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EFFECTS OF SOME NATURAL ORGANIC AND INORGANIC MATERIALS ON SOME SOIL PROPERTIES AND CORN GROWTH IN SANDY CALCAREOUS SOIL.

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ABSTRACT

Sandy calcareous soil samples from the west district of Minia Governorate were used in pot experiment to study the effect of Compost at 0, 2, 4 and 6 ton/fed., Taffla at 0, 400 and 800 kg/fed and Rock phosphate at 0, 200 and 400 kg/fed. The test materials were used separately and in different combinations. Results showed a significant increase in dry matter yield and NPK uptake by corn plants due to the application of the tested materials. More increase was obtained when these materials were applied with the half recommended chemical fertilizers. The highest pronounced yield was obtained with 6 ton compost/fed combined with 400 kg RP/800 kg TA. Soil organic matter content increased from 0.08% in control to 0.22, 0.35 and 0.41% with 2, 4 and 6 ton compost/fed. Also, N content P and K availability in the soil were increased after cultivation. Values of pH slightly decreased while EC values increased due to the application of these materials.

INTRODUCTION

In Egypt, large areas of desert lands are sandy soil which is low in organic matter content as well as the essential nutrients. So, organic fertilizer is one of the limiting factors for horizontal agricultural expansion especially under Egyptian conditions of arid and semi-arid areas *(Saleh et al., 1997)* and should be added to increase organic matter and nitrogen content. Phosphorous and potassium can be added

from the natural in organic materials to improve their content inorganic compost and in the soil (*El-Haggar et al., 2004* and *Sherif and Sherif, 2005*). The use of rock phosphate (PR) fertilizers has increased in recent years as cheap fertilizer and can be efficient than soluble fertilizer in terms of recovery of phosphate by plants even from short-term crops in soils where soluble P is readily leached as in sandy soils and possibly for long-term crops in other soils. Addition of rock phosphate during composting of agricultural wastes is known to increase the solubility of phosphorus out of rock phosphate *(Singh and jones 1986; Abdel-Motal, 2004; El-Haggar et al. 2004 and Sherif and Sherif, 2005)*. Also, utilization of natural desert clay sediments such as taffla to improve the hydro-physical and chemical properties and turn plant growth in sandy soils was tried by many authors. The clay mineral and exchangeable cations in taffla are responsible for definition its use (*Saleh et al., 1997*). Moreover, taffla has been effective in increasing the yield production of different crops grown on sandy soil such as groundnut (*Abdel-Naim et al. 1990*), sunflower *(Hussein et al. 1999, Mahmoud ,1996)* and corn *(Sherif and Sherif, 2005)*.

This work was designed to investigate the effects of organic compost, rock phosphate and taffla on sandy calcareous soil properties and their effects on the growth of corn plant with half the recommended rates of chemical fertilizers.

MATERIALS AND METHODS

Soils* and the investigated amendments *sampling:

Soil samples: Sandy calcareous soil samples were collected from the newly reclaimed soils at the west district of El-Minia (Village No. 5). Surface soil samples (0-30 cm) were taken, air dried, crushed, sieved through a 2 mm sieve, mixed well and stored for analysis and experimentation. The physical and chemical analyses of the tested soil are given in Table 1.

Table 1 : Some physical and chemical analyses of the studied soil.

Soil properties		Soil properties	
PH (1 :2.5)	8.03	Soluble Na ppm	12.18
EC(1: 5) dS/m	1.08	Ca (mg/100g)	10.12
O.M%	0.11	Mg (mg/100g)	09.68
$CaCO_3$ %	11.30	Sand %	86.00
Total N %	0.03	Silt %	09.20
Available P ppm	9.81	Clay %	4.80
Soluble K ppm	5.93	Texture & properties	Sandy calcareous

Effects of Natural Materials an soil properties and corn growth

Compost prepared from agricultural residues has been used as a source of organic material. Desert *taffla* (Qasre El-Sagha) and *rock phosphate* from Safaga area were also investigated. Some analytical properties of the investigated amendments are shown in Table 2.

Table 2: Some chemical analyses of the investigated organic and inorganic materials.

Material properties	Compost	Taffla	Rock phosphate
pH (1:2.5)	8.40	8.00	7.46
EC(1: 5) dS/m	9.70	9.20	1.04
Soluble K ppm	13.3	21.30	0.40
$CaCO_3$ %	5.20	2.20	0.68
Available Pppm	31	5.90	29.00
Total N %	1.80	---	---
O.M %	58.86	----	----

Treatments and experimental design:

Pot experiment was conducted under greenhouse conditions to study the effects of the tested materials on corn plant growth, dry matter yield, and uptake of N, P and K nutrients as well as the changes in some chemical properties of the treated sandy calcareous soil after cultivation. The different combinations of taffla, rock phosphate and compost are presented in Table 3. These treatments were used without chemical fertilizers addition and with half the recommended agronomic rates. These combinations of the investigated amendments were compared with the full recommended agronomic rates of chemical fertilizers. Chemical fertilizers were applied as ammonium nitrate (33.5%) at rate of 100 kg N, calcium super phosphate (15.5%) at rate of 30 kg P_2O_5 and potassium sulfate (48.5%) at rate of 60 kg K_2O/fed).

Each treatment was replicated 3 times. The treated pots were seeded with five seeds of corn (Zea maize) triad hybrid variety 310 as a tested crop. Two plants were finally left to grow in each pot. Irrigation was followed to compensate the losses of moisture which maintained at 60% of field capacity. Corn shoots were harvested after 60 days from sowing, oven dried at 70 °C to constant weight and dry weight was determined. Plant shoots were ground and digested by H_2SO_4 and H_2O_2 and then analyzed for N, P and K according to the standard methods in *Page et al.(1982).*

Table 3 : Treatment combinations used in the pot experiment.

Compost ton/fed.	Rock phosphate (RP) Kg/fed	Taffla (TA) Kg/fed	Compost ton/fed.	Rock phosphate (RP) Kg/fed.	Taffla (TA) Kg/fed
0	0	0	4	0	0
		400			400
		800			800
	200	0		200	0
		400			400
		800			800
	400	0		400	0
		400			400
		800			800
2	0	0	6	0	0
		400			400
		800			800
	200	0		200	0
		400			400
		800			800
	400	0		400	0
		400			400
		800			800

Soil samples were taken from each pot after the harvest, then air dried and prepared for analyses. Same chemical properties of the amended soils were determined according to the standard procedures of *Jackson (1973) and page et al. (1982).*

RESULTS AND DISCUSSION

Dry matter yield of corn plants:

Single effect of the amendments

The obtained dry matter of corn plants as a result of amendments application is presented in Table 4. Using of compost alone increased dry matter from 2.59 g/pot for control to 4.88 g/pot with the rate of 2 ton/fed, 4.46 g/pot with 4 ton/fed and 6.02 g/pot with 6 ton/fed. These values represent 21.58, 40.67, 45.50 and 50.17% compared with the yield obtained by using the recommended doses of chemical fertilizer. The addition of half recommended doses of chemical fertilizer resulted in an increase of 28.00, 43.33, 54.17 and 60.38%, respectively. These results are in a very close agreement with those obtained by many authers using compost or different organic materials (*El-Beshbeshy, 2000; Mekail, 2000; Abdel- Rahman, 2001 and Abdel-Motaal, 2004*). The positive effect of organic material related not only

to nutrients supply, but also to its beneficial effect on the physical, chemical and biological characteristics of the soil, which in turn influence the development of the plants (*Ali, 2001*). This beneficial effect recorded not only with compost but also with taffla and rock phosphate. Table 4 shows marked increases in dry matter yield of corn with increasing the rate of rock phosphate from zero to 200 and 400 kg/fed without any addition of chemical fertilizers. The recorded values were 21.58 ,31.83 and 52.17% from the yield obtained by recommended doses of chemical fertilizer application, for control, 200 and 400 kg RP/fed, respectively. The corresponding values with half recommended doses of chemical fertilizer were 28.00, 38.25 and 64.42% respectively. Improvement in corn dry matter yield by using different rates of taffla was also observed. The addition of 0, 400 and 800 kg taffla/fed without chemical fertilizers gave 21.58, 45.08 and 48.58% from the yield of recommended doses of chemical fertilizer, respectively. The addition of half recommended doses of chemical fertilizer ensuresd more effect and increasesd the previous values to 28.00, 54.00 and 58.25%, respectively. The increases in corn dry matter yield were significant with RP and TA at all different application rates. The positive effect of RP and TA could be due to their high content of nutrients (*Abdel- Naim et al., 1990; and Hussein et al., 1999*).

Combined effects of compost, taffla and rock phosphate on DM.

Using the combination of RP and TA rates i.e. 200 RP/400 TA, 200RP/800TA, 400RA/400TA and 400RP/800TA, led to a marked significant increases in dry matter yield of corn. The yield obtained by these treatments without chemical fertilizers application represented 47.42, 58.33, 61.67 and 65.00% from the yield obtained by recommended chemical fertilizer, respectively. The corresponding values for application of half recommended doses of chemical fertilizers were 57.75, 69.08, 67.08 and 73.17% respectively. Similar findings were reported by *Sherif and Sherif, (2005)*. The best results were obtained with 400 RP/800TA at 4 and 6 ton compost/fed, which represent 87.67 and 87.92% from the yield obtained by recommended chemical fertilizer, respectively. Application of compost and mineral rocks with half recommended doses of chemical fertilizers, resulted in a significant increase in dry matter yield of corn plants. Dry matter at 4 ton compost/fed with 200 or 400 kg RP with 800 kg TA/ fed. was about 96.67 and 103.75% from the yield obtained with recommended

doses of chemical fertilizer, respectively. More pronounced yield was obtained at 6 ton compost/fed combined with 200RP/800TA (107.5%) and 400RP/800TA (109.75%) compared to the yield obtained by using recommended doses of chemical fertilizer. This may be due to a highly nutrients released from RP and TA in the presence of high amounts of organic matter in the rate of 6 ton compost and also their positive effects on physio-chemical properties of the soil under the study. These results are in a good agreement with those obtained by Abdel-Aziz et al.(2000) and Sherif and Sherif (2005).

Table 4: Effect of compost, rock phosphate and taffla rates with and without chemical fertilizer application on the dry matter yield of corn (g/pot)

Compost ton/fed.(A)	Rock phosphate kg/fed. (B)	Without chemical fertilizer						With half dose of chemical fertilizer					
		Taffla kg/fed.(C)						Taffla kg/fed.(C)					
		0	%*	400	%*	800	%*	0	%*	400	%*	800	%*
0	0	2.59	21.58	5.41	45.08	5.83	48.58	3.36	28.00	6.48	54.00	6.99	58.25
	200	3.82	31.83	5.69	47.42	7.00	58.33	4.59	38.25	6.93	57.75	8.29	69.08
	400	6.26	52.17	7.40	61.67	7.80	65.00	7.73	64.42	8.05	67.08	8.78	73.17
2	0	4.88	40.67	6.41	53.42	6.83	56.92	5.20	43.33	7.42	61.83	7.50	62.50
	200	6.21	51.75	6.63	55.25	7.40	61.67	7.77	64.75	8.58	71.50	9.10	75.83
	400	7.09	59.08	7.75	64.58	7.92	66.00	8.69	72.42	9.79	81.58	9.76	81.33
4	0	4.46	45.50	7.59	63.25	8.05	67.08	6.50	54.17	9.84	82.00	10.17	84.75
	200	6.30	52.50	7.83	65.25	8.86	73.83	8.6	71.75	9.95	82.90	11.60	96.67
	400	7.12	59.33	7.14	59.50	10.52	87.67	8.63	71.92	10.04	83.67	12.45	103.75
6	0	6.02	50.17	7.79	64.92	8.98	74.83	7.30	60.83	10.09	84.08	11.14	92.83
	200	6.95	57.92	9.47	78.92	9.85	82.08	9.88	82.33	11.06	92.17	12.90	107.50
	400	7.45	62.08	9.07	75.58	10.55	87.92	10.70	89.17	11.89	99.08	13.17	109.75
LSD (P<0.05)	A	0.18						0.23					
	B	0.16						0.20					
	C	0.16						0.20					
	AxB	0.14						0.40					
	AxC	N.S						N.S					
	BxC	0.28						0.35					
	AxBxC	0.55						0.70					

* Percent to the DM obtained by full recommended dose of chemical fertilizer(12.0 g/pot).

Nutrients uptake by corn plants

Nitrogen

Data in Table 5 show that N uptake was increased with the increase not only of compost application rates but also with the

increase in the rate of mineral rocks. The best treatment was found at 6 tons compost with 400 kg RP/ 800kgTA. Similar results were obtained by Sherif and Sherif (2005), who found that N uptake by corn plants grown in sandy calcareous soil was increased significantly on using compost with 5% rock phosphate and 10% taffla through composting process.

Table 5: Effects of compost , rock phosphate and taffla rates with and without chemical fertilizer application on the N uptake (mg/pot) by corn.

Compost ton/fed. (A)	Rock phosphate kg/fed. (B)	Without chemical fertilizer						With half dose of chemical fertilizer					
		Taffla kg/fed.(C)						Taffla kg/fed.(C)					
		0	%*	400	%*	800	%*	0	%*	400	%*	800	%*
0	0	46.1	22.5	63.3	30.9	75.9	37.0	55.6	27.1	86.6	42.2	108.1	52.7
	200	57.1	27.8	83.2	40.5	95.7	46.7	75.1	36.6	124.6	60.1	123.8	60.3
	400	86.4	42.1	103.6	50.2	109.2	53.2	97.9	47.7	141.3	68.9	158.4	77.2
2	0	79.8	38.8	104.7	50.7	107.9	52.1	71.4	34.8	110.9	54.0	141.1	68.8
	200	98.5	48.0	106.2	51.8	114.0	55.6	122.9	59.9	146.5	71.4	177.7	86.6
	400	98.1	47.8	116.5	56.8	125.8	61.3	136.9	66.7	142.0	83.8	184.6	90.0
4	0	91.8	44.7	115.3	56.2	117.6	57.3	142.1	69.3	150.6	73.4	156.7	76.4
	200	98.5	48.0	118.4	57.7	129.2	63.0	146.6	71.4	154.9	75.5	199.1	97.0
	400	108.2	52.7	125.0	60.9	146.6	71.4	167.5	81.6	174.4	85.0	199.8	97.4
6	0	92.4	45.0	112.5	54.8	104.7	51.0	162.3	79.1	179.5	87.5	203.6	99.2
	200	94.3	46.0	124.9	60.9	149.3	62.8	167.9	81.8	179.9	87.7	218.1	106.3
	400	95.7	46.6	126.3	60.5	159.9	77.9	173.2	84.3	192.9	94.0	227.5	110.9
LSD (P<0.05)	A	4.05						3.38					
	B	3.51						2.93					
	C	3.51						2.93					
	AxB	7.02						5.85					
	AxC	N.S						N.S					
	BxC	6.08						N.S					
	AxBxC	12.16						10.13					

* Percent to the N uptake obtained by full recommended dose of chemical fertilizer (204.8 mg/pot).

.Phosphorus:

Results in Table 6 indicate that phosphorus uptake was significantly increased by all treatments compared with the control. The treatments received rock phosphate recorded more phosphorus uptake. The combining of rock phosphate with compost enhanced phosphorus availability (Biswas and Narayanasamy, 2002 and Sherif and Sherif, 2005), then phosphorus uptake increased. This was clear at the treatments of 400 kg RP combined with 2, 4 and 6 ton compost/fed.

Taffla treatments also enhanced P uptake by corn plants through the applying rate of 800 kg /fed with compost at the rate of 6 ton/fed. The combination of compost with rock phosphate as well as taffla led to more phosphorus availability and uptake. The addition of half recommended dose of chemical fertilizer to the treatment received 6 tons compost with 400 kg RP and 800kgTA enhanced P uptake by corn plants more than the treatment fertilized only with full recommended dose of chemical fertilizer.

Table 6: Effect of compost, rock phosphate and taffla rates with and without chemical fertilizer application on P Uptake (mg/pot) by corn

Compost ton/fed. (A)	Rock phosphate kg/fed.(B)	Without chemical fertilizer						With half dose of chemical fertilizer					
		Taffla kg/fed.(C)						Taffla kg/fed.(C)					
		0	%*	400	%*	800	%*	0	%*	400	%*	800	%*
0	0	8.31	8.55	15.89	16.34	20.01	20.58	32.39	33.31	44.99	46.27	54.30	55.85
	200	14.93	15.36	19.50	20.06	23.92	21.17	46.02	47.33	56.48	58.09	73.96	76.07
	400	22.59	23.23	28.79	29.61	30.15	31.01	57.25	58.88	78.01	80.23	85.09	78.51
2	0	19.80	20.36	24.30	24.99	25.96	26.70	51.36	52.82	55.80	57.39	59.30	60.99
	200	24.04	24.72	24.86	25.57	27.06	27.83	68.02	69.96	70.13	72.13	78.25	80.48
	400	24.09	29.92	31.53	32.43	35.90	36.92	68.05	69.99	82.26	84.60	96.54	99.29
4	0	24.36	25.05	24.88	25.59	30.84	31.72	73.67	75.77	60.66	62.39	82.24	84.58
	200	25.00	25.70	28.64	29.46	29.43	30.72	74.89	77.02	86.69	89.16	88.54	91.06
	400	27.03	27.80	33.92	34.89	47.30	48.65	75.89	78.05	97.05	99.81	99.21	102.04
6	0	33.70	34.66	42.22	43.42	50.19	51.62	80.97	83.28	70.88	72.90	89.33	91.87
	200	35.45	36.46	52.07	53.55	55.47	57.05	83.28	85.65	89.54	92.09	99.75	102.59
	400	55.21	56.78	65.96	67.84	77.69	79.90	83.59	85.97	98.93	101.75	107.01	110.06
LSD (P<0.05)	A	1.79						2.59					
	B	1.55						2.41					
	C	1.55						2.41					
	AxB	3.11						4.83					
	AxC	N.S.						N.S.					
	BxC	2.60						4.18					
	AxBxC	5.38						8.36					

* Percent to the P uptake obtained by full recommended dose of chemical fertilizer (97.22 mg/pot).

Potassium:

Data in Table 7 clearly indicate the beneficial effect of compost on the availability of K from taffla and rock phosphate treatments which reflected on the K uptake by corn plants. The values of K uptake with the highest rate of rock phosphate (400kg/fed.) without chemical fertilizers at zero level of compost was 54 mg/pot, increased

to 57, 66 and 70 mg/pot at 2, 4 and 6 ton compost/fed, respectively. The same trend was observed with 800kg/fed of taffla when combined with 2, 4 and 6 ton compost/fed.

The addition of half recommended dose of chemical fertilizer markedly increased K uptake in the order of 4 ton compost followed by 6 ton compost combined with 800 kg TA. It appears that the rate of 800 kg AT/fed gave high values of K uptake by corn plants when combined with 4 and 6 ton compost/fed. These results are in line with those obtained by Abdel- Aziz et al., (2000) and Sherif and herif, (2005).

Generally, from the results of this study, it could be concluded that the increase in N, P and K nutrients uptake was proportional to the increase of compost application rates with different combinations of taffla and rock phosphate.

Table 7: Effect of compost, rock phosphate and taffla rates with and without chemical fertilizer application on K Uptake (mg/pot) by corn

Compost ton/fed.(A)	Rock phosphate kg/fed. (B)	Without chemical fertilizer						With half dose of chemical fertilizer					
		Taffla kg/fed.(C)						Taffla kg/fed.(C)					
		0	%*	400	%*	800	%*	0	%*	400	%*	800	%*
0	0	23	23.2	47	47.5	54	54.6	37	37.4	64	64.7	75	75.8
	200	37	37.4	54	54.6	58	58.6	41	41.4	67	67.7	75	75.8
	400	54	54.6	59	59.6	63	63.6	59	59.6	70	70.7	79	79.8
2	0	49	49.5	53	53.5	58	58.6	53	53.5	73	73.7	75	75.8
	200	55	55.6	59	59.6	64	64.7	64	64.7	78	78.9	78	78.9
	400	57	57.6	66	66.7	70	70.7	69	69.7	82	82.8	86	86.9
4	0	47	47.5	66	66.7	75	75.8	70	70.7	79	79.8	102	103.0
	200	52	52.5	73	73.7	80	80.8	69	69.7	81	81.8	104	105.1
	400	66	66.7	74	74.7	105	106.1	70	70.7	95	96.0	110	111.1
6	0	58	58.6	78	78.8	88	88.9	82	82.3	99	100.0	124	125.3
	200	64	64.7	78	78.8	95	96.0	86	86.9	105	106.1	124	125.3
	400	70	70.7	91	91.9	98	99.0	91	91.9	118	119.2	125	126.3
LSD (P<0.05)	A	0.024						0.024					
	B	0.021						0.021					
	C	0.21						0.021					
	AxB	0.42						0.042					
	AxC	N.S.						N.S.					
	BxC	0.036						0.036					
	AxBxC	0.073						0.073					

Effects of treatment combinations on some soil properties after cultivation:

Organic matter content.

Organic matter content in sandy calcareous soil after cultivation is presented in Table 8. Organic matter content increased from 0.09% in the control to 0.22, 0.35 and 0.41% through amendment applied at 2, 4 and 6 ton compost/fed, respectively. The increase in organic matter content was attributed to compost. The highest value of 0.44% OM was found with 6 ton compost + 400 kg RP + 800 kg TA / fed. The same trend was found when half the recommended of chemical fertilizer was added. These results are in the same trend with the results reported by Ali, (2001) and El- Sedfy, (2002).

Table 8: Effect of compost, rock phosphate and taffla with and without chemical fertilizer application on O.M (%) in sandy calcareous soil after cultivation

Compost ton/fed. (A)	Rock Phosphate kg/fed. (B)	Organic matter%					
		Without chemical fertilizer			With half dose of chemical fertilizer		
		Taffla kg/fed.(C)			Taffla kg/fed.(C)		
		0	400	800	0	400	800
0	0	0.09	0.13	0.17	0.13	0.14	0.15
	200	0.09	0.16	0.18	0.13	0.15	0.16
	400	0.08	0.16	0.19	0.14	0.15	0.16
2	0	0.22	.0.26	0.30	0.26	0.27	0.29
	200	0.22	0.27	0.3	0.26	0.29	0.30
	400	0.22	0.28	0.29	0.27	0.29	0.30
4	0	0.35	0.37	0.38	0.38	0.40	0.43
	200	0.35	0.37	0.38	0.39	0.40	0.43
	400	0.36	0.36	0.38	0.39	0.41	0.44
6	0	0.41	0.43	0.44	0.51	0.53	0.54
	200	0.42	0.43	0.44	0.52	0.53	0.55
	400	0.42	0.43	0.44	0.54	0.54	0.55
LSD (P<0.05)	A	0.03			0.03		
	B	0.03			0.02		
	C	N.S.			N.S.		
	AxB	N.S.			N.S.		
	AxC	N.S.			N.S.		
	BxC	N.S.			N.S.		
	AxBxC	N.S.			N.S.		

pH:

The data presented in Table 9 show a slight decrease in pH values due to increasing the rates of compost application. The pH values were 8.00, 7.98, 7.98 and 7.96 for 0, 2, 4 and 6 ton compost/fed, respectively. However, taffla treatments showed a slight increase in pH values. The same trend was observed when compost, RP and TA combined together with and without chemical fertilizer. The same findings were reported by Ali, (2001) and El- Sedfy (2002).

Table 9: Effect of compost, rock phosphate and taffla with and without chemical fertilizer application on pH value (1:2.5) in sandy calcareous soil after cultivation

Compost ton/fed. (A)	Rock phosphate kg/fed. (B)	PH values					
		Without chemical fertilizer			With half dose of chemical fertilizer		
		Taffla kg/fed.(C)			Taffla kg/fed.(C)		
		0	400	800	0	400	800
0	0	8.00	8.01	8.06	8.00	8.03	8.04
	200	8.00	8.03	8.07	8.01	8.02	8.06
	400	8.01	8.03	8.08	8.00	8.01	8.07
2	0	٧,٩٨	8.00	8.02	8.01	8.02	8.02
	200	8.00	8.01	8.03	8.00	8.01	8.03
	400	8.00	8.02	8.05	8.00	8.02	8.03
4	0	7.98	7.99	8.02	7.98	7.94	8.03
	200	7.98	7.99	8.02	7.97	7.94	8.02
	400	7.99	7.99	8.02	7.97	8.00	8.03
6	0	7.96	7.97	7.98	7.95	7.96	7.98
	200	7.96	7.97	7.98	7.96	7.96	7.98
	400	7.97	7.98	7.98	7.96	7.96	7.98
LSD (P<0.05)	A	0.021			0.019		
	B	0.011			0.016		
	C	N.S.			N.S.		
	AxB	0.022			0.022		
	AxC	0.018			0.019		
	BxC	0.021			0.020		
	AxBxC	N.S.			N.S.		

Electrical Conductivity (EC):

The results of the effect of compost ,taffla and rock phosphate on EC in sandy calcareous soil after cultivation are presented in Table 10. The values of EC with the application of compost alone increased from 0.98 mS/cm in control to 1.16, 1.26 and 1.32 mS/cm 2, 4 and 6 ton compost/fed, respectively. The combination treatments enhanced

the values of EC with or without using of half recommended dose of chemical fertilizer treatments. (Ali, 2001 and El- Sedfy, 2002).

Table 10: Effect of compost, rock phosphate and taffla with and without chemical fertilizer application on EC (mS/cm) in sandy calcareous soil after cultivation

Compost ton/fed. (A)	Rock phosphate kg/fed. (B)	EC (mS/cm)					
		Without chemical fertilizer			With half dose of chemical fertilizer		
		Taffla kg/fed.(C)			Taffla kg/fed.(C)		
		0	400	800	0	400	800
0	0	0.98	1.21	1.35	0.72	1.28	1.41
	200	1.03	1.21	1.37	1.10	1.29	1.42
	400	1.09	1.23	1.38	1.11	1.29	1.42
2	0	1.16	1.27	1.43	1.21	1.28	1.45
	200	1.20	1.35	1.43	1.24	1.32	1.44
	400	1.21	1.35	1.44	1.23	1.37	1.46
4	0	1.26	1.44	1.50	1.28	1.44	1.53
	200	1.28	1.44	1.54	1.30	1.38	1.55
	400	1.31	1.44	1.54	1.32	1.43	1.54
6	0	1.32	1.48	1.64	1.39	1.54	1.71
	200	1.34	1.51	1.66	1.43	1.55	1.73
	400	1.34	1.51	1.66	1.44	1.55	1.74
LSD (P<0.05)	A	0.02			0.05		
	B	0.02			0.05		
	C	0.02			0.04		
	AxB	0.04			0.08		
	AxC	N.S.			N.S.		
	BxC	N.S.			N.S.		
	AxBxC	N.S.			N.S.		

Total nitrogen:

Data of soil N content presented in Table 11 indicate that soil treated with compost showed a positive effect on N content after cultivation. Soil content of total N increased significantly from 0.11% for control treatment to 0.15%, 0.18% and 0.20% for rates of 2, 4 and 6 ton compost/fed, respectively. The significant increases of total N content were due to biological fixation of atmospheric N which is more activated in the presence of compost beside the nitrogen content in the compost itself (El-Sedfy, 2002). Similar results were reported by Abdel-Rahman (2001) and El- Sedfy (2002). The addition of half recommended dose of chemical fertilizer with different compost rates increased the N content in the soil after cultivation. This increases

were not significant when compared with the same treatments without chemical fertilizer. The highest value was obtained with the treatment of 6 ton compost/fed. Using rock phosphate and taffla separately or combined with compost did not show any significant effect on the N content in the soil after cultivation.

Table 11: Effect of compost, rock phosphate and taffla with and without chemical fertilizer application on total N (%) in sandy calcareous soil after cultivation

Compost ton/fed. (A)	Rock phosphate kg/fed. (B)	Total N%					
		Without chemical fertilizer			With half dose of chemical fertilizer		
		Taffla kg/fed.(C)			Taffla kg/fed.(C)		
		0	400	800	0	400	800
0	0	0.11	0.11	0.11	0.14	0.16	0.16
	200	0.13	0.13	0.13	0.16	0.16	0.17
	400	0.13	0.13	0.13	0.16	0.17	0.17
2	0	0.15	0.15	0.15	0.18	0.18	0.18
	200	0.15	0.15	0.15	0.18	0.18	0.18
	400	0.15	0.15	0.16	0.18	0.18	0.18
4	0	0.18	0.18	0.18	0.19	0.19	0.19
	200	0.18	0.18	0.18	0.19	0.19	0.19
	400	0.18	0.18	0.18	0.19	0.19	0.19
6	0	0.20	0.20	0.20	0.25	0.25	0.25
	200	0.20	0.20	0.20	0.26	0.25	0.25
	400	0.20	0.20	0.20	0.26	0.25	0.26
LSD (P<0.05)	A	0.02			0.008		
	B	N.S.			0.001		
	C	N.S.			0.001		
	AxB	N.S.			0.001		
	AxC	N.S.			0.002		
	BxC	N.S.			0.001		
	AxBxC	N.S.			0.002		

Available Phosphorus:

Data in Table 12 show that compost treatment resulted in a high increases in the available P from 16.20 ppm in the control treatment (without any fertilizer) to 25.33, 32.97 and 33.47 ppm with 2, 4 and 6 ton compost/fed, respectively. Application of rock phosphate alone enhanced the available P from 16.20 for control to 23.80 and 25.86 ppm, at the rates of 200 and 400 kg RP/ fed., respectively. More increase was recorded when RP and Taffla were applied with compost at different rates. The highest value of 45.47 ppm was found at 6 ton compost, 800 kg TA and 400 kg RP /fed. The increases in available P were always pronounced in the case of chemical fertilizers addition.

The increases of the available P can be attributed to the beneficial effect of compost on the solubility and the release of P from RP. The effect of organic material on the solubility of P from RP was also reported by Biswas and Narayanasamy (2002) and Abdel- Motaal (2004).

Table 12: Effect of compost, rock phosphate and taffla with and without chemical fertilizer application on available P (ppm) in the soil after cultivation

Compost ton/fed. (A)	Rock phosphate kg/fed. (B)	Available P (ppm)					
		Without chemical fertilizer			With half dose of chemical fertilizer		
		Taffla kg/fed.(C)			Taffla kg/fed.(C)		
		0	400	800	0	400	800
0	0	16.20	20.53	22.63	25.00	26.67	27.80
	200	23.80	28.13	30.47	31.73	30.37	30.87
	400	25.87	30.00	31.20	35.13	35.00	35.80
2	0	25.33	28.43	29.97	31.10	31.63	39.63
	200	33.07	34.30	36.13	37.03	38.47	40.67
	400	35.07	35.20	37.80	40.00	41.80	42.23
4	0	32.97	33.00	34.10	35.27	36.03	36.47
	200	40.03	41.27	47.13	42.90	43.00	49.67
	400	41.93	43.50	47.63	48.57	47.87	52.23
6	0	33.47	33.87	34.00	37.73	38.30	38.40
	200	42.67	43.20	45.20	54.53	54.63	56.20
	400	44.70	44.73	45.47	55.50	55.57	56.43
LSD (P<0.05)	A	0.36			0.90		
	B	0.31			0.54		
	C	0.27			0.53		
	AxB	0.62			1.08		
	AxC	0.83			1.06		
	BxC	0.47			N.S.		
	AxBxC	0.97			1.83		

Available potassium:

Data of the available potassium after cultivation as affected by different amendments combinations are shown in Table 13. Without chemical fertilizers addition, compost and TA significantly enhanced the available K in the soil. Rock phosphate addition caused insignificant effects when used alone or combined with the other amendments. Compost treatments enhanced the available K from 10.43 ppm at the control to 22.57, 26.67 and 31.83ppm for 2, 4 and 6 ton compost/fed, respectively.

Taffla treatments increased available K from 10.43ppm in the control to 15.33 and 19.30ppm for 400 and 800 kg TA per feddan,

respectively. Combinations of TA and compost greatly increased available K up to 37.17ppm with the treatment of 6 ton compost + 400 kg RP + 800 kg TA per feddan. The increases in available K were always greatly pronounced in the case of chemical fertilizers application. The beneficial effect of compost combined with taffla on availability of K was also reported by Hussein et al. (1999); Abdel-Aziz et al. (2000); El- Sedfy (2002).

Table 13: Effect of compost, rock phosphate and taffla with and without chemical fertilizer application on available K (ppm) in sandy calcareous soil after cultivation.

Compost ton/fed. (A)	Rock phosphate kg/fed. (B)	Available K (ppm)					
		Without chemical fertilizer			With half dose of chemical fertilizer		
		Taffla kg/fed.(C)			Taffla kg/fed.(C)		
		0	400	800	0	400	800
0	0	10.43	15.33	19.30	12.42	16.71	19.77
	200	10.80	15.33	19.65	12.13	17.20	19.83
	400	10.97	15.47	19.80	13.77	17.30	20.93
2	0	22.57	23.97	25.03	24.00	25.10	26.10
	200	22.33	24.20	25.33	24.17	25.33	26.31
	400	22.57	24.67	25.47	24.20	25.50	26.50
4	0	26.67	28.70	29.53	26.60	27.97	28.80
	200	27.73	28.60	30.00	27.07	28.00	29.57
	400	26.67	28.47	30.17	27.12	28.10	29.67
6	0	31.83	32.00	33.03	30.93	30.23	35.43
	200	31.40	32.37	35.17	31.43	33.30	36.70
	400	31.13	32.67	37.17	32.13	34.13	38.17
LSD (P<0.05)	A	0.428			0.621		
	B	0.366			0.288		
	C	0.326			0.198		
	AxB	0.731			0.277		
	AxC	N.S.			0.395		
	BxC	N.S.			0.342		
	AxBxC	1.13			0.685		

CONCLUSIONS

From the results of this study, it could be concluded that addition of plant residues compost with taffla and rock phosphate to sandy soil improved some of the physical and chemical properties and increased yield and the uptake of NPK by corn plants. Field trials should be conducted to suggest how much compost and rock phosphate can replace partially mineral fertilizer, then some sort of cost benefit analysis would be very useful to indicate the most feasible combination of compost plant residues, taffla, rock phosphate and

mineral fertilizers for different crops. The obtained results show very clearly that the application of rock phosphate with plant residues compost can be very useful to agriculture.

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تأثيرات بعض المواد المعدنيه والعضويه الطبيعيه علي خواص التربه ونمو الذره فى الاراضى الرمليه الجيريه

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أجريت هذه الدراسة بقسم الأراضي بكلية الزراعة – جامعة المنيا ، حيث تم جمع عينات تربة من الطبقة السطحية (صفر – ٣٠ سم)لأرض رملية جيرية مستصلحة حديثاً غرب المنيا .

وقد تم تقييم ثلاث أنواع من المحسنات الطبيعية (مكمور المخلفات الزراعية – الطفلة – صخر الفوسفات)

وقد أجريت هذه التجربة لدراسة تأثير هذه المواد منفردة أو توليفات منها على المحصول وعلى امتصاص عناصر (النيتروجين – الفوسفور – البوتاسيوم) بالإضافة إلى التغيرات في بعض صفات التربة بعد الزراعة.

و قد استخدمت هذه المواد بالمعدلات الاتيه:

مكمور المخلفات الزراعية بمعدل (صفر – ٢ – ٤ – ٦) طن / فدان مع الطفلة بمعدل (صفر – ٤٠٠ – ٨٠٠) كجم/ فدان، صخر الفوسفات بمعدل (صفر – ٢٠٠ – ٤٠٠) كجم/ فدان .

تم خلط التربة مع المواد المستخدمة عند المعدلات المذكورة سابقاً وتم زراعة نبات الذرة الشامية كنباتات اختبار .

نتائج هذه الدراسة:

أظهرت النتائج زيادة محصول المادة الجافة لنباتات الذرة بالاضافه الى زيادة الكميه الممتصة من النيتروجين والفوسفور و البوتاسيوم نتيجة لاستخدام المواد محل

الدراسة وكانت أعلى زيادة مع المعاملة ٦طن/فدان من الكمبوست + ٤٠٠ كجم/فدان من صخر الفوسفات + ٨٠٠ كجم/ فدان من الطفلة مع إضافة نصف كميات التسميد المعدني الموصى بها.

صفات التربة بعد الزراعة :

زاد محتوى المادة العضوية من (٠,٠٨%) في الأراضي غير المعاملة إلى (٠,٢٢ ، ٠,٣٥ ، ٠,٤١ %) في حالة ٢ ، ٤ ، ٦ طن/ فدان من الكمبوست على الترتيب وكانت أعلى قيمة (٠,٥٤%) نتيجة لإضافة ٦ طن كمبوست مع ٤٠٠ كجم من صخر الفوسفات + ٨٠٠ كجم من الطفلة بجانب إضافة نصف معدلات التسميد المعدني للنبات السابق زراعته. اشارت النتائج الىوجود زياده معنويه فى محتوى التربه بعد الزراعه من النيتروجين ،الفوسفور والبوتاسيوم الميسروخاصة في حالة إضافة نصف كميات التسميد المعدني الموصى بها. انخفض رقم حموضة التربة انخفاض طفيف نتيجة لإضافة مكمور المخلفات الزراعيه إلى الأراضي بينما أدى إضافة صخر الفوسفات والطفلة إلى ارتفاع طفيف في رقم الحموضة. أيضاً سجلت زيادة طفيفة في رقم التوصيل الكهربي نتيجة لإضافة المواد المختلفة بالمقارنة بالأرض غير المعاملة.