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EFFECT OF DIFFERENT KINDS AND RATES OF BIO-SOLIDS ON SOME SOIL PROPERTIES AND ITS PRODUCTIVITY

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ABSTRACT

Field experiment was conducted at the farm of Sakha Agric. Res. Station during the two successive seasons (2001 and 2002). This investigation aimed to study the effect and residual effect of treated sewage sludge (air-dried) (TSS) and farmyard manure (FYM) application on some soils physical and chemical properties and its productivity of maize and sugar beet crops. Split plot design with 4 replicates was implemented. Application rate occupied the main plots. Five rates: 0, 10, 15, 20 and 30 tons/fed were added one time at the beginning of the experiment while TSS and FYM were applied to the sub-plots. Results could be summarized as follows:

Application of any of TSS or FYM had slightly decreased the soil pH, while EC, soluble Na, Ca, Mg and SAR were obviously increased. Microelements (Cu, Zn and Mn) were slightly increased. Meanwhile, the mean concentration of Fe was obviously increased.

It is noticed that FYM increased EC, SAR values and Cu content more than TSS especially at the low rates of application, while the inverse direction was noticed for Zn, Fe and Mn.

Application of any of TSS or FYM had slightly decreased aggregation index (AI). While mean weight diameter (MWD), optimum size, bulk density (BD), hydraulic conductivity and total porosity were slightly increased at the low rates of TSS (10 - 15 tons/fed.) and then declined.

It is found that FYM surpassed TSS in its effect on the physical properties in the surface layer, while the inverse direction was induced (i. e. TSS surpassed FYM) in the subsurface layer.

The residual effect of both TSS and FYM after sugarbeet was improving the studied chemical and physical properties.

Grain yield of maize was increased at the low rate (10 tons/fed.) and then gradually decreased with increasing the rate of either TSS or FYM. But TSS surpassed FYM in reducing maize grain

Root weight of sugarbeet yield, sugar percentage (%) and total sugar content were increased as a result of the residual effect for increasing TSS and FYM application rates.

Keywords: treated sewage sludge, farmyard manure, soils physical and chemical properties, maize and sugarbeet and residual effect.

INTRODUCTION

Organic matter (OM) plays an important role in improving physical, chemical and biological properties of the soils. Farmyard manure (FYM) constitutes the important source of organic matter (OM) as well as plant nutrients (*Allison*, 1973). But the total available amount of FYM is limited and unable to coverage the decrease in soil organic matter. Other sources of OM such as air-dried or so-called treated sewage sludge (TSS) have to be investigated. TSS is produced during the treatment process of wastewater.

Williams and *Cool* (1961) reported that the application of FYM might improve soil structure and have a positive effect on soil permeability and

water holding capacity. On the other hand, addition of TSS significantly reduced bulk density and increased field capacity (*Zeid* and *Askar,* 1987; *Tester,* 1990; Ghazy, 1994; and Talha, 2003).

Adding FYM significantly increased the availability of macro elements (*Barbaria* and *Patel*, 1980). On the other hand, *Abo Seeda et al.* (1984) and *Header* (1987) found that EC increased with TSS application. *Williams et al.* (1985) and Ghazy (1994) revealed that availability of Mn, Fe, Ni and Co were increased with TSS additions.

Moubarek (1960) pointed out that FYM increased the yield of both barley and corn. Also *El-Attar et al.* (1979) and *Abdou, et al.* (1969) found that FYM increased the corn yield. On the other hand, low rate of TSS (1%) increased the growth of barley while the high rate of TSS (6%) decreased the barley growth *(Abou Seeda et al.,*1984 and Ghazy, 1994). Moreover *Kirkham* (1976) stated that the dry matter yield was dropped with high rate of TSS and referred to the production of phytotoxic substances during sludge decomposition.

Hinsely et al. (1979) recorded a significant increase in corn grain yield in the second year as a residual effect of previous TSS application. Also Juste and Mench (1992) reported a sharp decrease in grain yield of maize grown on a soil amended with a sludge.

Proper application of TSS as a soil amendment should be adopted to overcome its harmful residual effect. Consequently, the current work aimed to evaluate the effect of TSS compared to FYM on some physical and chemical properties of soil, its productivity of maize crop and its residual effect on sugarbeet crop.

MATERIALS AND METHODS

Field experiment was conducted at the farm of Sakha Agric. Res. Station during the two successive seasons (2001 and 2002). Treated sewage sludge (air-dried) (TSS) which produced from Kafr El-Sheikh sewage station at Kafr El-Sheikh-Meseer was aerobically digested, ground and sieved to pass through 2mm screen for chemical analysis. Five rates namely: 0,10, 15, 20 and 30 tons/fed were applied to the surface layer (0 – 15 cm) one time at the beginning of the experiment before cultivating the maize plants. Physical and chemical analyses were done according to ***Page*** (1982). Some physical and chemical properties of the used soil, TSS and FYM are shown in Table 1. Maize (*Zea Mays*) var. Giza 2 was cultivated at summer season of 2001 and sugarbeet *(Beta Vulgaris*) Var. Cowmera at the winter season of 2001/2002. Split plot design with 4 replicates was implemented. Application rate occupied the main plots, while TSS and FYM were arranged to the sub-plots. Soil samples were taken from two depths (0 –15cm) and (15 – 30cm) after both maize and sugarbeet. Statistical analysis was done according to *Cochran* and *Cox* (1960). All the agricultural practices were carried out according to conventional local recommendations of Ministry of Agriculture and Land Reclamation.

Table 1: Physical and chemical analyses of the used soil, TSS and FYM.

Property	Soil depth (cm)		TSS	FYM
	0-15	15-30		
EC dS/m	0.73	0.90	2.4	5.6
PH	7.6	7.6	6.2	7.4
Soluble cations (meq/l)				
Na^+	6.7	10.0	11.8	27.8
Ca^{++}	1.8	1.2	10.6	6.4
Mg^{++}	0.8	2.2	5.0	2.8
K^+	0.07	0.06	0.70	2.7
Soluble anions (meq/l)				
Cl^-	5.1	6.1	10.0	28.2
HCO_3^-	4.2	3.1	6.4	7.2
CO_3^-	0.0	0.0	0.0	0.0
SO_4^-	1.0	4.3		
Total Nitrogen(%)	0.147	0.140	1.15	1.35
Organic matter(%)	1.67	0.45	21.8	13.3
Total phosphorus(%)	0.021	0.001	0.093	0.072
EDTA-extractable				
Fe, ppm	102	81.6	127.2	70.4
Mn, ppm	142.7	139.8	38.1	128.2
Zn, ppm	9.9	8.7	42.5	25.0
Cu, ppm	15.8	14.8	25.1	9.50
Textural class	Clay	Clay		
Bulk density(g/cm^3)	1.26	1.29		
Hydraulic conductivity(cm/h)	0.21	0.21		

RESULTS AND DISCUSSION

1- Effect of TSS and FYM application on some chemical properties and elemental content:

Data in Table (2) show for the surface layer (0.0 – 15 cm) that increasing rates of both TSS and FYM had slightly decreased the soil pH, while EC, soluble Na, Ca, Mg and SAR were obviously increased. These results may be attributed to that the decomposition of organic matter produced organic acids which may react with salts to produce salt humates which precipitate on the surface layer (*Heggi*, 1976). Microelements (Cu, Zn and Mn) were slightly increased. Meanwhile, the mean value of Fe was obviously increased. These results are confirmed with those obtained by *Zeid* and *Askar* (1987) and Talha (2003)

Moreover, it is worthy to mention that FYM increased EC, SAR and Cu content more than TSS especially at the low rates of application, while the inverse direction was noticed for Zn, Fe and Mn.

This result may be referred to the discrepant chemical composition of both TSS and FYM as it is demonstrated in Table 1. The same trend was noticed in the sub surface layer (15 – 30 cm), but TSS surpassed FYM especially for SAR and EC as it is shown in Table (3). It is obvious that almost the chemical properties in the surface layer (0 – 15cm) were improved after the second season whereas sugarbeet was cultivated (Table 4). The same observation was noticed for the subsurface layer (15 – 30cm) (Table 5)

Table 2: Effect of different rates of TSS and FYM on some chemical properties of the soil surface layer (0 – 15 cm) after maize cultivation.

Rate, T/fed	Applicant	pH	EC, dS/m	Soluble cations, meq/l				Soluble anions, meq/l				SAR	Available micro elements, ppm			
				Na^+	Ca^{++}	Mg^{++}	K^+	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}		Cu	Zn	Fe	Mn
Control	TSS / FYM	8.12	0.65	5.55	1.80	0.83	0.163	0.00	4.00	4.03	1.79	4.83	12.05	4.50	92.20	139.5
10	TSS	7.99	0.88	7.60	2.40	1.40	0.340	0.00	6.10	5.01	0.63	5.51	14.05	4.95	99.60	143.4
	FYM	8.09	1.04	10.00	2.60	1.60	0.150	0.00	5.00	5.00	4.35	6.89	22.60	4.30	94.30	139.1
15	TSS	7.93	0.98	7.60	2.20	0.60	0.075	0.00	5.01	5.00	0.47	6.44	16.45	7.23	103.0	142.4
	FYM	7.94	1.65	12.80	3.60	1.80	0.167	0.00	4.20	3.40	7.57	7.80	18.80	5.00	99.30	142.4
20	TSS	7.92	1.01	8.20	1.20	0.60	0.098	0.00	5.00	4.01	1.01	8.63	20.55	6.60	99.83	144.5
	FYM	7.77	1.73	11.01	3.02	1.40	0.175	0.00	4.00	7.00	4.61	7.38	25.10	4.94	87.45	139.7
30	TSS	7.92	1.21	11.00	2.60	2.20	1.105	0.00	5.00	5.00	5.90	7.14	31.05	7.35	123.6	142.9
	FYM	7.75	1.77	11.20	2.40	1.80	0.115	0.00	3.20	5.01	6.31	7.72	18.70	7.70	95.75	141.3

Table 3: Effect of different rates of TSS and FYM on some chemical properties of the soil subsurface layer (15 – 30cm) after maize cultivation.

Rate, T/fed	Applicant	pH	EC, dS/m	Soluble Cations, meq/l				Soluble anions, meq/l				SAR	Available micro elements, ppm			
				Na^+	Ca^{++}	Mg^{++}	K^+	$CO3^-$	$HCO3^-$	Cl^-	$SO4^{--}$		Cu	Zn	Fe	Mn
Control	TSS	7.90	0.78	8.00	2.30	1.05	0.117	0.00	3.54	3.75	4.18	6.20	13.05	3.80	70.9	137.9
	FYM															
10	TSS	7.89	1.14	11.20	2.20	2.40	0.082	0.00	2.20	6.20	11.5	7.37	18.20	4.50	70.9	139.7
	FYM	7.85	1.95	12.80	3.40	2.20	0.122	0.00	2.10	9.10	7.32	7.66	13.00	4.65	80.3	139.5
15	TSS	7.85	1.16	12.00	1.80	0.60	0.065	0.00	5.20	4.00	5.27	11.0	19.45	4.00	72.9	141.9
	FYM	7.79	1.85	14.00	3.40	2.60	0.128	0.00	2.33	10.0	7.79	8.09	25.45	5.25	85.9	141.0
20	TSS	7.82	1.40	14.00	2.20	1.40	0.075	0.00	6.00	4.10	7.58	10.5	16.03	4.40	82.9	139.7
	FYM	7.86	1.87	15.00	3.10	1.60	0.125	0.00	5.03	9.20	5.60	10.1	15.85	4.60	89.4	139.6
30	TSS	7.83	1.15	14.01	2.20	1.40	0.075	0.00	4.00	5.00	8.69	10.5	23.60	8.20	103.	141.9
	FYM	7.86	1.90	15.80	4.00	2.60	0.115	0.00	3.10	7.03	13.4	8.68	20.95	4.95	92.6	142.2

Table 4: The residual effect of different rates of TSS and FYM on some chemical properties of the soil surface layer (0 – 15 cm) after sugarbeet cultivation.

Rate, T/fed	Appli cant	pH	EC, dS/m	Soluble cations, meq/l				Soluble anions, meq/l				SAR	Available micro elements, ppm			
				Na^+	Ca^{++}	Mg^{++}	K^+	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}		Cu	Zn	Fe	Mn
Control	TSS / FYM	7.9	1.09	5.66	5.18	4.40	.180	00	4.00	6.60	5.92	2.58	8.65	6.18	75.40	141.0
10	TSS	7.86	1.51	15.50	4.40	4.20	.092	00	3.00	7.03	14.2	7.48	9.30	6.50	79.90	142.0
	FYM	7.85	2.11	12.80	6.60	3.60	.174	00	4.10	11.2	7.87	5.68	8.85	6.28	84.40	144.5
15	TSS	7.66	2.21	16.60	6.80	4.20	.160	00	3.10	9.20	15.5	7.06	9.65	6.95	91.90	142.0
	FYM	7.81	2.30	14.10	7.60	5.00	.275	00	3.10	12.0	11.9	5.62	10.35	7.00	89.70	146.5
20	TSS	7.63	2.38	21.40	7.80	4.40	.115	00	5.20	9.30	19.2	8.66	10.40	7.15	101.1	142.7
	FYM	7.78	2.68	20.00	8.60	6.40	.290	00	5.20	17.0	13.1	7.33	10.70	7.75	91.90	145.8
30	TSS	7.58	2.55	24.40	7.80	5.40	.122	00	4.30	13.3	20.1	9.53	10.70	7.25	102.3	144.5
	FYM	7.71	2.43	22.40	10.4	7.20	.295	00	4.20	18.0	18.1	7.57	10.70	7.85	88.10	146.1

Table 5: The residual effect of different rates of TSS and FYM on some chemical properties of the soil subsurface layer (15 – 30cm) after sugarbeet cultivation.

Rate, T/fed	Applicant	pH	EC, dS/m	Soluble Cations, meq/l				Soluble anions, meq/l				SAR	Available micro elements, ppm			
				Na^+	Ca^{++}	Mg^{++}	K^+	CO_3^{-}	HCO_3^-	Cl^-	SO_4^{-}		Cu	Zn	Fe	Mn
Control	TSS / FYM	7.82	1.27	8.15	2.40	1.10	.060	00	4.05	6.55	1.08	6.17	5.80	6.28	67.30	131.4
10	TSS	7.76	1.50	13.80	2.20	2.00	.065	00	4.00	6.20	7.87	9.51	7.00	6.20	66.60	131.0
	FYM	7.80	1.95	12.0	5.80	3.20	.115	00	4.20	11.0	5.92	5.66	9.25	6.18	75.50	143.4
15	TSS	7.67	1.39	15.10	1.80	1.60	.065	00	4.10	9.30	6.27	11.6	6.75	6.15	77.40	136.6
	FYM	7.77	1.99	14.0	5.40	3.60	.128	00	4.20	11.1	7.83	6.60	9.25	6.20	79.10	144.8
20	TSS	7.62	1.44	16.60	1.80	1.20	.065	00	4.10	9.01	6.56	13.6	7.85	6.85	95.20	142.3
	FYM	7.71	1.83	16.8	7.00	7.20	.115	00	3.30	14.0	13.82	6.32	8.90	7.10	77.40	144.8
30	TSS	7.55	2.60	21.50	2.60	2.80	.105	00	5.20	11.2	10.61	13.1	8.90	6.90	98.60	143.4
	FYM	7.78	2.09	21.4	7.11	6.80	.118	00	4.00	16.1	15.33	8.14	9.60	7.55	83.30	147.7

2 - Effect of TSS and FYM application on some physical properties:

Data in Table (6) show for the surface layer (0.0 – 15 cm) that increasing rates of both TSS and FYM had slightly decreased aggregation index (AI). While mean weight diameter (MWD) and optimum size were slightly increased with the low rates of TSS (10 tons/fed.) and then declined. Data also, show that the mean values of bulk density (BD) in the surface layer was slightly decreased with increasing TSS application rates, while in the subsurface layer BD increased with increasing application rate of TSS up to 20 tons/fed and then declined. Meanwhile the mean values of hydraulic conductivity and total porosity were increased with increasing application rates of TSS up to 15 tons/fed and then declined (Table 7). These results are confirmed with those obtained by *Zeid* and *Askar* (1987) and Ghazy (1994).

On the other hand, data in Table (6) show that AI in the surface layer was increased with increasing rates of FYM up to 10 tons/fed and then declined. Meanwhile, values of MWD and opt. size were slightly increased

Table 6: Effect of different rates of TSS FYM on some physical properties of the soil surface layer (0 – 15 cm) after maize cultivation.

Rate, T/fed	AI		MWD, mm		Opt. Size %		BD, g/cm³		Total Porosity %		Kc, cm/hr	
	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM
Control	0.377		0.98		38.9		1.231		53.60		0.32	
10	0.383	0.339	0.83	0.77	60.9	51.5	1.241	1.292	53.2	51.3	0.16	0.19
15	0.287	0.285	0.63	0.61	47.7	53.4	1.252	1.273	52.8	51.9	0.15	0.18
20	0.277	0.369	0.62	0.82	45.9	54.9	1.271	1.203	52.0	54.6	0.14	0.19
30	0.241	0.364	0.59	0.84	44.7	50.1	1.213	1.183	54.2	55.4	0.14	0.18

Also, data show that the values of BD in the surface layer were decreased with increasing FYM application rates and then declined, whereas, the change in BD in the subsurface layer (Table 7) was not obvious. Also, data show that values of hydraulic conductivity and total porosity were increased in the two layers (0-15cm and 15-30cm) with increasing FYM application rate up to 15-20 tons/fed and then declined. These results may be related to the increase of SAR and soluble Na^+ that had a negative effect on the physical properties. (*Talha et al.*, 1979) and Ghazy (1994).

Table 7: Effect of different rates of TSS FYM on some physical properties of the soil subsurface layer (15 – 30cm) after maize cultivation.

Rate, T/fed	AI		MWD, mm		Opt. Size %		BD, g/cm³		Total Porosity %		Kc, cm/hr	
	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM
Control	0.357		0.80		48.2		1.272		52.0		0.15	
10	0.261	0.319	0.64	0.71	41.8	50.6	1.293	1.321	51.2	50.2	0.14	0.13
15	0.230	0.236	0.62	0.55	40.5	46.5	1.302	1.33	50.9	49.7	0.12	0.14
20	0.216	0.166	0.53	0.50	41.6	44.4	1.284	1.351	51.5	49.0	0.11	0.15
30	0.239	0.245	0.51	0.43	42.3	45.1	1.292	1.362	51.3	48.6	0.13	0.12

It is worth to mention that FYM surpassed TSS in its effect on the physical properties in the surface layer, while the inverse direction was induced (i.e. TSS surpassed FYM) in the subsurface layer. This result may be

refer to the different composition and characteristics of TSS and FYM, that matter which allow to the effect of TSS to go deeply through the profile more than FYM. It is obvious that almost the physical properties in the surface layer (0 – 15cm) were improved after the second season whereas sugarbeet was cultivated (Table 8). The same observation was noticed for the subsurface layer (15 – 30cm) (Table 9).

Table 8: The residual effect of different rates of TSS and FYM on some physical properties of the soil surface layer (0 – 15 cm) after sugarbeet cultivation.

Rate, T/fed	AI		MWD, mm		Opt. Size %		BD, g/cm^3		Total Porosity %		Kc, cm/hr	
	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM
Control	0.203		0.43		42.4		1.229		53.6		.172	
10	0.202	0.241	0.43	0.48	46.16	43.9	1.201	1.232	54.7	53.5	.136	.183
15	0.200	0.211	0.39	0.42	42.40	40.9	1.189	1.231	55.1	35.6	.221	.192
20	0.185	0.192	0.37	0.38	41.01	39.0	1.187	1.245	55.2	53.0	.204	.180
30	0.157	0.147	0.34	0.33	38.0	31.7	1.211	1.242	54.3	53.1	.191	.133

Table 9: The residual effect of different rates of TSS and FYM on some physical properties of the soil subsurface layer (15 – 30cm) after sugarbeet cultivation.

Rate, T/fed	AI		MWD, Mm		Opt. Size %		BD, g/cm^3		Total Porosity %		Kc, cm/hr	
	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM	TSS	FYM
Control	0.198		0.35		39.8		1.281		51.6		.113	
10	0.190	0.140	0.38	0.33	40.71	38.9	1.322	1.379	50.1	47.96	.131	.122
15	0.165	0.175	0.37	0.38	40.80	35.8	1.290	1.341	51.3	49.4	.121	.119
20	0.170	0.180	0.34	0.36	40.40	35.2	1.283	1.330	51.6	49.8	.091	.109
30	0.146	0.145	0.30	0.31	37.7	27.2	1.266	1.343	52.2	49.32	.081	.099

3 - Effect of TSS and FYM on maize and sugarbeet crops:

Data in Table (10) show that grain yields of maize were increased with the low rate (10 tons/fed.) and then gradually decreased with increasing rates of either TSS or FYM.

Table (10): The effect of TSS and FYM on maize crop and their residual effect on sugarbeet crop.

App. rate	TSS				FYM			
	Maize (ton/fed)	Sugarbeet			Maize (ton/fed)	Sugarbeet		
		Root Weight (ton/fed)	Sugar %	Total sugar (ton/fed)		Root Weight (ton/fed)	Sugar %	Total sugar (ton/fed)
Control	2.3	9.5	17.0	1.6	2.3	9.5	17.0	1.6
10 tons/fed	2.6	13.4	17.4	2.3	2.5	11.3	17.3	2.0
15 tons/fed	2.2	16.1	18.6	3.0	2.1	12.6	18.6	2.3
20 tons/fed	2.0	18.4	19.1	3.5	2.1	15.6	19.1	3.0
30 tons fed	1.9	18.5	18.9	3.5	2.0	17.0	19.6	3.3
F - test	*	**	*	**	ns	**	*	**
LSD .05	.631	2.134	1.231	1.214	-	2.231	1.114	1.134
.01		3.211		1.983	-	3.413		1.886

This result could be attributed to the production of phytotoxic substances during TSS decomposition (*Kirkham*, 1976), or may be due to the increase of soluble salts specially Na^+ during mineralization (*Abo Seeda et al.* .1984), Fig (1). These results are confirmed with those obtained by *Hinsely et al.* (1979), *Abd-El-Naim et al.* (1984) and Juste and Mench (1992). Also it is noticed that TSS surpassed FYM at the low rate while the opposite direction was noticed at the high rate (Table 11).

Table (11): the increase percentage of the effect of TSS over FYM on maize and sugarbeet crops.

Crop		Control	10 tons/fed			15 tons/fed			20 tons/fed			30 tons fed		
			TSS	FYM	Increase +I %	TSS	FYM	Increase +I %	TSS	FYM	Increase +I %	TSS	FYM	Incr-ease +I %
Maize (t/fed)		2.3	2.6	2.5	4	2.2	2.1	4.8	2.0	2.1	-4.8	1.9	2.0	-5
Sugar beet	Root Weight (t/fed)	9.5	13.4	11.3	36.7	16.1	12.6	33.1	18.4	15.6	21.9	18.5	17.0	6.3
	Sugar %	17.0	17.4	17.3	2.8	18.6	18.6	0.0	19.1	19.1	0.0	18.9	19.6	-3.7
	Total sugar (t/fed)	1.6	2.3	2.0	13.0	3.0	2.3	23.3	3.5	3.0	14.3	3.5	3.3	5.7

Also, data in Table (10) show that root weigh of sugarbeet, sugar percentage (%) and total sugar yield were significantly increased with increasing TSS application rates. The same trend was observed with FYM application. But the increase in root weigh of sugarbeet and total sugar content due to TSS obviously surpassed that increase due to FYM with increasing average 8-18% and 6-30% for root weight and total sugar yield, respectively. There is no significant difference between the effect of TSS and FYM on sugar %, while this ratio was slightly affected by the application rate of TSS or FYM, (Table 11).

RECOMMENDATIONS

It is useful to state that using either treated sewage sludge (TSS) or farmyard manure (FYM) as organic fertilizers has several advantages such as; reducing the chemical applied fertilizers which in turn affected in saving foreign exchange as well as clean environment. At the same direction, more long investigations should be implemented on the residual effects of such organic matters on agricultural production and human health.

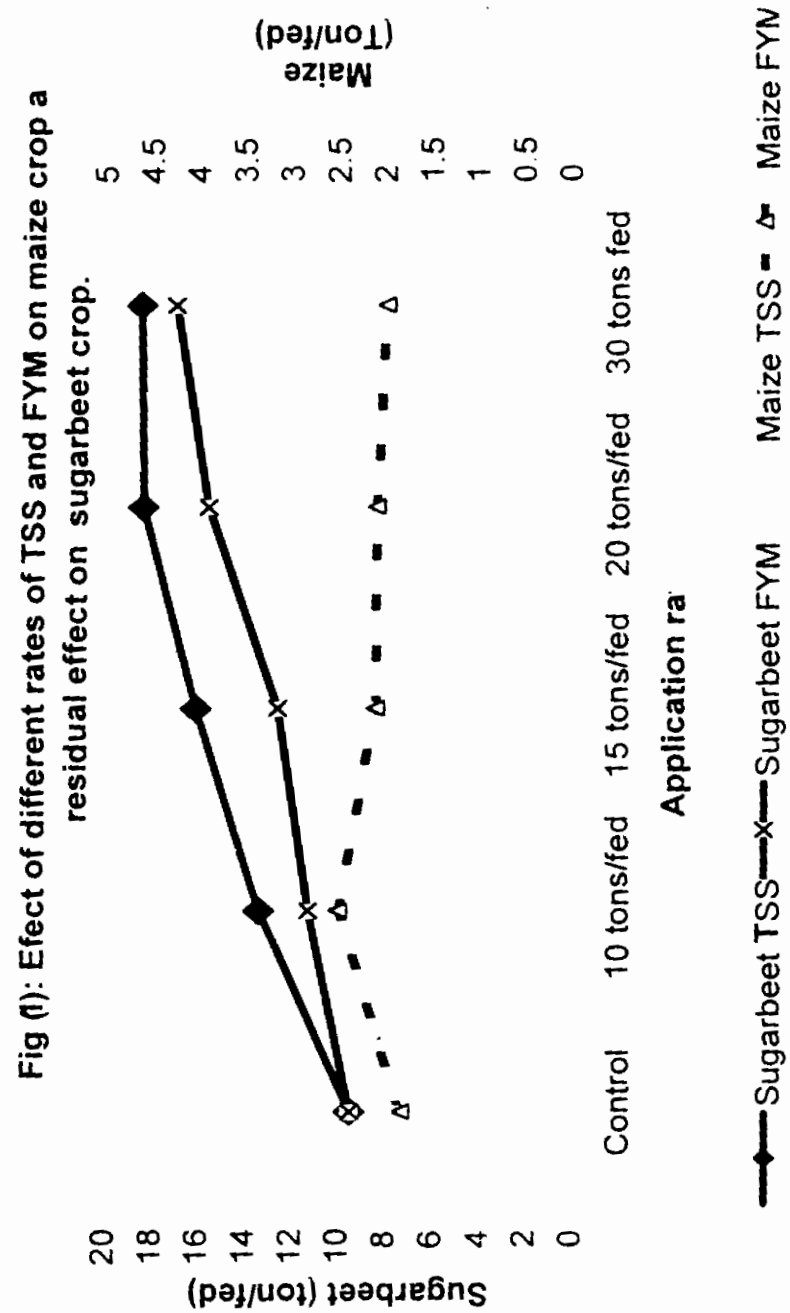
Fig (1): Efect of different rates of TSS and FYM on maize crop a
residual effect on sugarbeet crop.
Sugarbeet (ton/fed)
Maize
(Ton/fed)
Control
10 tons/fed
15 tons/fed
20 tons/fed
30 tons fed
Application ra
Sugarbeet TSS
Sugarbeet FYM
Maize TSS
Maize FYM

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تأثير إضافة معدلات مختلفة من المخلفات العضوية الصلبة على بعض خواص التربة وإنتاجيتها

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أقيمت تجربة فى مزرعة محطة البحوث الزراعية بسخا - كفر الشيخ خلال الموسمين الزراعيين ٢٠٠١ و ٢٠٠٢ لدراسة تأثير إضافة كل من الحمأة المعالجة المجففة هوائيا والسماد البلدي بأربعة معدلات على بعض الخواص الطبيعية والكيميائية للتربة وإنتاجيتها لمحصولي الذرة الشامية وبنجر السكر، وقد استخدم تصميم القطع المنشقة لتحليل النتائج. ويمكن تلخيص النتائج المتحصل عليها فيما يلي.

أدى إضافة أيا من الحمأة المعالجة المجففة هوائيا أو السماد البلدي الى تناقص طفيف فى قيم ال pH، بينما أدى الى زيادة واضحة فى قيم التوصيل الكهربائي EC وكاتيونات الصوديوم والكالسيوم والماغنسيوم الذائبة ، وكذلك زيادة قيم نسبة الصوديوم المدمص SAR. كذلك محتوى التربة من العناصر الصغرى الذائبة (النحاس والزنك والمنجنيز) ، كما زاد الحديد زيادة واضحة.

من الجدير بالذكر أن إضافة السماد البلدي أدت الى زيادة قيم التوصيل الكهربائي (EC) نسبة الصوديوم المدمص , (SAR) , ومحتوى التربة من النحاس أكثر من الحمأة المجففة هوائيا فى حين كان تأثير الحمأة المعالجة المجففة هوائيا أوضح فى زيادة الزنك والحديد والمنجنيز.

إضافة أيا من الحمأة المعالجة المجففة هوائيا أو السماد البلدي بمعدلات صغيرة أدت الى تناقص قيم دليل التحبب (AI) وزيادة الكثافة الظاهرية (BD) والحجم الأمثل (Opt. Size) ومتوسط القطر الفعال (MWD)والتوصيل الهيدروليكي فى حين أدت المعدلات المرتفعة الى تناقص هذه القيم.

لوحظ أن السماد البلدي تفوق على الحمأة المعالجة المجففة هوائيا فى تأثيره على الخواص الطبيعية فى الطبقة السطحية فى حين حدث العكس فى الطبقة التحت سطحية.

التأثير المتبقي لكل من الحمأة المعالجة المجففة هوائيا والسماد البلدي بعد محصول بنجر السكر هو تحسن الخواص الطبيعية.

إضافة أيا من الحمأة المعالجة المجففة هوائيا أو السماد البلدي بمعدلات منخفضة أدى الى زيادة محصول الذرة الشامية ، ولكن المعدلات المرتفعة أدت الى نقص المحصول وكان النقص أوضح فى حالة إضافة الحمأة. المجففة هوائيا.

أدى التأثير المتبقي لإضافة كلا من الحمأة المعالجة المجففة هوائيا والسماد البلدي الى زيادة محصول جذور بنجر السكر ونسبة ومحتوى السكر.