Zagazig J.Agric. Res., Vol. 29 No.(6) 2002 1973-1985

WHEAT AND SORGHUM RESPONSE TO BIOCOMPOSITE COMPOST ANDSULPHUR ADDED TO A CALCAREOUS SOIL

Negm M.A; M.H. El-Sayed; A.S. Ahmad and M.M. Abd Elghani

Soils, Water and Environ. Research Inst., Agric. Res. Centre, Giza, Misr (Egypt).

Received 18 / 8 / 2002 *Accepted 27 / 11 / 2002*

ABSTRACT: **(Biocomposite), the commercial compost prepared by Soil, Water and Environment Research Institute, Agriculture Research Centre, Giza, Misr was put under investigation. So, a field trial was conducted in Noubaria Research Station Farm using a calcareous normal soil to which 1.5 and 3 ton Biocomposite/fed. were added in combination with 0, 50, 100 and 200 kg S/fed. The plots were planted with wheat to study the direct effects on wheat as well as the residual effect on sorghum due to these applications.**

The agronomic yield components of wheat and grain sorghum were recorded and the chemical analysis of wheat grain and straw was done.

The obtained results could be summarized in the followings.

Wheat grain and straw yields increased significantly by both rates of Biocomposite and /or sulphur, harvest index was not affected with any of these applications. Weight of 500 grains increased but 200 kg S/fed treatment resulted in significant difference over the control.

Sorghum grain yield significantly and harvest index increased insignificantly by Biocomposite and/or sulphur applications.

Nitrogen, phosphorus and potassium uptake were increased by Biocomposite application significantly over the control either by grain or whole plant without significant differences between 1.5 and 3 ton Biocomposite/fed. The two high rates of sulphur 100 and 200 kg/fed. enhanced N, P and K uptake significantly either by grain or straw.

Application of 1.5 or 3 ton Biocomposite/fed. significantly increased the uptake of Mn and Zn by grains or straw without significant difference between rates. Sulphur application at the highest rate (200 kg/fed) increased uptake of Fe only by grains and straw. Sulphur application increased Mn uptake and decreased Zn uptake than that of the control but less than the significant limits.

It could be concluded that application of 3 ton Biocomposite plus 200 kg S/fed gave the lest results and recommended with more studies to limit the peak of Biocomposite application rates along with the economical considerations.

INTRODUCTION

The attention of organic fertilization and compost application widely extends. Wheat was selected as an important test crops for these applications by many investigators. During the later 5 years, the following mentioned works clarified the response of wheat to different treatments of organic, organo-mineral fertilization and/or sulphur applications.

Kurmysheva and Efremov (1998) using mineral and organic mineral NPK fertilization found that the best treatment was 40% of the total rate of applied N in organic form. Dyomin et al., (1999) using mineral NPK+10 ton manure/ha. obtained an increase of 1.8 ton/ha in grain yield corresponding 90% over the control. Jun et al., (1999) found that using returning composted Straus increased grain yield with 18% Disal et al., (2000) using, 120 kg N/ha half of them as vermicompost, municipal solid waste compost or farmyard manure and the another half as urea stated out that 120 kg N/ha half of them as vermicompost and the another half as urea produced the best grain yield (1.69 ton/ha). Habib et al. (2001) using 4% of the pot weight 6 month sugar beet residues compost, obtained that yield and uptake of N, P and K were of the highest values and Negm et al., (2002) using plant and animal residues compost under a commercial name Biotreasure in a rate of 1 ton/fed stated out that wheat markedly responded to those applications due to increases in grain yield, 500 grain weight macro and micronutrient uptake.

The inducing effect of compost application were lasted on the successive crop as a residual effect. Disal et al., (2000) found an increase of 1.124 ton grain/ha as a residual effect of their previously mentioned treatment as well as Habib et al (2001) on sudan grass and Negm et al., (2002) on grain sorghum. In the latter work, the increase was significant by application of 2 ton Biotrasure compost /fed.

Moreover, application of sulphur in combination with organic manures and composts was recommended for wheat in calcareous soil by several investigators. Zhang et al., (1999) using 45 kg S/ha found 13.4% increase in yield over the control and recommended with application of 46-83 kg S/ha each year. Kayser et al., (2000) pointed out that S application increased Cu, Zn and Cd uptake by plants. Abd El-Halim (2001) studied the effect of levels of S and organic manuring for three successive cultivation seasons and reported that the long term effect of S application was pronounced through these seasons. Negm et al., (2002) considered 100 kg S/fed mixed with Biotreasure compost was the best treatment for wheat and consequent grain sorghum production. In the same time, Al-Samarrai and Hussun (2000) considered that gypsum content more than 10% in a soil is unfavourable for the most common wheat varieties.

So, the work target was to investigate the new compost prepared by Soils, Water and Environment Research Institute applied either alone or in combination with different rates of sulphur. The rates were 1.5 and 3 ton/fed calculated according to the compost analysis and 50, 100 and 200 kg S/fed. Wheat was used as a test crop for direct effect. The residual effect was studied using grain sorghum.

MATERIALS AND METHODS

A field experiment was carried out in the Agricultural Research Station Farm of Noubaria in a split plot design with four replicates. The main treatments were 0, 1.5 and 3 ton/fed of SWERI prepared compost under a suggested commercial name (Biocomposite)/fed. This compost was a mixture of bentonite mud, farm residues and peanut pod huskes composted in a heap inoculated with special bio-decomposer strains of bacteria, fungi and actinomyses under aerobic conditions. and the submain treatments were 0, 50, 100 and 200 kg S/fed. The additions were thoroughly mixed with the soil tilth layer of plots on the day before sowing of wheat (*triticum valgare*) variety Sakha 69 and irrigation. Two doses of mineral fertilizes each of 8.0, 7.5 and 12.5 kg N, P_2O_5 and K_2O as ammonium nitrate 33% N, calcium superphosphate 15% P_2O_5 and potassium sulphate 48% K_2O, respectively, /fed were added after 3 and 6 weeks of planting. The recommended practices of cultivation were applied till crop maturity. In the same plots sorghum (*Sorghum vulagre*) variety Corado was planted after 15 days of wheat harvesting. The same doses of mineral fertilizers and common cultivation practices were applied up to maturity.

The analysis of Biocomposite were conducted after Brunner and Wasmer (1978) as shown in Table 1. Physical and chemical properties of the tested soil were determined according to Black et al. (1965) and Page et al., (1982) as tabulated in Table 2.

Table (1): Characterizing analyses of Biocomposite.

Determination	Value	Determination	Value
Color	Dark brown	Seed germination %	91.6
Moisture %	32.5	Total count of fungi	$14X10^6$
Water holding capacity (%)	162.5	Total count of actin.	$2.7X10^6$
Total soluble salts (%)	0.52	Total P %	1.05
Organic matter (%)	47.21	Total K %	0.48
Organic carbon (%)	27.45	Total Fe (ppm)	8000
Total nitrogen (%)	1.30	Total Mn (ppm)	284
C/N ratio	21.12	Total Zn (ppm)	167
NH_4-N (ppm)	200.0	Available P (ppm)	290
NO_3-N (ppm)	250.0	Available K (ppm)	1871
PH (1: 2.5 susp.)	6.3	Available Fe (ppm)	305
Total count of bacteria	$14x10^7$	Available Mn (ppm)	213
Dehydrogenase activity (mgTPF/100g)	13.1	Available Zn (ppm)	50
Nitrogenase activity (mol C_2H_4/g/hr)	98.8		

Table 2: Physical and chemical analysis of the experiment soil.

Layer depth (cm)	% without $CaCO_3$ removal				Texture class	$CaCO_3$ fractions (g/100 soil)			
	C. sand	F.sand	Silt	Clay		C. sand	F. sand	Silt+ clay	Total
0-20	9.71	23.22	44.76	22.21	S. clay loam	4.69	8.12	11.34	24.15
20-40	8.49	24.14	45.45	21.92	S. clay loam	4.22	8.20	11.30	23.72

Layer 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

Layer depth (cm)	W.H.C (%)	F.C (%)	CEC (meq/ 100 g soil)	pH (1:2.5 sup.)	O.M (%)	Total N%	C/N ratio	Available (ppm)				
								P	K	Fe	Mn	Zn
0-20	41.25	28.81	12.75	8.40	0.58	0.042	8.01	8.15	411	12.07	18.02	6.10
20-40	41.33	23.43	12.00	8.31	0.49	0.040	7.11	6.84	392	15.23	16.17	5.32

* in 1:5 soil water extract

On the 20th of May 1999 and 12th of October 1999, wheat and sorghum were harvested respectively. The grain and straw weight of each plot were recorded after separation and air drying for 5 days. Samples of wheat grains and straw were collected from the bulk plot yield, weighed, oven dried on 70 °C ground and prepared for digestion as the method described by Sommers and

Nelson (1972). Nutrients N, P, K, Fe, Mn and Zn were determined according to Chapman and Pratt (1961).

The obtained data were statistically analyzed according to Snedecor and Cochran (1971).

RESULTS AND DISCUSSION

a-Grain yield and yield components:

Data in Table 3 indicated that application of Biocompasite increased wheat grain significantly but increasing the rate of application from 1.5 to 3 ton/fed did not yield further increase in wheat grain. The residual effect on these compost additions on sorghum grain yield showed the same trend of the direct effect on wheat grains. These are results in agreement with those of Jun et al. (1999), Disal et al. (2000), Habib et al. (2001) and Negm et al. (2002). Sulphur application at a rate 100 kg increased wheat grain significantly and doubling that rate gave best results. Sulphur residual effect on sorghum grain was insignificant. There was no interaction effect of compost and sulphur on wheat or sorghum grain yield. Application of 3 ton compost significantly raised straw yield over the control where 200 kg S increased it significantly over no sulphur addition treatment. That result confirmed those of Zhang et al. (1999), Abd El-Halim (2001) and Negm et al. (2002).

Table 3: Effect of compost and sulphur application rates on wheat and sorghum yields and yield components.

Plant	Plant part	Compost (ton/fed)	Sulphur rate (kg/fed.)					L.S.D at 0.05 probability level	
			0	50	100	200	mean		
Wheat	Grain (Ard/fed)	0	3.780	5.085	5.920	7.043	5.457	Comp	1.351
		1.5	6.110	6.995	7.628	9.013	7.436	S	1.169
		3	7.350	7.310	8.808	10.050	8.379	Comp xS	2.025
		mean	5.747	6.463	7.452	8.702			
	Straw (Ton/fed)	0	1.365	1.595	1.785	2.485	1.808	Comp	0.445
		1.5	1.558	2.248	2.270	2.478	2.138	S	0.587
		3	2.123	2.210	2.370	2.635	2.334	Comp xS	1.017
		Mean	1.682	2.018	2.142	2.533			
	Harvest Index (%)	0	31.64	34.20	33.76	31.02	32.66	Comp	3.50
		1.5	39.24	32.09	34.58	35.95	35.46	S	6.53
		3	34.64	33.54	35.79	31.27	33.81	Comp.xS	11.31
		mean	35.17	33.28	34.71	32.75			
	500 grain Weight (g)	0	21.80	23.55	24.13	24.88	23.59	Comp	2.93
		1.5	22.75	23.10	24.78	24.18	23.70	S	1.99
		3	24.00	24.30	24.73	26.18	24.80	Comp xS	3.45
		mean	22.85	23.65	24.54	25.08			
Sorghum	Grain (Ard/fed)	0	2.075	2.050	2.050	2.025	2.275	Comp	0.320
		1.5	2.050	2.550	2.800	2.150	2.388	S	0.370
		3	2.375	2.400	2.450	2.500	2.431	Comp xS	0.641
		mean	2.167	2.333	2.433	2.225			
	Harvest Index (%)	0	36.61	35.34	30.550	35.05	34.390	Comp	4.100
		1.5	35.32	37.920	32.900	34.420	35.140	S	4.740
		3	37.96	40.160	35.910	35.950	37.500	Comp xS	8.210
		mean	36.63	37.81	33.120	35.140			

Harvest index (the percentage of grains to whole plant) and 500 wheat grain weight were slightly affected with compost application at any rate but in case of sorghum, harvest index significantly increased by 3 ton compost application over the control. Sulphur application did not increase harvest index of wheat or sorghum with exception of the rate of 200 kg S application compared to the control.

Generally it could be concluded that 3 ton Bicomposite and 200 kg S/fed was the best treatment for increasing wheat grain and straw yields as direct effect and sorghum grain yield as residual effect.

b- Wheat dry matter production:

Table 4 revealed that dry matter production of wheat grain and straw followed the same trend of the air dried yield as affected with Biocomposite compost and S applications. Whole plant significantly responded to Biocomposite rates as well as significant respones to 100 and 200 kg S. As for whole plant, cash of 1.5 and 3 ton Biocomposite rates were statistically as the same but higher significantly over the control and each of 100 and 200 kg S were of higher significant effect over the control. It was noticed also that the rate of 200 kg S was superior to 50 kg S with significant difference. These was in accordance with these findings and those of Habib et al. (2001), Abd El-Halim (2001) and Negm et al. (2002).

c- Macronutrient uptake by wheat plants:

Table 5 shows the amounts taken up by grains and straw of N, P and K.

As for nitrogen, application of 1.5 or 3 ton Biocomposite was significantly effective in increasing N uptake by grain or straw over the control. Also application of 100 or 200 kg S increased N uptake by them. In case of grain and whole plant, 100 kg S was significantly superior to 50 kg S and in case of straw 200 kg S was superior to 50 kg S for increasing N uptake.

Concerning P uptake, application of 1.5 or 3 ton/fed Biocomposite was beneficial for increasing P uptake by wheat grains or straw. Sulphur application at a rate of 100 kg S was significantly superior to the control but the rate of 200 kg S was significantly superior to 0 or 50 kg S/fed for increasing P uptake by grain or straw and consequently by whole plant.

Potassium uptake followed the same trend of P in case of Biocomposite effect. Sulphur application with 100 or 200 kg S was superior to 0 or 50 kg S in case of grains and 200 kg S was only superior to the control in case of straw and whole plant.

Thus, 1.5 ton Biocomposite and 100 kg S were the optimum rates to increase N, P, K uptake by wheat grains and straw with exception of K uptake by straw where 200 kg S was the significantly effective rate. Similar results were obtained by Abd El-Halim (2000), Habib et al. (2001) and Negm et al. (2002)

d-Micronutrient uptake by wheat plants:

The values of Fe, Mn, and Zn uptake by wheat are presented in Table 6.

Iron uptake by grain or straw was not affected statistically with compost application but the summation of Fe uptake in case of whole plant showed significant increase by application of 3 ton compost over the control. Sulphur application at any rate did not increase Fe uptake by grains significantly. In case of straw and whole plant, Fe uptake increased significantly by application of 200 kg S/fed compared to the other rates while 100 kg S rate was significantly superior to the control only.

Table 4: 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 Probability level	
Grain	0	547	734	854	1016	788	Comp.	:180
	1.5	886	915	1107	1282	1047	S	:173
	3	966	979	1266	1446	1164	Comp.xS	:300
	mean	799	876	1076	1248			
Straw	0	1239	1388	1616	2144	1597	Comp	428
	1.5	1414	2010	2070	2236	1932	S	508
	3	1955	2034	2172	2402	2141	Comp.xS	880
	mean	1536	1810	1952	2261			
Whole plant	0	1786	2122	2470	3159	2384	Comp.	:556
	1.5	2300	2925	3177	3518	2980	S	:589
	3	2921	3013	3437	3848	3305	Comp.xS	:1020
	mean	2335	2686	3028	3508			

Regarding to Mn uptake, grains and whole plants were affected by 1.5 or 3 ton Biocomposite application positively with significant difference over the control while in case of straw 3 ton compost was only the effective. Sulphur in case of grain significantly raised Mn uptake when it was applied at 200 kg S but in case of straw and whole plant rate of 100 kg S was also significantly effective

With respect to Zn uptake, application of 1.5 or 3 ton Biocomposite compost increased it significantly over the control in case of grains but as for straw or whole plant, each of those rates significantly was affected. Sulphur at rate of 200 kg/fed dropped significantly Zn uptake by grains compared to the other rates 50 and 100 kg S/fed. Such decline was found in case of straw but it was insignificantly. On the other hand 100 kg S was of significantly higher Zn uptake than the control of both grains and straw.

Generally the uptake of micronutrients was significantly affected with the application of 3 ton Biocomposite compost but grain led to higher Mn and Zn uptake than the control by application of 1.5 ton only.

Sulphur at rate of 100 kg/fed was significantly beneficial in increasing these micronutrients content in whole plant either in terms of grain, straw or both of them. The rate of 200 kg S was also significantly superior to the control in increasing Fe and Mn uptake but reduced Zn uptake especially in grain. The general observed trend of micronutrients was in harmony with Alves et al. (1999) who detected increase availability of some elements by application of refuse compost and suggested the possibility of soil pollution with conducting successive applications, Kayser et al. (2000) regarding to S effect on Zn and Cu uptake by wheat and Negm et al. (2002) regarding to the interaction effect of compost and S applications.

CONCLUSION

- From the aforementioned discussion it could be concluded that:

- Biocomposite, the SWERI prepared compost, at the rates used in this work (1.5 and 3 ton/fed) showed good results concerning grain and straw yields of wheat as a direct effect and the same pronounced effect under the used rates on sorghum yield as a residual effect in calcareous soil.
- Sulphur application enhanced such improving effects, hence sulphur combination with Biocomposite is of a synergistic effect.
- Uptake of macro and micronutrient were proportionally increased by each of added compost or sulphur where the best treatment was in almost cases 3 ton Biocomposite +200 kg S/fed under the experiment conditions.

- More studies should be conducted to suggest the growth curve as affected with Biocomposite application and hence the most suitable rates of both materials along with the economical considerations.

REFERENCES

Abd El-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.

Al-Samarrai. I.K. and A.J. Hussun (2000). Effect of gypsum levels on the rate of some macro and micro nutrition absorption of two cultivars of wheat crop. X^{th} International Colloquium for the Optimization of plant Nutrition, April 8-13, 2000, Cairo, Egypt, Session 14.

Alves, W.L., W.j. Melo and M.E. Ferreir (1999). Urban waste compost effects on sandy soil and sorghum plants. Revista Brasileira se Cie'ncia do Solo, 23(3) : 729-736 (c.f. Field Crop Abo., 53 (3) {1721} 2000).

Black, C.A., D.D.Evns, J.J. White, L.E. Ensminger and F.E.Clark (1965). Methods of Soil Analysis. I the Physical and Mineralogical Properties., S. Amer. Soc. Agron. Inc. Ser.9 in Agron., Madison, Wisconsin, U.S.A.

Brunner, P.H. and H.R. Wasmer (1978). Methods of Analysis of Sewage Sludge, Solid Wastes and Compost. WHO International Reference Center for Wastes. Disposal (H-8600 Dubendrof, Switzerland.

Chapman, H.D. and P.F. Pratt (1961). Methods of Analysis of Soil. Plants and Waters. Univ. Calif. Division of Agron. Sci.

Disal, V.R., R.N. Saball and P.U. Raindal (2000). Integrated nitrogen management in wheat coriander cropping system. J. Maharrashtra Agric. Univ., 24 (3). 273-275.

Dyomin, V.A., V.Akhmed and T. Brakhma (1999). Production of an 8-crop rotation on dark gray forrest soil for different fertilizer treatments. Izvestiya Timiryazevsta Sel' skokhozyaist-vennoi Akademii. 1:108-114. (c.F. Field Crop Abs., 53 (1) {7.38} 2000).

Habib, F.M., M.A. Negm and M.M. Hassan (2001). Composting of sugar beet residues. (3). The effect of application dose to a calcareous soil on plant growth and nutrient uptake. Egypt. J. Agric Res., 79 (4) : 1263-1275.

Jun, G.S., W.Z. Wen, S. Hao, H.Y. Ying and F.H. Guo 1999. The effects of returning composted straw to yields to yields on the micro-ecological environment of soil., Jiangsu Agric. Sci., 6:56-58. (c.f. Field Crop Abs., 53 (12) {8164} 2000).

Kayser, A., K. Wegner, A. Keller, W. Atinger, H.R. Felix, S.K. Gupta and R. Schulin 2000. Enhancement of phytoextraction of Zn, Cd and Cu from calcareous soil: the use of NTA and sulphur amendments. Environ. Sci & Technology, 34 (9): 1778-1783.

Kurmysheva, N.A. and V.F. Efremov 1998. The effect of saturation of the system fertilization of rotations with organic fertilizers on the yield of agricultural crops and quality of production in conditions of Moscow region. Agrokhimiya, 8:26-32. (c.f. Field Crop. Abs. 53 (1) {737} 2000).

Negm, M.A., H. El-Zaher, M.S.Awaad and M.H. El-Sayed 2002. Effect of a commercial compost (Biotreasure) and sulphur added to a calcareous soil on: II cereal productivity and nutrient uptake., Minufiya J. Agric. Res., 27 (2): 380-390.

Page, Al., R.H. Miller and D.R. Keeny 1982. Methods of soil Analysis, II Chemical and Microbiological Properties. Agron. Ser. 9. Amer Madison, Wisconsin, U.S.A.

Snedecor, G.W. and W.G. Cochran 1971. Statistical Methods. 7th Ed. Iowa State Univ. Press., Ames. Iowa, U.S.A.

Sommers, L.E. and D.W. Nelson 1972. Determination of phosphorus in soil. A rapid percholric acid digestion procedure. Soil Sci. Soc. Amer. Proc, 36: 902-904.

Zhang, Z.Y., K.G. Sun, Y. Lual and X. Zhang 1999. Study on the effect of sulphur fertilizer application on crops and the balance of sulphur in soil. Henan Agric. Sci., 5 : 25-27. (c.f. Field Crop Abs., 52 (12) [9422] 1999).

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

Nutrient	Plant part	Compost (ton/fed)	Sulphur rate (kg/fed.) 0	50	100	200	mean	L.S.D at 0.05 Probability level	
N	Grain	0	9.81	14.12	14.95	11.50	12.60	Comp.	:3.59
		1.5	16.93	18.39	23.24	21.71	20.07	S	:3.85
		3	20.29	20.56	27.97	25.31	23.53	Comp.xS	:6.67
		mean	15.68	17.69	22.05	19.51			
	Straw	0	9.58	12.66	12.21	16.23	15.17	Comp.	:4.95
		1.5	10.95	20.58	21.92	27.54	20.25	S	:6.02
		3	19.60	21.34	24.89	28.80	23.66	Comp.xS	:10.43
		mean	13.38	18.19	23.01	24.19			
	Whole Plant	0	19.38	26.78	37.16	27.73	27.76	Comp.	:7.48
		1.5	27.89	38.97	45.16	49.25	40.32	S	:8.27
		3	39.88	41.90	52.86	54.10	47.19	Comp.xS	:14.32
		mean	29.05	35.88	45.06	43.69			
P	Grain	0	2.409	3.089	3.391	3.845	3.184	Comp.	:1.073
		1	3.890	4.273	4.848	5.976	4.742	S	:0.856
		2	4.607	4.729	5.964	6.858	5.540	Comp.xS	:1.483
		mean	3.629	4.030	4.734	5.560			
	Straw	0	2.039	1.876	2.650	3.632	2.549	Comp.	:1.221
		1.5	2.799	3.990	4.529	5.212	4.133	S	:1.128
		3	4.047	4.404	5.277	6.586	5.079	Comp.xS	:1.954
		mean	2.962	3.423	4.152	5.143			
	Whole Plant	0	4.448	4.965	6.041	7.477	5.733	Comp.	:2.193
		1.5	6.668	8.263	9.376	11.190	8.874	S	:1.383
		3	8.654	9.133	11.240	13.440	10.620	Comp.xS	:2.395
		mean	6.590	7.454	8.886	10.700			
K	Grain	0	8.00	11.45	11.87	14.73	11.52	Comp.	:3.48
		1.5	13.46	14.73	18.70	21.23	17.03	S	:2.97
		3	15.46	15.96	22.02	22.01	18.86	Comp.xS	:5.14
		mean	12.31	14.05	17.53	19.32			
	Straw	0	43.90	47.71	54.52	75.07	55.30	Comp.	:15.19
		1.5	47.79	71.57	69.99	77.90	66.81	S	:17.87
		3	68.03	67.42	75.57	85.81	74.21	Comp.xS	:30.95
		mean	53.24	62.23	66.69	79.59			
	Whole Plant	0	51.90	59.16	66.39	89.79	66.81	Comp.	:17.24
		1.5	61.25	86.30	88.70	99.13	83.84	S	:19.35
		3	83.49	83.38	97.59	108.70	93.07	Comp.xS	:33.52
		mean	65.55	76.28	84.23	98.92			

Table 6: Effect of compost and sulphur application rates on micronutrient uptake by wheat plants, (kg/fed).

Nutrient	Plant part	Compost (ton/fed)	Sulphur rate (kg/fed.) 0	50	100	200	mean	L.S.D at 0.05 Probability level	
Fe	Grain	0	0.181	0.196	0.331	0.434	0.286	Comp.	:0.307
		1.5	0.362	0.390	0.443	0.587	0.445	S	:0.282
		3	0.377	0.315	0.500	0.705	0.474	Comp.xS	:0.488
		Mean	0.307	0.300	0.425	0.575			
	Straw	0	0.762	0.769	1.108	1.660	1.075	Comp.	:0.736
		1.5	0.722	1.371	1.484	1.915	1.373	S	:0.306
		3	1.227	0.953	1.394	1.964	1.385	Comp.xS	:0.530
		Mean	0.904	1.031	1.328	1.846			
	Whole Plant	0	0.943	0.964	1.439	2.094	1.361	Comp.	:0.539
		1.5	1.084	1.760	1.926	2.502	1.818	S	:0.332
		3	1.604	1.715	1.894	2.669	1.970	Comp.xS	:0.575
		Mean	1.210	1.480	1.753	2.421			
Mn	Grain	0	0.029	0.038	0.041	0.048	0.039	Comp.	:0.020
		1.5	0.062	0.070	0.072	0.068	0.068	S	:0.013
		3	0.057	0.059	0.063	0.070	0.062	Comp.xS	:0.023
		Mean	0.049	0.055	0.059	0.062			
	Straw	0	0.045	0.056	0.073	0.086	0.065	Comp.	:0.023
		1.5	0.060	0.090	0.095	0.088	0.083	S	:0.021
		3	0.085	0.093	0.122	0.101	0.100	Comp.xS	:0.036
		Mean	0.063	0.079	0.096	0.092			
	Whole Plant	0	0.074	0.093	0.114	0.134	0.104	Comp.	:0.042
		1.5	0.122	0.159	0.167	0.156	0.151	S	:0.025
		3	0.142	0.151	0.185	0.171	0.162	Comp.xS	:0.043
		Mean	0.113	0.135	0.155	0.154			
Zn	Grain	0	0.019	0.025	0.030	0.024	0.024	Comp.	:0.007
		1.5	0.037	0.037	0.039	0.028	0.035	S	:0.010
		3	0.035	0.044	0.053	0.019	0.038	Comp.xS	:0.017
		Mean	0.030	0.035	0.041	0.024			
	Straw	0	0.042	0.045	0.015	0.045	0.037	Comp.	:0.037
		1.5	0.056	0.052	0.063	0.037	0.052	S	:0.021
		3	0.047	0.023	0.067	0.030	0.042	Comp.xS	:0.036
		Mean	0.048	0.040	0.049	0.037			
	Whole Plant	0	0.061	0.070	0.044	0.070	0.061	Comp.	:0.037
		1.5	0.093	0.089	0.102	0.064	0.087	S	:0.026
		3	0.082	0.067	0.120	0.050	0.080	Comp.xS	:0.045
		Mean	0.079	0.075	0.089	0.061			

استجابة القمح والذرة الرفيعة للمخلط الحيوى والكبريت المضافين لأرض جيرية

محمد عبد السلام نجم، مصطفى حلمي السيد، أحمد سيد أحمد ومحمد محمد عبد الغنى
معهد بحوث الأراضى والمياه والبيئة – مركز البحوث الزراعيه – الجيزه – مصر

المخلط الحيوى هو الإسم التجارى المقترح لمكمور جهز بمعرفه معهد بحوث الأراضى والمياه والبيئه – مركز البحوث الزراعية – الجيزه – مصر والموضوع تحت الإختبارات من النواحى المختلفة – ومن ثم فقد نفذت تجربه حقليه بمزرعة محطة البحوث الزراعية بالنوبارية فى أرض جيرية عاديه أضيفت لها ١,٥ أو ٣ طن من المخلوط الحيوى/فدان مشتركاً مع صفر ، ٥٠ ، ١٠٠ ، ٢٠٠ كجم كبريت/فدان ، وقد زرعت أحواض التجربة بالقمح لدراسة الأثر الحالى ثم بالذرة الرفيعة لدراسة الأثر المتبقى لهذه الإضافات.

وقد سجلت الصفات المحصولية للقمح والذرة الرفيعة كما أجرى التحليل الكيماوى لكل من حبوب وقش القمح.

ويمكن تلخيص النتائج المتحصل عليها فيما يلى:

إزداد محصولا الحب والقش للقمح معنويا بزيادة معدل إضافة المخلط الحيوى أو الكبريت مفردين أو مجتمعين، ولم يتأثر الدليل المحصولى بتلك الإضافات أما وزن ٥٠٠ حبة فقد ازداد زيادة غير معنوية إلا أن إضافة ٢٠٠ كجم كب /فدان حقق الزيادة المعنوية عن المقارنة.

إزداد محصول حبوب الذرة الرفيعة معنوياً على مستوى خطأ ٠,٠٥ والدليل المحصولى بأقل من نفس مستوى المعنوية بإضافة المخلط والكبريت معاً أو كل بمفرده.

الممتص من النيتروجين والفوسفور والبوتاسيوم إزداد معنوياً على مستوى خطأ ٠,٠٥ بإضافة المخلط الحيوى عن المقارنة سواء فى الحبوب أو فى النبات الكامل بدون فروق معنوية بين معدلى المخلط ١,٥ ، ٣ طن/ فدان ، وشجع المعدلان العاليان من الكبريت (١٠٠، ٢٠٠ كجم/فدان) إمتصاص هذه العناصر معنوياً سواء بواسطة الحبوب أو القش.

إضافة ١,٥ أو ٣طن مخلوط حيوى/فدان زاد إمتصاص المنجنيز والخارصين معنوياً بواسطة الحبوب أو القش بدون فروق معنوية بين المعدلين حيث ازداد الكبريت عند معدله الأعلى (٢٠٠كجم/فدان) من إمتصاص المنجنيز لكن قلل إمتصاص الخارصين عن قيم المقارنة إلا أن ذلك دون مستوى المعنوية.

من الممكن إستنتاج أن أفضل معاملة هى ٣ طن مخلط حيوى مع ٢٠٠ كجم كبريت/فدان ويوصى بمزيد من الدراسات لتحديد أنسب معدل إضافة من المخلط الحيوى يتمشى مع الإعتبارات الإقتصادية.