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INFLUENCE OF HUMIC ACID , COMPOST AND MINERAL –N ON NUTRIENTS AVAILABILITY , YIELD QUALITY AND CHEMICAL COMPOSITION OF PEANUT IN SANDY SOIL

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ABSTRACT: *Soil amendments efficiently improves soil fertility and crop productivity, especially poorly fertile sandy soil. This study was conducted during summer 2012 and 2013 seasons, at Ismailia Agriculture Station Research, Ismailia Governorate, Egypt. To study the effect of organic and inorganic nitrogen forms at three N rates, i.e. 15, 25 and 40 kg N fed^{-1} ; humic acid (0 and 10 kg fed^{-1}) and (0 and 10 Mg fed^{-1}) compost on sandy soil content nutrients availability, yield, oil (%), protein (%) content as well as nutrients content of peanut plants. Peanut (Arachis hypogaea L.) Varity Giza 6 was use in the study as treated plants. The results showed that soil treated with humic acid combined with mineral nitrogen at rate of 40 kg N fed^{-1} in the presence of compost showed an increase in available N, P and K in compared with soil without compost. Relative increases in mean values of Fe, Mn and Zn were soil found in the pots treated with humic acid combined with mineral nitrogen without compost in the first season, while the mean value of Mn was increased with the soil treated with humic acid combined with mineral nitrogen and compost in second seasons. Increase in pod yield (Mg fed^{-1}); seed yield (Mg fed^{-1}) and 100 grain weight (g) in the second season was noticed with the plots treated with humic acid combined with mineral nitrogen and compost compared with the other treatments. The concentration of N, P and K by peanut seeds significantly increased amounted due to soil addition of humic acid combined with mineral nitrogen and compost compared with the other treatments. Concerning the oil (%) concentration of peanut seeds, results showed no significantly differences in both seasons as affected by all treatments without compost. Humic acid application and mineral nitrogen rates with or without compost significantly affected on Mn and Zn concentration in peanut seeds plants were significantly in both seasons, while the Fe concentration was not significantly affected in first season.*

Key words: *Humic acid; compost; urea; peanut; sandy soil.*

INTRODUCTION

Sandy soils, with low productivity and deficient in organic matter and plant nutrients, could be improved by compost application to sustain crop production, (Abdel Wahab *et al.,* 2003).

Composting of agricultural residues by supplying newly reclaimed areas with their requirements of inorganic nutrients such as nitrogen and phosphorus and applying proper moistening and turning resulted in the final product with high ability to improve soils and enhance plant growth, Lampkin (1990). Compost is an organic matter resource resulted from exploiting wastes through the controlled bioconversion process. It seems to meet the objectives of alternative agriculture system and the growing consensus of both environmentalists and those concerned with the public health through solving the waste disposal problem and its application in sustainable agriculture instead of ecologically undesirable mineral fertilization. Numerous studies have already shown the benefits of organic amendments in improving physical, chemical and biological properties of soil that depending on the amount and composition. Although, these parameters change slowly and several years are necessary to obtain significant differences, biological and biochemical parameters are more sensitive and can provide earlier measurements of changes produced by soil management , Cayuela *et al.* (2008) and Chitravadivu *et al.* (2009).

Rashad *et al.* (2011) found that the application of compost on decreased soil pH and EC (dSm^{-1}) values compared to untreated plots. Compost amendment increased available nutrient concentration of Fe, Mn and Zn in comparison to the control treatments, Brown and Cotton (2011). Ibrahim and Fandi (2013) reported that the application of compost to soil led to increase phosphors and potassium percentages (97.14%, 39.67%).

Humic compounds are the most abundant of the complex ligands, which are found in nature. In this regard, it is well known that the humic compounds improve soil structure, increase soil microbial population, increase soil cation exchange capacity and providing some specific materials for plant root indirectly by providing macro and micro nutrients, leading to the increase of soil fertility , (Tan, 2003). Mohamed (2012) reported that the application of humic acid was significantly decreased. Also, the EC decrease significantly with application of humic acid (2.0 and 3.0g kg^{-1}) doses. On the other hands, the application of humic acid generally had positive effect and increased significantly, N, P and K in soil and uptake of plants . Shehata *et al.* (2011) found that the application of compost and humic acid significantly to increased total yield of strawberry in comparison with the mineral fertilizers. Effects of foliar application of humic acid on the plant growth and nutrients uptake was study by Hussein and Hassan (2011), foliar applications of humic acid had a significant effect on the dry weight and mineral elements uptake in Corn. Ali *et al.* (2009) suggested that the application of humus enhanced N, K, and Zn uptake and highly dry weight compared with the untreated ones.

Peanut (*Arachis hypogaea L.*) is considered one of the most important legume and oil seed crops, which cultivated and thrive in the newly reclaimed sandy soil in Egypt. It contains about 50% oil, 25-30% protein, 20% carbohydrate and 5% fiber and ash which make a substantial contribution to human nutrition, Fageria *et al.* (1997). El-Habbasha *et al.* (2013) show that increasing N levels from 30 to 40 kg N/fed significantly increased number of pods/plant, weight of pods/plant, weight of seeds/plant, 100-seed weight, pod yield/fed, seed yield/fed and straw yield/fed. The highest value of seed protein content , N and K percentages in seeds were significantly increase with increases of 40 kg N fed^{-1} . Barik *et al.* (1998) reported that increasing nitrogen fertilizer increased pod and seed yield, pod weight/plant, 100- seed weight and 100–pod weight. Bozorgi *et al.* (2011) reported that the highest seed yield was obtained by 80 kg N/ha.

The current study aims to investigate the evaluation of humic acid individual and combined different rates of mineral nitrogen fertilizer combined with or without compost on some macro- and micronutrients in soil and peanut plant under sandy soil.

MATERIALS AND METHODS

A field experiment was carried out during two successive summer seasons 2012 and 2013 at Ismailia Agriculture Station, Ismailia Governorate, Egypt, to study the influence of organic amendments on soil fertility and peanut productivity grown in sandy soil. Representative, surface soil samples (0 -30 cm) were collected and prepared for some physical and chemical analysis as using the methods described by Page *et al.* (1982) and Cottonie *et al.* (1982). The obtained data are presented in Table (1).

Peanut of Giza 6 (*Arachis hypogaea L.*), the tested cultivar was which obtained from Crop Instiute Agriculture Research Center, Giza, Egypt. The seeds were sown in the 20^{th} and 25^{th} of April 2012 and 2013 seasons, respectively. The area of each experimental pilot unit was 5 X 10 m which divided into rows with 50 cm. The experimental plots were divided into two main groups. The first main group was without compost treatments, where the second main group was treated by compost at application rate of 10 Mg fed^{-1}. The plots of each main group were divided into the sub groups. The plots of first sub group were treated only by one of rate of added N mineral fertilizer , i.e. 15, 25 and 40 kg fed^{-1} which applied as urea (46 % N) , where the

plots of second sub group were treated by one rate of 10 kg fed^{-1} before 25 days of planting , the plants were thinned to twoplants per hill and then were singled to one plant per hill after 30 days of sowing.

Compost was plowed before 25 days before peanut planting at the rate of 10 Mg fed^{-1} and good mixed with surface layer.

Chemical composition of the used compost is shown in Table (2).

Humic acid was applied at a rate of 10 kg fed^{-1}, mixed with sandy soil to disperse before peanut planting during tillage soil. The chemical analysis of humic acid was presented in Table (3).

Table (1): Some physical and chemical properties of soil before peanut plant.

Characteristics	
Particle size distribution (%)	Value
Coarse sand	45.90
Fin sand	36.25
Silt	6.83
Clay	11.02
Texture class	Sandy
Chemical analysis	
pH (1:2.5 soil suspension)	7.85
$CaCO_3$ (%)	0.59
O.M (%)	0.56
EC (dSm^{-1}) soil paste	2.60
Soluble cations (meq/l)	
Ca^{++}	7.29
Mg^{++}	3.93
Na^{+}	14.21
K^{+}	0.65
Soluble anions (meq/l)	
HCO^{-}_3	3.98
Cl^{-}	12.93
SO^{--}_4	9.09
Available macronutrients (mg/kg)	
Available (N)	28.30
Available (P)	4.76
Available (K)	188.13
Available micronutrients (mg/kg)	
Available (Fe)	2.13
Available (Mn)	1.18
Available (Zn)	0.71

Table (2): Chemical analysis of compost.

Moisture content %	EC dSm^{-1} (1:10)	pH	C	C/N	O.M	N	P	K	Fe	Mn	Zn
		(%)							($mgkg^{-1}$)		
25-30	3.25	7.45	30	13.70	37	2.19	0.73	2.14	221	95	124

Table (3): Chemical properties of used humic acid.

pH	EC. (dSm^{-1})	O.M. (%)	Macronutrients (%)			Micronutrients (mg kg^{-1})		
			N	P	K	Fe	Mn	Zn
7.80	1.85	72	2.19	0.32	3.60	413	257	216

Mineral N fertilizer was added in three equal dosed after 21, 45 and 65 days of sowing plant. Calcium super-phosphate (15.5% P_2O_5) was added at a rate of 31 kg P_2O_5 fed^{-1} during soil preparation. Potassium sulphate (48 % K_2O) at a rate of 75 kg K_2O fed^{-1} was added in two equal doses; after 30 and 50 days from planting. These mineral fertilizer rates were recommended by Egyptian Ministry of Agriculture bulletin (2009). In both seasons, each experimental was arranged in a complete randomize block design with three replicates.

Surface (0- 30 cm) soil sample was taken from each experimental plot after plants harvesting. Each soil sample was air –dried separately and some available macro-micronutrients according to the methods described by Cottenie *et al*. (1982) and page *et al*. (1982).

Peanut plants were harvested on 25 September 2012 and 2013. Sample from the seeds of each experimental plot was taken ground and wet digested with a mixture of H_2SO_4 and $HClO_2$ acids at mixed ratio of 3: 1 and left to analysis (Chapman and Pratt, 1961). The chemical analysis i.e, N, P, K, Fe, Mn and Zn were carried out in seeds according to the methods given by Chapman and Pratt (1978). Seed oil (%) in dry seeds was determined by using Soxhelt apparatus and petroleum ether as solvent according to A.O.A.C (1980). Seed protein content was calculated by multiplying N (%) by 6.25 described by Hymowizer *et al*. (1972).

Statistical analysis of the data for the two seasons was carried out according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Available macronutrients in soil.

Data presented in Table (4) show that the application mineral N fertilizer at different rates (25 and 40 kg N fed^{-1}), compost and humic acid separately were resulted in a significant increase of soil content (mg kg^{-1}) of available N, P and K after plant harvesting. The rate of these increases was varied widely depending on the studied treatment and the determined macronutrient. For in season 2012 the found increase of soil content of available N associated the individual application of 40 kg N fed^{-1} (40.00 mg kg^{-1}) was higher than that found with the individual treatment of compost (38.00 mg kg^{-1}) and the lowest increase was found with individual treatment of humic acid (35.00 mg kg^{-1}) . These increases were reported by compared with data of control treatment (15.00 kg N fed^{-1}). On the other hand, individual application of compost resulted in an increase of soil content of available P and K more than these associated individual mineral N fertilizer especially at rate of 25 kg N fed^{-1}. The individual treatment of humic acid effect on the increase of soil content of available P and K was higher than that associated the individual application of

mineral N especially at rate of 25 kg N fed^{-1} , but its was lower than that resulted from the individual treatment of compost. In this respect obtained on similar results El-Galad *et al*. (2013) found that the application of humic acid or compost at high rates gave the highest soil available N, P, K.

Effect of compost combined with mineral N at rates of 40 kg N fed^{-1} was resulted in an increase of soil content (mg kg^{-1}) available N, P and K compared with other treatments. The application of humic acid combined with mineral nitrogen at rate 40 kg N fed^{-1} combined with compost was associated by more increase of the soil content of available N, P and K compared that found in the individual and double combination treatments. The content N and K available in soil treated with compost combination with mineral N at different application rates were increased significantly in both seasons, while the increase of available P was not significant in first season. Also, the increases of soil content of available N, P and K resulted from the treatment of humic acid combined with mineral nitrogen and compost was significant compared with that found in the soil untreated with compost.

Table (4): Effect of both organic amendments and mineral N fertilizes on sandy soil content ($mgkg^{-1}$) of available some macronutrients.

Grown of season	Humic acid ($kg\ fed^{-1}$)	Mineral N rates ($kg\ fed^{-1}$)	Compost treatments					
			0			10 ($Mg\ fed^{-1}$)		
			N	P	K	N	P	K
			($mgkg^{-1}$)					
2012	0	15	33.00	4.92	192.0	38.00	4.96	198.0
		25	38.00	4.95	194.0	45.00	4.99	204.0
		40	42.00	4.97	197.0	52.00	5.02	206.0
		Mean	38.00	4.93	194.0	45.00	4.99	203.0
	10	15	35.00	4.89	195.0	39.00	4.95	199.0
		25	40.00	4.93	198.0	47.00	5.02	206.0
		40	44.00	4.96	202.0	55.00	5.05	208.0
		Mean	40.00	4.95	198.0	47.00	5.01	204.0
L.S.D. 5 %			6.16	1.36	2.30	3.04	0.97	4.15
2013	0	15	35.00	4.96	194.0	41.00	5.02	197.0
		25	42.00	4.98	195.0	47.00	5.05	199.0
		40	45.00	5.01	199.0	54.00	5.07	202.0
		Mean	41.00	4.98	196.0	47.00	5.05	199.0
	10	15	39.00	4.90	197.0	43.00	4.98	203.0
		25	44.00	4.95	199.0	50.00	5.02	205.0
		40	47.00	4.99	201.0	57.00	5.04	208.0
		Mean	43.00	4.95	199.0	50.00	5.01	205.0
L.S.D. 5 %			2.58	ns	3.40	5.94	0.051	5.56

The corresponding relative increase of mean values N, P and K content in soil as treated with humic acid combined with mineral N different rates were 5.26 % in first season and 4.87 % for N in second season; 0.41 % in first season and 0.60 % in second season for P and 2.1 % in first season and 1.53 % in second season for K, respectively compared with soil without humic acid and compost. The relative increases of mean values N, P and K contents in soil as treated with humic acid and compost combined with different rates of mineral N fertilizer were 4.44 % in first season and 6.4 % in second season for N; 0.40 % in first season and 0.79 % in second season for P and 0.49 % in first season and 3.02 % in second season for K, respectively, compared with mineral N without humic acid.

It is worthy to mention that the relative increases of soil of available N, P and K in all studied soils with treated humic acid combined mineral nitrogen and without compost in first season, while the soils treated by humic acid combined with mineral nitrogen and compost were increases of N, P and K contents in soil. These results are in agreement with those obtained by (Sarwar *et al.,* 2010) they reported that the compost application increased soil organic matter, N, P, K content in soils. Tan (2003) found that the application of humic acid led to enhance soil fertility and improve physical and chemical characteristics of soil, like permeability, aeration, aggregation, water holding capacity, ion transport and availability of nutrients through pH buffering. Virgine and Singaram (2005) indicated that the soil application of humic acid, 20 kg ha^{-1} with 100 % recommended doses of fertilizer recorded the highest available of N, P and K contents in soil and led to reduced losses of nutrients.

The available micronutrients content in soil.

The presented data in Table (5) show that, individual treatment of mineral N, compost and humic acid was associated by an increase of soil content ($mgkg^{-1}$) of Fe, Mn and Zn. The found increases of the content of these micronutrients resulted from the individual treatment of compost were higher than these resulted from the individual treatments of humic acid. Individual treatments of mineral N, resulted in lower increase of the soil content of micronutrients compared with that resulted from organic amendments applications. These findings were found in the two seasons. These results are in agreement with these obtained by Soheil *et al.* (2012) found that the application of compost increased significantly of EDTA- Fe, Mn and Zn in the soil. El-Galad *et al.* (2013) indicated that the application of humic acid and compost led to increases of micronutrients Fe, Mn and Zn in both seasons. Concerning to the effect of double combination treatments under study .i.e. N + compost; N + humic acid and compost + humic acid, the data in Table (5) show a wide variations of these treatments effect on the soil content on available Fe, Mn and Zn. The highest content was associated the treatments of compost in combination with humic acid followed by that found with the treatment of compost combined with the N. These findings were found in the two seasons. This is more related to the residual of organic compounds that are directly decomposed after different biochemical and chemical changes, which led to the release of more available microelements. The corresponding relative increase of mean values Fe, Mn and Zn content in soil as treated with humic acid combined with mineral N different rates were 1.72 % in first season and 1.69 % in second season for Fe; 2.27 % in first season and 0.74 % in second season for Mn and 4.11 % in first season and 2.63 % in second season, respectively, compared with soil treated without humic acid and compost (mineral N alone).

On the other hand, the relative increase of mean values Fe, Mn and Zn content in soil as affected with application of humic acid combined with mineral N and compost were 1.64 % in first season and 1.23 % in second season for Fe; 1.45 % in first season and 1.42 % in second season for Mn and 5.00% in first season and 3.50 % in second season for Zn, respectively compared with soil treated with mineral N combined with compost (without humic acid).

Table (5): Effect of both organic amendments and mineral N fertilizes on sandy soil content (mgkg^{-1}) of available some micronutrients.

Grown of season	Humic acid (kg fed^{-1})	Mineral N rates (kg fed^{-1})	Compost treatments					
			0			10 (Mg fed^{-1})		
			Fe	Mn	Zn	Fe	Mn	Zn
			(mgkg^{-1})					
2012	0	15	2.26	1.28	0.70	2.34	1.34	0.76
		25	2.34	1.33	0.74	2.40	1.37	0.80
		40	2.38	1.36	0.76	2.46	1.42	0.85
		Mean	2.33	1.32	0.73	2.40	1.38	0.80
	10	15	2.31	1.31	0.72	2.37	1.36	0.78
		25	2.37	1.35	0.76	2.45	1.39	0.86
		40	2.42	1.38	0.79	2.49	1.44	0.89
		Mean	2.37	1.35	0.76	2.44	1.40	0.84
L.S.D. 5 %			0.078	0.022	0.054	0.006	0.042	0.065
2013	0	15	2.30	1.32	0.74	2.36	1.37	0.78
		25	2.36	1.35	0.76	2.44	1.40	0.83
		40	2.42	1.40	0.78	2.50	1.45	0.87
		Mean	2.36	1.36	0.76	2.43	1.41	0.83
	10	15	2.33	1.34	0.75	2.38	1.39	0.79
		25	2.41	1.36	0.77	2.49	1.43	0.88
		40	2.45	1.42	0.81	2.52	1.46	0.92
		Mean	2.40	1.37	0.78	2.46	1.43	0.86
L.S.D. 5 %			0.19	0.059	0.045	0.78	0.062	0.015

It is worthy to mention that the contents of all the studied available microelements, in general, lay within the sufficient limits of Fe and Mn or in the critical limits identical division for the others (FAO, 1992).

Peanut yield parameters.

The obtained results in Table (6) shown that there was an increase in pod yield (Mg fed^{-1}); seed yield (Mg fed^{-1}) and 100 grain weight (g) of peanut in second season than these found in the first one as affected by all treatments under study. The highest increases were associated the combined treatments of mineral N at rate of 40 kg N fed^{-1}, humic acid and compost. These results revealed that there are significant differences between the effects on three growth parameters especially the studied treatments in second season. On the other hand, the results indicated that no significantly occurred in weight seed yield (Mg fed^{-1}) and weight pod yield (Mg fed^{-1}) in the first season in the treatments of mineral N and humic acid. The seeds yield and weight pods yield (Mg fed^{-1}) showed significant increase with the treatments of compost in both seasons.

Table (6): Effect of both organic amendments and mineral N fertilizes on peanut yield and oil content (%)

Grown season	Humic acid (kg fed^{-1})	Mineral N rates (kg fed^{-1})	Added compost (Mg fed^{-1})							
			0				10 (Mg fed^{-1})			
			Weight pod yield (Mg fed^{-1})	Weight seed yield (Mg fed^{-1})	Weight 100 seed (g)	Oil content (%)	Weight pod yield (Mg fed^{-1})	Weight seed yield (Mg fed^{-1})	Weight 100 seed (g)	Oil content (%)
2012	0	15	0.853	0.582	74.68	39	1.094	0.972	79.88	41
		25	0.873	0.593	79.88	42	1.120	0.986	80.22	43
		40	0.870	0.598	82.57	44	1.142	1.024	83.14	46
		Mean	0.865	0.591	79.04	42	1.119	0.994	81.08	43
	10 kgfed^{-1}	15	0.912	0.637	77.51	40	1.149	1.038	81.57	43
		25	0.948	0.649	82.16	43	1.167	1.055	82.54	45
		40	0.955	0.653	83.18	45	1.178	1.062	83.10	46
		Mean	0.938	0.646	80.95	43	1.163	1.052	82.40	45
L.S.D. 5 %			ns	ns	5.83	ns	0.002	0.006	3.13	2.97
2013	0	15	0.869	0.597	75.22	40	1.155	1.050	80.12	41
		25	0.881	0.599	80.02	43	1.176	1.056	82.34	44
		40	0.887	0.610	83.17	45	1.183	1.063	84.20	47
		Mean	0.879	0.602	79.47	43	1.171	1.056	82.20	44
	10 kgfed^{-1}	15	1.023	0.604	78.60	41	1.214	1.056	81.61	42
		25	1.026	0.617	83.22	44	1.220	1.067	83.10	46
		40	1.029	0.623	84.10	46	1.226	1.075	83.20	48
		Mean	1.026	0.615	81.97	44	1.220	1.066	82.64	45
L.S.D. 5 %			0.073	ns	6.51	ns	0.040	1.070	5.80	2.13

Concerning, the corresponding relative increase of mean value weight of pod yield, seed yield (Mg fed^{-1}) and 100 seeds (g) as affected by humic acid combined with nitrogen mineral rates with or without compost were 8.44 and 3.93 % in the first season and 16.72 and 4.18 % in second seasons for weight pod yield ; 9.31 and 5.83 % in first season and 2.16 and 0.95 % in second one for seeds yield and 2.42 and 1.63 % in first season and 1.33 and 3.14 in second season for 100 seeds, respectively compared with the mean values of mineral nitrogen only. The results obtained of soil chemical properties and fertility status positively or negatively reflected on plants growth, and in turn their yields of seeds. Direct effects of the used different mineral nitrogen rates and humic acid combined with or without compost were noticed on pods and seeds yield. These results are in agreement by Shaban *et al.* (2012) reported that the application of compost fertilizers and humic acid in combination with all mineral N rates significantly increased sesame yield and its components, i.e. No of capsules plant^{-1}, seed weight plant^{-1}, seed yield kg fed^{-1}, and weight of 1000 seeds (g). Concerning that the oil (%) seeds content in peanut plant was no significantly in both seasons as affected by all treatments without compost, while the oil (%) content in seeds peanut plants was significantly increase as affect of all treatments combined with compost in both seasons. The relative increase of mean value oil contents as affect

by interaction humic acid with mineral N application without compost was 2.38 %, while 4.65 % with compost reactively in first seasons. The corresponding relative increase of mean values oil content in seeds peanut plants as affected by humic acid interaction with mineral N rates without compost was 2.32 % , while 2.27 % with compost respectively, in second season. These results are in agreement by Eissa (2011) indicated that application of humic acid led to increase of oil (%) content in seeds peanut plants. Chris *et al*. (2005) reported that the soil application of humic acid significantly improved seed yield and oil content of mustard.

Content of N, P and K and protein in peanut seeds.

Effect of humic acid and mineral nitrogen alone or together with or without compost on concentration of N, P and K (%) in seeds of peanut plant were positive. The obtained results in Table (7) suggested that the concentration of N, P and K in seeds increases significantly. The highest values of N, P and K increase of this content in seed peanut plant was found with the combined treatment of mineral N at rate 40 kg N fed^{-1} with 10kg humic acid fed^{-1} and compost. It should be mentioned that , the highest values for N, P and K content in seeds peanut were 3.30 ; 0.65 and 2.42 (%), respectively, in first season and 3.28; 0.68 and 2.46 (%) in second season, respectively, as affected by humic acid + 40 kg N + compost treatment. On the other hand, the effect of all treatments without compost were no significantly by N content in seeds for first season and K content in second season .

Table (7): Effect of both organic amendments and mineral N fertilizes on macronutrients concentration and protein in seeds peanut.

Grown season	Humic acid (kg fed^{-1})	Mineral N rates (kg fed^{-1})	Added compost (Mg fed^{-1})							
			0				10 (Mg fed^{-1})			
			N (%)	P (%)	K (%)	Protein (%)	N (%)	P (%)	K (%)	Protein (%)
2012	0	15	2.41	0.41	2.24	15.06	3.12	0.55	2.30	19.50
		25	2.49	0.48	2.26	15.56	3.19	0.59	2.35	19.94
		40	2.53	0.51	2.29	15.81	3.22	0.60	2.37	20.13
		Mean	2.48	0.47	2.26	15.48	3.18	0.58	2.34	19.86
	10 kgfed^{-1}	15	2.63	0.53	2.28	16.44	3.18	0.58	2.34	19.88
		25	2.69	0.59	2.33	16.81	3.23	0.62	2.38	20.19
		40	2.71	0.63	2.37	16.94	3.30	0.65	2.42	20.63
		Mean	2.68	0.58	2.33	16.73	3.24	0.62	2.38	20.23
L.S.D. 5 %			ns	0.06	0.02	ns	0.14	0.07	0.05	ns
2013	0	15	2.44	0.43	2.26	15.25	3.14	0.58	2.33	19.63
		25	2.50	0.52	2.28	15.63	3.23	0.62	2.37	20.19
		40	2.55	0.54	2.32	15.94	3.25	0.64	2.39	20.31
		Mean	2.50	0.50	2.29	15.61	3.21	0.61	2.36	20.04
	10 kgfed^{-1}	15	2.65	0.55	2.31	16.56	3.22	0.65	2.40	20.13
		25	2.70	0.62	2.36	16.88	3.25	0.66	2.44	20.13
		40	2.72	0.65	2.39	17.00	3.28	0.68	2.46	20.50
		Mean	2.66	0.58	2.33	16.60	3.23	0.65	2.41	20.12
L.S.D. 5 %			0.060	0.025	ns	ns	0.030	0.027	0.061	ns

The relative increase of mean values N, P and K concentration in seed peanut plants were 8.06% in first season and 6.40 % in second season for N; 14.86 in first seasons and 16.00 % in second season for P and 3.10 % in first season and 1.75 % in second season for K, respectively, as affected soil treated with humic acid 10 kg fed-1 plus mineral N fertilizer without compost compared with mineral N fertilizer alone. Concerning the relative increase of mean values N, P and K concentration in seed peanut plants as affect humic acid + mineral N fertilizer with compost were 1.89 % in first season and 0.62 % in second season for N; 6.90 % in first season and 6.56 % in second season for P and 1.71 % in first season and 2.11 % in second season for K, respectively. compared with mineral N fertilizer alone.

It is evident from the previous data that the relative of mean values N, P and K concentration in seed peanut plants were increase of N in second seasons , while increase of P and K in first season for soil treated with humic acid + mineral N – fertilizer without compost compared with mineral N fertilizer alone. Also, the relative of mean values N, P and K concentration in seeds of peanut plants were increase of N and P in first season , while K increase in second season for soil treated with humic acid + mineral N fertilizer combined with compost compared with mineral N fertilizer alone.

These results are in agreement with these obtained by Khalil *et al*. (2013) found that application of humic acid remarkably elevated the uptake of N, P and K by grains than compost treatment. Eissa (2011) found that application of humic acid with 6 g /L led to increase of N, P and K (%) in seeds peanut plants. Soheil *et al*. (2012) reported that the applying compost to soil increases N, P and K uptake by plant.

Data in Table (7) show that the effect of application humic acid and mineral N fertilizer combined with or without compost on protein (%) content in seed peanut plants was not significant in both seasons. The relative increase of mean values protein (%) in seed peanut plants were 8.07 % in first season and 6.34 % in second season for as affected soil treated with humic acid 10 kg fed^{-1} plus mineral N fertilizer without compost compared with mineral N fertilizer alone. Concerning the relative increase of mean values protein content in seed peanut plants as affect humic acid + mineral N fertilizer with compost were 1.86 % in first season and 0.40 % in second season compared with mineral N fertilizer alone. The protein content in seeds peanut plants increase in first season than second season as affected all treatments compared with without humic and compost. These results are in agreement by Gad El-Hak *et al.* (2012) found that the foliar application of humic acid at the concentration of 2g L^{-1} gave increases in protein (%). Radwan and Awad (2002) indicated that the Peanut seeds contained the greatest percentage of protein was fertilizer with compost.

Content of Fe, Mn and Zn in peanut seeds.

Data presented in Table (8) showed that the effect of humic acid application and mineral nitrogen rates with or without compost on Mn and Zn concentration in seeds peanut plants were significantly affected in both seasons, while the Fe concentration was no significant in first season. The highest values of Fe Mn and Zn (mg kg^{-1}) contents in seeds of peanut plants were 130, 79.00 and 44.00 mg kg^{-1}, respectively as affected by humic acid + 40 kg N fed^{-1} combined with compost. The relative increase of mean values Fe, Mn and Zn concentration in seed peanut plants were 3.26 % in first season and 4.35 % in second season for Fe; 3.13% in first seasons and 3.03 % in second season for Mn and 44.00 % in first season and 53.30 % in second season for Zn, respectively, as affected soil treated with humic acid 10 kg fed^{-1} plus mineral N fertilizer without compost compared with mineral N fertilizer alone.

Table (8): Effect of both organic amendments and mineral N fertilizes on micronutrients content (mgkg^{-1}) in seeds peanut plants.

Grown of season	Humic acid (kg fed^{-1})	Mineral N rates (kg fed^{-1})	Compost treatments					
			0			10 (Mg fed^{-1})		
			Fe	Mn	Zn	Fe	Mn	Zn
			(mgkg^{-1})					
2012	0	15	88.00	59.00	21.00	114.00	67.00	25.00
		25	92.00	64.00	26.00	119.00	69.00	33.00
		40	96.00	69.00	29.00	124.00	73.00	36.00
		Mean	92.00	64.00	25.00	119.00	70.00	31.00
	10	15	90.00	62.00	28.00	118.00	72.00	34.00
		25	95.00	66.00	34.00	126.00	74.00	41.00
		40	99.00	70.00	36.00	130.00	76.00	44.00
		Mean	95.00	66.00	36.00	125.00	74.00	40.00
L.S.D. 5 %			ns	6.17	3.53	ns	3.53	3.04
2013	0	15	85.00	61.00	17.00	117.00	69.00	23.00
		25	93.00	66.00	19.00	123.00	71.00	27.00
		40	99.00	71.00	22.00	126.00	75.00	33.00
		Mean	92.00	66.00	19.00	122.00	72.00	28.00
	10	15	92.00	63.00	26.00	120.00	73.00	35.00
		25	97.00	69.00	29.00	128.00	77.00	38.00
		40	98.00	72.00	32.00	130.00	79.00	42.00
		Mean	96.00	68.00	29.00	126.00	76.00	38.00
L.S.D. 5 %			3.53	1.48	1.99	5.83	4.60	4.05

On the other hand the relative increase of mean values Fe, Mn and Zn concentration in seed peanut plants as affect humic acid + mineral N fertilizer with compost were 5.04 % in first season and 3.27 % in second season for Fe; 5.71 % in first season and 5.56 % in second season for Mn and 29.03 % in first season and 36.14 % in second season for Zn, respectively, compared with mineral N fertilizer alone. . These results are agreement by Hussein and Hassan (2011) suggested that foliar application in 0.1 % humic acid increased the Fe, Mn and Zn amounts in plants compared with control. Soheil *et al.* (2012) reported that the applying compost to soil increases Fe, Mn and Zn absorption by plants.

Conclusion.

The results of this study showed an increase in peanut plants growth as well as an increase in the soil content of availability nutrients. It was demonstrated that the interaction between humic acid by mineral nitrogen rates application without compost to soil improves nutrients availability followed by its increases in the seeds of peanut plants and improvement quality seeds yield. Organic amendments improve unfavorable soil properties and plant growth productivity

and nutrient content. And its content of nutrients, oil and protein content in seeds peanut plants.

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تاثير الهيوميك اسيد والكمبوست والتسميد النتروجين على تيسر العناصر والمكونات الكميائية وجودة محصول السودانى فى الأراضى الرملية

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الملخص العربى

اضافة محسنات التربة للاراضى الرملية تزيد من كفاءه خصوبة التربة وانتاجية المحاصيل. لذلك اجريت تجربة حقلية لموسمين صيفين ٢٠١٢ و٢٠١٣ على التوالى فى محطة بحوث الاسماعلية بمحافظة الاسماعلية – مصر لدراسة تاثير اضافة ثلاث معدلات من التسميد المعدنى (١٥ و ٢٥ و ٤٠ كجم نتروجين للفدان) والتسميد بالهيومك اسيد مع (١٥ و ٢٥ و ٤٠ كجم نتروجين للفدان) فى وجود او عدم وجود الكمبوست على خصوبة التربة الرملية و انتاجية الفول السودانى وزيت (%) و البروتين (%) و محتوى العناصر فى بذور الفول السودانى صنف جيزة ٦ وقسمت التجربة فى قطاعات كاملة العشوائية . وقد وجد ان اضافة التسميد بالهيومك اسيد مع المعدل ٤٠ كجم نتروجين الى زيادة محتوى التربة من العناصر الميسرة (النتروجين والفوسفور والبوتاسيوم) مقارنة بالتسميد المعدنى فقط.

وجد ان الزيادة النسبية للعناصر الصغرى الميسرة فى التربة للتربة المضاف اليها حمض الهيومك المتحد مع معدلات النتروجين بدون الكمبوست فى الموسم الاول بينما زاد المنجنيز فى الموسم الثانى فى التربة المعاملة بالهيومك اسيد + معدلات النتروجين بالاتحاد مع الكمبوست . وجد زيادة فى محصول القرون والبذور للفدان وال ١٠٠ بذرة فى الموسم الثانى نتيجة اضافة الهيوميك اسيد متحد مع التسميد المعدنى النتروجينى والمتحد بالكمبوست بالمقارنة بباقى المعاملات . لوحظ زيادة معنوية فى تركيز العناصر الكبرى (النتروجين والفوسفور والبوتاسيوم فى بذور السودانى فى التربة المعاملة بالهيوميك اسيد والنتروجين بالاتحاد مع الكمبوست بالمقارنة بالمعاملات الاخرى بدون كمبوست. وجد ان محتوى البذور من الزيت كان غير معنوى مع كل المعاملات بدون الكمبوست. اضافة الهيوميك اسيد + معدلات مختلفة من النتروجين بالاتحاد مع الكمبوست او غير متحد ادى الى زيادة معنوية فى تركيز المنجنيز والزنك فى بذور السودانى فى الموسمين ، بينما تركيز الحديد كان غير معنوى فى الموسم الاول.

التوصية : وجد انة يمكن استخدام الهيوميك اسيد مع ٢٥ او ٤٠ كجم نتروجين للفدان متحد مع الكمبوست فى الاراضى الرملية ادى الى تحسين خصوبة التربة وتركيز العناصر وانتاجية محصول السودانى.