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EFFECT OF BIO AND ORGANIC AMENDMENTS ON GROWTH AND YIELD OF MAIZE IN NEWLY RECLAIMED SOIL

Abo El-Soud, A.A.; F. Sh. F. Badawi; Ahlam A. Mehesen and B. A. Hasouna
Soils, Water and Environ. Res. Instit., ARC, Egypt.

ABSTRACT

Two field experiments were carried out during two seasons of 2004-2005 to study the effect of inoculation with biofertilizers combined with different types of composts on the growth vigour and productivity of maize plants (*Zea mays*) grown in sandy soil. Some chemical and biological properties of the used soil after maize cultivated were concerned.

Results of two seasons showed that inoculation with *Serratia sp.*, *Trichoderma sp.* or their mixture exhibited the higher values of dry weight of shoot and roots as well as grain and stalk yields. Grains percentage of the mean of the two seasons increases over uninoculated plants were 17.1, 11.2 and 24.5%, respectively. There are significant increases in plant height, shoot dry weight due to bio-compost or town refuse application compared to unamended soil. The increases in shoot dry weight were 47.1 and 16.1% for biocompost and town refuses application, respectively against the unmanured soil. The increasing in grain yield over the mean of the two seasons were 28.9 and 17.7% at the same order. Data generally showed a slight effect of inoculation on pH, EC, organic matter and total nitrogen content of soil under investigation. On the other hand, application of organic materials displayed great effect on all investigated soil properties. Using of 5 ton compost followed by using of 5 ton town refuse, strongly affect soil properties. The season of 2005 recorded the higher values of the parameters than season 2004.

Keywords: Biofertilization, *Serratia* sp., *Trichoderma* sp., Bio-compost, Town refuse compost.

INTRODUCTION

It has been proved that the fertility of Egyptian soil is diminishing gradually due to soil erosions, loss of nutreints, accumulation of salts and other toxic elements, water logging and unbalanced nutrient compensation especially after construction of Hight Dam.

The high cost of chemical fertilizers, the widening gap between supply and demand, the law pusrchasing power of small and marginal farmers and their adverse effect on environment has led gricultural scientists to look for alternate strategies. Organic wastes and biofertilization are the alternate source to need requirments of crops and to bridge the future gap.

Further knowning the deleterious effect of using only the chemical fertilizers, use of soil microorganisms which either fix atmospheric nitrogen or solubilize phosphorus or plant growth promoting rhizobacteria (PGPR) will be environmentally begun approach for nutrient manegment and ecosystem function.

Maize is considered to be one of the most important grain crops in Egypt, as an economic crop that represents a major source of food. So, any trial to increase its yield is of a prime concern. Previous works on fertilizer requirements of such crop under local conditions had revealed that nitrogen

and phosphorus are the most important elements responsible for increasing crop production. The efforts to decrease chemical fertilization by using biofertilization with asymbiotic N_2-fixers might improve plant growth and reduce environmental pollution at the same time.

Over the last few years, a diverse array of bacterial species including *Pseudomonas, Serratia, Azospirillum, Azotobacter, Bacillus, Klebsiella* and *Anterobacter* has been shown to promote plant growth. The mechanism by which these rhizobacteria enhance plant growth is not clear, but it is postulated that they may: (a) production of secondary metabolites such as antibiotics, cyanide and hormonelike substances, (b) production of siderophores, (c) dinitrogen fixation (d) increase phosphate solubilization, (e) enhance mineral uptake and/or (f) antagonism to soil borne root pathogens (Okon and Kapulnik, 1986 ; Dileep Kumar *et al.*, 2001 and Nelson, 2004). The enhancement of growth and productivity of maize plants due to apply biofertilization have been reported by El-Borollosy *et al.* (2000) and Abdel-Wahab *et al.* (2005).

Awad *et al.* (2000) studied the effect of applying several soil amendments to sandy soil on corn plant growth and its yield. They found that addition of organic manure led to a maximum increase in plant growth and consequently crop yield. Taha (2000) reported that treating coarse texture soils with 10 ton/fed of composted organic residues significantly increased the dry matter yield of corn plants grown on the manured soils over control. Negm *et al.* (2003) found that the addition of compost increased the dry matter yield of plants grown on the treated soil against the control one.

Concerning the interaction between organic manures and soil microorganisms, Roper *et al.* (1994) and Roper and Ledha (1995) showed that the addition of FYM caused an immediate increase in the total number and activity of microflora in general within few days, especially N_2-fixers. El-Sheshtawy (2000) added that low doses of inorganic nitrogen fertilizer promoted the response of plant to inoculation.

Therefore, the aim of this study was to investigate the effect of inoculation with biofertilizers combined with different types of composts on the growth vigour and productivity of maize plants grown in sandy soil. Some chemical and biological properties of the used soil after maize caltivated were concerned.

MATERIALS AND METHODS

Two field experiments were carried out to study the effect of biofertilization combined with compost or town refuse compost on the growth vigour and productivity of maize plants grown in sandy soil. Some chemical and biological properties of the used soil after maize caltivated were concerned. The experiments were conducted in summer seasons of 2004 and 2005 at El-Tahrir Province Sector. They were designed as split spilt design with three replicates. Some physical and chemical properties of used soil, bio-compost and town refuse compost are shown in Table (1).

Table (1): Characteristics of soil, the bio-compost and town refuse used in the field experiment.

Property	Soil	Bio-compost	Town refuse
Sand (%)	68.96	-	-
Silt (%)	24.80	-	-
Clay (%)	6.24	-	-
Texture grade	Sandy loam	-	-
S.P (%)	41	-	-
pH	7.3	6.47	8.27
E.C. (dS/m at 25°C)	0.37	7.19	7.53
Soluble cations and anions (meq/L)			
Ca^{++}	1.85	-	-
Mg^{++}	0.97	-	-
Na^{+}	0.81	-	-
K^{+}	0.28	-	-
$CO^{=}_3$	0.00	-	-
HCO^{-}_3	0.81	-	-
Cl^{-}	0.79	-	-
$SO^{=}_4$	2.31	-	-
Organic-C (%)	0.36	26.77	20.21
Total N (%)	0.031	1.31	0.98
C/N ratio	11.61	20.44	20.32
Total-P (%)	-	1.16	0.50
Total-K (%)	-	0.64	1.51
Total soluble-N (ppm)	31.0	862.1	330.90
Available-P (ppm)	7.3	296.0	140.30
Available-K (ppm)	-	913.0	662.4
DTPA extractable (ppm):			
Fe	3.5	624.8	384.8
Mn	3.1	63.9	23.90
Zn	1.2	39.5	143.30
Cu	0.3	8.2	78.50
Total count of bacteria	6.9×10^5	14×10^7	3.3×10^7
Total count of fungi	0.9×10^4	13×10^6	1.1×10^6
Total count of actinomycetes	1.1×10^4	2.7×10^6	$1.0 \times 10.^6$
Dehydrogenase activity (□g TPF/g)	5.4	142.5	69.40

The experimental area was divided into three main plots. The first one left without manuring and received the recommended dose of nitrogen, phosphorus and potassium were 120, 200 kg/fed and 48 kg/fed, respectively. The fertilizers were applied as ammonium sulphate (20.5%N), superphosphate (15.5% P_2O_5) and potassium sulphate (48% K_2O) in the same order. The second main plot was received 100 kg N/fed and amended with 5 ton/fed of bio-compost (Abdel-Wahab and Ahmed, 2003) and the third was received 100 kg N/fed and amended with 5 ton/fed of town refuse compost (kindly supplied from Compost Plant at Domiatt governorate). Each main plot was divided into four sub plots. The first sub plot was left without inoculation (control), the second was inoculated with *Serratia* sp., the third was inoculated with *Trichoderma* sp. and the last subplot was inoculated with *Serratia* sp. + *Trichoderma* sp. The soil was irrigated before sowing to provide suitable moisture for inoculation.

Maize (*Zea maize* cv. Single hybrid 10) was cultivated in these experiments according to the recommended practice in such investigated area. Grains were socked just before sowing in liquid of each culture used, then repeat inoculated with the same liquid culture beside the seedling after 30 days of planting. The uninoculated grain was drenched in water for the same time likewise the inoculated grains. Irrigation was done using sprinkle system. The plants were thinned to one per hill after germination.

Corn plants were harvested after 60 and 120 days of planting to evaluate the vegetative growth and nitrogen content of plants as well as yield components. During the harvesting process, plant rhizosphere samples were collected from each treatment to evaluate some of their biological and chemical properties.

The physical, chemical and biological parameters of soil were analyzed according to Black *et al.* (1965) and Page *et al.* (1982). Plant materials were dried, weighted and ground for determined nitrogen content according to Jackson (1973). The data of plant parameters were combined statistically analyzed during two seasons according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

An approach for evaluating the growth and productivity of maize plants as affected by biofertilization and compost application in newly reclaimed soil was performed through the determination of some growth aspects such as plant height, plany dry matter and nitrogen content as well as the yield components.

1- Main effect of inoculation:

Statistical main effects during two seasons of different inoculation treatments on plant height, shoot and root dry matter and their nitrogen contents as well as grain and stalk yields of maize plants grown in sandy soil were presented in Tables (2 and 3).

Table (2): Main effects of inoculation treatments on the growth aspects and nitrogen yield of maize plants after 60 days of planting.

Inoculation	Plant height (cm)	Shoot per plant		Root per plant	
		DW (g)	N-content (mg)	DW (g)	N-content (mg)
Uninoculated	152.2	45.63	1019.8	6.32	115.9
Serratia	165.0	61.35	1287.5	8.02	151.6
Trichoderma	159.9	52.75	1184.7	7.77	139.6
Serratia + Trichoderma	166.3	61.37	1295.0	8.41	161.5
LSD 0.05	8.3	2.30	44.0	1.41	11.6

It is clear that inoculation with any microorganisms significantly enhanced the growth aspects as compared to uninoculated plants. However, inoculation with *Serratia* exhibited the suprority for all growth characters under investigation. Hence, the highest plant height (166.3 cm), plant dry weight (61.37 g/plant) and shoot N-content (1295.0 mg/plant) were recorded in the case of inoculation with *Serratia+Trichoderma* treatment. Generally,

there are no-significant differences between inoculation with *Serratia* or *Serratia* +*Trichoderma*, while *Trichoderma* recorded the lower.

Regarding to grain and stalk yields (Table 3) data clearly revealed that daul inoculation with *Serratia*, *Trichoderma* or their mixture exhibited higher values of grain and stalk yield comparison to uninoculated treatment. The percentage of increases over uninoculated plants were 17.1, 11.2 and 24.5%, respectively. The increses of stalk yield were 16.4, 8.1 and 20.9% in the same order. These results are in agreement with those obtained by Dileep Kumar *et al.* (2001), Nelson (2004) and Abdel-Wahab *et al.* (2005) who observed the enhancement of growth and productivity of maize plants due to apply biofertilization.

Table (3): Main effects of inoculation treatments on yield parameter of maize plants.

Inoculation	Yield (Ton/fed)		Crude protein (kg/fed)	
	Grain	Stalk	Grain	Stalk
Uninoculated	1.021	2.551	8.99	4.53
Serratia	1.196	2.969	9.43	4.90
Trichoderma	1.135	2.758	9.30	4.73
Serratia + *Trichoderma*	1.271	3.083	10.25	5.13
LSD 0.05	0.109	0.350	0.40	0.37

2- Main effect of organic application:

Concerning the statistical main effect of organic material (Table 4), it is apparent that the application of any type of organic matter resulted in significant increases in all parameters under study as compared to the control treatment (without organic applied). However, using compost gave the higher values of maize plant growth compared to town refuse. Data showed that there are significant increases in plant hight, shoot dry weight due to bio-compost application compared to unamended soil. The relative increases in plant hight reached to 10.9 and 7.5% for biocompost and town refuse application, respectively over the unamended soil. The increases in shoot dry weight were 47.1 and 16.1% for biocompost and town refuses application, respectively, as compared with unmanuring soil. The increases of shoot nitrogen content reached to 22.9 and 19.1% in the same order.

Table (4): Main effects of compost and town refuse application on plant height and growth of maize plants after 60 days of planting.

Fertilization	Plant height (cm)	Shoot per plant		Root per plant	
		DW (g)	N-content (mg)	DW (g)	N-content (mg)
Unfertilized	151.7	45.65	1050.1	5.81	106.3
Bio-compost	168.3	67.14	1290.3	9.55	174.1
Town refuse	163.0	53.02	1250.0	7.53	145.0
LSD 0.05	7.17	1.82	81.4	1.22	10.1

The obtained results of corn yields (Table 5) clearly showed that manuring with compost exhibited higher values of grain and stalk yield as compared to unfertilized treatment. This means that using of compost followed by town refuse gave higher values of grain and stalk yields as

compared to unamended one. For instance, addition of 5 ton/fed biocompost or town refuse caused increasing in grain yield by, 28.9 or 17.7%, respectively. The increses of stalk yield were 27.8 or 21.7% in the same order.

Table (5): Main effects of compost and town refuse application on yield parameter of maize plants.

Fertilization	Yield (Tan/fed)		Crude protein (kg/fed)	
	Grain	Stalk	Grain	Stalk
Unfertilized	1.000	2.438	8.81	4.36
Bio-compost	1.289	3.115	9.99	5.21
Town refuse	1.177	2.967	9.68	4.91
LSD 0.05	0.094	0.303	0.35	0.65

These results may be due to the role of organic materials in accelerating the growth and yield of maize. These results are in accordance with those obtained by Abdel-Wahab *et al.* (2005) who found that the application of organic materials to sandy soil led to a marked increase in the growth and grain yield of corn plants.

3- Interaction of biofertilizer and organic application:

Concerning the interaction of biofertilizer and compost application (Table 6), the highest value of plant height (173.3 cm) was recorded in the *Serratia* inoculation combined with bio-compost application. The data of shoots dry weight and its nitrogen content were recorded in Table (6). The *Serratia* or *Trichoderma* or their mixture inoculation combined with bio-compost application were recorded the significant increases over uninoculated ones in the same condition. The same results were shown in roots dry weight and its nitrogen content.

Table (6): Effect of inoculation treatments combined with compost and town refuse on plant height and growth of maize plants after 60 days of planting.

Treatments	Plant height (cm)	Shoot per plant		Root per plant	
		DW (g)	N-content (mg)	DW (g)	N-content (mg)
Unfertilized					
Uninoculated	141.3	35.9	927.1	4.37	92.2
Serratia	155.0	53.8	1146.2	6.02	113.3
Trichoderma	149.7	39.3	1040.7	6.00	103.1
Serratia + Trichoderma	160.7	53.7	1086.4	7.16	116.5
Bio-compost					
Uninoculated	151.7	57.8	1132.4	8.76	145.6
Serratia	173.3	70.3	1366.5	10.23	185.3
Trichoderma	168.3	69.6	1261.2	10.15	169.0
Serratia + Trichoderma	169.7	70.9	1401.2	9.07	196.7
Town refuse					
Uninoculated	155.0	43.2	1000.3	5.85	109.8
Serratia	166.7	60.0	1349.9	7.80	156.4
Trichoderma	161.7	49.4	1252.2	7.45	146.6
Serratia + Trichoderma	168.7	59.5	1397.5	9.00	171.2
LSD 0.05	14.34	10.66	162.8	2.45	20.16

The combined effect between organic application and inoculation on maize grain and stalk yields, Table (7), illustrated that using of compost followed by town refuse in combination with mixture of *Serratia* and *Trichoderma* gave higher values of maize grain yield to be (1428.6 and 1276.0 kg/fed) and stalk yield (3379.4 and 3237.8 kg/fed), respectively. The same results were shown in crude protein in grain and stalk yields.

Table (7): Effect of inoculation treatments combined with compost and town refuse on yield parameter of maize plants.

Treatments	Yield (Ton/fed)		Crude protein (kg/fed)	
	Grain	Stalk	Grain	Stalk
Unfertilized				
Uninoculated	0.895	2.260	8.48	4.15
Serratia	0.994	2.517	8.86	4.40
Trichoderma	1.008	2.345	8.77	4.32
Serratia + Trichoderma	1.107	2.633	9.12	4.57
Bio-compost				
Uninoculated	1.105	2.749	9.44	4.83
Serratia	1.362	3.276	9.89	5.35
Trichoderma	1.260	3.057	9.71	5.09
Serratia + Trichoderma	1.429	3.379	10.94	5.54
Town refuse				
Uninoculated	1.062	2.644	9.06	4.60
Serratia	1.232	3.113	9.55	4.96
Trichoderma	1.136	2.872	9.42	4.78
Serratia + Trichoderma	1.276	3.238	10.69	5.28
LSD 0.05	0.188	0.605	0.70	0.65

It looks true that the application of amended compost types (supplied with mineral amendments and biofertilizers) tended to give significant increases in maize plant growth as compared to the unamended one (control or town treatment). In fact, the enhancement of maize growth particularly resulting in amended compost could be attributed to the prominent role of decomposed organic matter for improving the physical, chemical and biological properties of the soil. These increasing of nutrient availability and microbial activity in rhizosphere may enhance the root proliferation and consequently boosting the plant growth. These results are in harmony with those obtained by Mikhaeel *et al.* (1997), Abdel-Wahab (1999), Abdel-Maksoud *et al.* (2002), Badawi (2003), Desoki (2004) and El-Etr *et al.* (2004) who pointed out that the application of organic materials which amended with biofertilizers and/or mineral amendments to clayey, calcareous and sandy soils led to a marked increase in the wheat plant growth. These results are in agreement with those obtained by Basyouny (2001), Awad *et al.* (2003) and Hegazi *et al.* (2005) who found that the applied organic manures were more effective for plant grown on both soil sandy and calcareous soils.

Indeed, the obtained results confirmed on the vital role of organic materials that can flourish the plant vigor and its productivity in newly reclaimed soils. This role may be magnifies when the organic material accompanied with efficient strains of rhizobacteria which commonly to undergo as regard to their activity in such desert soils.

4- Change in some chemical properties of soil:

The effects of bio- and organic amendments on some chemical properties of corn rhizosphere are shown in Table (8). Data generally showed a slight effect of inoculation for all parameters under investigation. On the other hand, application of organic materials showed a marked effect on all investigated soil properties. Using of 5-ton compost followed by using of 5-ton town refuse, strongly affect soil properties. In other word, using of manure slightly decreased pH values, while increased the electrical conductivity, organic matter, total nitrogen and available phosphorus. These results are in harmony with those obtained by Badawi (2003) and Abdel-Wahab and Said (2004) who observed the promotive effect caused by organic materials on physical, chemical and biological characteristics of the soil, which in turn the influence development of plants.

Table (8): Effect of bio-fertilizers inoculation combined with bio-compost and town refuse application on some chemical properties of corn rhizosphere after harvesting crop.

Treatments	pH	EC (dS/m^2)	Organic matter (%)	Total-N (ppm)	Available-P (ppm)
Unmanuring soil					
Uninoculated	7.68	0.35	0.69	438	32
Serratia	7.59	0.36	0.72	447	35
Trichoderma	7.72	0.32	0.67	428	28
Serratia + Trichoderma	7.60	0.33	0.72	436	29
Bio-compost					
Uninoculated	7.30	0.58	1.36	694	46
Serratia	7.28	0.62	1.26	688	48
Trichoderma	7.21	0.56	1.39	691	52
Serratia + Trichoderma	7.33	0.61	1.27	684	47
Town refuse					
Uninoculated	7.49	0.69	1.29	681	45
Serratia	7.40	0.64	1.26	673	43
Tricoderma	7.44	0.70	1.24	680	45
Serratia + Trichoderma	7.50	0.66	1.36	670	46

5- Change in some biological properties of soil:

Biological properties could be explained by the dehydrogenase activity as well as the bacteria, fungi and actinomyces counts (microbial counts) of the used soil after maize caltivated. Table (9) showed an increase in the dehydrogenase activity as an indicator to increase the microbial activity in the soil due to application of organic materials with relatively higher values by using the bio-compost manure. These results confirmed again the essential role of organic materials in the improvement of the main chemical and biological properties of sandy soils and led to a sush better environment for the growth of microbial community in plant rhizosphere. Also, the changes in microbial counts (Table 9) tended to increase in all treatments refering to control, reaching a maximum level in the application bio-compost compined with *Serratia+ Trichoderma* inoculation. Inoculation with *Serratia* or *Trichoderma* to soil has a positive influence on soil microorganisms. Upon

comparing between different inocula, data showed the following order: (microbial mixt.)> (*Serratia*)> (*Trichoderma*)> uninoculation. Data revealed that application of bio-compost, as well as, inoculation with a mixture increased microbial in rhizospheric soil of after grown maize plants comparing with the control treatment. The effect of organic manuring added to soil on total microbial count in the rhizosphere of maize plants could arrenged in descending order as follow: (bio-compost) > (town refuse) > unmanuring soil. It was also noticed that bio-compost at rate of 5 ton/fed gave higher activities than the town refuse. Similar results were reported by Roper *et al.* (1994) and Roper and Ledha (1995) who showed that the addition of FYM caused an immediate increase in the total number and the activitty of microflora in general within few days specially with N_2-fixing bacteria. Also, th organic materials represent the sources of carbon, energy and nutrients for the chemoorganotrophic microorganisms in soil (Alexander, 1977 and Khalil *et al.*, 1997).

Table (9): Effect of bio-fertilizers inoculation combined with bio-compost and town refuse compost application on some biological properties of corn rhizosphere after harvesting crop.

Treatments	DHA (mgTPF /g soil)	Log No. of counts (cfu/g soil)		
		Bacteria	Fungi	Actinomyces
Unmanuring soil				
Uninoculated	4.9	5.32	3.85	3.69
Serratia	6.1	5.94	3.95	3.71
Trichoderma	5.9	6.11	4.00	3.70
Serratia + Trichoderma	6.5	5.93	4.11	3.78
Bio-compost				
Uninoculated	7.9	7.12	5.61	5.32
Serratia	9.6	7.39	5.60	5.51
Trichoderma	9.4	7.29	5.72	5.48
Serratia + Trichoderma	10.1	7.41	5.59	5.50
Town refuse				
Uninoculated	7.5	6.51	4.98	5.42
Serratia	8.6	6.98	5.12	5.50
Trichoderma	8.1	6.65	5.22	5.44
Serratia + Trichoderma	9.2	6.66	5.10	5.38

6- Season effect:

The analysis of variance for seasons, treatments and their interactions of all studied characters are given in Table (10). The data revealed that season effected dry weight of plant, N-plant content, grains and stalk yields. These results indicated that season effect is important in the study. The season of 2005 recorded the higher values of the parameters than that of season 2004. The differences between seasons may be related to the differences of weather and other environmental conditions, and suggesting the possibility to raise yield level by selective time of agriculture and other agronomic practices.

Table (10): Statically mean of growth and yield for biofertilizers inoculation combined with organic fertilizers application during two seasons of 2004/05.

Parameters	Season 2004	Season 2005
Plant height (cm)	155.9	164.4
Shoot dry weight (g/plant)	50.4	60.2
Shoot N-content (mg/plant)	1109.2	1284.4
Root dry weight (g/plant)	6.88	8.43
Root N-content (mg/plant)	133.5	150.7
Grain yield (tan/fed)	1.065	1.246
Stalk yield (tan/ha)	2.734	2.946
Grain crude protein (kg/fed)	8.467	10.522
Stalk crude protein (kg/fed)	4.152	5.493

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تأثير المحسن الحيوى العضوى على النمو ومحصول الذرة الشامية فى الأراضى حديثة الاستصلاح

علاء الدين عبد الحميد أبو السعود ، فريد شوقي فريد بدوي ، أحلام علـى محيسـن و بهجت على حسونة

قسم بحوث الميكروبيولوجيا الزراعية – معهد بحوث الأراضي والمياه والبيئة – مركز البحوث الزراعية – مصر

أجريت تجربتين حقليتين في أرض رملية بقطاع جنوب التحرير خلال الموسمين الصيفى ٢٠٠٤، ٢٠٠٥ لدراسة تأثير التلقيح بالسماد الحيوى مشترك مع نوعين مختلفين من السماد العضوى الحيوى (الكمبوست) ، سماد مخلفات المدن على النمو الخضرى وإنتاجية الذرة النامية فى أراض رملية وكذلك التأثير على بعض الخواص الكيمائية والحيوية للارض تحت الدراسة بعد زراعة المحصول.

وأظهرت نتائج متوسط الموسمين أن التلقيح بالسرتيا أو التريكوديرما أو الخليط بينهما أعطى قيم عالية فى الوزن الجاف للجذر والساق فى المرحلة الخضرية وأنعكس ذلك على محصول الحبوب والحطب. وقد ظهر زيادة معنوية فى أطوال النباتات والوزن الجاف لها نتيجة أضافة الكمبوست أو سماد مخلفات المدن بالمقارنة بالنباتات المنزرعة فى أرض غير معاملة. وكانت متوسط زيادة الموسمين فى المجموع الخضرى ٤٧,١ ، ١٦,١% نتيجة أضافة الكمبوست وسماد مخلفات المدن على التوالى. عموماأظهرت النتائج تأثير طفيف للتلقيح على خواص التربة pH ، EC ، محتوى المادة العضوية ، النيتروجين الكلى للارض بعد الزراعة. وعلى الجانب الأخر أضافة المادة العضوية اظهر تأثير كبير على هذه الخواص وقد لوحظ أن أضافة ٥ طن سماد عضوى حيوى أظهر تأثير كبير على خواص الارض ويتبع ذلك أضافة ٥ طن سماد مخلفات المدن. وقد سجلت أعلى قيم المجموع الخضرى ومحصول الحبوب والحطب فى موسم ٢٠٠٥ عنها فى موسم ٢٠٠٤.