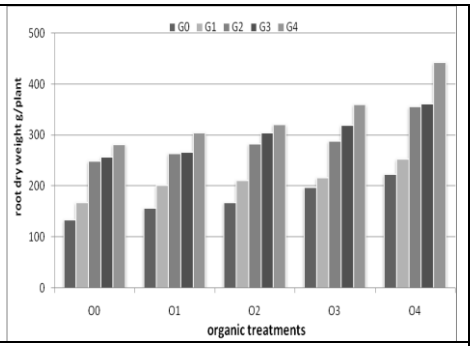

Fig (2): interaction Effect of organic manure and gypsum on root dry weight gm/plant of sugar beet at harvesting stage in second season (2008-2009).

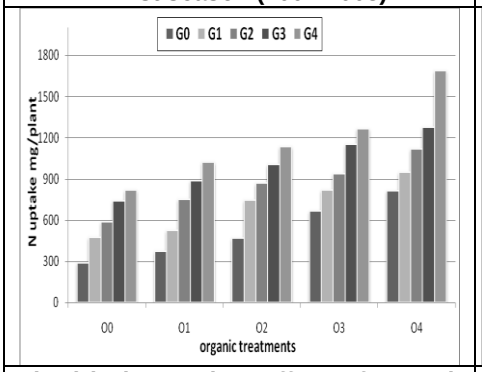

Fig (3): interaction Effect of organic manure and gypsum on N uptake mg/plant of sugar beet at harvesting stage in first season (2007-2008).

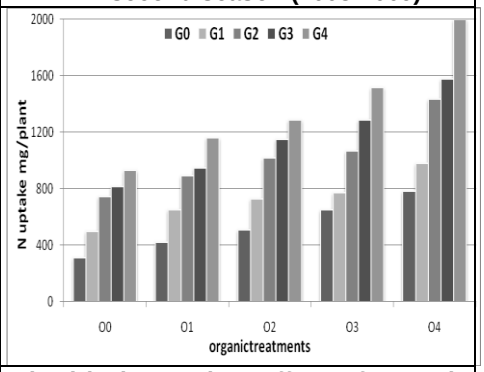

Fig (4): interaction Effect of organic manure and gypsum on N uptake mg/plant of sugar beet at harvesting stage in second season (2008-2009).

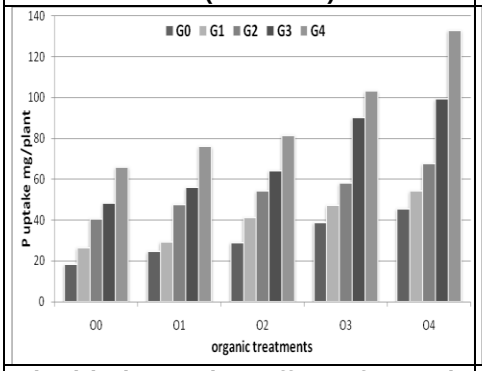

Fig (5): interaction Effect of organic manure and gypsum on P uptake mg/plant of sugar beet at harvesting stage in first season (2007-2008).

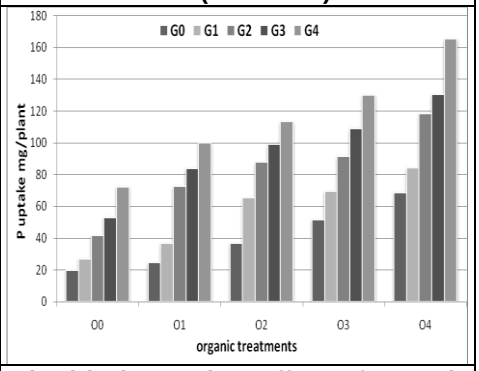

Fig (6): interaction Effect of organic manure and gypsum on P uptake mg/plant of sugar beet at harvesting stage in second season (2008-2009).

The highest value were 1687.8 and 1997.3 mg/plant with O4*G4 (20 ton chicken manure with 10 ton gypsum) in 1st and 2nd season, respectively. Whereas the interactions between organic manure and gypsum treatments induced highly significant increase in total P uptake (Fig 5 and 6) in both seasons. The highest values were 133.07 and 165.63 mg/plant with O4*G4 (20 ton chicken manure with 10 ton gypsum) in 1st and 2nd season, respectively. Chicken manure could be a good source for nutrients while gypsum may be a good soil amendment in improving soil properties, hence affecting nutrients availability. These results are in accordance with Neeteson (1995), Covertini *et al.* (1995), Sharif and Eghbal (1994), Simon (1994), Bellido *et al.* (1994) and Gazia (2001).

-K and Na uptake:

As observe from data in Table 5, chicken manure significantly increased K uptake by shoot of sugar beet at harvesting stage in both seasons. The highest value were 169.0 and 160.5 mg/plant with O4 (20 ton chicken manure per feddan) in the 1st and 2nd season, respectively. The increase of K uptake in shoot at 1st and 2nd season, repreented 202.88% and 96.30% over the value of control O0 (without organic manure). The same trend was found for K uptake by root as influenced by chicken manure in both seasons. The highest values were 776.1 and 915.5 mg/plant with O4 (20 ton chicken manure) in the 1st and 2nd season, respectively, The increasing percent of K uptake by root at 1st and 2nd season, were 85.13%, and 110.87% compared to control O0 (without chicken manure).

Table 5: Effect of gypsum and chicken manure on K and Na uptake, mg/plant, by root and shoot of sugar beet at harvesting stage in both seasons (2007-2008) and (2008-2009).

Characters / Treatments	K uptake mg\plant				Na uptake mg\plant			
	1st season		2nd season		1st season		2nd season	
	Shoot	Root	Shoot	Root	Shoot	Root	Shoot	Root
A- chicken manure levels								
Control	55.81 e	419.2 e	81.77 e	434.2 e	97.94 e	568.4 e	118.4 e	593.0 e
5 ton/fed	76.7 d	475.3 d	109.6 d	533.7 d	130.5 d	646.5 d	152.9 d	686.7 d
10 ton/fed	105.5 c	553.0 c	122.8 c	633.5 c	176.6 c	737.4 c	166.1 c	767.7 c
15 ton/fed	138.5 b	655.0 b	138.2 b	716.4 b	200.7 b	832.3 b	181.6 b	872.7 b
20 ton/fed	169.0 a	776.1 a	160.5 a	915.5 a	235.5 a	962.5 a	212.8 a	1084.5 a
F test	**	**	**	**	**	**	**	**
LSD at 5%	3.089	24.37	2.916	32.38	3.461	32.8	3.35	36.55
B- gypsum levels								
Control	70.69 e	357.61 e	83.06 e	362.3 e	130.06 e	499.14 e	118.06 e	485.3 e
2.5 ton/fed	89.45 d	460.03 d	106.3 d	462.6 d	148.52 d	618.42 d	148.7 d	605.2 d
5 ton/fed	106.36 c	563.61c	121.07 c	696.3 c	163.80 c	748.73 c	166.1 c	862.5 c
7.5 ton/fed	127.80 b	678.97 b	140.4 b	775.8 b	188.68 b	866.48 b	187.9 b	941.7 b
10 ton/fed	151.28 a	818.32 a	161.9 a	936.2 a	210.25 a	1014.2 a	210.9 a	1109 a
F test	**	**	**	**	**	**	**	**
LSD at 5%	3.595	43.38	2.193	39.96	3.443	60.41	2.496	45.59

Data in Table 5 indicate that Na uptake by shoot was significantly increased by increasing the level of the applied chicken manure in both seasons. The highest values were 235.5 and 212.8 mg/plant with O4 (20 ton/ fed) in the 1st and 2nd season, respectively, The increasing percent of Na

uptake by shoot were 140.5%, and 79.7% compared to control O0 (without organic manure). Also sugar beet root gave the same trend in its response for increasing the level of chicken manure, in both seasons. The highest values were 962.5 and 1084.5 mg/plant with O4 (20 ton/ fed) in the 1st and 2nd season, respectively. The increasing percent of Na uptake by root were 69.32% and 82.87%compared to control O0 (without organic manure). These results could be due to the ability of organic matter to release and maintain nutrients in soil around rhizosphere especially in a closed system.

Concerning gypsum effect it gives a significant increase in K uptake by shoot in both seasons. The highest values were 151.28 and 161.9 mg/plant with G4 (10 ton gypsum/fed) in the 1st and 2nd season, respectively. The increasing percent of K uptake by shoot were 114%, and 94.93%, compared to control G0 (without gypsum). Data in Table 5 show also that K uptake by root increased in both seasons with increasing the addition rate of gypsum/fed, The highest values were 818.32 and 936.2 mg/plant with G4 (10 ton gypsum/fed) in the 1st and 2nd season, respectively,

Also there was a significant increase in Na-uptake by shoot of sugar beet with increasing gypsum rate till 10 ton/fed. The highest values were 210.25 and 210.9 mg/plant with G4 (10 ton gypsum) in the 1st and 2nd season, respectively. The same trend was found with Na-uptake by root of sugar beet in both seasons the highest values were 1014.2 and 1109 mg/plant with G4 (10 ton /fed) in the 1st and 2nd season, respectively. The increasing percent of Na uptake by sugar beet root were 103.21% and 128.62% compared to control G0 (without gypsum). These results may be due that gypsum improve soil conditions to be more suitable for growing sugar beet roots hence increasing yield and elements uptake. These results are in accordance with Sharif and Eghbal (1994), Simon (1994), Neeteson (1995), Covertini *et al.*, (1995), Bellido *et al.*, (1994) and Gazia (2001).

Figs 7 and 8 show that the interactions between organic manure and gypsum treatments induced highly significant increases in total K uptake by plant in both seasons. The highest values were 1402.6 and 1548.3 mg/ plant with O4*G4 (20 ton chicken manure with 10 ton gypsum) in the 1st and 2nd season, respectively.

The interactions between organic manure and gypsum treatments have a highly significant positive effect in total Na uptake (Figs 9 and 10) in both seasons. the highest values were 1660.6 and 1858 mg/plant with O4*G4 (20 ton chicken manure with 10 ton gypsum) in the 1st and 2nd season, respectively. These results could be due to facilitating nutrients release and absorption and also due to gypsum effect in improving soil conditions to be more suitable for growing sugar beet roots hence increasing yield and nutrients uptake. This result is in accordance with Neeteson (1995), Covertini *et al.*, (1995), Sharif and Eghbal (1994), Simon (1994), Bellido *et al.*, (1994) and Gazia (2001).

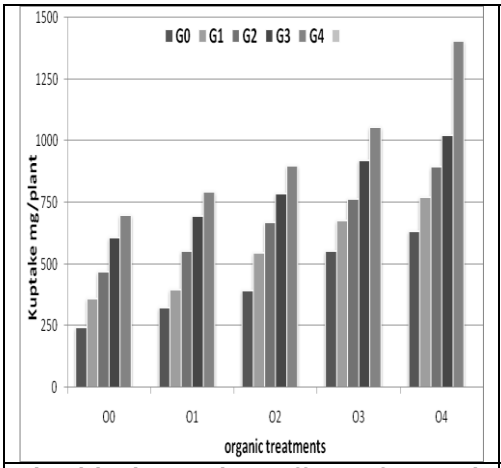

Fig (7): interaction Effect of organic manure and gypsum on K uptake mg/plant of sugar beet at harvesting stage in first season (2007-2008).

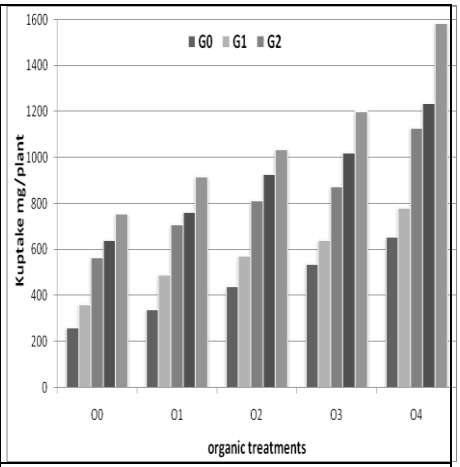

Fig (8): interaction Effect of organic manure and gypsum on K uptake mg/plant of sugar beet at harvesting stage in second season (2008-2009).

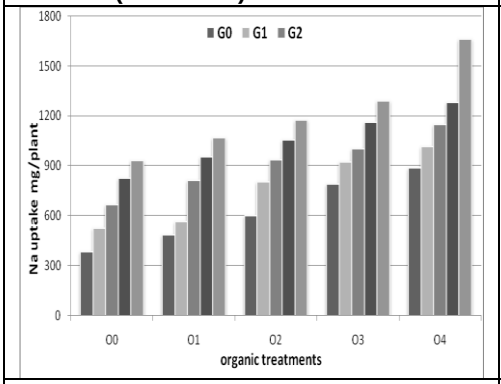

Fig (9): interaction Effect of organic manure and gypsum on Na uptake mg/plant of sugar beet at harvesting stage in first season (2007-2008).

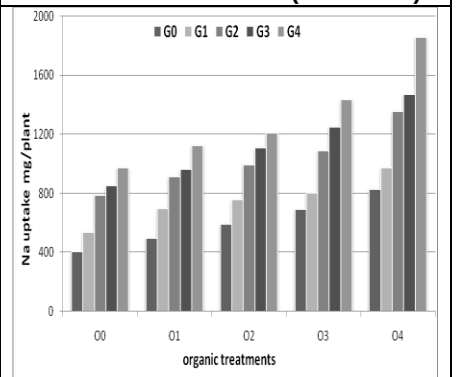

Fig (10): interaction Effect of organic manure and gypsum on Na uptake mg/plant of sugar beet at harvesting stage in second season (2008-2009).

-Sugar yield, TSS%, SC% and purity:

As Observed in Table 6, chicken manure treatments have a highly positive significant effect on TSS% in root plant in both seasons the highest values were 26.66 and 27.86% with O4 (20 ton chicken manure) in the 1st and 2nd season, respectively, The increasing percent of TSS% with organic treatments were 56.25% and 62.65% compared to control O0 (without organic manure). Organic manure treatments have a highly significant increasing effect in SC% in root plant in both seasons. The highest values were 18.96 and 18.74% which obtained under the treatment of (20 ton chicken manure) in the 1st and 2nd season, respectively. Data in Table 6 also

indicate that organic manure treatments induced a highly significant increasing effect on sugar yield in root plant in both seasons. The highest values were 77.39 and 79.98 gm/plant resulted from the treatment of (20 ton chicken manure) in the 1st and 2nd season, respectively. The increasing percent of sugar yield due to the highest organic treatments were 86.37 %and 108.62% compared to control O0 (without organic manure). These results are in accordance with Abd El-Gawad *et al.*, (1997); Al-Labbody (1998); Ramadan and Hassanin (1999); Zalat and Nemeat Alla (2001) and Gomaa *et al.*, (2005), Leilah *et al.*, (2005).

Table 6: Effect of gypsum and chicken manure on TSS%, SC% and sugar yield g/plant and tons/fed in root of sugar beet at harvesting stage in both seasons (2007-2008) and (2008-2009).

Characters / Treatments	TSS%		SC% in root plant		sugar yield g/plant		Purity	
	1st seasson	2nd season	1st seasson	2nd season	1st seasson	2nd season	1st seasson	2nd season
A- chicken manure levels								
Control	17.07 e	17.13 e	15.69 e	14.44 e	41.52 e	38.33 e	92.719	86.239
5 ton/fed	19.73 d	19.13 d	17.07 d	15.23 d	48.37 d	43.75 d	87.311	81.316
10 ton/fed	22.13 c	21.33 c	17.96 c	16.45 c	55.60 c	52.38 c	82.131	78.439
15 ton/fed	24.4 b	24.73 b	18.46 b	17.59 b	65.24 b	63.98 b	76.15	72.292
20 ton/fed	26.66 a	27.86 a	18.96 a	18.74 a	77.39 a	79.98 a	71.509	68.531
F test	**	**	**	**	**	**	**	**
LSD at 5%	0.4509	0.4763	0.2246	0.1767	0.706	0.6936	1.908	1.975
B- gypsum levels								
Control	17.73 e	16.66 e	15.43 e	14.62 e	38.65 e	32.21 e	88.40 a	89.29 e
2.5 ton/fed	19.66 d	19.06 d	16.25 d	15.51 d	45.73 d	40.31 d	84.13 b	82.89 d
5 ton/fed	21.8 c	21.60 c	17.58 c	16.43 c	57.59 c	60.05 c	82.05 c	76.96 c
7.5 ton/fed	23.93 b	25.26 b	18.76 b	17.41 b	67.84 b	67.53 b	79.53 d	69.93 b
10 ton/fed	26.86 a	27.6 a	20.11 a	18.46 a	78.94 a	78.33 a	75.70 e	67.72 a
F test	**	**	**	**	**	**	**	**
LSD at 5%	0.5369	0.4293	0.3378	0.2668	1.189	0.9071	1.575	1.402

Gypsum treatments induced a highly significant increase in TSS% in root plant in both seasons the highest values were 26.86 and 27.6% resulted from the application of 10 ton gypsum/fed in the 1st and 2nd season, respectively. Also, data in Table 6 reveal that gypsum treatments have a high significantly increased SC% in root plant in both seasons. The highest value were 20.11 and 18.46% induced from application of 10 ton gypsum/fed. Concerning sugar yield, gypsum treatments have a high significantly increased sugar yield in both seasons. The highest values were 78.94 and 78.33 g/plant under the treatment of 10 ton gypsum/fed in the 1st and 2nd season, respectively. The increasing percent of sugar yield with gypsum treatments were 104.21% and 143.15% over control G0 (without gypsum).

The interactions between organic manure and gypsum treatments have a highly significant increasing effect in TSS% (Figs 11 and 12) in root plant in both seasons. The highest values were 32 and 35.33% with O4*G4 (20 ton chicken manure with 10 ton gypsum) in 1st and 2nd season, respectively. Also Figs 13 and 14 show the interactions between organic

manure and gypsum treatments which gave highly significant increases in SC% in root plant in both seasons. The highest values were 21.41 and 21.51% with O4*G4 (20 ton chicken manure with 10 ton gypsum) in 1st and 2nd season, respectively. This result could be due to the interaction between organic manure with gypsum on soil granules cohesion and facilitating elements absorption by plant. This result is in accordance with Patterson and Watson (1960) and Eck *et al.* (1990).

Figs 15 and 16 show the interactions effect between chicken manure and gypsum on sugar yield g/plant in sugar beet root at harvesting stage in the 1st and 2nd season, respectively. Highly significant effect was found from the interaction between organic manure and gypsum in both seasons.

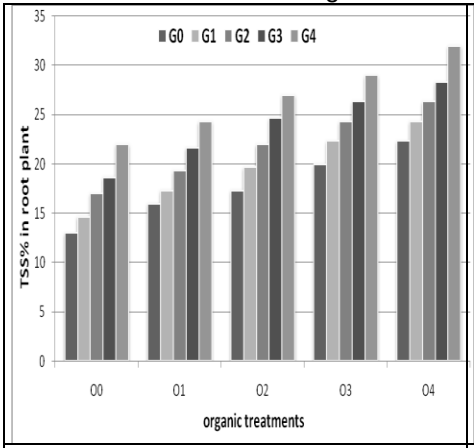

Fig (11): interaction Effect of organic manure and gypsum on TSS% in root of sugar beet at harvesting stage in first season (2007-2008).

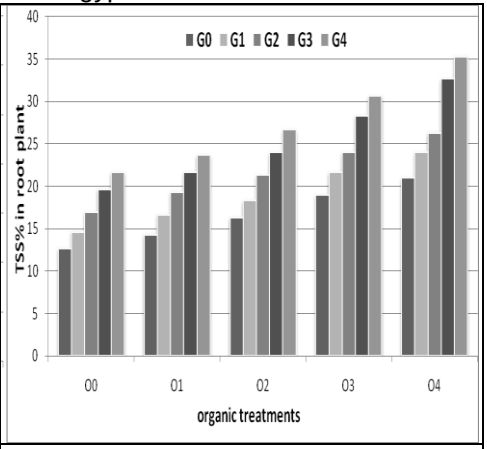

Fig (12): interaction Effect of organic manure and gypsum on TSS% in root of sugar beet at harvesting stage in second season (2008-2009).

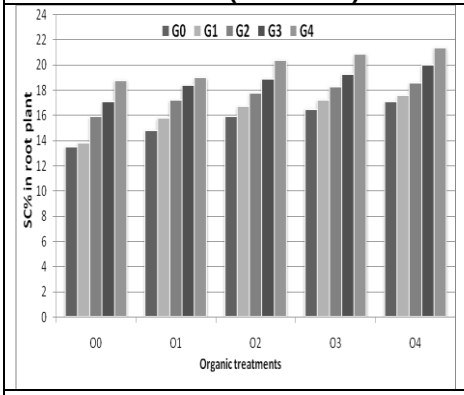

Fig (13): interaction Effect of organic manure and gypsum on SC% in sugar beet root at harvesting stage in first season (2007-2008).

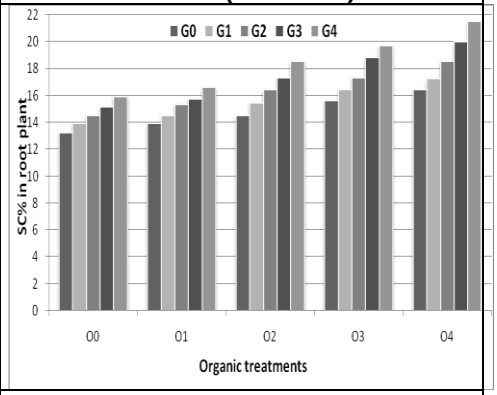

Fig (14): interaction Effect of organic manure and gypsum on SC% in sugar beet root at harvesting stage in second season (2008-2009).

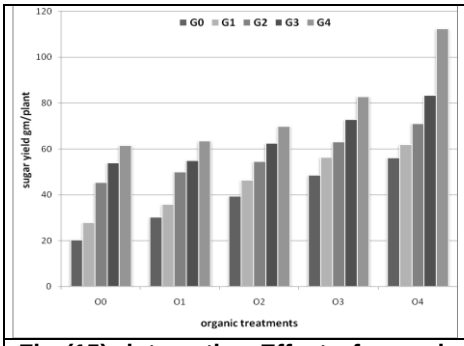

Fig (15): interaction Effect of organic manure and gypsum on sugar yield gm/plant in sugar beet root at harvesting stage in first season (2007-2008).

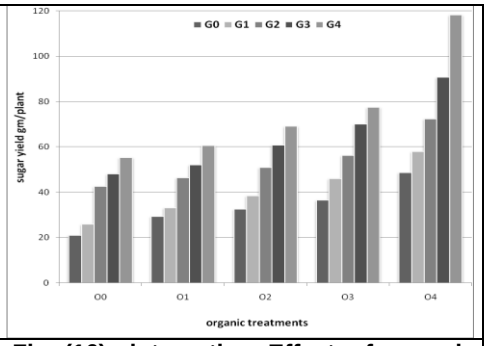

Fig (16): interaction Effect of organic manure and gypsum on sugar yield gm/plant in sugar beet root at harvesting stage in second season (2008-2009).

The highest values were 112.4 and 118.3 gm/plant with O4*G4 (20 ton chicken manure with 10 ton gypsum) in 1st and 2nd season, respectively. On the contrast purity decreased significantly with increasing either chicken manure or gypsum treatments this May be due to TSS% and SC% did not increase in the same pattern. This result is in accordance with Eck *et al.* (1990) and Patterson and Watson (1960).

Conclusions

In conclusion using high applications of chicken manure and gypsum could be adequate source for increasing sugar beet yield and nutrients uptake due to their nutrients release and content with regards to saline conditions and poor soil properties.

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تأثير سماد الدواجن والجبس على بنجر السكر تحت الظروف الملحيه.

محمد وجدى محمد العجرودى, طارق محمد الزهيري و حسناء لقمان عيسى .
قسم علوم الأراضي ، كلية الزراعة ، جامعة المنصورة .

نفذت تجربتي أكياس بلاستيك في محطة البحوث الزراعية– جامعة المنصورة باستخدام أرض رملية بهدف دراسة تأثير معدلات من سماد الدواجن (20,15,10,5,0 طن/فدان) ومستويات الجبس (0 ، 2.5 ، 5.0 ، 7.5 ، 10طن/فدان) على محتوى العناصر ومحصول بنجر السكر تحت ظروف الرى بمياه ملحية. وقد تم تنفيذ التجربتين في تصميم تجريبى قطع منشقة مرة واحدة فى ثلاث مكررات حيث تمثلت القطع الرئيسية فى السماد العضوى بينما كانت القطع المنشقه مستويات الجبس خلال موسمى شتاء 2007-2008 و2008-2009.

وتشير النتائج إلى أن محصول جذر بنجر السكر ازداد بصورة معنوية باضافة سماد الدواجن مقارنة بالكنترول حيث كان أعلى محصول 289.9 ، 327.1 جم/نبات خلال الموسم الأول والثانى على الترتيب ؛ كذلك أعطى أعلى مستوى جبس زيادة معنوية فى محصول جذر بنجر السكر ليكون 307.15 ، 341.77 جم/نبات خلال الموسم الأول والثانى على الترتيب. كما زاد امتصاص العناصر (نيتروجين-فسفور-بوتاسيوم-صوديوم) بالنبات زيادة معنوية عن الكنترول مع الامداد بكلا من سماد الدواجن والجبس. كذلك وجد نفس التأثير مع التفاعل بين كلا العاملين . كان لمعاملات سماد الدواجن تاثير نسبى اكبر عن معاملات الجبس فى كثير من صفات المحصول .

بالنسبة لبعض صفات الجودة للجذر مثل %للسكروز(SC%) و% للمواد الصلبة الكلية (TSS%) و% للنقاوة ومحصول السكر فقد زادت %للمواد الصلبة الكلية معنويا مع اضافة سماد الدواجن فاصبحت 26.67% ، 27.86% بالموسم الأول والثانى على التوالى واصبحت SC% 18.96 ، 18.74 بينما مع محصول السكر اعطى 77.39، 79.98 جم/نبات فى الموسم الأول والثانى على الترتيب. بينما % للنقاوة كاحد مقاييس جودة بنجر السكر قد انخفضت معنويا مع زيادة مستويات عاملى سماد الدواجن والجبس وقد يرجع ذلك للزيادة الغير متساوية لكل من SC% و TSS% والتى لم تكن بنفس المعدل مما ادى الى نقص النقاوة .

عموما أظهر التفاعل بين عاملى سماد الدواجن والجبس أن أعلى معدل منهما أعطى أعلى محصول بنجر ، وامتصاص للعناصر وكذلك اكبر محصول سكر.

قام بتحكيم البحث

أ.د / زكريا مسعد الصيرفي	**كلية الزراعة – جامعة المنصورة**
أ.د / أحمد عثمان محمد عبد النبي	**مركز البحوث الزراعية**