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EFFECT OF A COMMERCIAL COMPOST BIOTREASURE AND SULPHUR ADDED TO A HIGHLY CALCAREOUS SOIL ON: II- CEREAL PRODUCTIVITY AND NUTRIENT UPTAKE

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ABSTRACT: *Cereal crops (wheat followed by grain sorghum) through two successive seasons (2000-2001) were put under field study to complete the investigation of different application rates 1 and 2 tons/fed of a commercial compost combined with elemental sulphur 50, 100 and 200 kg S/fed applied to a calcareous soil in Noubaria Agric Res. Station,. The yields and yield components of these crops were recorded. Dry matter of wheat grains and straw, nutrient concentration in wheat plant tissues and their uptake were determined. Obtained data revealed that addition of 1 ton compost /fed was better significantly in increasing grain yield, 500 grain weight, dry matter production, macro-and micro nutrients (N, P, K, Fe, Mn and Zn) uptaken in grains and straw of wheat plants but addition of 2 tons compost was more effective in increasing sorghum grain yield and its harvest index. Sulphur was without significant effect on wheat and sorghum yields and its yield components. Added 100 kg S/fed was the most effective treatment for dry matter production and macro-and micronutrients uptake (N,P, Fe and Zn) by wheat plants. In conclusion, the best treatment with regard to improving soil properties as well as increasing wheat yield and their nutrient uptake was the combined treatment of 1 ton compost + 100 kgS/fed .*

Key words: Calcareous soil, Commercial compost, Biotreasure, Sulphur, Wheat, Sorghum.

INTRODUCTION

The direct and residual supplying with nutrients to plant feeding is essential role for soil fertilization or manuring. Yields, yield components and chemical composition of cereal plants are good parameters as indicators to estimate compost efficiency. Therefore, ryegrass was an indicator for a mature course of urban compost applied at 12 and 48 t/ha, (Murillo et al., 1995) and for composting wheat straw with rock phosphate, (Singh et al., 1995) barley as an indicators for peat moss-shrimp wastes application, (Hountin et al. 1995). Wheat for testing some plant residues composted with farmyard manure and injected with microbial decomposers and azotobacter, (Khamis and Metwally, 1998) and corn in a comparison between different composts of zea maize stalks and broad bean stalks, farmyard manure and biogas manure sludge, (Khalil et al., 2000). They reported that large doses were necessary for the apparent recovery of nutrients due to a significant

were necessary for the apparent recovery of nutrients due to a significant relationship found between soil organic carbon, nitrogen mineralization and plant growth.

Concerning sulphur combination, Awad et al., (2000) found that dry matter yield of maize plants and their content of N, P, K, Fe, Zn and Mn increased by added sulphur and some organic wastes to a light textured soil.

So, wheat and grain sorghum as winter and summer successive cereal crops were choosen to study the effect of compost and/or sulphur application rates on plant growth, yield and nutrient uptake.

MATERIALS AND METHODS

The field experiment conducted in Agriculture Research Station Farm of Noubraia included main treatments namely 0, 1 and 2 ton commercial compost/fed. That commercial compost have a name Biotreasure produced by Agric. Consultant House Comp, New Noubaria Town, Misr (Egypt). Biotreasure was of 14.5, 60.5 and 3.0% moisture, organic matter and total nitrogen, respectively. The submain ones namely 0,50,100 and 200 kgS/fed. (4200 m^2). Wheat (*Triticum vulgare*) Varity Sakha 69 was cultivated, then followed with grain sorghum (*Sorghum vulgare*) Variety Dorado after 15 days of wheat harvesting. Irrigation, mineral N, P and K fertilization, common practices of cultivation were carried out as explained in the 1st part of this work, (Negm et al., 2002). The following is some physical, chemical and nutrienal properties of the experiment soil as presented in the 1st part (Negm et al. 2002)

Samples of wheat were taken on the day before harvesting, air dried, weighed and prepared to chemical analysis according to Chapman and Pratt (1961). Plants of each plot were cropped. Yields of grains and straw and yield components of wheat and sorghum, such as 500 grain weight and harvest index were reordered. Data were statistically analyzed according to Snedecor and Cochran (1971).

Depth	% without $CaCO_3$ removal				Texture	$CaCO_3$ fraction (g/100 g soil)			
(cm)	C.sand	F.sand	Silt	Clay	grade	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	T.S.S	Anions (meq/100 g soil)				Cations (meq/100 g soil)			
(cm)	%	$CO_3^=$	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	WHC	FC	CEC	pH	OM	Total	C/N	Available (ppm)				
(cm)	%	%	meq/100 g soil	1:2.5	%	N %	Ratio	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

RESULTS AND DISCUSSION

1. Yields and yield components:

Data presented in Table (1) reveal that wheat grain yield was increased significantly from 7.99 ard/fed in control to 11.95 ard./fed about (49.6%) when 1 ton compost/fed was added. While increased by application 2 ton/fed to 9.72 (about 21.7%). The same trend was also observed in wheat straw. It may be due to nitrogen assimilation in bacterial bodies at that period, in which, roots suffered a competition in nitrogen absorption. With respect to sulphur, data presented the insignificant effect of its applications due to the short period from addition to time in which roots can utilize it. However, the higher rates of application increased wheat grain and straw yields over the control. Neither compost nor sulphur produced significant effects on harvest index (the percentage of grains to whole plants) or 500 grain weights. As for sorghum, the consequent crop (as Table 2 shows), 2 ton application rate of compost increased grain yield significantly over 0 or 1 ton compost addition while any rate of sulphur raised significantly grain yield over control without significant differences among these used rates. Harvest index was significantly affected by 2 ton compost application indicating that grain production increased in a rate higher than that of stalks while sulphur application did not produced significant effects on that index.

2. Dry matter production of wheat plants:

Data presented in Table (3) show that the dry matter production of grains, straw and whole plants were raised by any of additions. Concerning the effect of compost, the mean values of dry mater production of grains, straw and whole plants have significantly increased about 55.8,20.9 and 31.8% respectively, when 1 ton compost/fed was added. It decreased at the highest rate (2 ton compost/fed) lower than the rate of 1 ton but it was still higher than that of control. The differences were generally insignificant but it reflected, however the effect of the low mineral N reserves because of the net N immobilization by micro organisms (El-Fayoumy et al. 2001)

In regard to sulphur, data presented in Table (3) show that the mean values of dry matter production of grains increased with 8.0,15.8 and 18.5% over the control when 50,100 and 200 kg S/fed. were applied, respectively, while the dry matter production of straw and whole plants were increased compared to the control with 22.3, 18.1 and -10.8% in case of straw and 17.5, 20 and -1.13% in case of whole plant when sulphur rates were 50.100 and 200 kg/fed indicating some decreases at the highest rate (200 kg S/fed). These results were in agreement with these reported by Dawood et al., (1985) who stated that application of high level of sulphur caused a reduction in sorghum seedlings growth.

Table (1): Effect of compost and sulphur application rates on wheat yield and yield components.

Items & Units	Compost (ton/fed)	Sulphur rate (kg/fed.) 0	50	100	200	mean	L.S.D at (0.05) Level of error probability	
Grains (Ard/fed)	0	6.87	7.16	9.82	8.11	7.99	Comp.	:3.11
	1	10.63	11.51	12.90	12.75	11.95	S	:3.59
	2	9.26	9.66	10.44	9.50	9.72	Comp.xS	:6.22
	Mean	8.92	9.44	11.05	10.12			
Straw (ton/fed)	0	2.14	3.12	3.38	3.54	3.17	Comp.	:0.89
	1	3.17	3.29	3.44	3.74	3.41	S	:1.02
	2	2.78	3.27	3.28	3.71	3.26	Comp.xS	:1.77
	Mean	2.87	3.23	3.36	3.66			
Harvest Index (%)	0	34.32	34.76	35.39	35.76	35.06	Comp.	:3.20
	1	30.59	31.97	34.84	35.10	33.13	S	:3.70
	2	31.99	32.07	32.12	35.11	32.82	Comp.xS	:6.41
	mean	32.30	32.93	34.11	35.32			
500 grain Weight (g)	0	23.83	23.60	23.58	23.75	23.69	Comp.	:0.89
	1	24.28	24.75	24.75	24.73	24.63	S	:1.03
	2	24.50	24.58	24.73	24.88	24.67	Comp.xS	:1.77
	mean	24.20	24.31	24.35	24.45			

Table (2): Effect of compost and sulphur application rates on sorghum grain yield and harvest index.

Items & Units	Compost (ton/fed)	Sulphur rate (kg/fed.) 0	50	100	200	Mean	L.S.D at (0.05) Level of error probability	
Grains (Ard/fed)	0	1.35	1.70	1.65	1.70	1.60	Comp.	:0.239
	1	1.43	1.55	1.70	1.70	1.60	S	:0.276
	2	1.78	2.15	2.20	2.05	2.05	Comp.xS	:0.478
	mean	1.52	1.80	1.85	1.82			
Harvest Index (%)	0	26.23	24.55	24.13	23.79	24.68	Comp.	: 3.83
	1	27.05	28.62	27.58	26.59	27.46	S	: 4.43
	2	28.43	29.11	32.66	29.68	29.97	Comp.xS	: 1.82
	mean	27.24	27.43	28.12	26.69			

Table (3): Effect of compost and sulphur application rates on dry matter production of wheat plants, (kg/fed).

Plant Part	Compost (ton/fed)	Sulphur rate (kg/fed.) 0	50	100	200	mean	L.S.D at (0.05) Level of error probability	
Grains	0	987	1024	1156	1175	1085	Comp.	:493
	1	1521	1652	1751	1834	1690	S	:490
	2	1093	1214	1261	1258	1207	Comp.xS	:849
	mean	1200	1296	1389	1422			
Straw	0	2081	2799	2663	1920	2366	Comp.	:537
	1	2653	3072	3227	2491	2861	S	:902
	2	2538	3022	2995	2072	2657	Comp.xS	:1562
	mean	2424	2964	2961	2161			
Whole Plant	0	3068	3823	3819	3095	3451	Comp.	:904
	1	4174	4724	4978	3754	4550	S	:1345
	2	3631	4236	4256	3330	3863	Comp.xS	:2330
	mean	3624	4260	4350	3583			

3. Nutrient uptake:

Table (4) shows that the macronutrient N, P and K uptake by wheat grains, straw and whole plants followed approximately similar trend of dry matter production. In this connection, N uptake by grains, straw and whole plants were significantly increased over control (without compost additions) when 1 ton compost/fed was added, then it insignificantly decreased by using the highest rate (2 ton compost/fed). This may reflect the high microbial activity and consequently more nitrogen assimilation than that of 1 ton case. Generally, the slight decrease was not more than 10.3% of that in 1 ton treatment. The most effective treatment was the combined treatment (1 ton compost + 200 kg S/ fed). The depressive effect of high rate of compost possibly due to the mineral N reserves because of the net immobilization by micro organisms.

The P and K uptake followed approximately similar trend that resulted in N uptake, where the mean values of the total P and K uptake (grains+straw) were significantly increased over control treatment when 1 ton compost/fed was added, then it insignificantly decreased, at the highest rate (2 ton compost and 100 kg s)/fed, total P and K uptake (grains + straw) were increased. These findings are in agreement with those reported by Ramadan et al., (1996) and El-Fayoumy, (1996).

Data presented in Table (5) show that the micronutrients (Fe , Zn and Mn) uptake by grains, straw and whole plants increased by any additions.

In regard to the effect of compost on Fe uptake, the mean values of uptake by grains, straw and whole plants were significantly increased over the control treatment when 1 ton compost/fed was applied, then decreased at the highest rate (2 ton compost/fed). The most effective treatment was the combined treatment (1 ton compost+100 kg S/fed). Concerning the effect of compost on Zn uptake, date show that the mean values of Zn uptake by grains, straw and whole plants were significantly increased compared to control when 1 ton compost/fed was applied, and significantly decreased (as compared with the 1 ton compost /fed treatment) by adding the highest rate. The most effective treatment on total Zn uptake was the combined treatment (1 ton compost + 100 kg S/ fed). In regard to the effect of compost on Mn uptake, statistical analysis presented in Table (5) show that the mean values of Mn uptake by grains insignificantly increased when 1 ton compost /fed was added, then it decreased significantly as compared with the 1 ton compost / fed treatment, by adding more compost rate which was without significant effect on Mn uptake by straw and whole plants. Also the most effective treatment in total Mn uptake was the combined treatment (1 ton compost + 100 kg S) /fed. Similar results are reported by Awad et al. (1996).

Table (4): Effect of compost and sulphur application rates on macronutrient uptake by wheat plants, (kg/fed).

Nutri-Ent	Part	Compost (ton/fed)	Sulphur rate (kg/fed.) 0	50	100	200	mean	L.S.D at (0.05) Level of error probability	
N	Grains	0	16.17	18.80	23.13	25.26	20.84	Comp.	:11.03
		1	26.61	30.49	34.92	40.95	33.24	S	:9.92
		2	21.03	24.2	26.61	28.15	25.01	Comp.xS	:17.18
		mean	21.27	24.52	28.22	31.45			
	Straw	0	25.16	37.75	42.66	31.71	34.32	Comp.	:10.62
		1	40.56	48.40	49.64	45.37	45.99	S	:15.95
		2	35.81	42.17	51.51	33.40	40.72	Comp.xS	:27.63
		mean	33.84	42.77	47.94	36.83			
	Whole Plant	0	41.33	56.55	65.79	56.98	55.16	Comp.	:19.58
		1	67.17	78.89	84.56	86.31	79.23	S	:24.59
		2	56.83	66.44	78.12	61.54	65.74	Comp.xS	:42.59
		mean	55.11	67.29	76.16	68.28			
P	Grains	0	3.683	4.060	4.960	4.838	4.386	Comp.	:2.44
		1	6.257	6.561	7.568	7.735	7.030	S	:2.06
		2	4.620	5.594	5.947	5.988	5.537	Comp.xS	:3.57
		mean	4.853	5.405	6.158	6.187			
	Straw	0	3.663	5.654	5.458	4.221	4.749	Comp.	:1.35
		1	4.864	6.609	5.274	6.026	5.693	S	:2.20
		2	4.694	6.345	6.511	4.824	5.594	Comp.xS	:3.81
		mean	4.408	6.703	5.748	5.024			
	Whole Plant	0	7.345	9.714	10.42	9.059	9.134	Comp.	:3.27
		1	11.121	13.170	12.842	13.761	12.721	S	:3.84
		2	9.314	11.939	12.458	10.812	11.125	Comp.xS	:6.65
		mean	9.261	11.61	11.91	11.21			
K	Grains	0	14.35	16.28	18.32	19.38	17.08	Comp.	:8.95
		1	24.03	26.32	30.98	32.31	28.40	S	:8.83
		2	20.17	19.91	24.93	21.48	21.62	Comp.xS	:15.29
		mean	19.52	20.84	24.74	24.39			
	Straw	0	64.08	97.24	80.98	64.04	76.59	Comp.	:22.60
		1	76.62	101.40	99.31	85.59	90.73	S	:31.48
		2	89.09	101.80	100.30	72.11	90.83	Comp.xS	:54.52
		mean	76.60	100.15	93.53	73.91			
	Whole Plant	0	78.43	113.50	99.30	83.92	93.67	Comp.	:29.95
		1	100.70	127.80	130.30	117.90	119.20	S	:37.87
		2	109.30	121.70	125.20	93.60	112.50	Comp.xS	:65.59
		mean	96.12	121.00	118.30	98.31			

Table (5): Effect of compost and sulphur application rates on micronutrient uptake by wheat plats, (kg/fed).

Nutri-ent	Part	Compost (ton/fed)	Sulphur rate (kg/fed.)					L.S.D at (0.05) Level of error probability	
			0	50	100	200	Mean		
Fe	Grains	0	0.280	0.311	0.566	0.674	0.458	Comp.	0.307
		1	0.520	0.660	0.960	1.105	0.812	S	0.282
		2	0.399	0.552	0.748	0.717	0.604	Comp.xS	0.488
		mean	0.399	0.508	0.758	0.832			
	Straw	0	0.892	1.010	1.508	1.102	1.128	Comp.	0.457
		1	1.157	1.506	1.913	1.397	1.485	S	0.533
		2	1.157	1.595	1.833	1.291	1.469	Comp.xS	0.923
		mean	1.057	1.370	1.751	1.263			
	Whole Plant	0	1.171	1.321	2.073	1.773	1.585	Comp.	0.614
		1	1.643	2.167	2.874	2.502	2.296	S	0.743
		2	1.556	2.147	2.581	2.008	2.073	Comp.xS	1.287
		mean	1.457	1.878	2.509	2.096			
Mn	Grains	0	0.052	0.064	0.075	0.085	0.069	Comp.	0.030
		1	0.073	0.088	0.114	0.104	0.095	S	0.028
		2	0.047	0.070	0.071	0.065	0.063	Comp.xS	0.048
		mean	0.057	0.074	0.087	0.085			
	Straw	0	0.092	0.100	0.104	0.075	0.093	Comp.	0.018
		1	0.098	0.097	0.129	0.093	0.104	S	0.037
		2	0.089	0.094	0.108	0.062	0.088	Comp.xS	0.064
		mean	0.093	0.097	0.114	0.076			
	Whole Plant	0	0.144	0.163	0.179	0.159	0.161	Comp.	0.044
		1	0.172	0.185	0.243	0.196	0.198	S	0.061
		2	0.136	0.164	0.179	0.128	0.152	Comp.xS	0.106
		mean	0.150	0.171	0.200	0.161			
00 Zn	Grains	0	0.050	0.052	0.072	0.076	0.063	Comp.	0.037
		1	0.072	0.086	0.149	0.135	0.110	S	0.051
		2	0.060	0.055	0.177	0.152	0.111	Comp.xS	0.088
		mean	0.061	0.064	0.133	0.121			
	Straw	0	0.036	0.022	0.107	0.088	0.061	Comp.	0.025
		1	0.058	0.025	0.204	0.069	0.089	S	0.049
		2	0.020	0.018	0.078	0.054	0.043	Comp.xS	0.085
		mean	0.038	0.022	0.129	0.068			
	Whole Plant	0	0.086	0.074	0.179	0.156	0.125	Comp.	0.031
		1	0.130	0.111	0.353	0.204	0.200	S	0.059
		2	0.080	0.073	0.255	0.206	0.154	Comp.xS	0.102
		mean	0.099	0.086	0.262	0.190			

In conclusion, the best treatment with regard to improving soil properties as well as increasing wheat yield and nutrient uptake was the combined treatment of (1 ton compost + 100 kg S) / fed and high rates of both additions (2 ton compost + 200 kg S) / fed) need some longer time where wheat roots stop their nutrient uptake after 8-10 weeks, in which, the much quantities of these addition can not gave their beneficial effects yet.

REFERENCES

Awad, E. A. M., M. M., Mostafa and A. M., Helmy. 2000. Macro and micronutrient content of maize plant as effected by the application of some organic wastes and sulphur., Zagazig. J. Agric. Res., 27(4): 1015-1029.

Chapman, H. D. and P. F., Pratt. 1961. Methods of Analysis for Soils, Plants and Waters., Division of Agric. Sci., Univ. of California., U.S.A.

Dawood, F. A., S. M. A. Omari and N., Martatha. 1985. High level of sulphur affecting availability of some micronutrients in calcareous soils. Proceeding of the 2nd 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-Fayoumy, M. E., H. A., Ramadan and S. A., El-Shanawany. 2001. Calcareous soil amelioration as affected by different sources of soil amendments. J. Agric. Sci., Mansoura Univ., 25: 3193-3207.

Hountin, J. A., A. Karam, L. E. Parent and D. Isfan. 1995. Effect of peat moss-shrup wastes compost on the growth of barley (*Hordeum vulgare* L.) on a loamy sand soil. Commum. Soil Sci. & Plant Anal, 26 (19120): 3275-3289.

Khalil, M. E, A. Badran, M. Nadia and M. A. A. El-Emam. 2000. Effect of different organic manures on growth and nutritional status of corn. Egypt J. Soil Sci., 40(1/2): 245-263.

Khamis, M. A. and Sh. M. Metwally. 1998. Utilization of organic materials inoculated with microbial decomposers of azotobacter in a sandy soil. Egypt J. Soil Sci., 38 (1-4): 81-99.

Murillo, J. M., R. Lopez, F. Carbrera and Martin P. Chmedo. 1995. Testing a low quality urban compost as a fertilizer for arable farming, Soil Use & Manage., 11(3): 127-131.

Negm, M. A., H. El-Zaher, M. M. Abd Elghani and Madlain, M. Salib. 2002. Effect of commercial compost (Biotreasure) and sulphur added to a calcareous soil on: I. Soil properties and fertility. Menofiya J. Agric. Res., 27(2) (in press).

Ramadan, H. M., M. E. El-Fayoumy and A. M. Awad. 1996. Effect of sulphur, phosphorus and nitrogen fertilizers on micronutrients availability, uptake

and wheat production on calcareous soils. J. Agric., Mansoura Univ., 25 (4): 1589-1606.

Singh, C. P., A. Amberger and M. D. Greenbelt. 1995. The effect of rock phosphate-enriched compost on the yield and phosphorus nutrition of rye grass. Am. J. Alter. Agric. 10(2): 82-87.

Snedecor, G. W. and W. G. Cochran. 1971. Statistical Methods. 6th ed. Iowa State Univ. Press, Ames.

تأثير إضافة سماد عضوي تجارى وكبريت زراعي للأرض الجيرية على ٢- إنتاجيه محاصيل الحبوب وامتصاص العناصر الغذائية

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الملخص العربي

لاستكمال دراسة تأثير إضافة السماد العضوي التجاري بمعدل ١ ، ٢ طن/فدان متداخلاً مع الكبريت الزراعي بمعدل (٥٠ ، ١٠٠، ٢٠٠ كجم كبريت/فدان) على الأراضى الجيرية بمحطة البحوث الزراعية بالنوبارية تم اختيار محصولي حبوب (قمح يليه ذره رفيعة) خلال موسمين متعاقبين (٢٠٠٠-٢٠٠١) للدراسة. وتم تقدير محصولي الحبوب والقش والمحصول الكلى كذلك المادة الجافة لحبوب وقش نباتات القمح والكميه الممتصة لبعض العناصر الغذائية الكبرى والصغرى لنباتات القمح ويمكن تلخيص أهم النتائج المتحصل عليها كما يلي:

أدت إضافة السماد العضوي بمعدل ١ طن/فدان لزيادة معنوية في كل من محصولي الحبوب للقمح ووزن ٥٠٠ حبة والوزن الجاف لحبوب وقش نباتات القمح والكميه الممتصة من العناصر الغذائية الكبرى والصغرى (النتروجين - الفوسفور - البوتاسيوم - الحديد - المنجنيز - الزنك) بواسطة حبوب وقش نباتات القمح بينما أدت زيادة المعدل من السماد العضوي إلى ٢ طن/فدان إلى زيادة معنوية لمحصول الذرة الرفيعة فقط ولم يؤد إلى زيادة معنوية لمعظم هذه القياسات لمحصول القمح لمنافسه النشاط البكتيري في الامتصاص ولكن أدت إلى انخفاض غير معنوي في محصول الحبوب والمادة الجافة لحبوب وقش نباتات القمح والكميه الكلية الممتصة من العناصر الغذائية الكبرى والصغرى تحت الدراسة بواسطة نباتات القمح وذلك بالنسبة لمعاملة ١ طن/فدان.

إضافة الكبريت الزراعي لم يؤد لتأثير معنوي على محصولي القمح والذرة الرفيعة بينما أدت زيادة هذه الإضافة إلى ١٠٠كجم/فدان إلى زيادة معنوية في إنتاج المادة الجافة لحبوب وقش نباتات القمح والكميه الكلية الممتصة من العناصر الغذائية الكبرى والصغرى تحت الدراسة بواسطة نباتات القمح ما عدا عنصري البوتاسيوم والمنجنيز. وأدت إضافة المعدل المرتفع من الكبريت (٢٠٠ كجم/فدان) إلى انخفاض غير معنوي لمحصول الحبوب للقمح والذرة الرفيعة والمادة الجافة الكلية والكمية الكلية الممتصة من العناصر الغذائية الكبرى والصغرى تحت الدراسة بواسطة نباتات القمح وذلك بالنسبة لمعامله ١٠٠ كجم كبريت /فدان.

عموماً تحت ظروف التجربة فإن أفضل معاملة بالنسبة لتحسين خواص التربة وإنتاجيه محصول القمح وزيادة الكميه الممتصة من العناصر الغذائية هي المعاملة المركبة من ١ طن من السماد المكمور + ١٠٠ كجم كبريت/ فدان. ويتضح الأثر المتبقي في الموسم التالي لإضافة الكبريت بهذا المعدل ومضاعفه معدل إضافة المكمور المستخدم.