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Soil Propertes, Nutrints availability and Wheat Productivity as affected By Compost and Nitrogen Sources

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ABSTRACT

Two field experiments were performed in Agricultural Farm of Sides Agricultural Research Station , ARC ,Beni-Suef Governorate , Egypt to investigate the effect of different levels of compost (0.0 , 4.8 and 9.5 Mg ha^{-1}) and different nitrogen sources , *i.e.* , without ,ammonium ,sulphate (AS) , ammonium nitate (AN) and urea(U) on some soil chemical and physical properties after wheat harvested as well as wheat growth parameters ; yield and its components. The results show that all studied soil properties and nutrient availability were improved due to increasing compost level, except soil salinity, which increased by increasing compost. Also, increased compost level increased wheat growth, yields and its components as well as N, P and K content in grains and straw. N-fertilization did not affect soil properties and nutrient availability except soil reaction and soil available phosphorus. It could be arranged nitrogen sources on reducing soil pH and increasing soil available phosphorus in the descending order as follow : AS > AN > U . Irrespective of nitrogen sources, nitrogen application was significantly increased all studied growth parameters, yield and yield components and nutrients content, where as fertilizer surpassed other nitrogen forms followed by AN and U. The treatment of 9.5 Mg ha^{-1} compost +179 g Nha^{-1} consider the best treatment of wheat productivity and improved soil properties and fertility under the condition of alluvial soil for middle Egypt.

Keywords: Wheat, compost, nitrogen fertilizers.

INTRODUCTION

Wheat (*Triticum aestivum*, L.) is an important staple crop around the world. Its importance has risen even more due to frequently experienced food shortages and its role in world trade. Wheat ranks first among the cereal crops, accounting for 30% of all cereal food worldwide and major food for over one third of world people that provides about 20% of the total food calories directly or indirectly for the human race (Namvar and Khandan, 2013). Wheat (*Triticum aestivum* L) is the main food crop in Egypt. Because of the great gap between the consumption and production, Egypt imports above five million tons of wheat grains (USDA, 2013). Nitrogenous Fertilizer (N) has become the key input in food production worldwide. Cereals (rice, wheat, maize, millet, etc.) account for more than half of the total N fertilizer consumption in the world, and approximately 50 – 70% more cereal grain will be required by 2050 to feed over 9 billion world population (Wise, 2013). This will further increase demand for N fertilizer at greater magnitude unless the N fertilizer recovery efficiency in cereals is improved through better production technologies. A great attention is now paid to developing an integrated plant nutrition system (IPNS) that maintains and improve soil productivity during balanced nutrient application , including mineral and organic fertilizers. Nitrogen is the most nutrient for many compounds essential for plant growth and development, such as chlorophyll and many enzymes .there are many sources of nitrogen fertilizers used in Egypt, e.g., urea (U); ammonium nitrate (AN) and ammonium sulphate (AS). Its influence on plant growth is mainly due to its effect on soil reaction and the nutrient availability. Tisdale *et al* (1997) mentioned that some nitrogen fertilizer leaves an acid residue in soil, others are basic, and still others seemingly have no effect on soil reaction. Many workers found the superiority of ammonium sulphate fertilizer than other on plant growth such as Abd El-Hamed *et al* (1996) for gartic , Ismail *et al* (2006) and Abd El-hafeez *et al* (2013). El-masry *et al* (2006) for barley plants. Meanwhile, Ismail *et al* (1999) reported that ammonia gas exceeded urea fertilizer in its effect on quality and quantity of wheat.

Organic manure is used to supplying plants with nutrients as well as improving soil properties. Compost materials supplied an effective and environment friendly of organic waste, because it's more economical and environment friendly (Miller *et al*, 1998*)*. Compost as organic fertilizers are important in sustaining farming by supplied plants with nutrients and improve the fertility and physical properties of soil (Konsaeth *et al*, 2002). Many workers found a positive effect of organic manure on wheat plant Tahir *et al* (2011), Shah *et al* (2013) and Mohamed *et al* (2018). Organic farming is an excellent soil amendment which gave a balance of nutrients, while contributing valuable organic material to the soil. Soil microorganisms improved water holding capacity, soil structure for pH buffering and the organic complexing of nutrients, making them available for plant uptake. It is well documented that the incorporation of organic manure into the soil is increasingly important because it improves soil fertility and increased crop yield *(Singh, 2001).*

The aim of this research is to evaluate the effect of different nitrogen fertilizer sources under different levels of

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compost on productivity of wheat and some chemical and physical soil properties.

MATERIALS AND METHODS

This investigation was carried out in the Experimental Farm of Sides Agricultural Research Station , ARC , Beni-Suef Governorate , Egypt during the two successive seasons of 2017 / 2018 and 2018 / 2019 to study the response of quality and quantity of wheat to different sources of nitrogen fertilizers under compost application as well as it's effect on soil properties and fertility . Some physical and chemical properties of soil (0-30 cm depth) before planting were determined according to A.O.A.C. (1975) and listed in Table (1). Also, the used compost (composting from maize stalk residue) was analyzed to determine some chemical composition according to Chapman and Pratt (1961) and listed in Table (2). The design of the experiment was split plot design in completely randomized block in four replicates , where compost levels (0.0 , 4.8 and 9.5 Mg ha^{-1}) were allocated in main plots , while nitrogen sources , i.e. , without ; urea [$(NH_2)_2CO$, 46.5N)] (U) ;ammonium nitrate (NH_4NO_3, 33.5% N) (AN) and ammonium sulphate [$(NH_4)_2SO_4$, 20.6% N] (AS) were added in sub plots . The compost treatment added before planting during land preparation , whereas nitrogen treatment were applied at rate of 179 kg ha^{-1} in two equal doses , the first before the first irrigation and the other before the second one.

Table 1. Some physical and chemical characteristics of the experimental soil

Soil properties	2017/2018	2018/2019
Particle size distribution (%)		
Clay	52.36	50.67
Silt	27.19	31.36
Sand	20.45	17.97
Texture grade	Clay	Clay
Chemical properties		
pH(1 : 2.5 soil-water suspension)	7.93	8.03
EC(1 : 5 soil-water extraction)	1.20	1.26
Organic matter (%)	1.85	1.75
$CaCO_3$ (%)	1.01	1.12
Soil available N,(mg Kg^{-1})	21.1	19.56
Soil available P,(mg Kg^{-1})	12.6	11.9
Soil available K,(mg Kg^{-1})	181	176

Table 2.Some chemical characteristics of used compost.

Characteristics	2017 / 2018	2018 / 2019
pH (1 : 2.5) (soil : water suspension)	7.020	7.220
EC, dcm^{-1} (1 : 5) (soil : water extraction)	6.210	6.530
Organic matter (%)	39.55	36.18
Organic carbon (%)	22.94	20.98
Total nitrogen (%)	1.190	1.120
Total phosphorous (%)	0.730	0.770
Total potassium (%)	1.200	1.290
C/N ratio	19:1	18:1

The wheat grains (*Triticum aestivum cv.,* Sides12) were planted in 10 and 13 November in both growing seasons, respectively at rate of 190 kg ha^{-1} .Phosphorous and potassium fertilizer were added at rate of 52 and 57 kg P_2O_5 and K_2O ha^{-1}, respectively before planting .The preceding crop was maize in both seasons. The other cultural practices for wheat production were done as in district.

Representative soil samples were taken from each plot after harvest to determine soil pH, EC, O.M, CEC and bulk density as well as soil fertility, namely soil available N,P and K . Also , after harvest , ten representative plants were randomly taken for all plots to measure plant height (cm) , dry weight plant $^{-1}$(g) , number of spikes m^{-2} , number of grains spike $^{-1}$,1000 – grain weight (g) and grain , straw and biological yields (Mg ha^{-1}).The oven dried materials of straw and grains were ground and wet digested by a sulfuric-percloric acid mixture as described by Peterburgski (1968).The N,P and K concentration (g kg^{-1}) were determined in wheat grains and straw according to Chapman and Pratt (1961). The obtained data were subjected to the statistical analysis as described by Snedecor and Cochran (1980). The least significant differences were used to compared between means at 0.05 level probability.

RESULTS AND DISCUSSION

Soil Properties.

The effect of compost and nitrogen sources on some soil properties, e.g. soil pH, EC, organic matter, bulk density, total porosity and cation exchange capacity are given in Table (3). As for the main effect of compost, the data reveal that compost application was positively improved all studied soil properties, except soil salinity which increased as increasing compost level. The promotive effect of composting on reducing soil pH is mainly due to the releasing of organic acids through the decomposition of compost (Hizal, 1993). Also , the increasing in soil organic matter due to increasing compost level could be explained by the slow decomposition of organic matter contain in compost (Kunda , 2006), while the positive effect of compost on increasing soil salinity may be due to the high salinity in used compost as shown in Table (2), (Wong *et al* , 1999). Moreover, compost had a positive effect on improving soil bulk density, total porosity and C.E.C, which decreased bulk density and increased total porosity and C.E.C. The high organic content in compost is a good explanation of its effect on bulk density and C.E.C (Kunda, 2006). These results are in line with those obtained by El-Sheref *et al* (2018) and Mohamed *et al* (2018). With regard to nitrogen fertilizer sources, the data show that nitrogen sources affected only soil reaction. It could be arranged the effect of nitrogen sources on soil reaction in the following descending order: ammonium sulphate > ammonium nitrate > urea = control. In this conection , Tisdale and Nelson (1997) reported that when ammonium sulphate is added to soil , the ammonium ion is retained by the colloidal fraction of the soil until it is nitrified .due to the accompanying sulphate anion , this form of nitrogen fertilizer tends to more acidic in reaction than other sources . These results are in harmony with those obtained by Absalon *et al* (2011).

As for the interaction between compost and nitrogen sources, the data show that soil properties after wheat harvest did not respond to these interactions. In general , the best values of soil EC , O.M and C.EC and the lowest bulk density values were obtained under the treatment of 9.5 Mg ha^{-1} + any nitrogen form .

Soil Fertility.

The soil fertility in term of soil available N, P and K as affected by compost and nitrogen forms are presented in Table (4). The data reveal that soil available N, P and K are significantly increased as the level of compost increased. The increment of soil available N, P and K due to added 9.5 Mg ha^{-1} over 4.8 Mg ha^{-1} and without composting reached to 6.1 and 20.8 , 9.8 and 30.3 ; and 2.8

and 6.7 %in the first season , respectively . Same trends were obtained in the second season. The beneficial effect of compost on soil fertility may be due to it's content of N, P and K which release during compost decomposition (Mann *et al*, 2006). In this connection, Saison *et al* (2006) reported that compost is often viewed as a way to improving soil fertilizer by improving soil physical properties as well as increasing soil organic carbon and nutrient availability. Similar results were obtained by El-Sheref *et al* (2018). This may be due to the decomposition of organic manure which supplied more available nutrient elements and formation of organic and inorganic acids during decomposition which slightly reduced the soil pH which affected the solubility and availability of N, P and K. These beneficial effects were also reported by El-Kouny (2007).

As nitrogen treatments, the data clearly show that soil fertility did not affect by the nitrogen fertilizer sources, except soil available P, which increased under ammonium nitrate or ammonium sulphate than urea form. This increases is mostly due to the effect of these forms on decreasing soil pH, in turn increased phosphorous availability (Tisdale and nelson, 1997). Also , the N,P and K availability did not respond to the interaction between compost and nitrogen form ; which means that the highest values of soil available N,P and K in soil after wheat harvest were attained under the treatment of 9.5 Mg ha^{-1} + any nitrogen form . On the other hand, the plant without both compost and nitrogen fertilization exhibited the lowest one.

Table 3. Soil properties after wheat harvest as affected by organic and and mineral nitrogen fertilization.

Organic Mg ha-1 (A)	Mineral N sources (B)	pH		EC (dsm-1)		O.M (%)		Bulk density g cm-3		Total porosity(%)		C.E.C (Cmol Kg-1)	
		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
0	0	8.12	8.21	1.23	1.18	2.16	2.01	1.31	1.35	50.57	49.06	28.30	29.10
	urea	8.12	8.20	1.24	1.19	2.16	2.01	1.32	1.34	50.19	49.43	28.20	29.00
	A.N	8.06	8.12	1.24	1.18	2.15	2.02	1.31	1.35	50.57	49.06	28.00	29.20
	A.S	8.00	8.10	1.24	1.19	2.16	2.01	1.31	1.35	50.57	49.06	28.10	29.20
mean		8.08	8.16	1.24	1.19	2.16	2.01	1.31	1.35	50.57	49.06	28.15	29.13
4.8	0	8.08	8.17	1.28	1.24	2.21	2.06	1.28	1.32	51.70	50.19	28.84	29.50
	urea	8.08	8.17	1.28	1.24	2.21	2.07	1.28	1.32	51.70	50.19	28.86	29.60
	A.N	8.02	8.13	1.28	1.25	2.22	2.07	1.29	1.32	51.32	50.19	28.88	29.50
	A.S	7.96	8.08	1.28	1.24	2.21	2.06	1.28	1.32	51.70	50.19	28.69	29.60
mean		8.04	8.14	1.28	1.24	2.21	2.07	1.28	1.32	51.70	50.19	28.82	29.55
9.5	0	8.05	8.14	1.32	1.28	2.26	2.1	1.25	1.28	52.83	51.70	29.02	29.70
	urea	8.05	8.13	1.33	1.27	2.25	2.11	1.25	1.29	52.83	51.32	29.06	29.80
	A.N	8.01	8.09	1.33	1.27	2.26	2.11	1.24	1.29	53.21	51.32	29.04	29.60
	A.S	7.93	8.05	1.33	1.28	2.25	2.1	1.25	1.28	52.83	51.70	29.05	29.70
mean		8.01	8.10	1.33	1.28	2.26	2.11	1.25	1.29	52.83	51.32	29.04	29.70
mean of N sources	0	8.08	8.17	1.28	1.23	2.21	2.06	1.28	1.32	51.70	50.19	28.72	29.43
	urea	8.08	8.17	1.28	1.23	2.21	2.06	1.28	1.32	51.70	50.19	28.71	29.47
	A.N	8.03	8.11	1.28	1.23	2.21	2.07	1.28	1.32	51.70	50.19	28.64	29.43
	A.S	7.96	8.08	1.28	1.24	2.21	2.06	1.28	1.32	51.70	50.19	28.61	29.50
L.S.D 0.05 A	A	0.02	0.02	0.02	0.01	0.03	0.02	0.01	0.01	0.05	0.03	0.04	0.03
	B	0.01	0.02	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	A*B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

EC= Electrical conductivity, OM= Organic matter, CEC= Cation exchange capacity.

Table 4 .Available N,P and K as affected by organic and minerals nitrogen fertilization in soil after harvesting.

Organic Mg ha^{-1} (A)	Mineral N sources (B)	N (mg kg^{-1})		P (mg kg^{-1})		K (mg kg^{-1})	
		2018	2019	2018	2019	2018	2019
0.0	0.0	22.30	24.50	16.00	16.40	196.10	201.30
	urea	23.10	25.40	16.10	16.40	196.10	201.50
	A.N	23.20	25.40	18.30	18.06	196.20	201.70
	A.S	23.20	25.50	20.60	20.90	196.20	201.50
mean		22.95	25.20	17.75	17.94	196.15	201.50
4.8	0.0	24.40	26.10	19.70	19.90	203.70	208.10
	urea	26.70	28.70	19.60	19.70	203.50	208.30
	A.N	26.60	28.70	21.30	21.50	203.60	208.40
	A.S	26.80	28.60	23.60	23.70	203.50	208.50
mean		26.13	28.03	21.05	21.20	203.58	208.33
9.5	0.0	26.50	27.90	21.90	22.00	209.60	213.60
	urea	28.10	30.30	21.80	22.10	209.20	213.10
	A.N	28.20	30.40	23.50	23.80	209.30	213.50
	A.S	28.10	30.40	25.30	25.40	209.40	213.40
mean		27.73	29.75	23.13	23.33	209.38	213.40
mean of N sources	0.0	24.40	26.17	19.20	19.43	203.13	207.67
	urea	25.97	28.13	19.17	19.40	202.93	207.63
	A.N	26.00	28.17	21.03	21.12	203.03	207.87
	A.S	26.03	28.17	23.17	23.33	203.03	207.80
L.S.D at 0.05	A	0.62	0.54	0.46	0.41	1.26	1.38
	B	NS	NS	0.36	0.31	NS	NS
	AB	NS	NS	NS	NS	NS	NS

Growth and Yield Components Parameters.

The growth parameters, namely, plant height and dry weight plant^{-1} as well as yield component, *i.e.*, number of spikes m^{-2}, number of grains spike^{-1} and 1000 – grain weight for wheat as affected by organic and nitrogen fertilizers are presented in Table (5). With respect to compost , the data clearly indicate that all studied growth and yield component parameters significantly responded to compost application , where increasing compost levels from 0.0 to 9.5 Mg ha^{-1} were significantly increased these parameters . These primitive effect of compost may be due to compost supplying plants with nutrient and improved physical and fertility of soil ,(Tables 1 and 2) (Konsaeth *et al* , 2001). Also, compost enhanced the microbiological activity in soil (Tahir *et al*, 2011). These results were in accordance to those obtained by Abd El-Hfeez *et al* (2009) and Mohamed *et al* (2018). With regard to nitrogen forms, the result clearly show that nitrogen fertilizer sources were significantly affected growth and yield component of wheat. Inspective of nitrogen sources, applied nitrogen fertilizers had a positive effect on these parameters, which had a positive effect on meristmic activity, cell devition , vegetative growth and photosynthesis accumulation (Ismail *et al* , 2014) . These results agree with Morsy *et al* (1999) and Ewis and Hassan (2009).

Respecting to nitrogen sources, the data reveal that the former parameters were significantly affected by nitrogen fertilizer forms. It could be arranged the effect of nitrogen sources on growth and yield components , except 1000- grain weight in the following descending order : AS > AN > urea > control . As for 1000 grain weight, the obtained data reveal that the heaviest grains were recorded under AS or AN fertilizers followed by urea and then control. The positive effect of nitrogen forms on growth and yield component is mainly due to the influence of AS or AN on reducing soil pH, consequently enhanced the nutrient availability (Tisdale and Nelson, 1997) as discussed before. These results are in harmony with the data obtained by Hassanien (2009).

The data of the interaction between treatments reveal that all studied growth and yield components, except 1000 – grain weight did not respond to the interaction between compost and nitrogen fertilization. As for 1000-grain weight, it is obvious to notice that the effect of the studied forms did not differ in its effect on 1000 grain weight under no composting. However, the AS fertilizers gave the same effect as AN fertilizers under compost application followed by urea and control. In general, the wheat plant treated with 9.5 Mg ha^{-1} + ammonium sulphate fertilizer exhibited the highest growth and yield component parameters . Whereas, the plants without composting and nitrogen fertilization gave the lowest ones.

Table 5 . Plant height, dry weight , number of spikes , number of grains as affected by organic and minerals nitrogen fertilization.

Organic Mg ha^{-1} (A)	Minerals N sources (B)	Plant height (cm)		dry weight plant^{-1} (g)		Number of spike/m2		Number of grians/spikes		1000-grian weight (g)	
		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
0.0	0.0	70.50	73.70	0.98	1.01	205.10	210.30	61.50	63.40	31.10	31.30
	urea	86.30	89.90	1.19	1.21	260.60	265.80	73.10	75.60	37.30	37.50
	A.N	89.70	93.00	1.21	1.23	265.80	270.60	75.40	77.30	37.30	37.50
	A.S	93.40	96.50	1.23	1.25	271.90	276.80	78.90	80.80	37.40	37.40
mean		84.98	88.28	1.15	1.18	250.85	255.88	72.23	74.28	35.78	35.93
4.8	0.0	76.10	79.50	1.07	1.09	250.70	255.30	66.90	68.50	33.30	33.50
	urea	90.50	93.80	1.22	1.24	267.60	272.40	77.20	79.30	40.10	40.40
	A.N	93.60	97.10	1.24	1.27	283.90	288.60	80.50	83.10	45.20	40.40
	A.S	96.20	100.50	1.26	1.29	293.10	297.50	82.30	84.60	45.10	40.30
mean		89.10	92.73	1.20	1.22	273.83	278.45	76.73	78.88	40.93	38.65
9.5	0.0	80.20	84.50	1.22	1.24	266.60	271.30	72.90	74.70	35.60	35.80
	urea	96.30	101.70	1.24	1.30	278.30	283.50	79.30	81.60	43.60	43.90
	A.N	99.40	103.80	1.27	1.32	293.80	298.60	84.60	86.30	48.50	48.80
	A.S	99.40	103.80	1.28	1.32	293.70	298.50	84.70	86.40	48.50	48.80
mean		93.83	98.45	1.25	1.30	283.10	287.98	80.38	82.25	44.05	44.33
mean of N sources	0.0	75.6	79.23	1.09	1.11	240.80	245.63	67.10	68.87	33.33	33.53
	urea	91.03	95.13	1.22	1.25	268.83	273.90	76.53	78.83	40.33	40.60
	A.N	94.23	97.97	1.24	1.27	281.17	285.93	80.17	82.23	43.67	42.23
	A.S	96.33	100.27	1.26	1.29	286.23	290.93	81.97	83.93	43.67	42.17
L.S.D at 0.05	A	1.02	1.15	0.03	0.03	8.06	8.71	1.27	1.30	1.03	1.01
	B	1.13	1.16	0.02	0.02	7.75	8.02	1.36	1.42	1.12	1.16
	A B	NS	NS	NS	NS	NS	NS	NS	NS	1.67	1.82

Wheat Yields.

The data of wheat yields, i.e., grain, straw and biological yields as affected by compost and nitrogen fertilization are given in Table (6). The data indicate that wheat yields were significantly increased as compost level increasing comparing with control , increasing compost up to 9.5 Mg ha^{-1} increased grain , straw and biological yield by about 51.8 , 75.4 and 41.3% in the first season , and 49.5 , 35.3 and 44.1% in the second one . The superiority of compost in improving wheat yields is mainly due to its effect on increasing growth and yield component parameters as discussed before (Table 5) . In this connection, Khaliq *et al* (2006) mentioned that organic fertilizer hold great promise due to its availability as a source of many nutrients and improve soil properties. These results are in agreement with those obtained by Galal (2007), Abd El-Hafeez *et al* (2009) and Mohamed *et al* (2018).

As for nitrogen fertilizer, the data show that wheat yields were significantly affected by either nitrogen application or nitrogen sources. Irrespective of nitrogen sources, application of nitrogen was markedly increased wheat yields when compared with control. These increments may be due to influence of nitrogen as macronutrients in controlling yield of wheat (Mahmoud and Ismail, 1997). Similar results were obtained by Kozlovsky *et al* (2009) and Ghazanfar *et al* (2013*)*. Respecting nitrogen sources, it could be arranged the effect of the different studied nitrogen forms on the descending order as follow: AS > AN > urea. The relative increasing in grain, straw and biological yields due to ammonium sulphate reached to 24.1, 11.8 and 19.3 % over urea fertilizer in the first season, respectively. Same trends were obtained in the second season. It's obvious to notice that the differences between the effect of AS and AN on wheat yields did not reach to the significant value. The superiority of ammonium sulphate fertilizer comparing with the other forms is mainly due to its effect on improving soil reaction, in turn on nutrient availability (Tables 1 and 2). These results are in line with those obtained by Ismail *et al* (2006) and Hassanien (2009).

As for the interaction, the data clearly show that wheat yields did not respond to the interaction between compost and nitrogen fertilization. In general, the highest wheat yields were obtained for plant received 9.5 Mg ha^{-1} compost + fertilized with ammonium sulphate, while plants without both of compost and nitrogen fertilization exhibited the lowest ones.

Table 6 . Grain , straw and biological yields as affected by organic and mineral nitrogen fertilization.

Organic Mg ha^{-1}(A)	Mineral N sources (B)	grain yield t ha^{-1} 2018	grain yield t ha^{-1} 2019	straw yield t ha^{-1} 2018	straw yield t ha^{-1} 2019	biological yield t ha^{-1} 2018	biological yield t ha^{-1} 2019
0.0	0.0	3.92	4.11	3.16	3.37	7.08	7.48
	urea	7.16	7.42	4.61	3.97	11.77	11.39
	A.N	7.50	7.80	4.93	4.16	12.43	11.96
	A.S	7.96	8.13	5.25	5.51	13.21	13.64
mean		6.64	6.87	4.49	4.25	11.12	11.12
4.8	0.0	5.52	5.63	3.79	3.86	9.31	9.49
	urea	8.16	8.25	5.01	5.26	13.17	13.51
	A.N	10.27	10.50	5.56	5.77	15.83	16.27
	A.S	10.85	10.98	5.89	5.96	16.74	16.94
mean		8.70	8.84	5.06	5.21	13.76	14.05
9.5	0.0	6.95	7.15	4.06	4.22	11.01	11.37
	urea	9.49	9.64	5.96	5.81	15.45	15.45
	A.N	11.92	12.13	6.22	6.46	18.14	18.59
	A.S	11.97	12.17	6.26	6.49	18.23	18.66
mean		10.08	10.27	5.63	5.75	15.71	16.02
mean of minerals N source	0.0	5.46	5.63	3.67	3.82	9.13	9.45
	urea	8.27	8.44	5.19	5.01	13.46	13.45
	A.N	9.90	10.14	5.57	5.46	15.47	15.61
	A.S	10.26	10.43	5.80	5.99	16.06	16.41
L.S.D at 0.05 A		0.61	0.67	0.53	0.57	0.89	0.93
B		0.52	0.56	0.44	0.48	0.77	0.85
A B		NS	NS	NS	NS	NS	NS

Nutrient Content.

The data in Table (7) represent the effect of compost and nitrogen fertilization and their interaction on N, P and K content in grains and straw of wheat. The data indicate that nutrient content in grains or straw were gradually increased as compost level increased. Comparing to control, increasing compost level to 9.5 Mg ha^{-1} increased N ,P and K content in grains by about 1.4 , 3.0 and 16.9 % in the first season , respectively. Same trends were obtained in the second season in grains and straw. The pomotive effect of compost in enhancing nutrient content may be due to it contains sufficient amount of N , P and K which release in available form during compost decomposition (Makail *et al*, 2006 and Mohamed *et al*, 2018).

As for nitrogen fertilization, the data reveal that, comparing with control added any nitrogen fertilizer forms were significantly increased N, P and K content in grains or straw. Relative increasing in N, P and K content in grains duo to ammonium sulphate fertilizer over control reached to 2.9, 18.8 and 23.1 % in the first season, respectively. Same trends were obtained for the second season and N, P , and K content in straw. The increment of N, P and K content in wheat grains and straw may be due to nitrogen is the most important nutrients for plant, which enhanced the root growth and development, consequently increased nutrients uptake (Abd El – Hafeez *et al* , 2009).

These results are in harmony with those obtained by Morsy *et al* (1999) and Galal (2007). With regard to nitrogen source, the data show that N P K content in grains and straw were significantly affected by nitrogen forms. It could be arranged the effect of nitrogen sources on nutrient content in the descending order as follow: AS >AN > urea. The superiority of ammonium sulphate is mainly due to its effect on reducing soil pH (Teasdale and Nelson , 1997) as mentioned before (Table , 1) . Similar results were obtained by Hassanein (2009) who reported that as gave highest N , P and K content in maize grains and Stover followed by AN and then urea. This might be attributed to the role of nitrogen nutrient in increasing the root surface unit of soil volume and also the high capacity of the plant supplied with N in building metabolites, which increases the dry matter content and subsequently increase nutrients uptake by wheat plant. These findings are in harmony with those obtained by Abd El-Hady *et al* (2006) who concluded that nitrogen level had significant effect on grain and biological yield as well as yield components.

The data of the interaction indicate that N, P and K content in grains and straw did not affect by the interaction between compost and nitrogen fertilization. The highest N, P and K content in grains and straw were attained for wheat plants fertilized with 9.5 Mg ha^{-1} compost and received the recommended rate of nitrogen fertilizer as ammonium sulphate. However, the plant without composting and nitrogen fertilization exhibited the lowest ones.

Table 7. N,P and K content in grains and straw of wheat as affected by organic and mineral nitrogen fertilization.

Organic Mg ha^{-1} (A)	Mineral N sources (B)	Grains ha^{-1}						Straw ha^{-1}					
		N (mg kg^{-1})		P (mg kg^{-1})		K (mg kg^{-1})		N (mg kg^{-1})		P (mg kg^{-1})		K (mg kg^{-1})	
		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
0.0	0.0	11.01	11.04	3.46	3.00	4.21	4.25	3.11	3.14	1.11	1.08	12.93	12.96
	urea	11.25	11.28	3.62	3.42	4.89	4.91	3.72	3.75	1.17	1.15	13.13	13.15
	A.N	11.29	11.31	3.89	3.60	4.96	4.98	3.91	3.94	1.22	1.20	13.67	13.70
	A.S	11.33	11.34	3.89	3.85	5.13	5.16	3.98	4.02	1.28	1.26	13.96	13.97
mean		11.22	11.24	3.72	3.47	4.80	4.83	3.68	3.71	1.20	1.17	13.42	13.45
4.8	0.0	11.08	11.10	3.25	3.24	4.71	4.75	3.19	3.22	1.18	1.15	13.15	13.18
	urea	11.31	11.34	3.61	3.60	5.02	5.06	3.80	3.83	1.21	1.20	13.77	13.80
	A.N	11.36	11.39	3.80	3.77	5.41	5.46	3.99	4.06	1.27	1.24	13.91	13.95
	A.S	11.40	11.43	3.91	3.87	5.86	5.90	4.20	4.31	1.31	1.29	14.30	14.36
mean		11.29	11.32	3.64	3.62	5.25	5.29	3.80	3.86	1.24	1.22	13.78	13.82
9.5	0.0	11.14	11.17	3.37	3.35	5.01	5.07	3.25	3.31	1.22	1.20	13.36	13.38
	urea	11.42	11.45	3.82	3.80	5.42	5.44	3.91	4.02	1.26	1.24	13.91	13.96
	A.N	11.46	11.49	3.98	3.96	5.89	5.92	4.13	4.25	1.36	1.33	14.12	14.14
	A.S	11.48	11.51	4.16	4.14	6.13	6.15	4.34	4.47	1.45	1.41	14.33	14.36
mean		11.38	11.41	3.83	3.81	5.61	5.65	3.91	4.01	1.32	1.30	13.93	13.96
mean of N sources	0.0	11.08	11.10	3.36	3.20	4.64	4.69	3.18	3.22	1.17	1.14	13.15	13.17
	urea	11.33	11.36	3.68	3.61	5.11	5.14	3.81	3.87	1.21	1.20	13.60	13.64
	A.N	11.37	11.40	3.89	3.78	5.42	5.45	4.01	4.08	1.28	1.26	13.90	13.93
	A.S	11.40	11.43	3.99	3.95	5.71	5.74	4.17	4.27	1.35	1.32	14.20	14.23
L.S.D at 0.05	A	0.03	0.04	0.02	0.02	0.04	0.06	0.04	0.04	0.02	0.02	0.04	0.04
	B	0.02	0.02	0.03	0.04	0.03	0.03	0.05	0.05	0.03	0.02	0.05	0.04
	A B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NSs	NS	NS

Correlation analyses were performed between wheat yield and the following soil properties: pH, EC, CEC, OM, available NPK, Bd and Tp as shown in Table (8) showed positive and significant correlation with wheat yield (grain and straw) and soil surface pH (R=0.67) and available N(R=0.66) and P(R=0.68) the ones that negatively influence were EC(R=0.0.38), CEC(R=0.0.28), OM(R=0.35) available K(R=0.35)Bd (R=0.32)and Tp(R=0.32). The significant and positive correlation between organic carbon and available nitrogen could be because of release of mineralizable nitrogen from soil organic matter in proportionate amounts (Vanilarasu and Balakrishnamurthy, 2014). Vrindts *et al.* (2003) achieved in another study, a positive and significant correlation between grain yield and straw with the soil soluble phosphorus. According to Table 2, salinity has no significant relationship with the yield that it might be due to the limited range of salinity in this study. Thus, salinity has not appeared as a negative factor for plant growth. Ranjbar *et al.* (2014) reported that among different soil nutrition, soluble potassium, phosphorus, sulfate and available potassium with positive effects and the clay content with negative effects showed the most correlation with the wheat grain yield.

Table 8.Linear correlation matrix between yield and soil attributes at 0-30cm soil depth.

	Grain yield	Straw yield	pH	EC	CEC	OM	Available NPK			Bd	Tp
							N	P	K		
grain yield											
straw yield	0.91										
pH	0.67	0.62									
EC	0.38	0.33	0.24								
CEC	0.28	0.26	0.20	0.86							
OM	0.35	0.29	0.21	0.95	0.91						
N	0.66	0.61	0.37	0.83	0.78	0.85					
P	0.68	0.64	0.78	0.66	0.58	0.62	0.72				
K	0.35	0.29	0.22	0.97	0.9	0.98	0.84	0.60			
Bd	0.32	0.26	0.22	0.95	0.80	0.93	0.76	0.62	0.96		
Tp	0.32	0.26	0.22	0.95	0.80	0.93	0.76	0.62	0.96	1.00	

EC= Electrical conductivity, OM= Organic matter, CEC= Cation exchange capacity, Bd= Bulk density, Tp= Total porosity.

CONCLUSION

It could be concluded that, using compost and ammonium sulphate fertilizer are benefit for improving the growth. Yield and it components, and nutrient of wheat. Therefore, it could be recommended to added 9.5 Mg ha^{-1} compost during land preparation and added 179 kg N ha^{-1} as ammonium sulphate fertilizer to wheat plant for attained the maximum quality and quantity. The most important attributes which positively influence wheat yield with pH and available N and P the ones that negatively influence are EC, CEC, OM available K. Bd and Tp.

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تأثير الكمبوست ومصادر الأسمدة النيتروجينية على خواص التربة وصلاحية العناصر وإنتاجية القمح

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أجريت تجربتان حقليتان بالمزرعة البحثية بمحطة البحوث الزراعية بسدس- محافظة بني سويف –مصر لدراسة تأثير مستويات مختلفة من من الكمبوست (صفر ، 4.8 ، 9.5 طن كمبوست للهكتار) ومصادر مختلفة من السماد النيتروجيني (بدون ، كبريتات الأمونيوم ، نترات الأمونيوم ، اليوريا) علي بعض خواص التربة الكيميائية مثل (حموضة التربة, الملوحة, محتواها من المادة العضوية,السعة التبادلية الكاتيونية, وصلاحية كل من النيتروجين والفسفور والبوتاسيوم) وكذلك علي بعض خصائص التربة الطبيعية مثل بعد الحصاد وكذلك مدلولات النمو للقمح و المحصول ومكوناته. أظهرت النتائج أن كل خصائص التربة المدروسة وصلاحية العناصر الغذائية قد تحسنت بسبب زيادة مستوى سماد الكومبوست ، فيما عدا ملوحة التربة ، والتي زادت بزيادة الكومبوست. كما أدى ارتفاع مستوى الكومبوست إلى زيادة نمو القمح والمحصول ومكوناته وكذلك محتوى الحبوب والقش من النيتروجين والفسفور والبوتاسيوم. لم يؤثرالتسميد النيتروجيني على خواص التربة وصلاحية العناصر الغذائية باستثناء حموضه التربة وفوسفور التربة المتاح. يمكن ترتيب قدرة مصادر النيتروجين المدروسة على خفض درجة الحموضة وزيادة الفسفور المتاح في التربة بالترتيب التنازلي على النحو التالي: كبريتات الأمونيوم> نترات أمونيوم> يوريا. بصرف النظر عن مصادر النيتروجين ، نتج عن استخدام النيتروجين زيادة بشكل معنوي في جميع مدلولات النمو المدروسة والمحصول ومكوناته والمحتوى من العناصر الغذائية وكانت أفضل القيم لسماد كبريتات الأمونيوم يليها سماد نترات الأمونيوم ثم اليوريا. تعتبر إضافة 9.5 طن / هكتار كمبوست قبل الزراعة وتسميد نبات القمح بمعدل 179 كجم نيتروجين للهكتار أفضل معاملة لإنتاجية القمح و وتحسين خصائص التربة والخصوبة تحت ظروف التربة الرسوبية لمصر الوسطى.