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RESPONSE OF WHEAT AND MAIZE PLANTS TO APPLICATION OF COMPOST AND INOCULATION WITH VESICULAR ARBUSCULAR MYCORRHIZAE

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ABSTRACT

A pot experiment was conducted to investigate the effect of application of three rates of compost (40, 60 and 80 g/pot) and inoculation with VA mycorrhizae on growth of wheat and maize plants grown in clay loam and sandy soils. VA mycorrhizal root colonization was also studied.

The results revealed that the increasing of organic fertilization resulted in increases in growth measurements of both plants, (*i.e.* plant height, root length, fresh weight, dry weight, percentage of infection with mycorrhizae and N and P percentage). Inoculation of wheat and maize plants with mycorrhizae led to high significant increases in the above-mentioned parameters as compared to uninoculated plants grown in the two soils. The highest values of above-mentioned measurements were recorded in plants which received 80 g compost /pot (*i.e.* 20 tons/ feddan), in the clay loam and sandy soils. The interaction effect between compost and inoculation with mycorrhizae was significant in the plant height, root length and N percentage of wheat in the sandy soil, as well as the interaction effect between compost and inoculation with mycorrhizae was significant in the percentage of mycorrhizal infection in the sandy soil. The interaction effect between application of compost and inoculation with mycorrhizae was significant in plant height, % mycorrhizal infection and % N of maize in the clay loam and sandy soils. The highest values of the above-mentioned parameters of wheat and maize were achieved with application of compost at the rate of 60 g/pot which represent 15 tons/ feddan combined with inoculation with mycorrhizae in both experimental soils.

INTRODUCTION

In fact, wheat crops represent a strategic element in the food of developing countries occupying 17% of the total cultivated land in the world (CIMMYT 2000).The importance of wheat as an important food commodity is due to its high nutritive value. The whole grain wheat is a rich source of various antioxidants, protein (gluten), vitamins, minerals and fibers (Sramkova *et al.*, 2009).African countries are the world's biggest wheat importer with more than 45 million ton in 2013 where North African countries have the highest per capita wheat consumption.

Maize accounts for almost half of the calories and protein consumed in eastern and southern Africa (ESA), and one-fifth of the calories and protein consumed in West Africa. An estimated 208 million people in sub-Saharan Africa (SSA) depend on maize as a source of food security and economic wellbeing. Maize occupies more than 33 million ha of SSA's estimated 200 million ha of cultivated land. Considering the low average maize grain yields that are still pervasive in farmers' fields, meeting the projected increase demand for maize grain in Africa presents a challenge. Maize accounts for almost half of the calories and protein consumed in ESA, and one-fifth of the calories and protein consumed in West Africa. An estimated 208 million people in SSA depend on maize as a source of food security and economic wellbeing. Maize occupies more than 33 million ha of SSA's estimated 200 million ha of cultivated land. Considering the low average maize grain yields that are still pervasive in farmers' fields, meeting the projected increase demand for maize grain in Africa presents a challenge.(Macauley, 2015)

Compost is increasingly used as an organic fertilizer (Cavagnaro, 2014), it can slowly release nutrients for plants and microorganisms and help maintaining a medium-high nutrient availability (Scotti *et al*., 2016; Yang *et al*., 2017), which may benefit *Arbuscular micorrhizae* fungi. Although AM fungi are not saprotrophic fungi, some studies have shown that AM fungi can directly take advantage of organic matter (Hodge *et al*., 2001; Govindarajulu *et al*., 2005; Jin *et al*., 2005). In addition, compost addition usually promotes plant growth and enhances carbon allocation to soil fungi (Lee *et al*., 2004; Donn *et al*., 2014), thus can indirectly affect AM fungi. The effect of compost addition on AM can also be mediated through soil bacteria, which was reported to either directly enhance AM growth and germination or indirectly by influencing plant physiology (Saia *et al*., 2015a,b). Taken as a whole, the addition of compost mostly had beneficial effect on AM growth. A number of studies have reported that compost addition enhanced AM root colonization, spore production, and development of AM extraradical hyphae (Labidi *et al.*, 2007; Valarini *et al*., 2009; Tanwar *et al.*, 2013; Cavagnaro, 2015).

The object of the present study was to evaluate the interaction effect of application of compost and inoculation with mycorrhizae on growth of wheat (Sids 12) and maize (Giza 2) plants grown in clay loam and sandy soils.

MATERIALS AND METHODS

This investigation was carried out in the laboratory of microbiology and the greenhouse of the faculty of Agriculture, Minia University, during 2015/2016 seasons to study the effect of application of compost and inoculation with VA- mycorrhizae on growth of wheat and maize plants grown in two types of soils (clay loam and sandy soils).

1-The soil used

Two types of soil were used in this study (clay loam and sandy soils). The clay loam soil was collected from the experimental farm of Faculty of Agriculture, Minia University. Whereas, the sandy soil was obtained from newly reclaimed sandy soil of Shosha Agriculture Research Center, Minia University. The physical and chemicals properties of the used soils are presented in Table (1) as reported by Service Laboratory for soil, Plant and Water analysis of Minia University.

2- The compost used

Nile compost produced by Egyptain company for Agricultural Residues Utilization. EL-Minia industrial zone EL- Minia Egypt was used in this study. Some of the main characteristics of this compost are given in Table (2).

3-Vesicular-arbuscular mycorrhizae (VAM)

Two species of endomycorrhizal fungi (*Glomus fasiculatum* & *G. mosseas*), supplied by Agric. Microbiology Dept., Fac., Agric., Minia University, Egypt were used.

Preparation of inocula

For preparing VAM inoculum, fired clay pots of 30cm in diameter were filled with autoclaved sandy loam soil. The soil in each pot was inoculated with the two species of endomycorrhizal fungi. Five onion seedlings were transplanted in each pot as a host plant. At the end of the growth stage of onion, plants were unprooted. The soil of the used pots was mixed together and VAM spores were counted as described by (Gerdemann and Nicolson, 1963). The spores count was found to be 2.4 spores/g. soil. This soil containing mixture of VAM spores, mycelium and chopped roots, was kept to be used as VAM inoculum.

The experimental design and treatment

On the May and November experiment seasons, maize and wheat grains were sown in polyethylene bags 28x20 cm, each filled with 5 kg of clay loam or and sandy soils. These pots were subjected to the following compost treatments:

1-Control (without any treatment).

2-Nile compost at rates of 40, 60 and 80 g per pot (*i.e.* 10, 15 and 20 tons/Fed.).

3- VAM inoculum added at rate of 100g/bag (5 kg soil).

4- Nile compost at rates of 40, 60 and 80 g per pot (*i.e.* 10, 15 and 20 tons/Fed.) plus VAM inoculum added at rate of 100g/bag (5 kg soil) .

Table (1): Mechanical and chemical analysis of the used soils. Table (1): Mechanical and chemical analysis of the used soils.

Characteristics	Soil types	
	Soil I	Soil II
Physical analysisSandy %	26.44	92.40
Silt %	31.17	4.04
Clay %	42.39	3.16
Texture grade	Clay loam	Sandy
Chemical analysis		
pH	8.01	8.30
E.C.mmhos/cm	0.65	3.22
$CaCO_3$	1.82	13.85
Total N %	0.09	0.02
Available P (ppm)	12.62	2.41
Organic matter	1.69	0.06

Table (2): Chemical analysis of used compost

Characteristics	Value
pH	7.60
Ec	2.53
Total N (%)	0.69
NH_4^+(ppm)	97.50
NO_3^- (ppm)	43
Organic matter (%)	51.5
Organic carbon (%)	29.5
P(%)	0.43
K(%)	1.27
Fe (ppm)	1013
Mn (ppm)	108
Cu (ppm)	58
Zn (ppm)	2.53

Factorial design with three replicates and 2 plants/replicate was conducted. Maize and wheat plants grown in bags containing sandy or clay loam soil were carefully harvested at 60 days of growth. Then, the plants were thoroughly hand-washed to remove soil particles from the roots, then, heights of plants and root length, plant fresh weight and dry weight were recoded. Percentage of mycorrhizal root colonization was assessed microscopically by the slide method **(**Phillips and Hayman, 1970) as described below. Nitrogen content of the shoots and roots was determined by microkjeldahl procedure (Eastin, 1978). Phosphorus contents had been colorimetrically determined according to Olsen *et al.,* (1954).

The obtained data were statistically analyzed (Clewer and Scarisbrick, 2001) and the

Data collected were statistically analyzed by the analysis of variance using the general linear model (GLM) procedure of statistical analysis system (SAS,2006). The following statistical model Factorial design using the following models.

Yijk = µ+Fi+Ij+FIij+Eijk

where **Yijk** = The observation value of the concerned trait.

µ= The overall mean for the concerned trait.

Coi= The fixed effect to the fertilization (0, 50, 75, 100 %).

Ij= The fixed effect to inoculation (with, without).

Co**Iij**= The fixed effect due to the interaction (Fi×Ij).

Eijk= Arandom error.

Significant differences among treatments were sparated by Duncan,s multiple range tests (Duncan, 1955)at level 5% only when F-value were significantly different at level 5%. The differences were expressed as follow:

NS= Not significant (p≥0.05)

*= significant (p≤ 0.05)

** = Highly significant (p≤0.01)

RESULTS AND DISCUSSION

1- Effect of compost and inoculation with mycorrhizae on plant height, root length and fresh weight of wheat plant

Data in Table (3) show the mean values of plant height, root length and fresh weight of wheat plants. Data presented in Table (3) indicate that inoculation with mycorrhizae led to a high significant increase in the above parameters as compared to uninoculated treatment in the two types of soils. The superior estimated effect of VAM could be due to the great role played via mycorrhizae mycelia means, that they are more effective than plant root hairs in absorbing nutrient elements including phosphorus, nitrogen, potassium and some micronutrients. Similar results were reported by Rupam *et al.* (2001); Bhoopander *et al.* (2005); Pertot *et al.*(2006); Abd EL- Wahab (2007); Ali *et al*. (2009); Scotti *et al*. (2016) and Yang *et al*. (2017 **).**

Above mentioned parameters significantly increased as a result of application of different levels of compost in the two types of soils . The highest values of plant height, root length and fresh weight were obtained when the compost was applied at the rate of 80 g/pot which represent 20 tons/ feddan in the clay loam and sandy soils. These results may be due to the role of compost in increasing the vegetative growth of the cultivated plants.

These results are in agreement with those obtained by Linderman and Davis (2001); Velasco *et al.* (2001); Caravaca *et al.* (2002); Osorio *et al.* (2002); Linderman and Davis (2003); Nicole *et al.* (2003); Hakan *et al.* (2007); Tanwar *et al.* (2013); Cavagnaro (2015) and Saia *et al*. (2015a,b).) they found that the compost application enhance the vegetative growth of cultivated plants.

Also, data in Table (3) reveal that interaction effect between compost and inoculation with mycorrhizae was significant on the plant height and root length in the sandy soil. The interaction between compost and inoculation with mycorrhizae had no significant effect on plant height and root length in the clay loam soil.

The highest values of the above parameters were obtained when the compost was applied at the rate of 60 g/pot which represent 15 tons/ feddan with application of mycorrhizae in the clay loam and sandy soil**.**

2-Effect of compost and inoculation with mycorrhizae on plant height, root length and fresh weight of maize plant

Data presented in Table (4) indicate that inoculation with mycorrhizae lad to a high significant increase in the above parameters as compared with uninoculated treatment in the two types of soils. The superior effect of VAM could be due to the great role played by mycorrhizae mycelia means, that they are more effective than plant root hairs at absorbing nutrient elements including phosphorus, nitrogen, potassium and some micronutrients. Similar results were reported by Rupam *et al.* (2001) ; Bhoopander *et al.* (2005) ;Pertot *et al.* (2006); Abd EL- Wahab (2007); Ali *et al*. (2009); Scotti *et al*. (2016) and Yang *et al*. (2017).

Table (3) Effect of compost and inoculation with mycorrhizae on plant height, root length and fresh weight of wheat plant during 2015/2016 season.

Treatments		Plant height		Root length		Fresh weight	
	Soil Types	Clay loam	Sand	Clay loam	Sand	Clay loam	Sand
Compost	Co_w	*	***	*	***	*	**
	Control	57.17[b]	45.66[b]	12.83[c]	8.76[c]	2.07[c]	1.29[b]
	100%	83.33[a]	75.66[a]	18.16[ab]	15.26[b]	4.05[ab]	1.90[a]
	75%	80.66[a]	73.33[a]	17.50[a]	12.76[a]	3.02[a]	1.83[a]
	50%	60.00[b]	52.66[b]	14.83[bc]	11.26[b]	2.26[bc]	1.09[b]
	LSD	18.62	7.91	3.65	2.39	0.77	0.44
Inoculation	I	***	***	***	***	***	***
	With	83.17	74.66	18.83	14.33	3.14	1.91
	Without	57.41	49.00	12.83	9.50	2.06	1.15
	LSD	13.16	5.59	2.58	1.69	0.55	0.31
Compost x Inoculation	CO_w * I	Ns	**	Ns	**	Ns	Ns
	Control with	78.00	67.66	16.00	11.33	2.88	1.68
	Control without	36.33	23.66	9.66	6.00	1.27	0.90
	%100 with	81.00	78.00	18.00	11.66	3.33	2.07
	%100 without	80.00	69.33	16.33	12.66	2.78	1.60
	%75 with	93.66	84.66	23.33	19.66	3.27	2.62
	%75 without	73.00	66.00	13.66	11.66	2.77	1.18
	%50 with	80.00	68.33	18.00	14.66	3.08	1.26
	%50 without	40.00	37.00	11.66	7.66	1.44	0.92

In addition, data in Table (4) show the mean values of plant height, root length and fresh weight of wheat plants. These parameters significantly increased by levels of compost in the two soils. The highest values of plant height, root length and fresh weight were obtained when the compost was applied at the rate of 80 g/pot which represent 20 tons/ feddan in the clay loam and sandy soils. These results may be due to the role of compost in increasing the vegetative growth of the plants. These results are in accordance with those obtained by Linderman and Davis (2001); Velasco *et al. (*2001); Caravaca *et al.* (2002); Osorio *et al.* (2002); Linderman and Davis (2003); Nicole *et al.* (2003); Hakan *et al. (*2007); Tanwar *et al.* (2013); Cavagnaro (2015) and Saia *et al*. (2015a,b).

Data in Table (4) reveal that interaction effect between compost and inoculation with mycorrhizae was significant on the plant height in the clay loam and sandy soils and also significant on the plant height in the sandy soil. The interaction between compost and inoculation with mycorrhizae had no significant effect on fresh weigh of plant in the sandy soil.

The highest values of the above parameters were obtained when compost was applied at the rate of 60 g/pot which represent 15 tons/ feddan and inoculalion with mycorrhizae in the clay loam and sandy soil. This could be attributed to the synergistic effect for VAM inoculation and compost application.

Table (4) Effect of compost and inoculation with mycorrhizae on plant height, root length and fresh weight in the maize plant during 2015/2016 season .

	Treatments	Plant height		Root length		Fresh weight	
	Soil Types	Clay loam	Sand	Clay loam	Sand	Clay loam	Sand
Compost	Coz	***	***	***	**	***	**
	Control	60.33[c]	58.50[c]	42.83[b]	49.66[bc]	41.87[c]	30.54[b]
	100%	101.16[a]	98.00[ab]	82.50[a]	62.66[ab]	87.73[ab]	65.76[a]
	75%	95.33[a]	92.83[a]	80.16[a]	59.16[a]	67.43[a]	58.66[a]
	50%	86.16[b]	85.66[b]	54.16[b]	40.66[c]	61.16[b]	53.45[a]
	LSD	12.008	8.298	13.914	11.42	18.93	19.22
Inoculation	I	***	***	***	***	***	***
	With	99.25	94.58	81.25	78.41	87.97	73.71
	Without	75.75	72.91	48.58	27.66	45.63	30.49
	LSD	8.490	5.867	9.838	8.07	13.385	13.59
Compost x Inoculation	COZ * I	**	**	ns	**	ns	ns
	Control with	84.00	75.33	61.00	85.66	64.63	49.66
	Control without	36.66	41.66	24.66	13.66	19.12	11.42
	%100 with	101.00	92.66	91.33	73.33	90.56	74.10
	%100 without	101.33	91.33	69.66	46.00	62.90	43.43
	%75 with	118.00	114.00	97.00	87.66	108.16	95.73
	%75 without	86.66	83.66	67.33	36.66	66.70	35.60
	%50 with	94.00	96.33	75.66	67.00	88.53	75.36
	%50 without	78.33	75.00	32.66	14.33	33.80	31.53

3-Effect of compost and inoculation with mycorrhizae on dry weight, infection %, nitrogen % and phosphorus % of wheat plant

Results in Table (5) indicate that dry weight, percentage of infection, percentage of nitrogen and percentage of phosphorus in wheat plants were significantly affected by inoculation with endomycorrhizae fungi in the two types of soils. This increase may be due to the principle mechanism that carried out by mycorrhizae to benefit the plant growth through production of some useful materials transfer to the plant root area creating a direct effect on plant growth. These materials could be hormones, auxins, (GAS) and (CKS) that mycorrhizae release in the root zone and positively affect root growth and extension. The result could also attributed to more absorption of nutrients which reflect more growth activity, nitrogenous compound assimilation forming growth substances, more cell division and elongation. Similar results and explanation were obtained by Abd El Ati (2000); Grandcourt *et al.* (2004); Caglar and Bayram (2006); Ghazi *et al.* (2007); Ali *et al*. (2009); Scotti *et al*. (2016) and Yang *et al*. (2017).

Data presented in Table (5) showed that increasing compost levels resulted in increase of dry weight, percentage of infection, percentage of nitrogen and percentage of phosphorus in wheat plants growing in the two types of soils. The highest values were obtained when compost was applied at rate of 80 g/pot which represent 20 tons/ feddan in the clay loam and sandy soils. These results are in full agreement with those reported by **Velasco *et al.* (**2001); Osorio *et al.* (2002); Nicole *et al.* (2003); Hakan *et al.* (2007); Walsh and Ragupupathy (2007) and Saia *et al*. (2015a,b).

The interaction effect between inoculation with VAM and application of compost on percentage of nitrogen was highly significant on the clay loam and sandy soils where the dry weigh of wheat was significant in the clay loam soil.

The highest values of the above parameters were obtained when the compost was applied at the rate of 60 g/pot which represent 15 tons/ feddan with mycorrhizal inoculalion in the clay loam and sandy soil.

4-Effect of compost and inoculation with mycorrhizae on dry weight, infection%, nitrogen %and phosphorus% in maize plants

Results in Table (6) indicate that dry weight, percentage of infection, percentage of nitrogen and percentage of phosphorus in the maize plants were significantly affected by inoculation with endomycorrhizal fungi in the two soils. This increase may be due to the principle mechanism that carried out by mycorrhizae to benefit the plant growth through production of some useful materials transferred to the plant root zone creating a direct effect on plant growth. These materials could be hormones, auxins, (GAS) and (CKS) that mycorrhizae release in the root zone and positively affect root growth and extension. The result could be attributed to more absorption of nutrients which reflect more growth activity, nitrogenous compound assimilation forming growth substances, more cell division and elongation. Similar results and explanation were reported by Abd El Ati (2000); Grandcourt *et al.* (2004); Caglar and Bayram (2006), Ghazi *et al.* (2007) and Ali *et al.* (2009).

Data reported in Table (6) show that increasing compost levels resulted in increase of dry weight, percentage of infection, percentage of nitrogen and percentage of phosphorus in maize plants growing in the two soils. The highest values were obtained when compost was applied at rate of 80 g/pot which represent 20 tons/ feddan in the clay loam and sandy soils. These results are in full agreement with those reported by Velasco *et al.* (2001); Osorio *et al.* (2002); Nicole *et al.* (2003); Hakan *et al.* (2007) ;Walsh and Ragupupathy (2007) and Saia *et al*. (2015a,b).

The interaction effect between VAM inoculation and compost application on percentage of infection, percentage of nitrogen was significant on the clay loam and sandy soils.The highest values of the above parameters were obtained when the compost was applied at the rate of

60 g/pot which represent 15 tons/ feddan with mycorrhizal inoculalion in the clay loam and sandy soil

Table (5) Effect of compost and inoculation with mycorrhizae on dry weight, %infection, %nitrogen and %phosphorus in the wheat plant.

Treatments		Dry weight		% infection		%N		%P	
Soil Types		Clay loam	Sand	Clay loam	Sand	Clay loam	Sand	Clay loam	sand
	Co_w	*	Ns	*	Ns	***	***	***	*
Compost	Control	1.28[bc]	0.66[a]	36.83[c]	29.66[a]	7.71[c]	6.60[d]	0.27[b]	0.26[b]
	100%	2.85[ab]	0.99[a]	48.16[ab]	37.83[a]	29.63[a]	24.60[b]	0.36[a]	0.31[a]
	75%	1.93[a]	0.85[a]	44.50[a]	31.33[a]	25.11[a]	19.13[a]	0.35[a]	0.31[a]
	50%	1.14[c]	0.62[a]	39.50[bc]	32.83[a]	13.50[b]	8.23[c]	0.29[b]	0.28[ab]
	LSD	0.62	0.45	7.04	9.62	3.87	3.69	0.04	0.04
Inoculation	I	**	Ns	***	***	***	***	***	***
	With	1.94	0.89	51.08	39.83	27.91	20.47	0.36	0.32
	Without	1.16	0.66	33.41	26.00	10.06	6.30	0.27	0.25
	LSD	0.44	0.32	5.98	7.80	2.73	2.61	0.02	0.028
Compost x Inoculation	CO_w * I	Ns	Ns	*	Ns	***	***	Ns	Ns
	Control with	1.74	0.72	47.33	38.33	12.90	4.03	0.33	0.29
	Control without	0.83	0.59	16.33	11.00	6.53	6.16	0.20	0.21
	%100 with	2.12	0.94	51.00	40.00	29.96	22.90	0.36	0.32
	%100 without	1.58	1.04	36.00	21.66	21.30	16.30	0.34	0.30
	%75 with	2.32	0.99	59.33	43.00	35.00	29.73	0.41	0.36
	%75 without	1.55	0.70	19.00	13.66	13.23	8.53	0.30	0.25
	%50 with	1.60	0.91	46.66	38.00	23.80	15.23	0.31	0.32
	%50 without	0.68	0.32	22.33	17.66	3.20	1.23	0.14	0.13

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Table (6) Effect of compost and inoculation with mycorrhizae on dry weight, %infection, %nitrogen and %phosphorus in the maize plant during 2015/2016 season.

Treatments		Dry weight		% infection		%N		%P	
	Soil Types	Clay loam	Sand	Clay loam	Sand	Clay loam	Sand	Clay loam	sand
	Coz	**	*	***	**	***	***	*	*
Compost	Control	16.28^{b}	10.60^{c}	34.00^{c}	28.83^{b}	9.66^{c}	3.11^{b}	0.16^{b}	0.11^{bc}
	100%	28.75^{a}	24.41^{ab}	50.83^{b}	44.33^{b}	40.15^{a}	32.76^{a}	0.22^{a}	0.18^{a}
	75%	27.96^{a}	19.63^{a}	46.66^{a}	32.50^{a}	31.18^{a}	21.33^{a}	0.21^{a}	0.16^{ab}
	50%	19.00^{b}	15.38^{bc}	38.33^{c}	33.16^{b}	30.73^{b}	11.11^{b}	0.16^{b}	0.10^{c}
	LSD	6.851	7.818	5.919	7.79	9.22	12.572	0.0479	0.0579
Inoculation	I	***	***	***	***	***	**	***	**
	With	29.75	24.04	53.83	44.66	32.28	29.67	0.25	0.17
	Without	16.24	10.97	32.58	24.75	23.58	14.49	0.13	0.11
	LSD	4.814	5.528	3.478	4.80	6.522	8.889	0.0339	0.040
Compost x Inoculation	COZ* I	ns	ns	**	**	*	*	ns	ns
	Control with	21.36	16.20	41.66	37.00	13.60	16.26	0.22	0.13
	Control without	11.20	5.01	16.33	10.66	10.73	9.96	0.09	0.09
	%100 with	32.86	23.23	52.00	34.00	45.43	22.56	0.25	0.19
	%100 without	22.00	15.60	31.66	20.00	36.86	20.96	0.20	0.18
	%75 with	35.93	31.73	67.33	61.00	46.43	41.83	0.30	0.23
	%75 without	22.00	17.53	30.00	18.00	26.93	22.83	0.12	0.09
	%50 with	28.86	25.00	54.33	46.66	26.66	18.03	0.22	0.14
	%50 without	9.13	5.76	12.33	9.66	14.80	14.20	0.10	0.06

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استجابة نباتات القمح والذرة الشامية للمعاملة بالكمبوست والتلقيح بالميكروهيزا

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أجريت تجربة أصص تحت ظروف الصوبة بغرض دراسة تأثيرالكومبوست والتلقيح بالميكورهيزا على نمو ومحتوى نباتات القمح والذرة الشامية من العناصر الغذائية، وذلك تحت ظروف التربة الطينية الطميية والرملية، كما تم تدعيم التربة بصخر الفوسفات (26.4% P_2O_5) بمعدل 2.4 جرام لكل أصيص أى 300كجم للفدان. ثم إضافة المعدلات المختلفة للكومبوست وذلك قبل الزراعة. وقد أوضحت النتائج ان أعلى زيادة فى الاوزان الجافة للمجموع الخضري والجذري والوزن الجاف الكلى للنبات ونسبة الاصابة بالميكورهيزا ومحتوى النباتات من عناصر النيتروجين والفوسفور فى المعاملات الملقحة بواسطة الميكوريزا.

وقد سجلت أعلى التقديرات للصفات المدروسة فى النباتات المعاملة بالكومبوست عند معدل 80جرام /إصيص أى 20طن للفدان فى التربة الطينية الطميية والرملية .وكانت التفاعلات موجبة بين التلقيح بالميكورهيزا ومستويات الكومبوست على طول النبات وطول الجذر ونسبة النيتروجين لنباتات القمح فى التربة الرملية، ونسبة الإصابة ونسبة النيتروجين في التربة الطينية الطميية وبالإضافة إلى أن التلقيح بالميكورهيزا ومستويات الكومبوست كانت ذات تأثير معنوي على طول النبات ونسبة الإصابة ونسبة النيتروجين لنباتات الذرة الشامية في كلا النوعين من التربة . ومن ناحية أخرى فإن المعاملة بالكومبوست والتلقيح بالميكورهيزا أدى إلى تقليل كمية الكومبوست المضافة إلى كل من القمح والذرة الشامية بمقدار الربع في كلا النوعين من التربة.