RESIDUAL EFFECT OF COMPOST AND BIOFERTILIZER ON MAIZE YIELD, AND SOME SOIL CHEMICAL PROPERTIES

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Abstract: Two field experiments were carried out at the Experimental Farm of Mallawi Agric. Res. Station, El-Minia Governorate during the two successive seasons of 2003 and 2004 to investigate the comparative residual effects of two different types of compost (town refuse and filter press mud were subjected to decomposition process for six months before application to soil) applied at the rates of 3.5, 7.0and 10.5 or 2.0,4.0 and 6.0 ton/fed, respectively either alone or in combination with biofertilizer (Biofertan – T.W.C.310, a mixture of free- living nitrogen fixing bacteria), on grain yield and nutrients uptake by maize plants as a second successive crop after wheat .

Also the effect of these treatments on some chemical properties of the treated soils after harvesting the second crop as maize plants grown in post harvest soils the first crop as wheat plants during the two successive seasons (2002 / 2003) and (2003 / 2004) were studied . The experiment was laid out in split plot design with four replicates . The obtained results revealed that the residual effects of application of compost alone or in combination with biofertan before the first crop (wheat) had a positive effect on improving plant growth parameters . Grain yield , nutrients uptake of the second crop (maize plants) and chemical properties of treated soil were affected .

The results showed that grains yield of maize plants as well as the uptake of NPK by grains were increased and this increase was proportional to the application rates of compost and biofertan .

Key wards: Compost, residual effect, biofertilizer,maize crop and soil properties

Introduction

Biological nitrogen fixation (BNF) has an assured place in agriculture, mainly as a source of nitrogen for legumes . The probability of eventual success of nitrogen fixation with cereals should now be regarded as significant. Such crops will also need mineral or organic fertilizers to maintain a good status of nutrients.

It is well known that addition of organic fertilizers has shown a considerable increase in crop yield and exerts a significant influence on physical, chemical and biological properties of soil. But its use alone

is not sufficient to meat the requirements of nutrients.

Makary (2001) reported that the organic manure fertilizer (FYM) plus inoculation with free- living nitrogen fixing bacteria, biofertan and mineral nitrogen fertilizer improved wheat shoot tissue content of NPK.

Drija and Kazakove(1975) indicated that the grain yield of maize and wenter wheat during three years was increased by 33% from the direct and residual effect of the application of 10 ton FYM/ha. Kapur (1995) reported that the residual effects were equivalent to 28 Kg/ha of urea N/ha for sugar beat grown after corn and 22 Kg /ha for sugar beat after rice, with an apparent recovery of 14.3 and 11.2 percent respectively. The soil treated with sulphiation cane filter cake had higher contents of organic carbon, available N and P. Though some reports are available that indicate the press mud advantages in terms of crop yield and fertility status, (Singh et al.,1996).

Ramamurthy and Shivashankar (1995), indicated that the residual effect of application of 10 ton/ha organic manure significantly increased sunflower seed yield grown after soybean or maize plants, compared with 0.0 or 5.0 ton/ha, as well as, data are presented an available NPK in the soil after each crop. Soliman and Monem (1995) found that the use of biofertilizers and nitrification inhibitors could play an important role in the maize grain production in sandy soils, as well as, decreasing the losses of applied nitrogen fertilizers. Abd El.Moez (1996) reported that the application of organic wastes alone or mixed with ash significantly increased dry matter yield of maize plants grown in pots , in which *bean* (*Vicia faba)* was previously grown with application of 20 tons , of lentil waste /fed. the most effective uptake of NPK was higher with application of filter cake with or without ash.

Yaduvanshi and Yadav (1996), indicated that an increased addition of sulphication press mud to , cane plant had a significant residual effect on the increased availability of NPK in the soil for the succeeding ratoon crop . Atta Allah (1998) stated that the applicatio of biofertilize treatments were given higher grains yield of maize plants .

This study was conducted to evaluate the residual effects of two different types of compost sources either alone or in combination with bioferilizer (biofertan) on maize plant growth , grain yield and nutrients content in grains as a second crop grown in plots after harvesting of wheat as first crop . Also , the residual effects on soil fertility was examined .

Materials and Methods

Two field experiments were carried out at the Experimental Farm

of Mallawi Agric. Res. Station during the two successive seasons of 2003 and 2004 . In the winter seasons(2002 and 2003) wheat was grown as the first crop and received two different types of compost as organic residues (town refuse and filter press mud) were subjected to decomposition process for six months before application to soil) either added alone or in combination with biofertan :(a mixture of free-living nitrogen fixing bacteria : *Azospirillum, Azotbacter, Bacillus, Klebsiella,* 10^8–10^{11} CFU g^{-1}) .

In the summer seasons (2003 and 2004), maize was grown in the same plots as the second crop to study the residual effect of the applied treatment on maize plants growth, grain yield and nutrients content. Also, its residual effects on some chemical properties of the treated soils after harvesting the second crop .

The experimental design was split plot, with four replicates, as the main plots were devoted to two different types compost sources with or without inoculation with biofertan as follows:

1- compost type A (uninoculated town refuse).

2- compost type A (inoculated town refuse).

3- compost type B (uninoculated filter press mud).

4- compost type B (inoculated filter press mud).

The area of each sup- plot was 42 m^2 and they were assigned for three rates of compost types, i. e., C1, C2 and C3 as follows:

Rates	compost type	
	Town refuse	Filter press mud
C1	3.5 ton/ fed (50 Kg N)	2.0 ton/ fed (50 Kg N)
C2	7.0 ton/ fed (100 kg N)	4.0 ton/ fed (100 Kg N)
C3	10.5 ton/ fed (150 Kg N)	6.0 ton/ fed (150 Kg N)

The two compost types were added either alone or combined with biofertan before cultivation of wheat as the first crop (*Triticum astivum L* .) during preparation of soil.

Chemical and physical soil properties were measured in six soil samples before the sowing of the first crop according to Black (1995), as shown in Table (1) .

Table(1): Some physical and chemical properties of the soil used in the study for two seasones before cultivation of wheat as the first crop in 2002-2003 and 2003-2004.

Season	Particle size distribution%			Texture	Field capacity%	CaCO3 %	O.M.%	CEC meq. /100gm soil	pH (1:2.5)	EC_e(ds/m(1: 1)	Anion meq. /100g soil			Cations meq. /100g soil				Avaliable nutrients (ppm)		
	Sand	silt	clay								- Cl	-- (CO_3 + HCO_3^-)	-- SO_4	++ Ca	++Mg	+ Na	+ K	N	P	K
First	7.63	61.87	30.50	clay loam	48.1	2.08	1.09	36.5	8.16	1.59	1.98	1.61	4.4	1.65	1.45	4.5	0.39	45.3	11.4	75.2
Second	8.10	61.21	30.69	clay loam	49.5	1.63	1.09	38.2	8.05	1.95	2.2	1.85	5.7	1.95	1.86	5.69	0.35	39.5	11.4	79.4

Table(2): Chemical analysis of compost used in the experament as a mean of six samples .

Compost typ	Moisture%	pH (1:2.5)	EC_e(ds/m (1:5)	O.M.%	CEC meq. /100g compost	CaCO3%	T.N,%	T.C,%	C/N ratio	Avaliable nutrients(ppm)		
										N	P	K
Town refuse	40.21	6.51	1.61	21.63	68.39	1.1	1.45	12.55	8.66	131	14.0	28.0
Filter press mud	40.26	5.96	1.18	58.65	138.52	1.22	2.51	33.83	13.48	223.1	40.71	62.0

Some chemical properties of the two compost types sources , were determined according to Chapman and Pratt (1962) as given in Table (2) . The aerobic composting process of two single sources of residues heap consisted of the following portions according to the method described by

Abou El.Fadl (1970) ; 100 parts if residues material, 2.5 parts of each of ammonium sulfate , calcium superphosphate and fine calcium carbonate and 10 parts of animal wastes . The total mixture (heaps) were subjected to decomposition process for six months and were turned every month from starting .

Biofertan, T.W.C. 310, a mixture of free- living nitrogen fixing bacteria, isolated from the rhizosphere of wheat plants propagated and provided from Agriculture Microbial Res. Dep., Res. Center, Giza Egypt, were used through out the present work as wheat grains coating inoculum before planting .

The maize grains were planted on the 15th May 2003 or 2004 on some post – harvest soils of the first crop. The Maize was planted in furrow in which the plants were spaced 30 cm apart, within rows .

As to the fertilization of the two successive crops (wheat and maize), all plots received phosphorous and potassium at rates of 30 and 25 Kg /fed as super phosphate (15.5% P_2O_5) and Potassium sulfate (48-52% K_2O) respectively, at planting of each crop.

The nitrogen fertilizer was added in one dose after 30 days from sawing of wheat and maize at rate of 50 k g N /fed. As ammonium nitrate 33.5 % N .

After maturity, the maize plants were harvested . The grain yield was measured and the results were expressed on dry weight basis.

Representative samples of maize grains were collected from all the treatments. All samples were digested using (H_2SO_4 –$HCLO_4$) mixture as described by Chapman and Partt (1962).

Also, The soil samples were collected from all the plots of before and after planting of the second crop for determination of some chemical properties and nutrients content according to Black (1965).

All data were tabulated and statistically analyzed according to Steel and Torric (1983) using LSD test.

Results and Discussion

The residual effects of application of two different types of compost (town refuse or filter press mud) either alone or combined with biofertan are presented . The data of yield components , nutrients uptake by maize grains and some chemical properties of treated soil after harvest of the wheat and maze plants, well be discussed .

1- Yield components :

Concerning residual effect of two compost sources (TR and FPM) either alone or combined with biofertan on grain yield of maize plants cultivated after the first crop (wheat) in the two studied successive seasons, the data presented in Tables (3and 4) .

The data show that the grain yield of maize plants and 100 grain weight were significantly increased at all

application rates of compost either alone or combined with biofertan .The data show that, the highest increase was recorded in grain yields of maize , while the 100 grains weight were slightly increased, also the results indicated that the residual effect of the two compost types were in the following order: FPM+ biofertan> FPM>T R+ biofertan >TR alone .

The relative increment percentage of grain yields obtained in the first season were 101.27, 105.36, 109.17% and 103.50, 104.59, 109.69% when 3.5.7.0, 10.5 ton of TR/ fed., were added alone or in combination with biofertan , respectively . While the relative increases were 101.00, 111.17, 113.62.% and 103.23, 109.87, 119.84% when 2.0, 4.0, 6.0 ton of FPM/ fed., were added alone or in combination with biofertan , respectively .

However , in the second season were 102.76. 115.45, 120.67% and 105.58, 115.35, 122.60% when 3.5,7.0, 10.5 ton of TR/ fed., While the increases were 110.10, 115.71, 122.00% and 11.0.05, 121.30, 123.91% when 2.0,4.0 , 6.0 ton of FPM/ fed., respectively .

The 100 grains weight of maize following the same trend as in the case of the other parameters . The increasing trend in the 100 grains weight and it was highly significant as compared to control . In the first season , the increases were 106.32 , 109.08, 117.71% and 113.19, 121.06, 125.66% when 3.5,7.0, 10.5 ton of TR/ fed., respectively . Also, were 110.42 , 123.96, 130.88% and 109.69 , 118.66, 132.36% when 2.0, 4.0, 6.0 ton of FPM/ fed., were added alone or in combination with biofertan , respectively . The relative increases in the second season were 104.90 , 108.56, 117.98% and 110.00, 115.04, 120.61% when 3.5, 7.0, 10.5 ton of TR/ fed., respectively . While were 104.36, 110.35, 120.31% and 112.52, 113.89, 121.37% when 2.0, 4.0, 6.0 ton of FPM/ fed., respectively .

The increase in the 100 grains weight and grain yields of maize plants grown in the treated soil may be attributed to the improvement in soil hydrophysical, microbial, physical, chemical and nutritional properties. The variation in the performance of the two compost types alone or incombination with biofertan during the second crop (maize plants) could be ascribed to the C/N ratio and either composition.

These results are in agreement with those obtained by many researches, (Abd El.Salam, 1997; El.Sedfy, et al., 2003; Negm, et al., 2002 $_{a,b}$; and khalil and Aly 2004) .

2- Nutrients uptake :

The results presents in Tables (3 and 4) show significant increase in NPK uptake (kg/fed.) by grains of maize plants due to the residual effect of added two compost types alone as compared to control. Whereas residual effect of using two compost types

incombination with biofertan in two studied seasons was insignificant.

A- NPK uptake by maize grains in the first season :

Compared to control treatment , the nitrogen uptake obtained the increase were 108.41 , 115.80 , 123.50 % and 110.57. 112.19 , 120.15 % when 3.5 , 7.0 , 10.5 ton of TR/ fed ., respectively . Also , the increases were 119.59 , 134.79, 142.05 % and 116.35, 127.30, 141.54% when 2.0, 4.0 , 6.0 ton of FPM/ fed., respectively

While , the relative increases of phosphorous uptake were 111.78 , 138.54 , 160.51% and 126.90 , 142.39 , 159.51% when 3.5,7.0 , 10.5 ton of TR/ fed., respectively . Also, were 180.53, 216.24, 250.96% and 168.75, 204.62 , 233.97% when 2.0,4.0 , 6.0 ton of FPM/ fed., respectively .

Also, the potassium uptake by maize grains increases were 111.04 , 121.76 , 127.22% and 110.07 , 116.35 , 128.23 when 3.5,7.0 , 10.5 ton of TR/ fed., respectively . While , were 118.98, 134.28 , 147.33% and 124.98, 130.76 , 151.03% when 2.0,4.0 , 6.0 ton of FPM/ fed., respectively .

B- Nutrients uptake by maize in the second season :

However , the relative increment percentage of NPK uptake by maize grains in the second season as affected by residual effect of added two compost alone or in combination with biofertan . The increases of nitrogen uptake were 112.55. 126.09 , 139.03% and 113.69 , 126.13 , 141.68% when 3.5, 7.0 , 10.5 ton of TR/ fed., respectively . Also, were 123.18 , 133.89, 145.80% and 117.06 , 138.04 , 146.76% when 2.0 , 4.0, 6.0 ton of FPM/ fed., respectively .

The relative increases of phosphorous uptake were 121.99 , 159.04 , 188.86% and 134.37 , 162.53 , 205.92% when 3.5, 7.0 , 10.5 ton of TR/ fed., respectively . Also, were 146.39, 175.60 , 208.43% and 160.00, 209.30 , 230.99% when 2.0,4.0 , 6.0 ton of FPM/ fed., respectively .

The relative increases of potassium uptake were 104.99, 120.42, 128.51% and 102.02 , 113.81 , 125.05% when 3.5,7.0 , 10.5 ton of TR/ fed., respectively . While , were 121.20 , 130.70. 141.13% and 115.92 , 130.18, 137.12% when 2.0, 4.0, 6.0 ton of FPM/ fed., respectively .

The increase in nutrients uptake presented herein may be attributed to the following reasons :

1- The content of these nutrients in the compost , increased the yield of maize and decomposition of organic acids which were responsible for increasing nutrients availability in the treated soil:

2- The increase of organic acids which in turn can liberates the nitrogen , increases its availability to plants .

Similar results were obtained by (Raman et al., 1996 ; Atta Allah, 1998; Negm, et al., 2002 $_{a,b}$ and Khalil and Aly , 2004).

Table(3): Residual effect of two different types of compost with biofertan on grain yields, 100 grain weight and nutrients uptake by grains of maize in the first season (2003) .

Treatments			Grain yields ard./fed	100grains, wt. G	Nutrients content in grains					
					Nitrogen		Phosphorous		Potassium	
Biofertan	Compost type, ton/fed.				%	Uptake , kg/ fed	%	Uptake , kg/ fed	%	Uptake , kg/ fed
uninoculated	control		11.01	13.44	2.12	35.01	0.19	3.14	1.41	22.29
	TR	3.50	11.15	14.29	2.28	38.13	0.21	3.51	1.48	24.75
		7.00	11.60	14.66	2.33	40.54	0.25	4.35	1.56	27.14
		10.50	12.02	15.82	2.40	43.27	0.28	5.05	1.58	28.49
		mean	11.59	14.92	2.34	40.68	0.25	4.35	1.54	26.77
	FPM	2.00	11.12	14.84	2.51	41.87	0.34	5.67	1.59	26.52
		4.00	12.24	16.66	2.57	47.19	0.37	6.79	1.63	29.93
		6.00	12.51	17.59	2.65	49.73	0.42	7.88	1.75	32.84
		mean	11.96	16.37	2.28	46.25	0.38	6.82	1.66	29.78
inoculated	Control		11.14	13.72	2.22	37.07	0.22	3.68	1.42	23.73
	TR	3.50	11.53	15.53	2.37	40.99	0.27	4.67	1.51	26.12
		7.00	11.65	16.61	2.38	41.59	0.30	5.24	1.58	27.61
		10.50	12.22	17.24	2.43	44.54	0.32	5.87	1.66	30.43
		mean	11.80	16.46	2.39	42.30	0.30	5.31	1.58	27.97
	FPM	2.00	11.50	15.05	2.50	43.13	0.36	6.21	1.66	29.64
		4.00	12.24	16.28	2.57	47.19	0.41	7.53	1.69	31.03
		6.00	13.35	18.16	2.62	52.47	0.43	8.61	1.79	35.84
		mean	12.36	16.50	2.56	47.46	0.40	7.42	1.71	31.70
L.s.d.	A		0.47	0.19	N.S	1.73	0.03	0.57	0.02	1.48
	B		0.32	0.45	0.05	1.47	0.03	0.79	0.03	0.85
	AB		0.44	0.54	0.07	2.07	0.04	1.11	0.04	1.20
	C		0.36	0.85	0.04	1.14	0.02	0.4	0.02	0.67
	AC		N.S.	0.39	0.05	N.S.	0.05	N.S	N.S	N.S
	BC		N.S.	0.55	0.07	2.35	N.S	0.78	N.S	N.S
	ABC		0.86	0.78	0.10	N.S.	N.S	N.S	0.05	N.S

* Ardab = 150 kg grains .

* A : 2 Compost types B : 3 Rates C: Biofertan .

Table(4): Residual effect of two different types of compost with biofertan on grain yields, 100 grain weight and nutrients uptake by grains of maize in the second season (2004)

Treatments			Grain yields ard./fed	100grains, wt. G	Nutrients content in grains					
					Nitrogen		Phosphorous		Potassium	
Biofertan	compost type, ton/fed.				%	Uptake kg/ fed	%	Uptake kg/ fed	%	Uptake kg/ fed
Uninoculated	Control		10..50	12.85	2.10	33.08	0.21	3.31	1.39	21.89
	TR	3.50	10.79	13.48	2.30	37.23	0.25	4.05	1.42	22.98
		7.00	12.12	13.95	2.35	42.72	0.29	5.28	1.45	26.36
		10.50	12.67	15.16	2.42	45.99	0.33	6.27	1.48	28.13
		mean	11.86	14.20	2.36	41.98	0.29	5.12	1.45	25.80
	FPM	2.00	11.56	13.41	2.35	40.75	0.28	4.86	1.53	26.53
		4.00	12.15	14.18	2.43	44.29	0.32	5.83	1.57	28.61
		6.00	12.81	15.46	2.51	48.23	0.36	6.92	1.61	30.94
		mean	12.17	14.35	2.43	44.36	0.32	5.95	1.57	29.03
Inoculated	control		10.75	13.10	2.25	36.28	0.22	3.55	1.50	24.19
	TR	3.50	11.35	14.41	2.38	40.52	0.28	4.77	1.45	24.69
		7.00	12.40	15.07	2.46	45.76	0.31	5.77	1.48	27.53
		10.50	13.18	15.80	2.60	51.40	0.37	7.31	1.53	30.25
		mean	12.31	15.09	2.48	45.75	0.32	5.91	1.49	27.51
	FPM	2.00	11.83	14.74	2..41	42.77	0.32	5.68	1.58	28.04
		4.00	13.04	14.92	2.56	50.08	0.38	7.43	1.61	31.49
		6.00	13.32	15.90	2.65	52.95	0.41	8.20	1.66	33.17
		mean	12.73	15.19	2.54	48.50	0.36	6.87	1.62	30.93
L.s.d.	A		0.41	0.12	0.01	1.61	0.01	0.32	0.01	1.31
	B		0.32	0.22	0.05	1.42	0.01	0.62	0.01	0.80
	AB		0.41	0.34	0.05	2.01	0.02	0.01	0.03	1.11
	C		0.29	0.53	0.02	1.10	0.01	0.29	0.01	0.42
	AC		N.S.	0.12	0.03	N.S.	0.01	N.S.	N.S.	N.S.
	BC		N.S.	0.32	0.05	2.11	N.S.	0.70	N.S.	N.S.
	ABC		0.77	0.61	0.06	N.S.	N.S.	N.S.	0.02	N.S.

*Ardab = 150 kg grains .

* A : 2 Compost types B : 3 Rates C: Biofertan .

3 - **The residual effect of two types compost either added alone or combined with biofertan on some chemical properties and available nutrients in the soil** :

A- pH and EC :-

The data of Table (6) show that, the pH and EC of the treated soil after harvest of maize plants in the two seasons did not show any significant change as compared to control except in case of addition of filter press mud where, the pH slightly decreased more than town refuse. This effect of filter press mud could be due to its initial low pH (5.96) and organic acids producing during the course of decomposition. A slight EC increase over control treatment has been noticed as it could be due to the added materials (compost and biofertan), the decreasing trend of EC could be ascribed to the increased filter press mud , leaching of salts .

B- Organic matter contents:

Results of organic matter contents of the treated soil after harvesting of the second crop (maize plants) are presented in Table (6). The increase in organic matter content is attributed to organic compounds during the mineralization of organic refuse (composts) and biofertan. Among the different compost sources, the largest increase in soil organic matter content was recorded in filter press mud treatment either alone or in combination with biofertan. These variations could be due to their different compost decomposition rates which in turn control led by several factors including the chemical composition of the organic manure (two types compost sources i. e. organic matter content, C/N ratio).

C- **Cation exchange capacity (CEC)**:

Perusal of the data in Table (6) indicated a slight increase in CEC in the treated soil after harvest of the second crop (the maize plants) over control, as a result of the residual effect addition of types of compost sources and biofertan. The increase in CEC could be attributed to the increase in humus content of the treated soil form the applied two types of composed sources (TR and FPM) and biofertan. A superiority for two composts were achieved due to they attains a relatively high content of highly hymified organic materials (21.63 and 58.65%), respectively and decomposition of the plant residues in the soil .

The variation in the performance of the two types of the compost sources (TR and FPM) and the decreasing trend from crop to crop may be ascribed to their individual effect of organic refuse (two types compost sources) and the continuous depletion of soil organic matter contents from crop to crop. Similar results were reported by (Arafat, et

al., 1992 ; El.Dawwey, 1994 and Atta Allah, 1998) .

4- Available nutrients :

Available nitrogen:

The increase in available nitrogen in the treated soil after harvesting the second crop (maize plants) over control was observed as a result of incorporation of two types of compost sources and biofertan Table (6) . The increased in available nitrogen over control could be attributed to the mineralized nitrogen from the added two types of compost (TR and FPM) either alone or combined with biofertan .

The results also indicated a decreasing trend in available nitrogen from before to after second crop (maize plants) which could be due to the removal of nitrogen by maize plants growing and also, due to nutrient loss by leaching .

Available phosphorous:-

The results in Table (6) show that the two compost sources (TR and FPM) and biofertan treatments increased available phosphorous in the treated soil after harvesting the maize plants over control . Further more than data also indicated that the magnitude of increase in the available phosphorous from before to after maize crop is very low. The increased was in available phosphorous over to control may be due to the phosphorous content of the two compost types sources (TR and FPM) and also by the solubility increase of native phosphorous by means of organic acids resulted from organic refuse decomposition (composts) and the activities of phosphate solublizing micro-organisms. The maximum increase recorded in (FPM) treatments, as this could be due to the higher content of phosphorous (Table, 2) compared to compost of town refuse.

Available potassium:-

The data in Table (6) show that, the treatments effect on available potassium in the treated soil for two compost types sources either added alone or in combination with biofertan after harvesting the maize plants. Results indicated an increase in available potassium in the treated soil over control. It may attributed to the release of K from the compost types as well as from the native sources and the retention of K by organic colloids against leaching. Also, the results indicated a decreasing trend from before to after maize plants harvesting which could be ascribed to the much removal of either by plant uptake or by leaching from the soils.

The results obtained are also in agreement with these obtained by many researches (Thind, et al., 1993 and Sidhu, et al.,1993) .

Table(5): Residual effect of two different types of compost with biofertan on some chemical properties and available N, P and k of post harvest soils of the two successive seasons after wheat plant harvesting and befor maize planting .

Season	Treatments			Available nutrirents, ppm			Chemical properties			
	Biofertan	Compost type ton/fed,		N	P	K	pH (1: 2.5)	EC, (ds/m1:1)	O.M.%	CEC meq. /100gm soil
First season	uninoculated	Control		45.18	17.25	70.15	8.14	1.63	1.09	38.29
		TR	3.50	51.18	17.78	73.37	8.14	1.64	1.11	39.51
			7.00	59.21	18.52	79.48	8.12	1.66	1.15	40.12
			10.50	67.62	21.45	91.11	8.11	1.69	1.16	40.78
			mean	59.34	19.25	81.32	8.12	1.66	1.14	40.14
		FPM	2.00	53.21	18.46	74.28	8.12	1.65	1.14	40.31
			4.00	67.72	22.68	76.72	8.09	1.68	1.17	40.85
			6.00	82.24	25.13	79.15	8.08	1.73	1.19	45.85
			mean	67.72	22.09	76.72	8.10	1.69	1.17	42.34
	Inoculation	Control		45.89	17.24	66.65	8.13	1.65	1.13	41.31
		TR	3.50	58.10	17.78	73.45	8.10	1.67	1.15	41.79
			7.00	69.89	18.68	76.81	8.09	1.68	1.18	43.35
			10.50	71.24	21.82	95.32	8.07	1.71	1.22	45.29
			mean	66.41	19.43	81.86	8.09	1.69	1.18	43.48
		FPM	2.00	58.68	19.73	76.76	8.08	1.66	1.15	42.45
			4.00	72.25	25.57	79.45	8.06	1.71	1.19	44.29
			6.00	87.37	25.89	82.21	8.03	1.75	1.25	45.59
			mean	72.77	23.73	79.47	8.06	1.71	1.20	44.11
Second season	Uninoculated	Control		38.55	25.38	73.12	8.02	2.11	1.18	41.31
		TR	3.50	49.42	26.75	76.75	8.02	2.12	1.21	42.53
			7.00	53.37	27.82	81.16	7.98	2.14	1.27	43.25
			10.50	61.27	31.82	86.32	7.97	2.16	1.33	43.36
			mean	54.69	28.80	81.41	7.99	2.13	1.27	43.05
		FPM	2.00	49.37	30.37	75.37	7.98	2.14	1.25	43.30
			4.00	61.29	32.58	75.91	7.96	2.15	1.31	43.65
			6.00	73.45	44.12	79.08	7.95	2.18	1.38	45.28
			mean	61.37	35.69	76.79	7.96	2.16	1.31	44.08
	inoculated	Control		46.88	27.12	74.29	7.98	2.11	1.21	45.31
		TR	3.50	51.98	27.59	76.35	7.98	2.12	1.27	45.61
			7.00	59.21	30.61	85.39	7.96	2.15	1.35	46.29
			10.50	72.31	32.29	90.69	7.93	2.19	1.42	48.39
			mean	61.17	30.16	84.14	7.96	2.15	1.35	46.76
		FPM	2.00	52.90	30.85	77.28	7.96	2.16	1.41	47.15
			4.00	72.85	34.19	81.35	7.93	2.21	1.45	48.39
			6.00	80.87	49.27	82.79	7.91	2.26	1.48	49.31
			mean	68.87	38.10	80.47	7.93	2.21	1.45	48.28

Table(6): Residual effect of two different types of compost with biofertan on some chemical properties and available N, P and K of post harvest soil of the two successive seasons after maize harvesting .

Season	Treatments			Available nutrirents, ppm			Chemical properties			
	Biofertan	Compost type ton/fed,		N	P	K	pH (1: 2.5)	EC, (ds/m1:1)	O.M.%	CEC meq. /100gm soil
First season	uninoculated	Control		41.01	12.11	53.12	8.15	1.62	1.06	38.10
		TR	3.50	46.11	12.25	53.20	8.12	1.67	1.07	38.31
			7.00	47.63	12.35	55.48	8.10	1.67	1.12	38.78
			10.50	51.81	13.48	58.16	8.09	1.68	1.12	39.27
			mean	48.52	12.69	55.61	8.10	1.67	1.10	38.79
		FPM	2.00	56.83	15.85	51.79	8.10	1.64	1.11	39.61
			4.00	59.65	16.59	54.28	8.07	1.65	1.15	39.83
			6.00	63.28	16.23	54.89	8.05	1.70	1.16	41.27
			mean	59.92	16.22	53.65	8.07	1.66	1.14	40.24
	Inoculation	Control		44.25	13.27	53.75	8.10	1.65	1.10	40.13
		TR	3.50	48.66	13.98	53.78	8.07	1.65	1.11	40.51
			7.00	49.46	14.21	54.95	8.05	1.66	1.16	41.48
			10.50	49.86	14.37	59.18	8.02	1.69	1.18	44.16
			mean	49.33	14.19	55.97	8.05	1.67	1.15	42.05
		FPM	2.00	57.71	15.18	51.78	8.03	1.64	1.11	40.36
			4.00	59.83	16.63	54.63	8.01	1.69	1.14	41.78
			6.00	64.33	16.78	55.47	7.97	1.71	1.17	43.15
			mean	60.62	16.20	53.96	8.00	1.68	1.14	41.76
Second season	Uninoculated	Control		32.13	10.19	68.29	8.04	2.09	1.15	41.78
		TR	3.50	35.70	10.25	69.34	8.02	2.09	1.18	41.80
			7.00	37.63	10.28	69.51	7.98	2.10	1.24	42.16
			10.50	37.85	11.46	71.39	7.95	2.12	1.26	42.68
			mean	37.06	10.66	70.08	7.98	2.10	1.23	42.21
		FPM	2.00	35.51	14.68	68.65	8.01	2.11	1.18	42.19
			4.00	40.29	15.83	69.67	7.95	2.14	1.26	42.85
			6.00	42.65	17.19	69.87	7.93	2.15	1.27	43.62
			mean	39.48	15.90	69.40	7.96	2.13	1.24	42.89
	inoculated	Control		33.19	10.32	69.40	8.01	2.08	1.17	43.18
		TR	3.50	36.37	10.35	70.31	7.96	2.09	1.25	42.48
			7.00	36.48	11.48	70.38	7.95	2.12	1.27	45.29
			10.50	45.28	14.80	72.25	7.91	2.16	1.35	46.78
			mean	39.38	12.21	70.98	7.94	2.12	1.29	44.85
		FPM	2.00	36.25	14.60	67.69	7.92	2.13	1.34	45.38
			4.00	36.79	17.61	70.23	7.90	2.17	1.36	45.79
			6.00	43.19	17.80	70.68	7.86	2.25	1.36	47.51
			mean	38.74	16.67	69.23	7.89	2.18	1.35	46.23

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دراسة التأثير المتبقي للأسمدة العضوية الصناعية والسماد الحيوى على محصول الذرة الشامية وبعض الخواص الكيماوية للتربة

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أقيمت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بملوى – محافظة المنيا – مصر . خلال موسمين متعاقبين 2003 ، 2004 لدراسة التأثير المتبقى لنوعين مختلفين من الأسمدة العضوية الصناعية (مخلفات المدن وطينة المرشحات) مع المخصب الحيوى البيوفرتان (Biofertan -T.W.C 310) وهو عبارة عن مخلوط من البكتريا الحرة المثبتة للنتروجين الجوى على محصول الذرة الشامية ومحتواها من العناصر الغذائية كمحصول ثانى متعاقب لمحصول القمح الشتوى وكذلك تاثيرها على بعض خواص التربة الكيماوية بعد حصاد محصول القمح كمحصول أول وبعد محصول الذرة كمحصول ثانى فى كل موسم ، وقد أضيفت هذه الأسمدة مرة واحدة عند التجهيز لزراعة المحصول الأول (القمح) فى كل موسم زراعى بعد إجراء عملية كمر هوائى لمدة ستة أشهر مع التقليب كل شهر وتوفير الرطوبة المناسبة خلال فترة الكمر وكانت معدلات إضافة هذه الأسمدة فى ثلاث مستويات 3.5 ، - 7.و ، 10.5 طن / فدان من مخلفات المدن و 2 ، 4 ، 6 طن / فدان من طينة المرشحات سواء فى صورة منفردة أو متحدة مع المخصب الحيوى البيوفرتان وقد اجريت التجربة فى تصميم قطع منشقة فى أربعة مكررات .

وأوضحت النتائج المتحصل عليها ظهور تأثير إيجابى على محصول الذرة الشامية وعلى محتواها من العناصر الغذائية وكذلك الخواص الكيماوية للتربة تحت الدراسة ومحتواها من عناصر النتروجين والفوسفور والبوتاسيوم التى ظهرت فى صورة أكثر تحسناً ولكن فى صورة أقل من الصورة التى كانت عليها قبل زراعة محصول الذرة حيث ان التحلل السريع للأسمدة العضوية المضافة واستنفاذ محصول الذرة للعناصر الغذائية جعلها تظهر بصورة أقل مما كانت عليه قبل زراعة الذرة .

ولهذا يجب الاهتمام بإضافة الأسمدة العضوية الصناعية بصورة دورية لما لها من دور كبير فى تحسين خواص التربة وزيادة محتواها من العناصر الغذائية وزيادة خصوبتها كما ينعكس بصفة عامة على المحصول وتكوينه الكيماوى وكان هذا التأثير الايجابى يزيد مع زيادة معدلات الإضافة من كلا النوعين من الاسمدة الا انه كان بصورة واضحة فى اضافات سماد طينة المرشحات سواء منفردة أو متحدة مع البيوفرتان أكبر من اضافات سماد مخلفات المدن سواء فى صورة منفردة او فى صورة متحدة مع البيرفرتان .