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COMPOSTING OF SUGARBEET RESIDUES. (3) THE EFFECT OF APPLICATION DOSE TO A CALCAREOUS SOIL ON PLANT GROWTH AND NUTRIENT UPTAKE

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Abstract

A pot experiment was conducted using a calcareous soil in pots (6 kg capacity) receiving either half, same or double the recommended dose (10 ton /fed) of either aerobic or anaerobic compost. The compost was subjected to one of three composting periods; 3, 6 or 9 months. Wheat was planted up to maturity followed by sudangrass which was cut three times to study the concurrent and residual effects of compost. Results obtained could be summarized in the following: * Dry matter yield of wheat and sudangrass were affected by period of composting and application rate treatments revealing the significant superiority of 6 month composting period under aerobic conditions and 4% dose of application. * Uptake of nitrogen, phosphorus and potassium by plant was improved by increasing the dose of application for the 6 month aerobic composting and 4% dose of compost.

However, for practical recommendation, the studied factors should be tested in field.

INTRODUCTION

The immediate and residual effects of both organic or inorganic matter on soil and plant have been extensively studied. Composts and their effects on calcareous soil are usually of great concern for agricultural expansion in Egypt. Continuous trials were carried out to clarify the different aspects in order to recommend the most beneficial utilization of these residues for such soils. Compost of Egyptian clover and wheat straw added to calcareous soil increased soybean and corn dry matter (Soliman, 1982). Mixure of organic residues and superphosphate significantly increased barley dry matter (Abdel–Latif and Abdel-Fattah, 1983). Town-refuse compost, at a rate of 2% w/w, increased growth and yield of sugarbeet, (Abou –Bakr and El-Maghraby, 1994). Municipal waste application as a mature compost significantly enhanced growth, seed yield and yield components of sunflower (Abou- Bakr and Omar, 1996). In a calcareous soil, at

Ras-Sudr, sheep manure and town refuse were effective in increasing wheat grain and straw yields, (El-Maghraby,1997).

The indicated additions, whatever they are, increased the N uptake by plants. About 27% of N content of sugarbeet tops incorporated in soil was taken up by wheat crop (Abshahi *et al.*, 1984). Incorporation of wheat straw into a silty clay loam soil sown with winter wheat was of little overall effect on the uptake of N by the crop (Powlson *et al.*,1985). Water–hyacinth compost addition to a calcareous soil significantly increased the N uptake by some crops (Rabie *et al.*,1995). Phosphorus uptake also increased by application of composted plant residues application depending on both C/N and C/P ratios (Hilal *et al.*, 1981 and Mbgwu, 1985). Potassium uptake by plants from a calcareous soil increased by compost addition (El-Maghraby, 1997).

The current work was planed to investigate the effect of the sugarbeet residues - aerobically or anaerobically composted - on plant dry matter as well as uptake of N, P and K through long period (More than 10 months) after addition to a calcareous soil.

MATERIALS AND METHODS

Fifty seven earthenware glazed pots Nº 30 were filled with a calcareous soil sample at a rate of 6 Kg/pot. The soil sample was collected from the upper 30 cm layer of Noubaria Research Station Farm soil having a clay loam texture, pH 7.9 and 26 % $CaCO_3$ content. It contained 1.57%, .09%, 54.6 ppm, 10.8 ppm and 275 ppm of organic matter, total N, available N, P and K, respectively. Sudangrass (*Sorghum vulgaris*) variety Imperial hybrid was sown at a rate of 1g/ pot to consume any residual manures or chemical fertilizers through three cuts (each every 45 days) from 1 July to 15 November 1994 in order to obtain satisfied back ground of soil prepared to manuring studies. After 15 days of the 3rd cut of sudangrass, pots were arranged as follows: (A) a control without any compost addition; (B), (C) and (D) manured with sugarbeet residues composted aerobically for 3,6, and 9 months respectively; while (E), (F) and (G) manured with anaerobic compost for 3,6 and 9 months, respectively in amounts of 60, 120 or 240 g/pot, corresponding to 1, 2 and 4% per weight of soil, representing half, same and double of recommended dose applied in the field, (recommended dose = 10 ton / fed.) Each treatment was repeated three times in a complete randomization factorial design. Three heaps were prepared: the 1st in March 1994, the 2nd in June 1994 and the 3rd in September 1994 to obtain the composting periods of 9,6 and 3 months, respectively. Pots were planted on the 1st of December 1994 with 10 grains/ pot of wheat (*Triticum vulgare*) variety Sakha 69. After 15 days of sowing, seedlings

were thinned to 5 plants / pot and fertilized after three weeks of sowing with 1.2 g / pot ammonium sulphate (20% N) equivalent to the rate of 40 kg N/fed. After wheat harvesting on the 4th of May 1995, soil of each pot was mixed once again and planted with 15 seeds grains of sudangrass (the same variety used before) on the 15th of May 1995. Plants were thinned to 8 seedlings after 11 days of plantation. After one week from thinning and after each cut, the plants were fertilized with 0.6g ammonium sulphate/pot. Pots were irrigated as needed up to the field capacity with tap water. Three cuts of sudangrass were taken after 45 days from planting, 45 and 60 days from the previous cut. Plant material of wheat grains and straw and the 3 cuts of sudangrass planted after wheat were collected. The fresh weight of each was recorded (g/pot), dried at 70°C in electric oven and weighed. The dry plant material of each was ground and prepared for the determination of total N, P and K. The wet digestion method was used according to Sommers and Nelson (1972). Total N was assayed using the semimicro–Kjeldahl method, total P being measured colorimetrically in aliquots of digested samples using stannous chloride and K was determined flame- photometrically as described by Chapman and Pratt (1961).

RESULTS AND DISCUSSION

Dry matter production:

Growth and yield of developed plants were studied through evaluation of dry mater yield of wheat grains and straw and sudangrass; values are presented in Table 1.

The condition of composting did not have any significant effect on dry matter yield of either wheat or sudangrass. Differences between aerobic and anaerobic conditions of composting are within the experiment error.

Periods of composting were found to have significant differences between each of 9 or 6 and 3 months toward increasing wheat grain and straw. In sudangrass case, the descending order was 6>9>3 with significant differences among them. Similar results were obtained by several workers, (Sakr et al.1992, Abou Bakr and El–Maghraby, 1994 and Gendy and Derar 1995).

Concerning the dose of application, the data show significant responses for the dry matter yield of either wheat grains or straw as well as of the 3 cuts of sudangrass under any of the studied conditions. Only in case of wheat straw, both 2% and 4 % rates of application were statistically the same.

Table 1. Effect of compost applications on dry matter content of wheat and sudan-grass, (g/pot).

Sample	App. rate (%)	Aerobic cond.				Anaerobic cond.				Mean of periods			Mean of rates
		3	6	9	mean	3	6	9	mean	3	6	9	
Wheat (grains)	0	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
	1	13.3	15.3	12.7	13.8	11.0	13.1	15.3	13.3	12.2	14.2	14.0	13.5
	2	15.1	18.7	16.7	16.8	12.3	16.5	18.7	15.8	13.7	17.6	17.7	16.3
	4	18.5	24.2	19.9	20.9	17.5	19.2	22.8	19.8	18.0	21.7	21.4	20.4
	mean	13.6	16.5	14.2	14.8	12.1	14.1	16.1	14.1	12.9	15.3	15.2	14.4
	L.S.D. at 0.05 level period					(P) 2.0			Cond. (C)	: 1.7		Dose (D) : 2.3	
	PxC : 2.9					PxD : 4.0			CxD	: 3.3		PxCxD : 5.7	
Wheat (straw)	0	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1
	1	26.6	33.2	25.9	28.6	23.5	29.2	34.6	29.1	25.1	31.2	30.3	28.8
	2	30.9	39.0	29.0	33.0	26.6	35.7	38.9	33.7	28.8	37.4	34.0	33.4
	4	32.1	44.3	31.1	35.8	29.4	37.3	40.3	35.7	30.8	40.8	35.7	35.8
	mean	28.2	34.9	27.3	30.1	25.7	31.3	34.2	30.4	26.9	33.1	30.8	30.3
	L.S.D. at 0.05 among period					(P) 2.4			Cond. (C)	: 1.9		Dose (D) : 2.7	
	PxC : 3.4					PxD : 4.8			CxD	: 3.9		PxCxD : 6.7	
1st cut sudangrass	0	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3	14.3
	1	16.7	21.5	15.9	18.0	15.3	18.1	19.3	17.6	16.0	19.8	17.6	17.8
	2	20.0	29.7	19.2	23.0	18.5	27.8	28.3	24.9	19.3	28.8	23.8	23.9
	4	22.3	33.6	23.5	26.5	20.9	32.7	31.8	28.5	21.6	33.2	27.7	27.5
	mean	18.3	24.8	18.2	20.5	17.3	23.2	23.4	21.3	17.8	24.0	20.8	20.9
	L.S.D. at 0.05 among period					(P) 2.0		Cond. (C) : 1.6				Dose (D) : 2.3	
	PxC : 2.8					PxD : 4.0		CxD	: 3.3			PxCxD : 5.7	
2nd cut sudangrass	0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
	1	18.3	20.6	17.6	18.3	16.4	18.9	20.1	18.5	17.4	19.8	18.9	18.7
	2	21.4	32.5	19.9	24.6	20.2	28.3	30.4	26.3	20.8	30.4	25.2	25.5
	4	26.6	35.2	25.3	29.0	23.4	31.4	32.0	28.9	25.0	33.3	28.7	29.0
	mean	20.3	25.8	19.5	21.9	18.8	23.4	24.4	22.2	19.5	24.6	21.9	22.0
	L.S.D. at 0.05 among period					(P) 2.0		Cond. (C) : 1.7				Dose (D) : 2.3	
	PxC : 2.9					PxD : 4.0		CxD	: 3.3			PxCxD : 5.7	
3rd cut sudangrass	0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	1	14.2	17.0	13.0	14.7	11.9	14.7	18.0	14.9	13.1	15.9	15.5	14.8
	2	16.6	23.4	16.7	18.9	14.3	21.5	24.1	20.0	15.5	22.5	20.4	19.4
	4	19.4	28.1	18.2	21.9	16.7	24.5	26.9	22.7	18.1	26.3	22.6	22.3
	mean	15.4	20.0	14.9	16.8	13.6	18.1	20.1	17.3	14.5	19.0	17.5	17.0
	L.S.D. at 0.05 among period					(P) 2.1		Cond. (C) : 1.8				Dose (D) : 2.5	
	PxC : 3.0					PxD : 4.3		CxD	: 3.5			PxCxD : 6.1	

The interaction between composting condition and period of composting was significant in case of wheat straw dry matter being in the following descending order: aerobic 6 months = anaerobic 9 months > anaerobic 6 months > aerobic 6 months = aerobic or anaerobic 3 months. As for grains, there were no significant differences. After 5 months of wheat plantation and through sudangrass cuts, anaerobic 6 months = aerobic 6 months > aerobic 9 months = aerobic or anaerobic 3 months. Such results agree with those of Hussain *et al.* (1987) and Rabie *et al.* (1995). The another effective interaction reveals that addition of 2%. (per weight) compost having composting period of 6 months was significantly superior to the dose 4% of 3 months period in case of wheat straw only. This may suggest that adjustment of composting period is important for reducing the added dose; this is in agreement with the findings of Abou–Bakr and El-Maghraby (1994). Addition of either 2% or 4% of 6 months either aerobic or anaerobic compost and the same rate of 9 months anaerobic compost to the soil significantly raised the dry matter yield of plants over the control.

The triple interaction was found to be of significant effect; values obtained from treatment receiving 4% of either aerobic 6 months or anaerobic 9 months composted composts were with significant superiority over others in case of both wheat and sudangrass.

Nitrogen uptake:

Nitrogen uptake by plants, (Table 2), decreased gradually from wheat to the 3rd cut of sudangrass due to the gradual decreases in N% and dry matter production through the cultivation season and following cuttings.

Composting condition indicated that aerobic conditions resulted in significant higher N uptake than anaerobic ones in case of wheat grains. As regards to sudangrass no significant effect was detected.

Period of composting gave the peak values of N uptake at 6 months composting followed by 9 and 3 months, respectively, with significant differences between each other.

The higher added dose was the higher in N uptake by plants with significant ascending differences; obtained data agree with those of Hussain *et al.* (1987).

The double interaction between each studied factor was significantly reflected on the N uptake by plants. 6 months aerobic composting appeared to be at the peak of effect followed with 9 months anaerobic composting; the addition of 6 months anaero-

Table 2. Effect of compost applications on N uptake by wheat and sudangrass, (mg/pot).

Sample	App. rate (%)	Aerobic cond.				Anaerobic cond.				Mean of periods			Mean of rates
		3	6	9	mean	3	6	9	mean	3	6	9	
Wheat (grains)	0	112	112	112	112	112	112	112	112	112	112	112	112
	1	214	308	218	248	168	233	306	236	191	271	262	241
	2	285	426	331	347	207	328	417	317	246	337	374	332
	4	389	605	438	477	333	444	549	442	361	525	493	460
	mean	250	362	275	296	205	279	346	277	228	321	310	286
	L.S.D. at 0.05 level period					(P) 8			Cond. (C) : 7			Dose (D) : 10	
	PxC : 12					PxD : 17			CxD : 14			PxCxD : 24	
Wheat (straw)	0	102	102	102	102	102	102	102	102	102	102	102	102
	1	144	209	148	167	110	172	208	163	127	191	178	165
	2	192	308	189	230	146	246	303	232	169	277	246	222
	4	221	412	243	292	191	306	363	287	206	359	303	289
	mean	165	258	171	198	137	207	244	196	151	232	207	196
	L.S.D. at 0.05 among period					(P) 4			Cond. (C) : 3			Dose (D) : 4	
	PxC : 5					PxD : 7			CxD : 6			PxCxD : 11	
1st cut sudangrass	0	88	88	88	88	88	88	88	88	88	88	88	88
	1	122	253	155	177	98	190	216	168	110	222	186	172
	2	180	386	220	262	140	336	376	284	160	361	298	273
	4	256	500	293	350	204	444	491	380	230	472	392	365
	mean	162	307	189	219	133	265	293	230	147	286	241	225
	L.S.D. at 0.05 among period					(P) 3			Cond. (C) : 2			Dose (D) : 3	
	PxC : 4					PxD : 6			CxD : 5			PxCxD : 8	
2nd cut sudangrass	0	57	57	57	57	57	57	57	57	57	57	57	57
	1	86	197	128	137	65	158	191	138	75	178	160	138
	2	139	341	171	217	103	277	322	234	121	309	247	226
	4	226	443	260	310	163	351	387	300	195	397	324	305
	mean	127	260	154	180	97	211	239	182	112	235	197	181
	L.S.D. at 0.05 among period					(P) 4			Cond. (C) : 3			Dose (D) : 4	
	PxC : 6					PxD : 7			CxD : 6			PxCxD : 10	
3rd cut sudangrass	0	20	20	20	20	20	20	20	20	20	20	20	20
	1	35	107	58	67	25	79	113	72	30	93	86	70
	2	71	198	100	12	47	150	202	133	59	174	151	128
	4	11	267	131	169	75	205	250	177	92	236	191	173
	mean	58	148	77	95	42	114	146	101	50	131	112	98
	L.S.D. at 0.05 among period					(P) 3			Cond. (C) : 2			Dose (D) : 3	
	PxC : 4					PxD : 6			CxD : 5			PxCxD : 8	

bic composted compost came at the 3rd position followed with 9 months aerobic prepared compost, the average values of 3 months composting under aerobic conditions were higher than those resulted from anaerobic ones. Khalil (1979) also found similar results.

The triple interaction of the studied factors was a reflection for their absolute trends; these observations were noticed for all plant parts of wheat or cuts of sudangrass.

Phosphorus uptake:

As for amounts of phosphorus uptake by plants, Table 3 indicates that the aerobic compared with the anaerobic composting was more favorite for increasing P uptake by wheat grains as well as 1st and 2nd cuts of sudangrass. However, differences were insignificant in wheat straw and 3rd cut of sudangrass.

Period of 6 months composting was significantly superior to 9 months composting. The least was 3 months composting. The dose of compost application was of considerable effect, in the P uptake, by increasing the added compost dose was noticed in both wheat and sudangrass.

The double interactions were found to be of significant influence on the P uptake indicating the superiority of the compost association for 4% with 6 months composting and 4 % compost with aerobic condition for phosphorus content in either wheat grains or straw. Concerning sudangrass cuts, double interaction of all factors were of significant effects, 6 months composting with aerobic conditions or with 4% dose of application gave the highest values.

Regarding the triple interaction, it was significant with best value being obtained when the 6 months aerobic compost was added with a dose of 4% for wheat and the three sudangrass cuts.

Potassium uptake:

Table 4 indicates that 6 months composting was of the highest effect on K uptake in all plant tissues than either 9 or 3 months ones with significant differences between each period and another. The aerobic conditions of composting were always significantly superior to anaerobic conditions. Higher doses of compost increased the K uptake; with significant differences with each dose and another. The dose 1% (of soil weight) raised significantly K-uptake over control indicating the benefit of sugarbeet

Table 3. Effect of compost applications on P uptake by wheat and sudangrass, (mg/pot).

Sample	App. rate (%)	Aerobic cond.				Anaerobic cond.				Mean of periods			Mean of rates
		3	6	9	mean	3	6	9	mean	3	6	9	
Wheat (grains)	0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
	1	45.0	57.0	45.0	49.0	35.0	46.0	57.0	46.0	40.0	51.0	51.0	47.5
	2	55.0	73.0	58.0	62.0	44.0	56.0	70.0	56.7	49.0	64.5	64.0	59.4
	4	79.0	100.0	76.0	85.0	64.0	75.0	91.0	76.7	71.5	87.5	83.5	80.8
	mean	50.5	63.2	50.5	54.7	41.5	50.0	60.3	50.6	46.0	56.6	55.4	52.7
	L.S.D. at 0.05 level period (P) 2.8 Cond. (C) : 2.3 Dose (D) : 3.3 PxC : 4.0 PxD : 5.7 CxD : 4.6 PxCxD : 8.0												
Wheat (straw)	0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	1	16.0	22.0	16.0	18.0	13.0	18.0	23.0	18.0	14.5	20.0	19.5	18.0
	2	20.0	28.0	19.0	22.3	16.0	23.0	27.0	22.0	18.0	25.5	23.0	22.2
	4	25.0	36.0	24.0	28.3	21.0	29.0	33.0	27.7	23.0	32.5	28.5	28.0
	mean	17.8	24.0	17.3	19.7	15.0	20.0	23.0	19.4	16.4	22.0	20.3	19.6
	L.S.D. at 0.05 among period (P) 3.6 Cond. (C) : 2.9 Dose (D) : 4.1 PxC : 4.0 PxD : 5.7 CxD : 5.8 PxCxD : 10.1												
1st cut sudangrass	0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
	1	38.0	51.0	36.0	41.7	35.0	42.0	46.0	41.0	36.5	46.5	41.0	41.4
	2	62.0	107.0	60.0	76.3	53.0	79.0	90.0	74.0	57.5	93.0	75.0	75.2
	4	80.0	140.0	79.0	99.7	65.0	111.0	108.0	94.7	72.5	125.5	93.5	97.2
	mean	53.0	82.0	51.8	62.4	46.2	66.0	69.0	60.4	49.6	74.3	60.4	61.4
	L.S.D. at 0.05 among period (P) 9.0 Cond. (C) : 7.4 Dose (D) : 10.4 PxC : 12.7 PxD : 18.6 CxD : 14.7 PxCxD : 25.5												
2nd cut sudangrass	0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
	1	25.0	37.0	27.0	29.7	22.0	28.0	34.0	28.0	23.5	32.5	30.5	28.0
	2	39.0	79.0	50.0	56.0	31.0	63.0	70.0	55.0	35.0	71.0	60.0	55.7
	4	55.0	104.0	61.0	73.3	40.0	82.0	97.0	73.0	47.5	93.0	79.0	73.2
	mean	34.8	60.0	39.5	44.8	28.3	48.2	55.3	43.9	31.5	54.1	47.4	44.3
	L.S.D. at 0.05 among period (P) 2.3 Cond. (C) : 1.9 Dose (D) : 2.7 PxC : 3.3 PxD : 4.6 CxD : 3.8 PxCxD : 6.6												
3rd cut sudangrass	0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	1	10.0	15.0	9.0	11.3	8.0	12.0	14.0	11.3	9.0	13.5	11.5	11.3
	2	24.0	48.0	28.0	33.3	17.0	35.0	42.0	31.3	20.5	41.5	35.0	32.3
	4	39.0	69.0	37.0	48.3	30.0	52.0	59.0	47.0	34.5	60.5	48.5	47.7
	mean	19.8	34.5	20.0	24.8	15.2	26.3	30.0	23.9	17.5	30.4	25.1	24.3
	L.S.D. at 0.05 among period (P) 2.2 Cond. (C) : 1.8 Dose (D) : 2.5 PxC : 3.1 PxD : 4.4 CxD : 3.6 PxCxD : 6.2												

Table 4. Effect of compost applications on K uptake by wheat and sudangrass, (mg/pot).

Sample	App. rate (%)	Aerobic cond.				Anaerobic cond.				Mean of periods			Mean of rates
		3	6	9	mean	3	6	9	mean	3	6	9	
Wheat (grains)	0	21	21	21	21	21	21	21	21	21	21	21	21
	1	51	66	51	56	35	51	65	50	43	59	58	53
	2	66	95	75	79	46	72	94	71	56	84	85	75
	4	89	134	97	107	75	94	124	98	82	114	111	102
	mean	57	79	61	66	44	60	76	60	51	69	69	63
	L.S.D. at 0.05 level period					(P) 8			Cond. (C) : 7			Dose (D) : 9	
	PxC : 11					PxD : 16			CxD : 13			PxCxD : 23	
Wheat (straw)	0	346	346	346	346	346	346	346	346	346	346	346	346
	1	465	733	518	572	373	569	768	570	419	651	643	571
	2	566	880	567	671	468	680	863	670	517	780	715	671
	4	706	1120	674	833	591	865	1003	820	649	993	839	827
	mean	521	770	526	606	445	615	745	602	483	692	636	604
	L.S.D. at 0.05 among period					(P) 10			Cond. (C) : 9			Dose (D) : 12	
	PxC : 15					PxD : 22			CxD : 18			PxCxD : 31	
1st cut sudangrass	0	155	155	155	155	155	155	155	155	155	155	155	155
	1	185	260	172	206	157	204	240	200	171	232	206	203
	2	244	409	224	292	203	342	382	309	224	376	303	301
	4	287	415	293	365	248	425	454	376	268	420	374	370
	mean	218	333	211	254	191	282	308	260	204	308	259	257
	L.S.D. at 0.05 among period					(P) 3			Cond. (C) : 3			Dose (D) : 4	
	PxC : 4					PxD : 6			CxD : 5			PxCxD : 9	
2nd cut sudangrass	0	144	144	144	144	144	144	144	144	144	144	144	144
	1	188	243	169	200	159	206	241	202	174	225	205	201
	2	246	429	217	297	214	331	395	313	230	380	306	305
	4	322	503	301	375	262	393	448	368	292	448	375	372
	mean	225	330	208	254	195	269	307	257	210	299	257	256
	L.S.D. at 0.05 among period					(P) 32			Cond. (C) : 26			Dose (D) : 37	
	PxC : 45					PxD : 64			CxD : 52			PxCxD : 91	
3rd cut sudangrass	0	97	97	97	97	97	97	97	97	97	97	97	97
	1	128	172	120	140	102	138	194	145	115	155	157	142
	2	161	274	165	200	130	219	280	210	146	247	223	205
	4	204	354	195	251	164	277	331	257	184	316	263	254
	mean	148	224	144	172	123	183	221	177	135	204	185	175
	L.S.D. at 0.05 among period					(P) 3			Cond. (C) : 3			Dose (D) : 4	
	PxC : 5					PxD : 7			CxD : 5			PxCxD : 10	

residues compost for K fertilization. The double interaction produced a significant effect of K uptake by plant tissues. The highest values of those interactions were of soil receiving 4 % of 6 months composting and 4 % of aerobic compost. The triple interaction also produced effect on K uptake by wheat grains and straw as well as each of the 3 cuts of sudangrass. These results are in accordance with those of El-Leboudi *et al.* (1976) and Abdel-Latif and Abdel-Fattah (1983).

As a general recommendation, the studied factors should be tested in field.

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كمر مخلفات بنجر السكر : (٣) اثر معدلات إضافتها لأرض جيرية على نمو النباتات وامتصاصها للعناصر الغذائية

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أقيمت التجربة باستعمال ارض جيرية فى أصص سعة ٦كجم تربة أعطيت نصف أو مثل أو ضعف المعدل الموصى به من مكمور هوائى من أحد ثلاث مدد كمر (٣ أو ٦ أو ٩ اشهر). زرع القمح بالأصص واستمر حتى النضج ثم اتبع بحشيشة السودان حيث اخذ منها ثلاث حشات لدراسة الأثر المباشر والمتبقى لهذه الإضافات.

يمكن تلخيص النتائج فيما يلى : تأثرت المادة الجافة لكل من القمح وحشيشة السودان بكل العوامل المدروسة مظهرة تميزا لفترة كمر ٦ شهور تحت الظروف الهوائية ومعدل إضافة ٤٪ من وزن الأرض بفارق معنوى عن المعاملات الأخرى ، وازداد امتصاص النباتات من النتروجين والفوسفور والبوتاسيوم فى معاملة إضافة السماد المكمور هوائيا لمدة ٦ اشهر وتبعتها معاملة إضافة السماد المكمور لا هوائياً لمدة ٩ اشهر ، وفى كلتا المعاملتين كان معدل إضافة ٤٪ هو الأفضل . ويوصى بصفة عامة باختبار هذه العوامل المدروسة تحت الظروف الحقلية .