Minufiya J. Agric. Res. Vol. 27 No. 2: 369 - 379 (2002)

EFFECT OF A COMMERCIAL COMPOST (BIOTREASURE) AND SULPHUR ADDED TO A HIGHLY CALCAREOUS SOIL ON I- SOIL PROPERTIES AND FERTILITY

M. A. Negm, H. El-Zaher, M. M. Abd Elghani and Madlain M. Salib
Soils, water & Environ. Res. Inst. Agric-Res. Centre, Giza, Egypt.

(Received: Jan., 13, 2002)

ABSTRACT: ***A commercial compost (Biotreasure) in a rate of 1 or 2 ton /fed combined with 50,100 or 200 kg S/fed was applied to a calcareous soil in a field experiment at Noubaria Agric Res. Station to investigate the resultant effects on soil properties and cereals production wheat followed by grain sorghum through two successive seasons (2000-2001). Obtained data revealed the importance of these additions in improving soil properties to productive trend. The WHC, TSS, CEC, OM, total and fractions of nitrogen and availability of macro-and micro nutrients (P, K, Fe, Zn and Mn) were increased while soil pH decreased by any additions, especially in the surface layer. It could be recommended with using such prepared compost. Sulphur application gave a pronounced effects through the both seasons as an activating material under the experiment conditions.***

Key words: ***Calcareous soil, Commercial compost (Biotreasure), Sulphur,***

INTRODUCTION

Recycling of organic wastes became more necessary to convert these wastes to beneficial manure. A grand projects should be established for producing organic composts from these wastes to meet the ascending demand of organic fertilization (manuring) in the new reclaimed calcareous and sandy soil. Under field conditions, farmers also can maximize the compost efficiency through the rate of application and/or mixing with some other useful materials as sulphur or other amendments.

In this connection, Hanlon et al. (1996) using solid waste products, Velthof et al. (1998) using nine widely deferring organic products obtained by different fractionation methods and Badran, Nadia et al. (2000) using plant residues compost, farmyard manure and biogas products; obtained positive response translated into improvement of soil water relationships, soil organic matter, N and P availability. Mahimairaja et al. (1995) mixed elemental sulphur to poultry manure composts and stated that the greater agronomic effectiveness of sulphocompost could be attributed to the improved N use efficiency and S nutrition. Arisha and Ald Elbary (2000) did not find any significant effect to added 50 kg S/fed to sewage sludge on soil properties.

In order to decide the optimum rate of a commercial compost have a market name (Biotreasure) alone and by combination of rates of elemental

sulphur, the work was planed to carry out in a field for enough period during which, the applied amendments can improve calcareous soil properties.

MATERIALS AND METHODS

A field experiment was carried out in the Noubaria Agriculture Research Station Farm in a split plot design with four replicates. The main treatments were 0, 1 and 2 ton of Biotreasure (commercial compost)/fed. (4200 m^2) and the submain treatments were 0,50,100 and 200 kg S/fed. The Biotreasure contained 14.5 , 60.5 and 3.0% of moisture, organic matter and total nitrogen, respectively. The additions were thoroughly mixed with the soil tilth layer of plots few days before sowing of wheat (*Triticum vulagre*) variety Sakha 69 and irrigation. Two doses of mineral fertilizers each of 8.0 , 7.5 and 12.5 kg /fed of N P_2O_5 and K_2O as ammonium nitrate (33% N), calcium super phosphate 15% P_2O_5 and potassium sulphate (48% K_2O), respectively, were added after 4 and 7 weeks of planting. The recommended practices of cultivation were followed till crop maturity. In the same plots grain sorghum (*Sorghum vaulgare*) variety Dorado was planted after 15 days of wheat harvesting. The same doses of mineral fertilizers and common cultivation practices were applied up to maturity. The Noubaria Station soil analyses are presented in (Table 1).

Table (1). Some physical, chemical and nutritional properties of the Noubaria Station soil.

Depth (cm)	% without $CaCO_3$ removal				Texture grade	$CaCO_3$ fraction (g/100 g soil)			
	C.sand	F.sand	Silt	Clay		C.sand	F.sand	Silt+clay	Total
0-20	9.71	44.76	19.65	25.88	S clay loam	4.69	5.87	12.76	23.32
20-40	8.49	45.45	23.40	22.66	" " "	4.22	6.06	14.29	23.32

Depth (cm)	T.S.S %	Anions (meq/100 g soil)				Cations (meq/100 g soil)			
		$CO_3^=$	HCO_3^-	Cl^-	$SO_4^=$	Ca^{++}	Mg^{++}	Na^+	K^+
0-20	0.125	-	0.55	2.50	1.85	1.30	0.69	2.70	0.25
20-40	0.126	-	0.75	2.50	1.75	1.25	0.60	2.95	0.20

Depth (cm)	WHC %	FC %	CEC meq/100 g soil	pH 1:2.5	OM %	Total N %	C/N ratio	Available (ppm)				
								P	K	Fe	Zn	Mn
0-20	41.25	23.81	12.75	8.40	0.58	0.042	7.87	6.30	312	2.21	0.28	2.80
20-40	41.33	23.43	12.00	8.31	0.49	0.040	6.98	6.25	280	2.35	0.27	2.30

A soil sample from each plot after each crop harvesting was collected from the surface (0-20 cm) and the subsurface (20-40 cm) layers for chemical analyses according to Jackson (1973) and Page et al. (1982).

RESULTS AND DISCUSSION

1- General soil properties:

Data presented in Table (2) show the effect of compost and sulphur application on soil properties after harvesting of wheat (5.5 months of additions) followed by sorghum (10 months of additions). These results in general revealed the importance of these .additions in improving soil properties to production trend.

1.a. Water-holding capacity (WHC):

Values of WHC estimated from soil paste were raised by any of additions, especially in case of compost and in surface layer (0-20 cm). In regard to the effect of compost application on surface layer; the mean values of WHC increased from 42.6% at control to 44.9 and 45.7 when 1 and 2 ton compost / fed. were applied, respectively, by the end of the first cultivation (5.5 months of additions). In regard to the effect of sulphur on surface (0-20 cm), the obtained results indicated that the mean values of WHC slightly by changed from (41.3 and 45.7%) at control to (43.4 and 43.2%), (43.3 and 43.4%) and (43.8 and 44.9%) by each end of the two successive seasons, respectively when 50,100 and 200 kg S/fed were applied. Also, the highest mean values of WHC (46.5 and 47.8%), by the end of the two successive seasons were obtained for the surface layer when the highest rate of compost (2 Ton) + 50 kg S /fed was applied.

1.b. Total soluble salts (T.S.S):

Data presented in Table (2) revealed that after wheat harvesting negligible increases in T.S.S values due to compost addition and negligible decreases were detected by high rates of sulfur application. After sorghum harvesting, soil salinity increased even at 0.0 compost and/or sulphur. It may be due to the dry hot summer season. It could be noticed that higher sulphur application rates increased figures of T.S.S with about 0.06% after the summer season. It may be due to gypsum formation in soil (El-Fayoumy, 1996 and Abd-El Halim 2001). As for depths, salinity values were higher in the subsurface layer than the surface after winter season and the opposite was true after summer season.

1.c. Soil pH :

Results presented in Table (2) show that the additions of compost and sulphur alone or in combination slightly decreased soil pH values, especially in top layer (0-20 cm) with mixing compost and sulphur. The soil pH of surface layer (0-20 cm), at each end of the two seasons decreased from (8.47 and 8.47) for the control to (8.01 and 7.93) when the highest rates of both compost and sulphur were applied (2 ton compost + 200 kg S) /fed. This final decrease could be related to the organic acids resulting from the de-composition of compost, and biological oxidation of sulphur. Accordingly, the pH values were decreased. These results are in agreement with Dawood et al., (1985), Abdel-Aziz et al. (1986), El-Fayoumy (1996) and Abd-Elhalim, (2001). They observed that the application of sulphur decreased soil pH.

Table (2). Changes in the indicating soil properties after harvesting of wheat (5.5 months of additions) and sorghum (10 month of additions).

Compost	Sulphur	Depth (cm)	WHC* (%)		T.S.S. (%)		C.E.C (meq/100 g soil)		pH (1:2.5 susp.)	
			Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.
OM 0 (Control)	0	0-20	42.8	43.0	0.125	0.191	12.03	12.84	8.46	8.47
		20-40	42.5	42.3	0.135	0.170	14.67	11.85	8.46	8.37
	50	0-20	43.0	43.3	0.148	0.233	13.32	12.09	8.42	8.40
		20-40	42.0	42.5	0.156	0.297	15.72	9.30	8.51	8.45
	100	0-20	43.5	43.5	0.127	0.191	11.22	13.20	8.45	8.45
		20-40	40.5	42.0	0.170	0.212	13.47	10.77	8.53	8.42
	200	0-20	40.8	43.3	0.127	0.324	11.52	12.69	8.40	8.33
		20-40	42.0	42.5	0.170	0.351	14.85	10.65	8.45	8.37
	Mean		42.6	42.8	0.246	0.336	13.35	11.67	8.46	8.41
OM 1 Ton/fed.	0	0-20	44.8	46.0	0.141	0.223	11.79	13.20	8.57	8.39
		20-40	45.5	43.0	0.170	0.254	15.81	10.47	8.51	8.44
	50	0-20	45.0	46.3	0.127	0.339	13.47	14.64	8.45	8.32
		20-40	43.5	44.7	0.148	0.233	14.55	11.25	8.42	8.39
	100	0-20	41.0	46.0	0.127	0.248	14.67	14.55	8.49	8.41
		20-40	45.0	43.0	0.127	0.309	17.22	11.40	8.43	8.39
	200	0-20	43.0	46.5	0.127	0.227	10.92	12.78	8.52	8.41
		20-40	42.0	43.5	0.212	0.227	13.62	11.19	8.41	8.44
	Mean		44.9	44.9	0.147	0.258	14.01	12.44	8.48	8.40
OM 2 Ton/fed.	0	0-20	45.3	48.0	0.127	0.226	13.98	14.55	8.52	8.30
		20-40	45.5	44.5	0.160	0.248	15.87	9.36	8.53	8.45
	50	0-20	46.5	47.8	0.127	0.297	19.41	17.94	8.53	8.30
		20-40	46.0	45.5	0.124	0.226	22.08	15.84	8.55	8.41
	100	0-20	46.0	46.5	0.127	0.339	13.89	14.88	8.51	8.31
		20-40	45.0	45.0	0.127	0.254	16.59	11.97	8.49	8.43
	200	0-20	46.0	45.0	0.127	0.270	16.56	14.73	8.54	8.33
		20-40	45.0	44.0	0.170	0.248	20.52	11.43	8.57	8.42
	Mean		45.7	45.8	0.136	0.264	17.36	13.84	8.53	8.37
Sulphur mean	0	0-40	44.4	45.5	0.143	0.219	14.03	12.05	8.51	8.40
	50	0-40	44.3	45.0	0.138	0.271	16.43	13.51	8.48	8.38
	100	0-40	43.5	44.3	0.134	0.258	14.51	12.80	8.48	8.40
	200	0-40	43.1	44.1	0.156	0.275	14.67	12.25	8.48	8.38
Depth mean		0-20	43.8	45.8	0.130	0.259	13.57	14.01	8.49	8.37
		20-40	43.7	43.5	0.156	0.252	16.25	11.29	8.49	8.42
Crop mean			43.8	44.5	0.140	0.256	14.64	12.92	8.49	8.39

* Only weight basis.

2. Soil fertility properties:

2.a. Organic matter content (O.M).

Data presented in Table (3) indicate that O.M contents were raised by any of additions, especially in case of compost in surface layer (0-20cm).

In regard to the effect of compost, the O.M in the surface layer increased from 0.42 and 0.58%, in the two successive seasons for the control to (0.44 and 0.63%) and (0.51 and 0.64%) when 1 and 2 ton compost/fed were applied, respectively. Also, the highest values of O.M (0.70 and 0.64%) by the end of the two successive seasons were obtained for the surface and subsurface layers when the hightest rates of compost (2 ton) and sulphur (200 kg)/fed were applied. This may be due to the addition of compost and to more plant residues produced from larger plant growth in the treatments of high compost and S rates. Hanlon et al. (1996) and El-Fayoumy et al. (2001) considered also the effect of plant residues after harvesting crops on increasing soil organic matter.

2.b. Total nitrogen :

Data presented in Table (3) indicate that compost and sulphur application individually or in combination increased total N in soil, especially at surface layer. After sorghum, each of 1 and 2 ton/fed treatments gave the same quantity of total N higher than the control regardless of sulphur effect. These findings were in agreement with Awad et al. (1991) and Badran et al. (2000).

As for sulphur effect, total N increased proportionally by increasing S application rates in the 1^{st} season but tended to decrease by increasing the rate more than 100 kg S/fed in the 2^{nd} season. It may be due to the effect of S on encouragement of sorghum growth and consequently consumption of more nitrogen

2.c. Fractions of nitrogen:

Data presented in Table (3) reveal that ammonical N increased by compost addition after wheat harvesting due to ammonification process and disappeared after sorghum indicating that ammonification process was stopped. Nitrate N was generally stable after wheat season where plant roots adsorbed the nitrate formed due to nitrification process. Since compost addition enhanced plant growth, roots absorbed any formed quantity of nitrate N. Also, nitrate could be lost by leaching through 10 months of irrigation.

2.d. Carbon / nitrogen ratio:

After 5.5 months of applications, C/N ratio was more narrow than control by 1 ton compost addition and more wide after addition of 2 tons compost/fed. It may be explained through more mineralization of nitrogen after addition of the higher rate in a form of NH_4-N and consequently NH_3-N which suffered loss by volatilization and leaching. After 10 months, the C/N ratio was more wider than that after 5.5 regardless of compost rate of application due to nitrogen consumption by plants and somewhat loss in a rate faster than carbon mineralization.

Table (3): Changes in the indicating soil fertility after harvesting of wheat (5.5 months of additions) and sorghum (10 month of additions).

Compost	Sulphur	Depth	O.M (%)		Avail. N (ppm)				Total N (%)		C/N ratio	
					NH_4-N		NO_3-N					
		(cm)	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.
OM 0 (Control)	0	0-20	0.53	0.55	9.7	0.0	37.17	25.20	0.062	0.074	4.96	3.80
		20-40	0.39	0.52	5.5	0.0	31.41	21.00	0.050	0.064	5.66	3.59
	50	0-20	0.47	0.55	5.1	0.0	43.00	21.10	0.082	0.076	3.32	4.43
		20-40	0.41	0.52	8.3	0.0	46.60	39.60	0.095	0.084	2.50	3.59
	100	0-20	0.37	0.65	8.5	0.0	41.60	21.30	0.094	0.094	2.28	4.01
		20-40	0.41	0.58	8.2	0.0	31.20	19.52	0.078	0.089	3.05	3.78
	200	0-20	0.38	0.69	8.0	0.0	48.70	31.62	0.100	0.083	2.20	4.82
		20-40	0.43	0.61	10.7	0.0	38.70	26.32	0.099	0.067	2.52	5.28
	Mean		0.424	0.584	8.00	0.0	39.80	25.71	0.081	0.083	3.31	4.16
OM 1 Ton/fed.	0	0-20	0.55	0.60	13.3	0.0	41.00	21.00	0.098	0.093	3.22	3.74
		20-40	0.41	0.55	6.7	0.0	28.60	23.60	0.084	0.089	2.67	3.58
	50	0-20	0.50	0.62	12.9	0.0	34.60	24.60	0.090	0.091	3.22	3.95
		20-40	0.41	0.55	6.7	0.0	22.50	21.40	0.081	0.087	2.94	3.67
	100	0-20	0.42	0.68	8.6	0.0	42.20	22.52	0.073	0.072	3.34	5.48
		20-40	0.43	0.62	10.4	0.0	24.70	28.32	0.091	0.078	2.74	4.61
	200	0-20	0.42	0.70	8.6	0.0	40.20	20.52	0.095	0.089	2.56	4.83
		20-40	0.43	0.69	10.5	0.0	29.50	37.72	0.076	0.073	3.28	5.48
	Mean		0.446	0.626	9.71	0.0	30.41	24.96	0.086	0.083	2.99	4.47
OM 2 Ton/fed.	0	0-20	0.63	0.65	13.8	0.0	24.30	22.40	0.079	0.079	4.63	4.77
		20-40	0.43	0.60	5.0	0.0	31.41	13.70	0.084	0.084	2.97	4.14
	50	0-20	0.51	0.64	14.3	0.0	44.00	12.70	0.088	0.088	3.02	4.21
		20-40	0.48	0.63	8.7	0.0	33.40	15.75	0.080	0.080	3.48	4.57
	100	0-20	0.47	0.68	12.6	0.0	31.30	17.62	0.088	0.088	2.78	4.48
		20-40	0.51	0.61	11.8	0.0	35.10	18.12	0.095	0.085	3.11	4.16
	200	0-20	0.51	0.70	9.5	0.0	28.00	31.52	0.093	0.083	3.18	4.37
		20-40	0.57	0.64	10.8	0.0	23.80	30.62	0.078	0.078	4.24	4.76
	Mean		0.514	0.644	10.81	0.0	31.41	20.30	0.088	0.084	3.43	4.27
Sulphur mean	0	0-40	0.490	0.578	9.00	0.0	32.32	21.15	0.075	0.084	4.02	3.94
	50	0-40	0.463	0.585	9.33	0.0	37.35	22.53	0.088	0.084	3.08	4.89
	100	0-40	0.435	0.637	10.02	0.0	32.68	21.23	0.088	0.084	2.88	4.07
	200	0-40	0.457	0.672	9.68	0.0	33.15	29.72	0.090	0.079	2.99	4.42
Depth mean		0-20	0.480	0.643	10.41	0.0	36.34	22.68	0.089	0.085	3.23	4.39
		20-40	0.443	0.593	8.61	0.0	31.41	24.64	0.082	0.082	3.26	4.23
Crop mean			0.465	0.623	9.69	0.0	34.37	23.46	0.086	0.083	3.24	4.31

3. Nutrients availabilityies:

Availability of P, K and micronutrients are also important indicators of soil fertility. They were put in a separated table (Table 4) according to the fact that these nutrients may be present in soil in sufficient quantities but require to conditions to enhance their availabilities.

3.a. Available phosphorus :

Results in Table (4) show that the availability of soil phosphorus was increased in the amended treatments which decreased after sorghum than that after wheat in all cases. The surface layer (0-20 cm) contained lower available P than the subsurface after wheat but higher after sorghum. The increase in compost treatment for the surface and subsurface layers averaged at (5.4 and 7.9%), (8.0 and 7.9%) and (19.3 and 17.7%) when 50,100 and 200 kg S/fed were applied. The highest increment was associated with the 2 ton compost + 200 kg S/fed treatment for both layers, respectively, at the end of the second season which reached (45.4%) as compared with control. This reflects the relative beneficial effects of both additions. Such effect is mainly chemical in case of sulphur due to decreasing soil pH (Table 2), beside the possible release of phosphate ions from soil colloids by sulphate ions (Ismail et al. 1990). On the other hand, the organic and inorganic acids resulted from compost decomposition could have a contribution in decreasing soil pH as well as chelating Ca^{2+}. This could increase the availability of soil-P (El-Fayoumi and El-Gamal 1998 and Abd El-Halim, 2001). Such results stood in a good agreement with those reported by Mahimairajia et al. (1995).

3.b. Available potassium:

Potassium increased by compost applications. The increases after one ton addition was something more than that after 2 tons due to more growing roots consuming K from soil. These observation were noticed after wheat or sorghum harvesting. The available K declined after two crop consumption than after one crop only. Surface layer contained more available K than the deeper one. In all cases sulphur application did not affect K availability.

3.c. Micro nutrient (Fe, Mn and Zn) availablities:

The data presented in Table (4) show considerable increases in DTPA-extractable micronutrients from the soil after additions of compost and/or sulphur after each of the two successive seasons. As for Fe, mean values obtained from the surface (0-20 cm) and subsurface layers increased by 3.13 and 7.43%, respectively, by the end of the experiment over the control when 2 tons compost/fed was applied. The increases reached as an average of the two layers after wheat 2.6, 5.2, and 1.9% when 50, 100 and 200 kg S/fed were applied, respectively but decreased than the control after sorghum.

Table (4): Changes in the nutrient availabilities in soil after harvesting of wheat (5.5 months of additions) and sorghum (10 month of additions).

Compost	Sulphur	Depth	P (ppm)		K (ppm)		Fe (ppm)		Mn (ppm)		Zn (ppm)	
		(cm)	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.	Wheat	Sorgh.
0 (Control)	0	0-20	7.27	6.16	336	336	2.60	3.43	2.27	3.67	0.379	0.451
		20-40	7.27	5.82	305	297	2.60	4.12	2.42	3.37	0.379	0.425
	50	0-20	8.00	6.24	391	297	2.56	3.32	2.85	2.87	0.392	0.294
		20-40	6.68	6.16	344	266	2.69	3.76	2.49	2.87	0.328	0.352
	100	0-20	6.98	6.12	383	336	2.82	4.03	2.99	3.40	0.375	0.441
		20-40	7.18	5.60	360	266	3.02	3.58	3.43	2.83	0.333	0.474
	200	0-20	6.34	6.78	328	305	2.22	3.31	3.31	3.67	0.549	0.332
		20-40	9.00	6.10	350	258	3.08	2.93	3.60	3.32	0.299	0.305
	Mean		7.34	6.12	349.6	295.1	2.70	3.56	2.92	3.25	0.379	0.384
1 Ton/fed.	0	0-20	7.44	6.36	399	313	2.76	4.57	2.81	4.77	0.510	0.441
		20-40	7.36	6.30	336	282	2.72	4.29	2.72	3.67	0.489	0.256
	50	0-20	6.40	6.66	407	259	2.61	3.21	2.76	3.73	0.424	0.371
		20-40	6.72	6.06	360	258	2.62	3.52	2.42	3.22	0.276	0.276
	100	0-20	7.18	7.22	383	336	2.81	3.57	2.62	3.87	0.620	0.525
		20-40	7.26	6.92	297	297	2.61	3.44	2.52	2.93	0.396	0.574
	200	0-20	9.44	6.84	430	266	2.51	4.72	2.42	3.70	0.680	0.611
		20-40	8.16	6.08	352	266	3.01	2.67	2.98	2.49	0.570	0.548
	Mean		7.50	6.56	370.5	284.6	2.71	3.75	2.66	3.55	0.496	0.450
2 Ton/fed.	0	0-20	7.52	5.96	360	336	2.77	3.63	2.50	3.77	0.483	0.475
		20-40	7.82	5.84	352	282	2.72	4.58	2.82	3.93	0.449	0.556
	50	0-20	6.70	6.58	360	399	2.65	4.29	2.60	3.18	0.381	0.630
		20-40	9.58	6.56	344	368	3.46	3.69	2.33	3.50	0.278	0.710
	100	0-20	8.20	6.62	336	313	2.44	3.06	2.93	3.60	0.680	0.591
		20-40	8.58	6.86	305	274	3.35	3.42	2.82	3.50	0.570	0.686
	200	0-20	7.68	8.44	383	321	2.47	3.52	2.97	3.67	0.464	0.499
		20-40	6.58	8.98	368	235	3.19	3.78	2.27	3.93	0.287	0.700
	Mean		7.83	6.98	351.0	316.0	2.88	3.75	2.66	3.64	0.449	0.606
Sulphur Mean	0	0-40	7.45	6.07	348.0	307.7	2.70	4.10	2.59	3.86	0.448	0.434
	50	0-40	7.35	6.38	367.7	307.8	2.77	3.63	2.58	3.23	0.347	0.439
	100	0-40	7.56	6.56	344.0	303.7	2.84	3.52	2.89	3.36	0.496	0.549
	200	0-40	7.87	7.20	368.5	275.2	2.75	3.49	2.93	3.46	0.475	0.499
Depth Mean		0-20	7.43	6.67	374.7	318.1	2.60	3.72	2.75	3.66	0.495	0.472
		20-40	7.68	6.44	339.4	279.1	2.92	3.65	2.74	3.30	0.388	0.489
Crop mean			7.53	6.58	360.6	302.5	2.73	3.69	2.75	3.51	0.452	0.478

Similar trend of Zn and Fe was noticed as affected by compost addition but Mn increased after sorghum season when 1 and 2 tons compost/fed were applied. While increases in Zn concentration reached (10.0 and 26.5%) and (6.0 and 15.0%) when 100 and 200 kg S/fed were applied, respectively, Mn followed the same trend of Fe as affected by S application. On the other hand, the increases in the mean values of extractable Fe, Mn and Zn from surface and subsurface layers by the end of the two successive seasons than those after the 1st season with about 35, 28 and 6% for Fe, Mn and Zn, respectively. This reflected the biochemical activity in soil through 10 months after compost and sulphur additions leading to more nutrient availability. Similar results were obtained by Dawood et al. (1985), Awad et al. (1991) and El-Sokkary and Abdel-Salam (1998).

ACKNOWLEDGEMENT

The author(s) would like to thank the Agricultural Consultant House at New Noubaria Town for offering the Biotreasure free of charge for research.

REFERENCES

Abdel-Aziz, S. M., M. E. El-Fayoumy, M. H. Gamal and H. M. Ramadan, 1986. Soil and crop responses to applied soil conditioners. Alex. Sci. Exch. 17 : 261 – 270.

Abdel– Halim, A. K. 2001. Effect of Sulphur Application on the Main Morphological, Physical, Chemical and Microbiological Properties of Soils and on Production of Some Field Crops. M . Sc. Thesis, Fac . of Agric., Alex . Univ., Egypt.

Arisha, H. M. and E. A. Abd El-bary, 2000. Productivity and chemical content of spinach and pea after sulphur and sewage sludge application., Egypt. J. Soil Sci., 40 (4) : 531-543.

Awad, A. M., H. M. Ramadan and M. E. El-Fayoumy, 1991. Effect of sulfur, phosphorus and nitrogen fertilizer on micronutrients availability uptake and wheat production on calcareous soils. Alex. J. Agric. Res. 41: 311-327.

Boadran, Nadia, M., M. E. A. Khalil and M. A. A. El Emam, 2000. Availability of N , P and K in sandy and clayey soils as affected by addition of organic materials., Egypt. J. Soil Sci., 40 (1/2) : 265-283.

Dawood. F. A., S. M. Al-Omari and N. Murtatha, 1985. High level of sulphur affecting availability of some micronutrients in calcareous soils. Proceedings of the Second Arab Regional Conference on Sulphur and its Usages, Riyadh, 2-5 March, 1985, 1:55-67.

El-Fayoumy, M. E. 1996. Response of highly calcareous soils and faba bean crop to sulphur mixed with organic manure application, J. Agric. Sci Mansoura Univ. 21 (3) : 1183-1191.

El-Fayoumi, M. E. and A. M. El-Gamal, 1998. Effect of sulphur application Rates on nutrients availability, uptake and potato quality and yield in calcareous soil. Egypt J. Soil Sci. 38: 241-286.

El–Fayoumy, M. E., H. M. Ramadan and S. A. El-Shanawany, 2001. Calcareous soil omelioration as affected by different sources of soil amendments. J . Agric. Sci., Mansoura Univ., 25 : 3193 – 3207.

El-Sokkary, I. H. and A. A. Abdel Salam, 1998. Bioavailability and DTPA-extractability of soil heavy metals from successively sewage sludge treated calcareous soils. Alex. J. Agric. Res. 43: 349-365.

Hanlon, E. A., B. Schaffer, Ozeres M. Hampton and H. H. Bryan. 1996. Ammonium bicarbonate-DTPA extraction of elements from waste amended calcareous soil., Commun. Soil Sci. Plant Anal., 27 (9/10) : 2321-2335.

Ismail, A. S., A. A. Sakhr and S. A. Ramadan. 1990. Effect of the interested Helwan sulphur and peat under different leaching processes on certain chemical properties of saline calcareous soils. Middle East Sulphur Symposium, Cairo, 12-16, Feb., 1990.

Jackson, M. L. 1967. Soil Chemical Analysis., Prentice Hall Inc . N. J. California.

Mahimairajia, S., N. S. Bolan and M. J. Hedley. 1995. Agronomic effectiveness of poultry manure composts., Commun. Soil Sci. Plant Anal., 26 (11/12) : 1843-1861.

Page, A. L., R. H. Miller and D. R. Keeny. 1982. Methods of soil Analysis. II-Chemical and Microbiological Properties., Social Sci. Amer., Madison Wisconsin, U.S.A.

Ramadan, H. M., M. E. El-Fayoumy and A. M. Awad. 1996. Effect of sulfur, Phosphorous and fertilizer on macronutrients availability, uptake and wheat production on calcareous soils. J. Agric. Mansoura Univ. (4) 1589-1606.

Velthof, G. L., M. L. van Beusichem, W. M. F. Raijmakers and B. H. Janssen. 1998. Relationship between availability indexes and plant uptake of nitrogen and phosphorus from organic products., Plant and Soil., 200: 215-226.

تأثير إضافة سماد عضوي تجارى وكبريت زراعي للأرض الجيرية على
١- خواص الأرض وتيسير بعض العناصر الغذائية الكبرى والصغرى

محمد عبد السلام نجم - حسين الظاهر جمعة -محمد محمد عبد الغنى-
مادلين ميخائيل صليب
معهد بحوث الأراضى والمياه والبيئة-مركز البحوث الزراعية - الجيزة-مصر

الملخص العربي

أجريت تجربه حقليه لدراسة تأثير إضافة سماد عضوي تجارى بمعدل ١ ، ٢ طن/ فدان مع المعدلات المختلفة للكبريت الزراعي ٥٠ ، ١٠٠ و ٢٠٠ كجم/فدان والخليط منهما خلال موسمين متعاقبين (٢٠٠٠-٢٠٠١) على بعض خواص التربة وتيسير بعض العناصر الغذائية الكبرى والصغرى فى الأراضي الجيرية بمزرعة محطة البحوث الزراعية بالنوبارية وأوضحت النتائج أهمية إضافة هذا السماد العضوي والكبريت في تحسين خواص الأرض الجيرية حيث أدت هذه الإضافات إلى زيادة في كل من السعه المائية ومحتوى الأرض من المادة العضوية وكميه النتروجين الكلى والكمية الميسرة من العناصر الغذائية الكبرى والصغرى (الفوسفور - النتروجين - البوتاسيوم - الحديد - الزنك - المنجنيز) بينما أدت تلك الإضافات إلى خفض في رقم الحموضة للتربة وكان هذا التأثير واضحاً في الطبقة السطحية (٠-٢٠سم). مما سبق يتبين بصفة عامة أنه تحت نفس ظروف الأرض الجيرية يفضل استخدام خليط من هذا السماد العضوي مع الكبريت الزراعي لتحسين الخواص الطبيعية والكيميائية للأرض وزيادة صلاحية العناصر الغذائية الكبرى والصغرى للنبات.