Egypt. J. Soil Sci. 45, No. 3, pp. 279 - 296 (2005)

Response of Sugar Beet and Corn Crops to Saw-dust Compost and Farmyard Manure with Combination of N Sources: I. In Relation to the Effective Properties of a Calcareous Soil

M.A. Negm, A.A.M. Mohammedein, R.N. Zaki and A.I.A. Elmeneasy
Soils, Water and Environment Research Institute, Agricultural Research Center, Cairo, Egypt.

IN A FIELD trial at Noubaria, where the soil is normal calcareous one having a sandy clay loam texture, locally composted saw-dust (SDC) at rates 4and 8 ton was compared with 12 ton farmyard manure (FYM) both were in combination with diluted HNO_3, urea or slow-release N compound named Enciabien at 20 kg N/fed. rate. During two successive seasons, sugar beet and corn were cropped to study the direct and residual effects of the organic manures on the role of soil through 10 months and crop yields.

The obtained results indicated that yield of sugar beet roots increased significantly by manuring over the control without differences between the 3 manure treatments, while the 8 level of SDC was the only significantly effective on increasing corn grain yield over the control and FYM. Nitrogen sources did not effect on sugar beet roots but either of urea or Enciabien. was significantly the highest .However, Enciabien was the lowest in case of corn. The ratio of root/shoot in sugar beet was significantly affected with the higher rate of SDC over FYM and control while N sources were as the same as control .Weight of 100 grains increased significantly with the higher rate of SDC and FYM over the lowest SDC rate and control. Urea and Enciabien. were superior to others for 100 grain weight. whereas , corn harvest index was not affected with neither organic nor mineral applications.

There were real relationships between some soil properties (as independent variables) and . sugar beet crop , root / shoot ratio corn grain yield weight of 100 grains (as dependent variable).The regression equations were calculated for those significant relationships and discussed due to behavior of the effective soil properties after 1, 5.5 and 10 months of organic additions .

In conclusion , saw-dust compost could be a satisfactory manure for production of sugar beet followed by corn where the compost was combined with urea and a slow release-N(Enciabien). Due to application , improvement of certain soil properties enhancing crop responses under calcareous condition .

Keywords: Calcareous soil, Saw-dust compost, FYM, Mineral N, Soil properties, Sugar beet, Corn .

Over the last decade, there has been growing interest among farmers, researches, governmental agencies and environmental conservation groups in investigating and adopting crop production practices that function to conserve soil and water resources.Soil organic matter content strongly affects soil fertility by means of its influence on nutrient cycling and on the physical, chemical and biological properties of soils . Composted manures application is an important agriculture practice that has received much attention as a means for ameliorating soil chemical, hydro-physical and biological properties. It has been shown to reduce soil pH and to increase cation exchange capacity as well as the availability of some plant nutrients (Reganold *et al.*, 2001 *and* Bulluck *et al.*, 2002). Moreover, it obviously enhances soil water retention and infiltration, declines soil surface strength and significantly improves both hydraulic conductivity and bulk density. On the long run, it may be effective in stabilizing soil aggregates. At the same time, changes in soil-water relations can affect the quality and quantity of crop yields depending upon the characters and rates of the applied compost manure that had a buffering capacity to retain and supply water and nutrients to the plants (Pagliai *et al.*, 1981 and Sainju & Singh, 1997). The far distance between the most ready and slowly releasing nitrogen sources was generally under attention especially when both sources were accompanied with N releasing organic sources. El-Gizi & Rifaat (2001); Negm *et al.* (2003) and Zaki (2004) studied the effect of different mineral N sources added to calcareous soils accompanied with organic manures as diluted HNO_3, calcium nitrate or urea on tomato, diluted HNO_3, 1:1 calcium nitrate + HNO_3, calcium nitrate or urea on squash followed with sugar beet and diluted HNO_3, ammonium nitrate and urea on sugar beet as. They found that NO_3 was better than urea in their effects on fruit yields and nutrient uptake, (El-Gizi & Rifaat, 2001) , no pronounced effect on T.S.S. and CEC while saturation per cent (SP) slightly increased by the neutral forms of N but decreased under the acidic ones. Soil pH decreased in the order urea > calcium nitrate > 1:1 calcium nitrate and nitric acid > diluted HNO_3, (Negm *et al.*, 2003) and the combination of composted FYM and ammonium nitrate showed the best results of plant growth, yield and sugar quality (Zaki, 2004).

Thus, further studies should be done to cover that important field .

Our objectives were to investigate the combined effect of composted saw-dust or farmyard manures and combination of different nitrogen sources, *i.e.*, diluted nitric acid urea and Enciabeen (as a nitrogen slow release fertilizer) on the productivity of sugar beet and corn grown on calcareous soils and to define the most effecting physical and chemical properties of such soil conditions .

Material and Methods

The used materials included soil , organic manure and nitrogen fertilizers in addition to cultivation of sugar beet and corn cultivated successively as test crops in a field experiment .

Saw-dust compost was prepared as follows .One ton of fine saw-dust was mixed on the 15^{th} of July, 2003 with one ton of cattle dung and a chemical activator mixture (50 kg ammonium sulphate + 50 kg super phosphate). These proportions were based upon to get a theorètical C/N ratio of 30-1 on dry weight basis. This composte material was prepared as follows: a portion of the fine saw-dust was scattered over an area of 2×5 m^2, then a portion of the cattle dung and the activator mixture was spread over it and moistened with water. The moisture was considered satisfactory when a handful of the composting material would wet the hand but not drip, (about 70% of water holding capacity WHC). The previous mixture represents a first layer of 20 cm height, then four layers were built over the first one in the same manner. After the heap was built to reach 1.0 m height ,it was loosely covered with a plastic sheet and was moistened with tap water from above if needed. The heap was turned from inside to outside wards every three weeks for four months. The main properties of the prepared mature compost are given in Table 1 along with the used farmyard manure (FYM) were analyzed using the methods described by Brunner & Wasmer (1978).

TABLE 1. **Analysis of the used organic manures .**

Composition		Composted SD	Fresh FYM
O.M.	%	57.82	43.64
Carbon	%	34.12	25.37
Total	%	1.32	0.44
C/N ratio		14.99	57.65
Total P	%	0.56	0.23
Total K	%	0.68	1.09
Available N	$mg.kg^{-1}$	328.0	223.0
Available P	$mg.kg^{-1}$	180.0	259.0
Available K	$mg.kg^{-1}$	1296.0	2800.0
EC, 1:5:water extract mS/m		8.30	7.40
pH		7.14	8.50

The field experiment was conducted on the farm of Noubaria Research Station . The soil of the farm was normal calcareous , its mechanical analysis according to Kilmer & Alexander (1949) and chemical ones are scheduled in Table 2.

TABLE 2. Physical and chemical analysis of the experiment soil.

Layer depth	% without $CaCO_3$ removal: C sand	F. sand	Silt	Clay	Texture class	$CaCO_3$ fractions (g/100 g soil): C sand	F. sand	Silt+clay	Total
0-20	9.71	23.22	44.76	22.21	S. clay loam	4.69	8.12	11.34	24.15
20-40	8.49	24.14	45.45	21.92	S. clay loam	4.22	8.2	11.3	23.72

Layer depth	T.S.S %	Cations (me/100 g soil)*: Ca^{2+}	Mg^{2+}	Na^+	K^+	anions (me/100 g soil)*: $CO_3^=$	HCO_3^-	Cl^-	$SO_4^=$
0-20	0.13	1.30	0.69	2.70	0.25	-	0.55	2.50	1.85
20-40	0.13	1.25	0.60	2.95	0.20	-	0.75	2.50	1.75

Layer depth	W.H.C (%)	F.C (%)	CEC me/100 g soil	pH 1:2.5 susp.	O.M (%)	Total N%	C/N ratio	Available (ppm) P	K
0-20	33.25	22.81	11.75	8.20	1.08	0.018	34.80	4.15	3.11
20-40	33.33	23.43	11.75	8.11	0.99	0.018	31.90	3.84	2.92

* soil paste extract

The prepared saw-dust compost (SDC)was investigated in comparison with other treatments in a fertilization program of sugar beet (*Beta vulgaris* c.v. Loli) and corn (*Zea mays* .L c.v. Giza10). Two rates of 4 and 8 ton SDC/fed. and 12 ton FYM/fed(to be approximately as the same total N content as the added in SDC4 treatment and as the same organic matter content as added in SDC8 treatment) were applied in addition to unmanured control as main treatments and 4 sub main treatments of 3 nitrogen sources and without N –fertilization control. Each treatment was replicated 4 times in split plots each of 3×3.5 m^2 (0.0025 of fed.) .

After organic manure applications and good turning through the soil, samples of the soil were taken and then sugar beet seeds were sown on the 20th of November 2003. Nitrogen sources were applied in a rate of 20 kg N/fed. (half of the recommended dose to express the effect of organic manure N) on two equal doses of urea (46% N) and Enciabien. (slow release N fertilizer containing 40% N prepared by The General Organization of Agricultural Equilibrium Fund ; GOAEF) on the 18th of December, 2003 and 19th of January, 2004 while diluted HNO_3 added in 5 equal doses on 18-12-2003, 19-1, 18-2, 3-3, 16-3 and 3-4/2004 where each row was given about 10 liters (The plot has 5 rows) of about 0.028 N HNO_3 conc. (20g N) before gentle irrigation for plots of HNO_3 treatments was done. No other fertilizers were added till sugar beet roots were harvested on the 15th. June, 2004. corn was planted on the 27th. June, 2004 after cultivation for each row inside each plot without any disturbance for plot limits to study the residual effect of organic manure application. Calcium super phosphate 15% P_2O_5 was added 0.25 kg for each plot corresponding to 100 kg /fed at row cultivation. The given N rate was also 20 kg N/fed. as urea and Enciabien in two equal doses on the 24th of August, 2004 and diluted HNO_3 in 5 doses on the 24th of July, 8th, and 20th. of August, 1st and 12th of September, 2004 without any other fertilizers. The crop was harvested on the 22nd of October, 2004.

The studied parameters of plant yield and yield components were sugar beet root yields, root/shoot ratio, corn grain yield, 100 grain weight and percentage of grain to whole plant where that data were statistically analyzed according to Petersen (1976).

Surface soil samples from each plot were collected 1,5.5 and 10 months of SDC applications (samples I,II and III , respectively) to study the role of organic manuring on the main physical, chemical and fertility properties of soil . Soil bulk density (BD) was determined by core method according to Black *et al.* (1983). Total soil porosity (T Pors.) was calculated using the data of bulk density .The used pore size distribution into quick ,slow drainable pores (QDP,SDP) and water holding pores (WHP) as well as soil moisture characteristics namely water holding capacity (WHC), field capacity (FC), wilting point (WP) were carried out for each treatment over the range from 0 to 15 atm., using the pressure cooker for the pressures of 0.1 and 0.33 atm. and the pressure membrane apparatus for the pressures >1 atm. Accordingly, available water(AW) was computed as described by Loveday(1974). Soil salinity expressed in electrical conductivity (ECe) in soil paste extract, pH in 1:2.5 water suspension, cation exchange capacity (CEC) and calculation of sodium adsorption ratio (SAR) according to Richard's (1954).Soil organic matter (OM) and total N according to Page *et al.* (1982) are presented in the appendix .

Correlation coefficients between soil properties (independent variables X) and crop parameters (dependent variable Y) and step wise regression equations (Y= a+b X) for the significant correlations were calculated after Snedecor & Cochran (1971).

Results and Discussion

Sugar beet and maize yields and yield components

Table 3 shows yields of sugar beet roots, its ratio to shoots, grain maize yield, 100 grain weight and harvest index of maize crop.

Yield of sugar beet roots was significantly responded to organic manuring regardless of SDC or FYM. Such trend means more root growth under the manured soil surface. Nitrogen sources did not differ significantly from the control with respect to their effect on root yield, but among each other, urea was significantly superior to diluted HNO_3 which affected adversely but insignificant on root yield. Interaction effect of SDC8 or FYM12 and urea produced significantly increased root yield over N unfertilized plots (control). In this connection , Ferri *et al.* (1996) reported that sugar beet was influenced positively by municipal waste compost but quality and technological properties was not influenced by different fertilizers or increasing N dose. Negm *et al.* (2003) confirmed the response of table beet to saw –dust compost .The trend of N forms was in agreement with Zaki (2004).

TABLE 3. Yield and yield components of sugar beet and maize as affected by organic manuring and mineral N forms.

Plant		Organic manuring	Mineral N application: HNO_3	Urea	Ens.	Control	mean of Org. manure	L.S.R. (at 0.05)
Sugar beet	Root yield	Comp. I	11.00	10.65	11.73	10.78	11.04	Org.: 1.71
		Comp. II	8.57	13.97	10.88	8.92	10.59	N:1.48
		FYM	9.30	12.51	9.57	8.82	10.05	Org. x N: 3.42
		Control	7.18	5.12	7.06	8.69	7.01	
		Mean of N	**9.01**	**10.56**	**9.81**	**9.30**		
	Root/Shoot	Comp. I	3.65	3.73	3.31	4.13	3.71	Org.: 0.84
		Comp. II	3.71	4.97	5.19	4.33	4.55	N: 0.49
		FYM	3.13	3.30	2.45	3.12	3.00	Org. x N: 1.68
		Control	4.08	2.74	1.81	3.03	2.92	
		Mean of N	**3.64**	**3.69**	**3.19**	**3.65**		
Corn	Grain yield (Ard./fed.)	Comp. I	8.90	9.17	9.11	6.80	8.50	Org.: 0.94
		Comp. II	8.25	9.39	10.51	7.23	8.85	N: 0.92
		FYM	8.44	11.51	9.94	7.26	9.29	Org. x N: 1.88
		Control	5.86	7.88	8.64	7.38	7.44	
		Mean of N	**7.86**	**9.49**	**9.55**	**7.17**		
	100 grain weight (g)	Comp. I	29.22	29.03	27.91	28.18	28.59	Org.: 1.50
		Comp. II	31.20	29.58	31.28	29.42	30.37	N: 1.90
		FYM	28.79	30.91	32.98	30.16	30.71	Org. x N: 3.00
		Control	27.62	31.49	26.14	26.51	27.94	
		Mean of N	**29.21**	**30.25**	**29.58**	**28.57**		
	Harvest Index	Comp. I	36.80	32.70	30.33	33.30	33.28	Org.: n.s
		Comp. II	32.40	33.91	35.58	31.04	33.23	N: n.s
		FYM	30.58	34.90	31.45	29.73	31.67	Org. x N: n.s
		Control	32.35	31.60	31.80	31.58	31.83	
		mean of N	**33.03**	**33.28**	**32.29**	**31.41**		

Root to shoot ratio in sugar beet was only affected with the addition of SDC8 significantly over both SDC4 and FYM12 which showed on the same level of the control (unmanured treatment). Referring to Appendix Table 8 the SDC 8 the highest OM content after 5 months from addition ,thus that finding could be due to the effect of the higher rates of manure addition on increasing weights of .roots to their shoots. Nitrogen sources showed no significant effect on that ratio. Concerning the interaction of the two factors (*i.e.*, organic manures and mineral N fertilization), Enciabien produced heavy shoot converting the ratio to be significantly lower than in case of diluted HNO_3 when each of them was applied alone because the root yield of each treatment was almost the same. The differences here occurred in shoot density . These data are in accordance with Negm *et al.* (2003) .

Yield of corn grains, in Table 3 revealed a residual effect of organic manuring whatever the used kind or rate which were statistically the same as each other. Nitrogen mineral source comparison showed that urea and Enciabien were significantly superior to diluted HNO_3 and N- unfertilized treatments, which were also statistically the same as each other. By studying the interaction effects of these two factors, it could be noticed that the residual effect of SDC 4 or 8 raised diluted HNO_3 to the same effect with urea indicating that the dramatic depression occurred when diluted HNO_3 was used alone without previous organic manuring. Negm *et al.* (1996) and Rehan *et al.* (2004) found real progress in corn grain yield and Negm *et al.* (2002 a & b) on sorghum grain yield along with residual effect of different composts .

Concerning the 100 grain weight, the specific grain weight, the high levels of organic matter in SDC 8 and FYM12 increased that parameter significantly over the low level of SDC 4or unmanured control.No effect was found for mineral N fertilization on the specific weight. Urea alone without organic manures raised the specific grain weight significantly over the other mineral N sources and the control. In the same time, FYM12 combined with Enciabien raised that weight over FYM12 only or SDC4 with diluted HNO_3 treatments significantly.

As for Harvest index, the ratio of grain to whole plant, was unaffected with any of the studied treatments. Referring to the effect of the used manures on grain yield, it could be detect the same trend for whole plants deflexed on harvest index values if these amendments decreased the vegetative growth. The actual trend indicated that more increases in grain yield combined with more increase in vegetative growth also in maize as limited top plant. The used composts by Negm *et al.* (1996 ,2002 a , b) and Rehan (2004) did not result any residual effect on their tested crops corn and sorghum.

How far sugar beet and corn crops could be affected by soil properties

In a try to correlate sugar beet and corn yields and yield components as affected factors (Y) with the studied soil properties after 1 and 5.5 months of manure application as effecting factors (X), correlation coefficients were calculated, as tables 4a and b show, were calculated. The significant ones (on a level of exp. error 0.05) were discussed and obtained their regression equations as were developed (Table 4 a&b).

TABLE 4a . Correlation coefficients of sugar beet yield parameters (Y) and soil properties (X).

PROPERTY	ROOT YIELD	ROOT/ SHOOT	PROPERTY	ROOT YIELD	ROOT/ SHOOT	PROPERTY	ROOT YIELD	ROOT/ SHOOT
BD I	-.018	-.103	Cl^- I	.522 *	.260	Na^+ II	-.515 *	.555 *
T Pros I	-.050	-.007	$SO_4^=$ I	.524 *	.375	K^+ II	-.032	.018
QDP I	-.300	-.570 *	SAR I	-.607 *	-.636 *	HCO_3^- II	-.160	-.262
SDP I	.233	.073	pH I	.217	-.339	Cl^- II	.266	.164
WHP I	.139	.010	CEC I	.016	.188	$SO_4^=$ II	-.084	.020
WHC I	.027	.107	OM I	.320	.141	SAR II	-.559 *	-.604 *
FC I	.304	.348	TN I	.064	.066	pH II	.312	-.270
WP I	.348	.390	C/N I	.218	.116	CEC II	.036	.004
AW I	.097	.117	TP I	.664 **	.497 *	OM II	.405	.517 *
EC I	.570 *	.352	Av P I	.299	-.179	TN II	.324	.130
Ca^{++} I	.637 **	.599 *	TK I	.074	.113	C/N II	.218	.130
Mg^{++} I	.256	.119	Av K I	.401	.035	TP II	.704 **	.450
Na^+ I	-.048	-.566 *	EC II	.008	.054	Av P II	.343	.406
K^+ I	.487	.190	Ca^{++} II	.485	.564 *	TK II	.336	.204
HCO_3^- I	.440	.098	Mg^{++} II	-.024	-.015	Av K II	.279	.229
HCO_3^- I	.571 *	.441	OM II	.506 *	.573 *	Av K III	.331	.739 **

TABLE 4b . Correlation coefficients of maize yield parameters (Y) and soil properties(X).

PROPERTY	GRAIN YIELD	100GRAIN WEIGHT	PROPERTY	GRAIN YIELD	100GRAIN WEIGHT	PROPERTY	GRAIN YIELD	100GRAIN WEIGHT
BD I	-.499 *	-.664 *	Cl^- I	.152	-.047	TN II	.049	.329
T Pros I	.541 *	.560 *	$SO_4^=$ I	.337	.469	C/N II	.217	.181
QDP I	.186	.029	SAR I	-.069	-.241	TP II	.400	.202
SDP I	.302	.372	pH I	.136	-.369	Av P II	-.310	-.095
WHP I	.460	.212	CEC I	-.349	-.024	TK II	.349	.302
WHC I	.509 *	.583 *	OM I	.503 *	.414	Av K II	.220	-.111
FC I	.492 *	.676 *	TN I	-.070	.466 *	EC III	.070	-.021
WP I	.072	.295	C/N I	.329	.050	Ca^{++} III	.235	.160
AW I	.581 *	.628 *	TP I	.552 *	.152	Mg^{++} III	.044	-.182
BD III	-.378	-.265	Av P I	-.231	.080	Na^+ III	.072	-.097
T Pros III	.529 *	.573 *	TK I	.197	.313	K^+ III	-.177	.198
QDP III	.198	.284	Av K I	.211	.645 *	HCO_3 III	.211	.422
SDP III	.268	-.142	EC II	-.276	.116	Cl^- III	.011	-.176
WHP III	.100	.147	Ca^{++} II	-.277	-.214	$SO_4^=$ III	.001	-.108
WHC III	.579 *	.656 **	Mg^{++} II	-.161	.116	SAR III	-.213	-.093
FC III	.570 *	.558 *	Na^+ II	.042	-.460	pH III	-.085	.181
WP III	-.227	.148	K^+ II	-.003	.350	CEC III	-.313	.157
AW III	.632 *	.420	HCO_3^- II	-.051	.366	OM III	.267	.447
EC I	.343	.366	Cl^- II	-.260	.311	TN III	.066	.556 *
Ca^{++} I	.262	.266	$SO_4^=$ II	-.087	-.617 *	C/N III	.248	.097
Mg^{++} I	.221	.399	SAR II	.092	.381	TP III	.400	.578 *
Na^+ I	.278	.093	pH II	.348	.272	Av P III	510 *	.340
K^+ I	.469	.469	CEC II	-.218	.265	TK III	-.202	-.171

Root yield of sugar beet.was significantly affected with EC I*(Y = 1.006 + 5.565 X)*, soluble Ca I*(Y=0.167+6.725 X)*,Cl I*(Y=0.318 +4.864 X)*and SO_4 I *(Y=0.130 +15.204 X)*.In soil extract after 1month of manure application . On the contrary ,the negative ones were SAR I and II after 1and 5.5 months and soluble Na I after 1month of application ,*(Y=15.204-1.761 X)*, I*(Y=12.745 -1.182 X)* and *(Y=12.897 -0.419 X)*, respectively .

The root/shoot ratio was significantly affected due to positive correlation co-efficient by soluble Ca II in soil extract after 1 and 5.5 months, *(Y=2.568 +0..55X)*, *(Y=1.522 +0.164X)* and OM II after 5.5 months of organic applications*(Y=0.435 + 3.091X)* .Root/shoot ratio was significant affected reversely by soluble Na I, II, SAR I,II and QDP I *(Y=7.219 -0.345X)*,*(Y=5.850-0.734X)* ,*(Y=4.925 -0.180X)*, *(Y=4.865-0.509X)* and *(Y=5.987-0.150X)*, respectively.

Many physical soil properties were significantly effected on grain yield . Some of them was positive such as T Pros *(Y= 13.388 + 0.363 X)* , *(Y= 9.543 + 0.294 X)* , WHC *(Y=2.421 +0.156X)* , *(Y= 2.299 + 0.138 X)*, FC*(Y= -3.244 + 0.485X)* , *(Y= -4.175 + 0.469 X)* and AW *(Y= -2.401+ 0.747 X)* ,*(Y=0.795 + 0.465 X)* while BD I after 1 month was of negative effect *(Y= 21.053 – 11.931 X)* . Chemically, soluble HCO_3 I, *(Y= 3.974 +0.811 X)* OM I ,II, *(Y= 2.346 + 5.399X)* , *(Y= 0.028 + 6.354 X)* were significantly of positive effects .

Concerning 100 grain weight ,15 soil properties were significantly effective. Nine of them had the same effect on grains .However, the positive physical ones were T Pros *(Y=22.651 + 0.182 X)* , *(Y=9.787 + 0.325 X)*, WHC *(Y=22.651 + 0.182X)* , *(Y=22.583+0.159X)* , FC *(Y=13.394 + 0.679X)* *(Y=17.056 + 0.467 X)* each for samples I and III , respectively, AW I *(Y=17.724 + 0.823X)* and the negative was BDI (*Y=46.845-16.198X)* . Tow negative correlations were drown by plotting EC II and SO_4 II *(Y=37.206-2.829X)* and *(Y=31.772-0.274X)* . Due to fertility properties OM II *(Y=19.979+7.322X)*, TN I and II; , *(Y=21.906+0.041X)*, *(23.014+0.046X)* gave positive correlation in their effects on 100 grain weight with the following regression equations .

Multiple regression equations of the most three independent factors on each dependent factor :

Root yield (ton/fed.) = 10.88 + 0.29 CaI – 1.67 ECI +0.22 SARII (R^2 = 0.1586)

Root / Shoot (ratio) = 3.74 +0.36SARI -0.0SARII - 0.07 QDPI (R^2 =0.0711)

Grain yield(ardab/fed.) =3.31 +0.02AWIII +0.34BDIII +0.11 WHCIII (R^2 =0.3320)

100 grain weight (g) =18.302 +.35 FCI +0.08 WHCIII -0.02 AWI (R^2 = 0.3532)

These equations indicated that sugar beet root yield and its root / shoot ratio were affected essentially with few initial soil salinity while corn grain yield and grain specific weight were markedly with the resultant good soil- water relationships after 10 months of organic additions .

Trends of the effecting soil properties due to treatments

The following discussion deals with the effect of SDC rates, FYM, N-sources and their interaction on the soil properties and the effect of both groups on sugar beet and corn yield parameters .

Physical properties

Bulk density ,total porosity ,quick drainable pores ,water holding capacity, field capacity and available water of samples I and II were the significant effecting physical properties (Appendix Tables 5 I and 5 II).

The highest values of BD were resulted from the non manured plot samples indicating an improving effect due to FYM or the higher rate of SDC .Moreover, a sharp decrease in BD value was existed by FYM combined with either urea or Enciabien .

In general, there is no wide differences between FYM and the high application rate of composted saw-dust (8 ton/fed.) to decrease BD values. So, the use of composted saw dust may be economically beneficial compared to FYM. Comparing to the untreated calcareous soils (control), a reduction percentage reached 1.77, 6.19 and 7.96% for the plots treated with the low and high composted saw-dust and FYM, respectively. These results are agreed with those of Tester (1990) who found that the high application rates of organic materials decreased soil bulk density.

Values of total porosity were markedly increased in the manured plots comparing with unmanured one through the experimental time. The highest increase was noticed in plots treated with FYM followed by SDCII. The interaction effect of combined organic manures with nitrogen fertilizers was remarkable with FYM12 + Enciabien followed by SDC8 + urea. This favorable interaction may be due to the enhancement in soil biological activities resulted from the small or narrow C/N ratio. This biological activity increases the organic exudates which act as cementing agents for individual particles. Such process increase aggregate formation and consequently total soil porosity. These findings are in agreement with those of Aggelides & Londra (2000) who showed that total porosity was improved by the use of compost, the increase over the untreated soil being 11.0, 27.0 and 32.8% in the loamy soil for the 75, 150 and 300 m^3 h^{-1} compost rates.

The amount of water held by amended soil was greater than that held by the unamended one at both field capacity and permanent wilting point. This in general resulted in greater amounts of available water. Simultaneously after manures application, the volumetric available water amounted to, 8.95, 23.84 and 23.55% for SDC4, SDC8 and FYM12, respectively. such increase in available water is expected to have a beneficial effect on improving seed germination and plant growth. These results are coineied with those of Mitchell *et al.* (1997) and Sainju & Singh (1997) who stated that the changes in soil-water relations can affect the quality and yield of crop harvests depending upon the availability of soil water to plants.

TABLE 5 I. Changes in some soil physical properties as affected by manures and N sources after one month of applications.

Organic manure	Nitrogen sources	B.D g/cm^3	Total porosity	Pore size distribution %			Water limits (%) w.w			
				Q.D.P	S.D.P	W.H.P	W.H.C	F.C	W.P	A.W
SDC I	Dil. HNO3	1.17	55.85	12.74	3.33	19.51	30.40	22.67	9.73	12.94
	Urea	1.04	60.75	13.08	3.89	32.60	40.77	24.84	9.42	15.42
	Enci.	1.05	60.38	18.64	3.72	30.09	37.72	23.57	9.07	14.50
	Control	1.17	55.85	12.98	3.38	19.64	36.66	22.67	9.87	12.80
	mean	1.11	58.21	14.36	3.58	25.46	36.39	23.44	9.52	13.92
SDC II	Dil. HNO3	1.01	61.89	11.36	3.19	28.43	39.44	25.13	11.29	13.84
	Urea	1.16	56.23	14.40	2.78	20.16	27.45	22.67	10.07	12.60
	Enci.	0.94	64.53	13.33	3.88	25.25	50.83	26.06	8.54	17.52
	Control	1.04	60.75	12.56	3.97	30.71	40.20	24.10	10.67	13.43
	mean	1.04	60.85	12.91	3.46	26.14	39.48	24.49	10.14	14.35
FYM	Dil. HNO3	1.14	56.98	18.53	3.51	26.81	30.96	21.63	7.44	14.19
	Urea	1.06	60.00	19.80	3.81	30.00	40.09	26.88	11.79	15.09
	Enci.	0.95	64.15	17.70	3.86	28.62	45.25	25.76	9.16	16.60
	Control	1.01	61.89	21.72	3.88	23.55	41.08	21.77	7.86	13.91
	mean	1.04	60.76	19.44	3.77	27.25	39.35	24.01	9.06	14.95
Control	Dil. HNO3	1.13	57.36	17.34	2.91	26.66	31.26	23.34	9.66	13.68
	Urea	1.09	58.87	21.20	3.16	19.35	35.97	23.62	9.05	14.57
	Enci.	1.18	57.92	16.54	2.78	23.60	33.46	19.46	7.36	12.10
	Control	1.09	58.87	18.18	3.54	19.22	33.09	23.17	9.28	13.89
	mean	1.12	58.26	18.32	3.10	22.21	33.45	22.40	8.84	13.56

TABLE 5 II. Changes in some soil physical properties as affected by organic manures and N sources after ten months of applications.

Organic manure	Nitrogen sources	B.D g/cm^3	Total porosity	Pore size distribution %			Water limits (%) w.w			
				Q.D.P	S.D.P	W.H.P	W.H.C.	F.C	W.P	A.W
SDC I	Dil. HNO3	1.16	56.61	15.82	2.20	20.52	34.38	23.48	13.53	9.95
	Urea	1.01	61.89	19.74	3.40	27.94	48.78	25.36	10.17	15.19
	Enci.	1.17	63.02	16.44	2.90	21.34	41.51	28.88	12.18	16.70
	Control	0.98	55.25	18.07	3.90	32.77	39.49	28.16	9.12	19.04
	mean	1.08	59.19	17.52	3.10	25.64	41.04	26.47	11.25	15.22
SDC II	Dil. HNO3	1.07	62.33	22.46	2.90	27.96	49.62	28.30	10.08	18.22
	Urea	0.91	57.38	19.53	4.50	36.03	35.68	26.41	8.19	18.22
	Enci.	1.03	67.57	21.96	3.00	27.96	57.36	29.37	11.99	17.38
	Control	1.06	61.67	18.80	2.40	23.80	46.23	27.07	11.69	15.38
	mean	1.02	62.24	20.69	3.20	28.94	47.22	27.79	10.49	17.30
FYM	Dil. HNO3	1.09	57.26	17.65	3.20	33.45	31.52	25.67	9.36	16.31
	Urea	1.04	60.38	22.41	3.20	26.91	49.12	27.49	10.38	17.11
	Enci.	1.05	64.91	16.37	3.00	20.77	54.52	30.23	10.90	19.33
	Control	0.98	62.75	16.93	2.90	32.93	48.21	25.47	9.19	16.28
	mean	1.04	61.33	18.34	3.08	28.52	45.84	27.22	9.96	17.26
Control	Dil. HNO3	1.14	59.08	22.46	2.50	27.16	34.08	23.12	10.28	12.84
	Urea	1.10	59.53	21.19	2.70	26.79	39.53	24.93	10.65	14.28
	Enci.	1.09	58.39	12.79	2.30	17.99	38.39	22.70	9.89	12.81
	Control	1.09	57.62	21.60	4.60	24.42	37.62	25.90	9.96	15.94
	mean	1.11	58.66	19.51	3.03	24.09	37.41	24.16	10.20	13.97

Drainable soil pores are responsible for evacuating excess water above the field capacity and permeating gases exchange. In fact, the values of slowly drainable pores are superior to that of quickly ones in calcareous soils . Pagliai *et al.* (1981) mentioned that refuse derived compost and other organic amendments increase the volume of storage pores as well as transmission pores.

Salinity and soluble cations and anions

Data in Tables 4a, b reveal that the average values of soil salinity ECe were almostly duplicated in plots treated with different organic manures comparing with the untreated plots after one month of application. The relative increase percentages are being 65.77, 79.23 and 83.08% for SDC4, SDC8 and FYM12, respectively. These increases in ECe values are expected and has been reported that manure application caused a build up of soluble salts and Na adsorption ratio in the soil (Chang *et al.*, 1990 and Khalifa *et al.*, 2000). Salinity levels in the treated plots were suppressed to be very close to that of control after 5 and 10 months of manuring. This reduction in ECe values may be rendered to plant consumption and leaching by alternative irrigation process.

The obtained results show the domination of soluble calcium ions followed by sodium, magnesium and potassium after one month of application. This cation distribution was changed in the order of Ca^{2+}> Mg^{2+}> Na^{+}>K^{+} through experimental time. Ca^{2+} and Mg^{2+} ions were two folds in the compost amended plots while no differences were appeared on Na^{+} content. Also, K^{+} ions were greatly increased after manuring. In general, all soluble cations were declined through the experimental time. These finding is in agreement with those obtained by Clark *et al.* (1998) who found that concentrations of calcium, magnesium and potassium were greater in soils incorporated with composted manures.

Changes in soluble anions due to manuring were observed, where bicarbonates, chloride and sulphate ions were highly recorded after one month of manures application, then gradually decreased after 5 and 10 months. The high soluble cations and anions recorded in soils after manure additions due to the initial high salinity contained in such added materials. These results are in accordance with that of Yours *et al.* (1984) and Khalifa *et al.* (2000) who showed that addition of farmyard manure or town refuse in different treatments either with or without NPK mineral fertilizers to a sandy soil increased insignificantly EC and soluble ions.

Organic matter and N contents in the soil

Table 6 indicates that soil content of organic matter increased by application of SDC8 and FYM12 . Organic matter increased in all plots including the unmanured control. The differences through this period were 0.27, 0.22, 0.15 and 0.17% for SDC4, SDC8, FYM12 and control, respectively. The increase in O.M. content in unmanured plots may be attributed to the plant residues after sugar beet harvesting. The increases over the control in that period which reached 0.08, 0.25 and 0.22% were attributed to degree of SDC4, SDC8 and FYM12 decompositions, respectively. After 10 months all the organic additions raised soil organic matter content over their values after one month with 0.44, 44, 34% in the respective order SDC4, SDC8 and FYM12.

Sources of mineral N showed an irregular trend but after 10 months, urea and Enciabien exhibited lower soil organic matter content than those treated with diluted HNO_3 with 0.04 and the control with 0.07% due to their relative slow release of N which according to Gray & Williams (1979) , encouraged organic manure decompositions, Total N content increased after one month of manure additions over the control with 27, 12 and 7 mg N/kg soil in the treatments of SDC4, FYM12 and SDC8, respectively. Total N of all these treatments increased proportionally by time while the unmanured plot decreased their total N content markedly after 5 months on a level be stable up to 10 months. The highest N content at the end of the experiment was that of SDCII followed with FYM and SDCI which was at least.

As for mineral N (Table 6 I,II,III) the content of N decreased in the 5 and 10 month periods than the 1[st] period due to the continuous plant consumption with same increase after 10 months. The remainder N after diluted HNO_3 application was the highest followed with Enciabien and control but urea was less than them (Table 7&8).

TABLE 6 I. Changes in soil salinity, soluble ions and sodium adsorption ratio as affected by organic manuring and N sources after one month from their applications.

Organic manure	Nitrogen sources	EC dSm^{-1}	Soluble cations meq/l				Soluble anions meq/l			SAR
			Ca	Mg	Na	K	HCO_3^-	Cl	$SO_4^{=}$	
SDC I	Dil. HNO3	3.89	19.79	6.71	9.84	2.56	3.74	14.49	20.67	2.70
	Urea	4.72	23.53	8.47	11.43	3.77	6.23	15.70	25.27	2.86
	Encl.	4.31	21.66	7.59	10.63	3.17	6.23	17.30	19.52	2.78
	Control	4.31	21.66	7.59	10.63	3.17	4.98	15.56	23.51	2.78
	mean	4.31	21.66	7.60	10.63	3.17	5.30	15.76	21.99	2.78
SDC II	Dil. HNO3	2.30	5.88	7.63	8.32	1.18	3.74	8.45	20.81	3.20
	Urea	5.31	27.81	10.19	8.69	6.41	4.98	19.32	28.80	1.99
	Encl.	5.85	33.69	9.31	9.86	5.64	6.23	16.43	35.84	2.13
	Control	5.18	22.46	13.04	10.53	5.77	6.23	18.12	27.43	2.50
	mean	4.66	22.46	10.04	9.35	4.75	5.30	15.58	26.73	2.46
FYM	Dil. HNO3	4.40	16.58	11.42	9.59	6.41	6.23	21.74	16.03	2.56
	Urea	3.60	11.23	6.77	13.01	5.95	6.23	13.29	16.44	4.00
	Encl.	5.90	26.20	11.80	13.95	7.05	7.47	16.91	34.62	3.20
	Control	5.13	18.72	13.78	11.75	7.05	6.23	17.78	27.29	2.91
	mean	4.76	18.18	10.94	11.83	6.62	6.54	17.43	23.60	3.17
Control	Dil. HNO3	2.11	7.81	2.69	9.34	1.26	3.74	12.61	4.75	4.08
	Urea	2.41	6.29	5.80	10.24	1.77	3.74	8.65	11.71	4.16
	Encl.	2.92	10.16	5.84	11.28	1.92	3.74	13.29	12.17	3.99
	Control	2.96	8.88	6.63	12.33	1.77	3.74	11.93	13.93	4.43
	mean	2.60	8.29	5.24	10.90	1.68	3.74	11.62	10.64	4.16

TABLE 6 II. Changes in soil salinity, soluble ions and sodium adsorption ratio as affected by organic manuring and N sources after 5 months from their applications.

Organic manure	Nitrogen sources	EC dSm^{-1}	Soluble cations meq/l				Soluble anions meq/l			SAR
			Ca	Mg	Na	K	HCO_3^-	Cl	$SO_4^{=}$	
SDC I	Dil. HNO3	2.80	14.60	5.71	6.19	1.50	3.99	18.12	5.89	1.94
	Urea	3.00	12.39	6.67	9.56	1.39	3.99	13.59	14.43	3.10
	Encl.	2.80	15.46	5.36	5.48	1.72	2.99	14.50	10.53	1.70
	Control	3.07	18.13	6.52	4.74	1.31	3.99	18.50	8.21	1.35
	mean	2.92	16.16	6.07	6.49	1.48	3.74	16.48	9.77	2.02
SDC II	Dil. HNO3	2.57	11.76	5.74	6.87	1.33	3.99	14.95	6.76	2.32
	Urea	2.97	14.09	7.88	6.28	1.45	3.49	15.68	10.53	1.89
	Encl.	2.80	14.09	5.41	6.96	1.54	3.99	15.56	8.45	2.23
	Control	2.94	16.42	5.58	5.86	1.54	3.49	13.74	12.17	1.77
	mean	2.82	14.89	6.15	6.48	1.47	3.74	14.98	9.40	2.05
FYM	Dil. HNO3	2.57	10.16	4.63	9.64	1.27	2.99	12.97	9.74	3.54
	Urea	2.04	8.93	3.66	6.34	1.47	3.48	14.95	1.97	2.53
	Encl.	2.34	9.04	7.57	5.28	1.51	5.98	17.37	0.05	1.83
	Control	3.13	13.85	8.70	6.79	1.96	5.98	16.31	9.01	2.02
	mean	2.52	10.50	6.14	7.01	1.56	4.61	15.40	6.19	2.48
Control	Dil. HNO3	2.28	9.44	5.59	6.25	1.55	3.99	15.10	3.74	2.28
	Urea	2.58	7.57	6.16	10.40	1.62	3.49	13.84	8.42	3.97
	Encl.	3.19	10.27	5.91	14.30	1.41	3.99	14.25	13.65	5.03
	Control	3.06	11.07	6.41	12.15	1.01	3.99	12.01	14.64	4.11
	mean	2.78	9.59	6.02	10.78	1.36	3.87	13.80	10.11	3.96

TABLE 6 III. Changes in soil salinity, soluble ions and sodium adsorption ratio as affected by organic manuring and N sources after ten months from their applications.

Organic manure	Nitrogen sources	EC dSm^{-1}	Soluble cations meq/l				Soluble anions meq/l			SAR
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	Cl^-	$SO_4^{=}$	
SDC I	Dil. HNO3	1.57	4.06	2.54	7.97	1.10	3.99	4.83	6.85	4.39
	Urea	1.31	4.99	1.61	5.70	0.80	3.99	3.86	5.25	3.14
	Enci.	1.57	3.64	3.96	7.25	0.87	3.99	4.83	6.90	3.72
	Control	1.34	3.64	2.16	6.79	0.80	3.99	3.86	5.54	3.99
	mean	**1.45**	**4.08**	**2.57**	**6.93**	**0.89**	**3.99**	**4.35**	**6.14**	**3.81**
SDC II	Dil. HNO3	1.35	3.42	2.18	7.25	0.63	3.99	3.86	5.63	4.33
	Urea	1.98	5.99	4.81	8.22	0.73	3.49	5.31	10.95	3.54
	Enci.	1.57	4.71	2.89	7.25	0.80	3.99	3.86	7.80	3.72
	Control	1.56	4.92	3.68	6.34	0.69	3.49	3.86	8.28	3.06
	mean	**1.61**	**4.76**	**3.89**	**7.27**	**0.71**	**3.74**	**4.22**	**8.17**	**3.66**
FYM	Dil. HNO3	1.28	3.21	2.19	6.56	0.80	2.99	3.86	5.91	3.99
	Urea	1.31	3.42	2.18	6.74	0.80	4.48	3.86	4.80	4.03
	Enci.	1.76	4.71	2.69	8.99	1.23	5.98	6.28	5.36	4.67
	Control	1.50	3.64	2.56	7.25	1.54	4.98	4.83	5.18	4.12
	mean	**1.46**	**3.75**	**15.51**	**7.39**	**1.09**	**4.61**	**4.71**	**5.31**	**4.20**
Control	Dil. HNO3	1.54	3.21	3.19	8.22	0.80	3.99	4.83	6.60	4.60
	Urea	1.23	2.14	3.06	6.56	0.56	3.49	3.86	4.97	4.07
	Enci.	1.69	3.42	3.58	9.25	0.66	3.99	6.76	6.16	4.94
	Control	1.41	3.42	2.58	7.25	0.87	3.99	4.35	5.78	4.19
	mean	**1.47**	**3.05**	**3.10**	**7.82**	**0.72**	**3.87**	**4.95**	**5.88**	**4.45**

TABLE 7. Changes in soil pH and cation exchange capacity as affected by organic manuring and N sources after ten months from their applications.

Organic Manure	Nitrogen sources	pH			CEC		
		Months from application start and sample symbol					
		1 (I)	5 (II)	10 (III)	1 (I)	5 (II)	10 (III)
SDC I	Dil. HNO3	7.90	7.90	8.00	11.61	12.12	11.88
	Urea	8.10	8.00	7.90	10.56	11.49	11.61
	Enci.	7.90	8.00	7.90	10.12	10.56	10.12
	Control	7.60	7.90	7.80	11.61	12.39	12.39
	mean	**7.88**	**7.95**	**7.90**	**10.98**	**11.64**	**11.50**
SDC II	Dil. HNO3	7.80	8.00	8.20	11.61	12.39	12.12
	Urea	7.90	7.90	7.90	11.61	11.61	11.88
	Enci.	7.90	8.10	7.90	10.56	10.95	10.83
	Control	7.70	8.10	7.90	10.56	11.83	11.61
	mean	**7.83**	**8.03**	**7.98**	**11.09**	**11.70**	**11.61**
FYM	Dil. HNO3	7.90	8.00	8.10	12.12	12.66	12.66
	Urea	8.10	8.00	8.10	11.49	11.61	11.49
	Enci.	7.90	8.30	8.00	10.12	11.34	10.56
	Control	7.80	7.90	8.00	12.12	12.66	12.51
	mean	**7.93**	**8.05**	**8.05**	**11.46**	**12.07**	**11.81**
Control	Dil. HNO3	8.30	8.10	8.10	12.12	10.66	11.39
	Urea	7.90	8.00	8.20	10.83	11.49	11.34
	Enci.	8.30	8.10	7.90	10.83	11.34	10.56
	Control	8.00	8.00	8.20	10.12	10.56	10.44
	mean	**8.13**	**8.05**	**8.10**	**10.98**	**11.01**	**10.93**
mean of	Dil. HNO3	8.00	8.00	8.10	11.87	11.96	12.01
	Urea	8.00	8.00	8.00	11.12	11.55	11.58
	Enci.	8.00	8.10	8.00	10.41	11.05	10.52
	Control	7.80	8.00	8.00	11.10	11.87	11.74

TABLE 8. Changes in soil organic matter, total N and C/N ratio through 10 months as affected by organic manuring and N source application.

Organic manure	Nitrogen sources	Organic matter % 1 (I)	5 (II)	10 (III)	Total N mg/kg soil 1 (I)	5 (II)	10 (III)	C/N ratio 1 (I)	5 (II)	10 (III)
		Cultivation period (month) and sample symbol								
SDC I	Dil. HNO3	0.82	1.19	1.21	220	180	170	21.62	38.34	41.28
	Urea	1.15	1.24	1.41	200	110	130	33.35	65.38	62.46
	Enci.	1.07	1.22	1.29	170	100	120	36.51	62.06	62.35
	Control	0.80	1.27	1.68	210	100	150	22.10	46.40	64.96
	mean	0.96	1.23	1.40	200	123	143	28.40	53.05	57.76
SDC II	Dil. HNO3	1.08	1.46	1.50	180	110	170	34.80	76.98	51.18
	Urea	1.36	1.35	1.69	160	120	150	49.30	65.25	65.35
	Enci.	1.03	1.59	1.62	210	170	160	28.45	54.25	58.73
	Control	1.24	1.21	1.66	170	140	140	42.31	50.13	68.77
	mean	1.18	1.40	1.62	180	135	155	38.72	61.65	61.01
FYM	Dil. HNO3	1.03	1.39	1.58	190	150	140	31.44	53.75	65.46
	Urea	1.27	1.53	1.48	180	140	150	40.92	63.39	57.23
	Enci.	1.22	1.20	1.62	200	160	160	35.38	43.50	58.73
	Control	1.37	1.34	1.54	170	120	150	46.74	64.77	59.55
	mean	1.22	1.37	1.56	185	143	150	38.62	56.35	60.24
Control	Dil. HNO3	1.01	1.22	1.25	150	100	110	39.05	70.76	65.91
	Urea	0.98	1.23	0.81	210	90	100	27.07	79.27	46.98
	Enci.	0.92	1.07	0.87	160	120	110	33.35	51.72	45.87
	Control	1.01	1.08	0.79	170	120	110	34.46	52.20	41.65
	mean	0.98	1.15	0.93	173	108	108	33.48	63.49	50.10
mean of	Dil. HNO3	0.99	1.32	1.39	185	135	148	31.73	59.21	55.96
	Urea	1.19	1.34	1.35	188	115	133	37.66	68.31	58.01
	Enci.	1.06	1.27	1.35	185	138	138	33.42	52.88	56.42
	Control	1.11	1.23	1.42	180	110	138	36.40	53.38	58.73

References

Aggelides, S.M. and Londra, P. A. (2000) Effects of compost produced from town wastes and sewage sludge on the physical properties of a loamy and a clay soil. *Bioresource Technology* 71, 253.

Black, C.A. (1983) *"Methods of Soil Analysis. I. Soil Physical Properties"*, Soil Sci. Soc. Am. Inc. Publ., Madison, Wisc., U.S.A

Brunner, P.H. and Wasmer, H.R. (1978) *"Methods of Analysis of Sewage Sludge, Solid Wastes and Compost"*, WHO International Reference Center for Wastes Sisposal, CH 8600, Dubendorf, Switzerland.

Bulluck, L.R.; Brosius, M.; Evanylo, G.K. and Ristaino, J.B. (2002) Organic and synthetic fertility amendments influence soil microbial, physical and chemical properties on organic and conventional farms. *Applied Soil Ecology* **19**, 147.

Chang, C.; Sommerfeldt, T.G. and Entz, T. (1990) Rates of soil chemical changes with eleven annual applications of cattle feedlot manure. *Can J. Soil Sci.* **70**, 673.

Clark, M.S.; Horwath, W.R.; Shennan, C. and Scow, K.M. (1998) Changes in soil chemical properties resulting from organic and low-input farming practices. *Agron. J.* **90**, 662.

El-Gizi, Samira M. and Rifaat, M.G.M. (2001) Response of some tomato cultivars to saw-dust compost and nitrogen sources under a calcareous soil conditions. *Annals of Agric. Sci.*, Moshtohor, Egypt 39 (2), 1185.

Ferri, D.; Convertini, G.; Rinaldi, D.De.; Giorgio, P. La.; Cava, M.E. and Tartaro, (1996) Effect of composted urban waste on some characteristics of crops and soils in Southern Italy. IX International Colloquium for the Optimization of Plant Nutrition 8-15 Sep.1996, pp.526 – 530, Prague, Czech Republic.

Gray, T.R.G. and Williams, S.T. (1979) "*Soil Micro-Organisms*", Longman, London and New York.

Khalifa, M.R.; Rabie, A. and Hassan, N.A. (2000) Effect of farmyard manure and twon refuse application on some soil properties, growth, yield and fruit elemental compositions of pepper. *J. Agric. Sci.*, Mansoura Univ. **25**(8), 5539.

Kilmer, V.J. and Alexander, E. (1949) Methods of making mechanical analysis of soil. *Soil Sci.* **68**, 15.

Loveday, J. (1974) Methods for analysis of irrigated soils. Commonwealth Agriculture Bureaux: 43-67 and 67-74.

Mitchell, J.P.; Goodell, P.B.; Prather, T.S.; Coviello, T.S.; Hartz, T.K.; Hembree, K.J.; Munk, D.S.; May, D.M.; Menezes, F.; Grimes, K.; Diener, J. and Neill, T.O. (1997) Cooperative farmer-scientist evaluations of biologically integrated soil and pest management practices. 94^{th} Annual International Conference of the American Society for Horticultural Science, 22-26 July, Salt Lake City, Utah, *Hortscience* **32**, 540.

Negm, M.A.; El-Zaher, H.; Abd Elghani, M.M. and Salib, M.M. (2002a) Effect of a commercial compost (Biotreasure) and sulphur added to a highly calcareous soil on : 1. Soil properties and fertility. *Minofiya J. Agric. Res.* **27**(2), 369 .

Negm, M.A.; El-Zaher, H.; Awaad, M.S. and El-Sayed, M.H. (2002b) Effect of a commercial compost (Biotreasure) and sulphur added to a highly calcareous soil on : I I.Cearial productivity and nutrient uptake. *Minofiya J. Agric. Res.* **27**(2), 381 .

Negm, M.A.; El-Zaher, H. and Kerlous, R.G. (1996 b) Utilization of NPK through two successive sesons from a calcareous soil amended with saw-dust and farmyard manure. *Menofiya J. Agric. Res.* **21** (6), 1603.

Negm, M.A.; Kerlous, R.G. and El-Zaher, H. (1996 a) Manuring value of saw-dust added to a calcareous soil. I. Organic carbon and nitrogen. *Menofiya J. Agric. Res.* **21** (6),1591.

Negm, M.A.; Rifaat, M.G.M. and Estefanous, A.N. (2003) Impact of composted saw-dust and some nitrogenous sources on the production of squash and table beet crops grown on a calcareous soil. *Fayoum J. Agric. Res. & Dev.* 17(1), 116.

Page, A.L.; Miller, R.H. and Keeny, D.R. (1982) Methods of Soil Analysis II. Chemical and Microbiological Properties. *Soil Sci. Soc. Amer.* Madison, Wisconsin, USA.

Pagliai, M.; Guidi, G.; La Marca, M.; Giachetti, M. and Lucamente, G. (1981) Effect of sewage sludge composts on soil porosity and aggregation. *J. Environmental Quality* **10**, 556.

Petersen, R.G. (1976) *"Experimental Designs for Agric. Research in Developing Areas"*, O.S.U. Book Stores, Inc. Corvallis, Oregon, Litho, USA.

Reganold, J.P.; Glover, J.D.; Andrews, P.K. and Hinman, H.R. (2001) Sustanability of three apple production systems. *Nature* **410**, 926.

Rehan, M.G.; El-Sayed, A.H.; Hassan, M.M. and Negm, M.A. (2004) Direct and residual effects of mixing the added compost to a calcareous soil with sulphur and phosphorus .1.On crop yields and some soil properties. *J.Agric. Sci.Mansoura Univ.* **29** (3), 1603 .

Richard's, L.A. (1954) *"Diagnosis and Improvement of Saline and Alkaline Soils"*, United States Salinity Lab. Staff Agric., Handbook No. 60, USDA.

Sainju, U.M. and Singh, B.P. (1997) Winter cover crops for sustainable agricultural systems: Influence on soil properties, water quality and crop yield. *Hortscience* **32**, 21.

Snedecore, G. W. and Cochran, W. G. (1971) *"Statistical Methods"*, 7th ed., Iowa Univ., Press Amer, Iowa, USA.

Tester, C.F. (1990) Organic amendments effects on physical and chemical properties of a sandy soil. *Soil Science Society of America Journal* **54**, 827.

Yours, H.A.; Hegg, R.O. and Mc Carthy, L.S. (1984) Soil manure and salinity problem. Amer. *Agric. Univ. J. Res.* (14), 136.

Zaki, R.N. (2004) Effect of organic manure and inorganic N fertilizers on growth, yield and some physiological characters of sugar beet on calcareous soil. *Zagazig J. Agric. Res.* 31 (4B), 1617.

(*Received* 5 / 2005;
accepted 11/2005)

تجابة محصولى بنجر السكر والذرة لأضافات مكمور نشارة نشب مع مصادر نيتروجين مختلفة وعلاقتها بصفات الأرض ذات أثير

مد عبدالسلام نجم ، عبدالله أحمد محمد محمدين ، رأفت نظمى زكى ،
دالعزيز إبراهيم و عبدالعزيز المنيسى
هد بحوث الأراضى والمياه والبيئة – مركز البحوث الزراعية – القاهرة –
سر.

نفذت تجربة حقلية بالنوبارية حيث الأرض جيرية عادية ذات قوام طميى طينى رملى أضيف إليها ٤ أو ٨ طن نشارة خشب تم كمرها محلياً فى موقع التجربة مقارنة بمعدل ١٢ طن/ فدان سماداً بلديا فى وجود معدل ٢٠ كجم ن / فدان من محلول حامض النتريك المخفف أو اليوريا أو الأنسيابين كسماد أمونيومى بطئ الانسياب وزرعت ببنجر السكر ثم الذرة لدراسة الأثر الحالى والمتبقى لهذه الإضافات العضوية على مدى عشرة أشهر عند مصاحبتها لمعدل ٢٠ كجم ن معدنى للفدان لكل محصول منهما.

وقد دلت النتائج علىازدياد محصول جذور بنجر السكر معنوياً بالتسميد العضوى عن المقارنة بدون فروق تذكر بين المعاملات العضوية الثلاثة، ورفع المعدل الثانى من مكمورة نشارة الخشب محصول حبوب الذرة معنوياً عن المقارنة والسماد البلدى، ولم يؤثر التسميد النتروجينى فى محصول جذور بنجر السكر إلا أن كلا من اليوريا والأنسيابين تفوقتا معنوياً فى رفع محصول جذور البنجر لكن الأنسيابين كان الأقل فى حالة حبوب الذرة، وتأثرت نسبة المجموع الجذرى إلى الخضرى فى البنجر بالمعدل الأعلى من مكمور نشارة الخشب عن السماد البلدى والمقارنة بينما كانت مصادر النتروجين متماثلة كالمقارنة فى هذا الصدد، كذلك فلم يتأثر الدليل المحصولى للذرة بأى من الإضافات العضوية أو مصادر النتروجين. أيضاً زاد وزن ١٠٠ حبة من الذرة معنوياً بكل من المعدل العالى من مكمورة نشارة الخشب والسماد البلدى عن المعدل الأقل من مكمورة نشارة الخشب والمقارنة. وقد تفوقت كل من اليوريا والأنسيابين عن المعاملات الأخرى فى زيادة وزن ١٠٠ حبة ذرة معنوياً.

وقد كانت هناك علاقات مؤكدة بين بعض الصفات الأرضية (كعوامل مؤثرة *س*) وكل من محصول جذور بنجر السكر ونسبة الجذورألى المجموع الخضرى وكذلك محصول حبوب الذرة ووزن المئة حبة منه (كعوامل متأثرة *ص*) وقد حسبت معادلات الأنحدار لهذه العلاقات المعنوية ونوقشت من خلال سلوك هذه الصفات الأرضية المؤثرة بعد ١ ، ٥,٥ ، ١٠ أشهر من الأضافات العضوية.

وأستنتاجا مما سبق يمكن أعتبار مكمور نشارة الخشب سمادا عضويا مقبولا لأنتاج بنجر السكر والذرة الشامية من بعده خاصة عندما يكون هذا المكمور مصحوبا باليوريا او الأنسيابين من خلال أصلاحه بعض الصفات الأرضية المهيئة لأستجابة تلك المحاصيل تحت ظروف مثل هذه الأرض الجيرية.