INFLUENCE OF ORGANIC, INORGANIC NITROGEN FERTILIZATION AND POTASSIUM LEVELS ON WHEAT PLANT GROWN IN NEWLY RECLAIMED SOIL.

Journal

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ABSTRACT

Two field experiments were carried out at El- Areish Agricultural Research Station, North Sinai Governorate during the two winter growing seasons of 2006/2007 & 2007/2008 to study the effect of organic and inorganic nitrogen fertilization as well as potassium levels (24 and 48 kg K_2O /fed.) on yield components, grain & straw yield and chemical composition of wheat plant in calcareous soils.

Results can be summarized as follows:

1- Generally, in most cases, the treatment of compost of chicken manure (CCM) with addition of soaking compost with drip irrigation (SCD) or/and foliar application of soaking compost (FSC) on wheat plant gave the highest significant values on all parameters under study in two seasons. On the other hand, the lowest significant values were obtained when sole mineral fertilizer was applied in both seasons.

2- The higher level of potassium achieved the highest significant values of plant height in first season, grain & straw yield in seasons as well as N % in grain at both seasons as well as P & K % in wheat grain and straw yield in second season compared with the lower one.

3- In most cases, there were no significant interaction effects between the organic and inorganic nitrogen fertilization and potassium levels on all parameters under study in both seasons.

4- The opposite trend was noticed for soil nitrogen fractions (NO^-_2, NO^-_3 and NH^+_4) after harvest as well as nitrite & nitrate in wheat grain and straw occurred by yield, its components and macronutrients percentage. Sole application of mineral fertilizer gave the highest significant values of all cases, while, the lowest significant values of the same one were obtained when compost of chicken manure (CCM) with addition of soaking compost with drip irrigation (SCD) or/and foliar application of soaking compost (FSC) was applied.

INTRODUCTION

Wheat is the worlds most important and most widely grown cereal crop through many properties and uses of its grains and straw. Increasing grain yield of wheat is an important national goal to face the continuous increasing food needs of Egyptian population. Wheat production in Egypt increased from 2.08 in 1983 to 7.37 million ton in 2007. This increase was achieved by increasing wheat area from 1.83 to 2.71 million fed/year and grain yield from 1.50 to 2.71 ton/fed. in the same period(ERMAE, 2007).

Use of chemical fertilizers has increased worldwide for cereal production (Abril et al., 2007) due to availability of inexpensive fertilizers (Graham and Vance, 2000). The continued use of chemical fertilizers causes health and environmental hazards (Pimentel, 1996). Recycling of indigenous agricultural wastes should be done properly i.e. wastes should be recycled as green manure (GM) or compost to achieve highest nutrient recovery. Between the two, compost would be better than GM because compost handling is less dangerous than raw material handling in terms of ammonia volatilization and leaching of N and P (Arja and Maritta, 1997). The manure contains important nutrients such as N, P, K, Ca, Mg and organic matter etc. (Abdelhamid et al., 2004). The benefits of bioorganic fertilizers for increasing wheat grain yield are not always easy to optimize because of N content and its subsequent release being difficult to predict. Increasing wheat yield by combined effect of bioorganic and chemical fertilizers is a promising goal in wheat production for decreasing high doses of chemical fertilizer, also, get more clean product with low undesirable high doses of heavy metals and other pollutants, these benefits were reported by(Sushila, et al., 2000; Zeidan, and El - Karmany, 2001 and Radwan, et al., 2002). Kabesh, et al.,(2009) concluded that fertilization of wheat by 75 % recommended dose of NPK + 25 % recommended dose of bio-organic fertilizer (chicken manure) can be increase yield, its components, protein, P, K in grains. The low input of organic materials to soil and the intensive orchard management could reduce soil organic matter content, functioning and quality of soil (Canali et al. 2002). Among the different strategies which guarantee an adequate input of organic matter to soil, organic fertilization could represent an effective solution, particularly by applying high quality composts obtained from organic wastes of different origin (i.e. agro-industries, intensive livestock, municipal solid wastes) and characterized by stabilized organic matter (Tittarelli and Canali 2002). Eusuf Zai, et al., (2008) stated that the farmers use huge chemical fertilizers for cereal production, which cause health and environmental hazards. Adoption of legumes in cereal based cropping systems and improvement of organic fertilizers are needed to reduce chemical fertilizer use.

Next to nitrogen, potassium is the second-most abundant mineral macronutrient in plants (Gerendás, et al., 2008). Applying K fertilizer represents an effective measure to ensure adequate K supply. In developing countries, where the proportion of less fertile soils is particularly high, it may be difficult to fulfil the nutritional requirements of high-yielding crops (Sauerbeck and Helal, 1990; Marschner, 1995). Koch and Mengel (1977) concluded that plants at the higher K rate produced more vegetative dry matter, higher grain yields, fewer unproductive tillers and improved translocation of N from the vegetative plant parts into the grain. They added that, between 87.4 % and 89.0 % of the N absorbed during the reproductive stage was present in the grain of plants which had received the higher K supply.

The aim of this investigation is to study the effect of organic and inorganic nitrogen fertilization as well as potassium levels on wheat yield, its components and contents of N, P, K in straw and grain as well as nitrite and nitrate in wheat, nitrogen fractions in soil after harvest.

MATERIALS AND METHODS

Two field experiments were carried out at El- Areish Agric. Res. Station, representing sandy loam soil during the winter seasons 2006/2007 & 2007/2008 to study the effect of nitrogen fertilizer sources and potassium levels on yield, its components and macronutrients contents of wheat plants as well as nitrogen fractions(NO^-_2, NO^-_3 and NH^+_4) in soils after harvesting .

Some physical and chemical properties of the studied soil which were measured and determined before planting according to Black (1982) and Ryan et al., (1996) are presented in Table (1). Chemical analysis of chicken manure compost is presented in Table (2).

Each experiment was arranged in a split plot design with four replicates. The plot area was 10 m^2 (2.5 m width and 4.0 m length) in which the main treatments were devoted for nitrogen fertilizer sources and rates, while the sub-ones included soil applications of potassium fertilizer rates. Such treatments were as follows:-

1- Nitrogen fertilizer sources and rates:
   - A- Mineral fertilizer 100 kg N/fed. as ammonium nitrate (33.5% N) (M F).
   - B- Organic fertilizer 100 kg N /fed. as compost of chicken manure (CCM)
   - C- Mineral fertilizer 50 kg N/fed. + spray of soaked chicken manure compost at rate of 10 % (M F +FSC).
   - D- Mineral fertilizer 50 kg N/fed + fertigation of soaked chicken manure compost at rate of 10 % (MF + SCD).
   - E- Organic fertilizer 50 kg N /fed. as compost of chicken manure + spray of soaked chicken manure compost at rate of 10 % (CCM + FSC).
   - F- Organic fertilizer 50 kg N /fed. As compost of chicken manure + fertigation of soaked chicken manure compost at rate of 10 % (CCM + SCD).

2- Potassium fertilizer rates

K fertilizer in the form of potassium sulphate (48% K_2O).with two levels i.e., K_1, and K_2 which were 24 and 48 kg K_2O /fed., respectively. The fertilizer was applied before cultivation.

* Compost of chicken manure was added before planting.

Nitrogen fertilizer as ammonium nitrate was added in three portions at 30, 50 and 70 days from planting.

Preparation and application of chicken manure compost (CCM).

Ten kg of chicken manure compost (CCM) were soaked in 100 litre water for 7 days then filtrated. The supernatant was injected in the drip irrigation system or sprayed on wheat plants. This was repeated three times, i. e. 30, 50 and 70 days after sowing.

A basal application of phosphorus fertilizer was added at the rate of 30 kg P_2O_5/fed. as superphosphate (15% P_2O_5) was added according to recommended dose by Ministry of Agriculture before cultivation.

Table (1): Some physical and chemical properties of the experimental site

Properties	value	
	Season 2006/2007	**Season 2007/2008**
Particle size distribution (%)		
Coarse sand	11.70	11.10
Fine sand	55.50	52.70
Silt	31.92	35.50
Clay	0.88	0.70
Textural class	Sandy loam	Sandy loam
EC_e (dSm^{-1})	2.81	3.12
pH (1:2.5)	7.86	7.98
CEC	10.53	10.22
Soluble ions ($meqL^{-1}$)		
Ca^{+2}	3.30	4.10
Mg^{+2}	11.1	11.30
Na^{+}	12.60	14.9
K^{+}	1.60	1.30
HCO^{-}_3	8.80	10.50
Cl^{-}	12.60	12.50
SO^{--}_4	7.20	8.60
$CaCO_3$ (%)	18.52	20.10
Available N (ppm)	14.12	12.30
Available P (ppm)	4.16	3.78
Available K (ppm)	28.70	26.30
Water holding capacity (WHC) %	19.87	18.52
Available water (AW) %	6.25	5.81

Table (2): Some chemical analysis of the used manure

Season	Parameters													
	*EC_e (dSm^{-1})	*pH	O C	OM	C/N	%			(ppm)				
						N	P	K	Fe	Mn	Zn	Cu	Pb
2006/2007	1.68	6.6	29.84	51.32	17.45	1.71	1.16	1.83	568	243	210	292	11.87
2007/2008	1.59	6.3	26.37	45.36	16.28	1.62	1.19	1.74	547	237	204	298	11.96

*In manure extract 1:2.5

Wheat grains (variety Sakha, 94) were planted on 18th and 27th of November 2006 & 2007, respectively under drip irrigation system and harvested after 150 days (20th and 28th of May 2007 & 2008, respectively). Plant height (cm), spike length (cm), spike number / m^2, kernels number / spike, kernels weight / spike (g) and weight of 1000 grains (g) were estimated at harvesting in ten plants taken randomly from each treatment. Grain and straw yields (ton/ fed) were also measured and recorded.

Plant samples after harvesting were separated into straw and grains, dried at 70 ºC; ground, digested and assigned for analyzing N, P, K,. After harvesting NO^-_2, NO^-_3 and NH^+_4 were determined in the soil surface layer (0-30 cm) for all plots according to the procedure outlined by Singh, (1988)

Nitrogen was determined using modified Kjeldahl method, phosphorous was determined colourimetrically using ammonium molybdate and ammonium metavanadate according to the procedure outlined by Ryan et al.,(1996).Potassium was determined using the flame spectrophotometry method (Black, 1982).

The results were statistically analyzed using Mstat computer package to calculate F ratio according to Snedecor and Cochran (1980). Least significant differences method (L.S.D) was used to differentiate means at the 0.05 level (Waller and Duncan, 1969).

RESULTS AND DISCUSSION

1.Yield and its components

1.a. plant height, spike length, spike number / m2 and kernels number / spike

Data presented in Table (3) show that the highest significant values of plant height, spike length, spike number/m^2 and kernels number / spike were observed when the treatment of compost of chicken manure (CCM) + foliar application of soaking compost (FSC) on wheat plant or/and addition of soaking compost with drip irrigation (SCD) with no significance differences between them in both seasons. On the other hand, the lowest values of the same parameters were recorded when mineral fertilizer (MF) or half amount of (MF) + foliar application of soaking compost (FSC) was practiced in both seasons. Similar results were obtained by Sweeten, (1988) who concluded that the composting manure is a useful method of producing a stabilized product that can be stored or spread with little odor problem. They added that the composting process occurs through biological action and spontaneous chemical reactions that produce heat. Willson and Hummel (1975) concluded that other advantages of composting include the destruction of pathogens and weed seeds, and improved handling characteristics by reducing the volume and weight of material. They added that manure and compost should be managed and applied at rates that do not adversely affect the environment. Also, Vitosh et al., (1973) found that a significant increase in salt and nutrients may occur in soils as a result of manure or compost application in excess of crop requirements.

All parameters tabulated in Table (3) weren't affected by potassium levels with one exception, plant height in the first season where the high level of K fertilizer (48 kg K_2O/ fed.) was superior compared to the low level (24 kg K_2O/ fed.). These results agree with those obtained by Sauerbeck and Helal, 1990 and Marschner, 1995.

Results also reveal that there were no significant differences between the interacted organic or inorganic nitrogen fertilizer and potassium levels on the same yield components as shown in Table (3) in both seasons.

Table (3): Effect of the applied treatments on vegetative growth characters of wheat plants

Treatments	Season 2006/2007				Season 2007/2008			
Nitrogen fertilizer	Plant height (cm)	Spike length (cm)	Spike number / m^2	kernels number / spike	Plant height (cm)	Spike length (cm)	Spike number / M2	kernels number / spike
MF (100 kg N/fed.)	67 00	5.45	197.00	36.25	62.00	5.66	189.00	34.25
CCM (100 kg N/fed.)	69.00	6.26	228.00	38.00	66.50	6.60	222.50	35.75
MF (50 kg N/fed.) + FSC	79.50	6.92	280.00	44.25	76.00	7.29	271.13	41.25
MF (50 kg N/fed.) + SCD	75.13	6.39	262.25	41.25	71.00	6.91	252.00	40.00
CCM (50 kg N/fed.) + FSC	92.50	7.47	312.50	48.25	87.50	7.89	304.00	46.00
CCM (50 kg N/fed.) + SCD	86.63	7.24	287.50	45.75	76.00	7.59	282.00	42.75
L.S.D	8.75	0.98	37.80	3.23	10.54	1.13	27.88	4.037
Potassium levels								
24 kg/fed.	76.21	6.52	254.67	41.25	72.17	6.90	247.50	38.92
48 kg/fed.	80.38	6.72	267.75	43.33	74.17	7.08	259.38	41.08
F test	*	—	—	—	—	—	—	—
N. fertilizer * K levels								
MF (100 kg N/fed.) + 24 kg/fed.	65.00	5.20	191.00	35.00	244.00	5.38	185.00	33.50
MF (100 kg N/fed.) + 48 kg/fed.	69.00	5.70	203.00	37.50	252.00	5.94	193.00	35.00
CCM (100 kg N/fed.) + 24 kg/fed.	68.00	6.20	222.00	36.50	260.00	6.45	219.00	34.50
CCM (100 kg N/fed.) + 48 kg/fed.	70.00	6.32	234.00	39.50	272.00	6.75	226.00	37.00
MF (50 kg N/fed.) + FSC +24 kg/fed.	79.00	6.88	274.00	43.50	304.00	7.25	265.00	40.00
MF (50 kg N/fed.) + FSC +48 kg/fed.	80.00	6.96	286.00	45.00	304.00	7.33	277.25	42.50
MF (50 kg N/fed.) + SCD +24 kg/fed.	72.00	6.35	258.00	40.00	276.00	6.90	248.00	38.50
MF (50 kg N/fed.) + SCD +48 kg/fed.	78.25	6.43	266.50	42.50	292.00	6.93	256.00	41.50
CCM (50 kg N/fed.) + FSC +24 kg/fed.	90.00	7.38	302.00	47.50	344.00	7.95	293.00	45.00
CCM (50 kg N/fed.) + FSC +48 kg/fed.	95.00	7.55	323.00	49.00	356.00	7.83	315.00	47.00
CCM (50 kg N/fed.) + SCD +24 kg/fed.	83.25	7.12	281.00	45.00	304.00	7.48	275.00	42.00
CCM (50 kg N/fed.) + SCD +48 kg/fed.	90.00	7.35	294.00	46.50	304.00	7.70	289.00	43.50
L.S.D	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

MF = mineral fertilizer
CCM = compost of chicken manure
FSC = foliar application of soaking compost
SCD =soaking compost with drip irrigation

1.b. Kernels weight / spike, weight of 1000 grains as well as grain and straw yields

Data presented in Table (4) show that the kernels weight / spike, grain and straw yields in two seasons were affected significantly by addition of organic and inorganic nitrogen fertilizers in both seasons. The treatment of CCM + FSC gave the highest significant values of such parameters in both seasons. Meanwhile, the lowest significant values of the same parameter were obtained when mineral fertilizer (MF) was applied in both seasons. On the other hand, weight of 1000 grains wasn't affected significantly by nitrogen fertilizers in two seasons. In this connection, McAndrews et al., (2006) stated that the livestock manure has been used as a soil amendment in agricultural systems for centuries. Also, Clark et al., (1999) and Grandy et al., (2002) concluded that the application of manure to soil provides several potential benefits, including improving the fertility, structure, and water-holding capacity of the soil, increasing soil organic matter, and reducing the amount of synthetic fertilizer needed for crop production. Moreover, Cherney et al., (2002 and Matsi et al., 2003) stated that, fields receiving organic fertilizers only have been known to produce crop yields equal to or greater than fields that have received only inorganic fertilizer . Also, Sary,et al.,(2009)concluded that increasing wheat yield by combined effect of bio-organic and chemical fertilizers is a promising goal in wheat production for decreasing high doses of chemical fertilizer also, get more clean product with low undesirable high doses of heavy metals and other pollutants.

Concerning the effect of potassium levels on grain and straw yield, results reveal that the higher level of K fertilizer (48 kg K_2O/ fed.) gave the higher significant values than the lower one in both seasons. While, Kernels weight / spike and weight of 1000 grains weren't affected significantly by potassium levels in two seasons. This results agree with those obtained by Mehdi, et al.,(2007) who found that the increasing rates of potassium fertilizer increased significantly the plant height, grain and straw yield. Also, Mengal, (1982) and Niazi et al., (1992) concluded that actually K has significant role in starch synthesis and in grain development, thus its adequate supply showed a profound effect in producing heavier wheat grains.

With respect to the interaction effect between the factors under study, data obtainable in Table (4) reveal that the highest significant values of grain and straw yield were obtained when CCM + FSC under both potassium levels in second season only. Meanwhile, the lowest significant values of same one were recorded when mineral fertilizer (MF) + 24 kg K_2O/ fed. was applied in two seasons. On the other hand, Kernels weight / spike, weight of 1000 grains were not affected significantly in two seasons.

Table (4): Effect of the applied treatments on yield and yield components of wheat plants

Treatments	Season 2006/2007				Season 2007/2008			
Nitrogen fertilizer	Kernels weight / spike (g)	weight of 1000 grains (g)	Grains yield (Ton/ fed.)	Straw yield (Ton/ fed.)	Kernels weight / spike (g)	weight of 1000 grains (g)	Grains yield (Ton/ fed.)	Straw yield (Ton/ fed.)
MF (100 kg N/fed.)	1.49	42.77	1.20	2.30	1.44	42.55	1.10	2.42
CCM (100 kg N/fed.)	1.73	42.42	1.50	3.18	1.58	42.28	1.37	3.14
MF (50 kg N/fed.) + FSC	1.88	41.97	1.97	4.46	1.76	41.90	1.80	3.98
MF (50 kg N/fed.) + SCD	1.81	42.21	1.82	4.08	1.71	42.07	1.78	3.85
CCM (50 kg N/fed.) + FSC	2.05	41.72	2.04	4.69	2.03	41.34	1.99	4.63
CCM (50 kg N/fed.) + SCD	1.93	41.79	2.01	4.66	1.80	41.65	1.94	4.35
L.S.D	0.19	N.S.	0.04	0.20	0.19	N.S.	0.001	0.04
Potassium levels								
24 kg/fed.	1.77	42.14	1.72	3.83	1.68	41.92	1.63	3.62
48 kg/fed.	1.86	42.15	1.79	3.95	1.76	42.01	1.69	3.83
F test	—	—	*	*	—	—	*	*
N. fertilizer * K levels								
MF (100 kg N/fed.) + 24 kg/fed.	1.46	42.71	1.15	2.27	1.40	42.48	1.05	2.16
MF (100 kg N/fed.) + 48 kg/fed.	1.51	42.82	1.25	2.33	1.49	42.61	1.15	2.67
CCM (100 kg N/fed.) + 24 kg/fed.	1.68	42.35	1.45	3.08	1.56	42.24	1.33	3.04
CCM (100 kg N/fed.) + 48 kg/fed.	1.77	42.48	1.54	3.27	1.60	42.32	1.41	3.24
MF (50 kg N/fed.) + FSC +24 kg/fed.	1.81	42.00	1.95	4.37	1.72	41.83	1.75	3.86
MF (50 kg N/fed.) + FSC +48 kg/fed.	1.94	41.94	1.99	4.55	1.79	41.96	1.84	4.10
MF (50 kg N/fed.) + SCD +24 kg/fed.	1.75	42.17	1.78	3.99	1.67	42.00	1.74	3.75
MF (50 kg N/fed.) + SCD +48 kg/fed.	1.86	42.25	1.87	4.16	1.74	42.13	1.81	3.95
CCM (50 kg N/fed.) + FSC +24 kg/fed.	2.01	41.75	2.02	4.65	1.95	41.26	1.98	4.59
CCM (50 kg N/fed.) + FSC +48 kg/fed.	2.08	41.68	2.05	4.72	2.11	41.42	2.00	4.66
CCM (50 kg N/fed.) + SCD +24 kg/fed.	1.88	41.85	1.99	4.63	1.77	41.70	1.92	4.31
CCM (50 kg N/fed.) + SCD +48 kg/fed.	1.97	41.72	2.03	4.68	1.84	41.59	1.96	4.38
L.S.D	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.04	0.13

2- Macronutrients in grain and straw

Results in Table (5) demonstrate that, in most cases, the treatment of compost of chicken manure (CCM) with addition of soaking compost with drip irrigation (SCD) or/and foliar application of soaking compost (FSC) on wheat plant gave the highest significant values of all macronutrients in grain and straw yield in two seasons, while, the lowest significant values were observed when sole mineral fertilizer was applied in both seasons. On the other hand, K % wasn't affected significantly by organic and inorganic nitrogen fertilizers in grain in the first season and straw in the second one. In this connection Amanullah et al., (2006) stated that composting, or the controlled biological decomposition of organic waste, has been investigated as a method of stabilizing poultry manure prior to land application. This process produces a material with several advantages with respect to handling by reducing volume, mass of dry matter, odours, fly attraction and breeding and weed seed viability.

With regard to the influence of potassium levels on macronutrients percentage in grain and straw yield , data available in Table (5) show that, in the second season, the upper level of potassium fertilizer increased significantly P & K % in grain and straw yield and N % in grains in both seasons compared with low level. Similar findings were obtained by Mehdi, et al.,(2007) who stated that the increasing rates of potassium fertilizer increased significantly concentration of potassium in grain and straw yield.

Results also reveal that there were no significant differences between the interacted treatments on N, P and K percentage in grain and straw yield in both seasons. One exception was observed , the highest significant values of P % in wheat straw when compost of chicken manure (CCM) was added + foliar application of soaking compost (FSC) under (24 kg K_2O/ fed.) or compost of chicken manure (CCM) with addition of soaking compost with drip irrigation (SCD) under (48 kg K_2O/ fed.) in the first season only. Whereas, the lowest significant values were obtained when sole mineral fertilizers was applied with (24 kg K_2O/ fed.) in both seasons.

Table (5): Effect of the applied treatments on nutrients percentage of grains and straw of wheat plants

Treatments	Season 2006/2007						Season 2007/2008					
	Straw			Grains			Straw			Grains		
	N	P	K	N	P	K	N	P	K	N	P	K
Nitrogen fertilizer	%											
MF (100 kg N/fed.)	0.24	0.24	1.18	1.88	0.56	0.24	0.21	0.21	1.14	1.84	0.55	0.21
CCM (100 kg N/fed.)	0.31	0.27	1.26	2.01	0.59	0.27	0.28	0.25	1.23	1.98	0.59	0.24
MF (50 kg N/fed.) + FSC	0.32	0.30	1.29	2.16	0.61	0.27	0.31	0.25	1.24	2.13	0.58	0.24
MF (50 kg N/fed.) + SCD	0.31	0.31	1.26	2.14	0.64	0.29	0.29	0.26	1.21	2.08	0.61	0.24
CCM (50 kg N/fed.) + FSC	0.38	0.34	1.33	2.25	0.65	0.29	0.34	0.26	1.27	2.18	0.62	0.27
CCM (50 kg N/fed.) + SCD	0.35	0.35	1.30	2.19	0.69	0.28	0.31	0.28	1.24	2.14	0.66	0.27
L.S.D	0.04	0.09	0.08	0.11	0.07	N.S.	0.07	0.057	N.S.	0.15	0.08	0.03
Potassium levels												
24 kg/fed.	0.31	0.29	1.26	2.07	0.61	0.27	0.28	0.23	1.20	2.02	0.58	0.23
48 kg/fed.	0.32	0.31	1.28	2.14	0.63	0.27	0.30	0.27	1.24	2.09	0.62	0.26
F test	—	—	—	*	—	—	—	*	*	*	*	*
N. fertilizer * K levels												
MF (100 kg N/fed.) + 24 kg/fed.	0.24	0.22	1.15	1.84	0.54	0.24	0.20	0.20	1.09	1.80	0.52	0.20
MF (100 kg N/fed.) + 48 kg/fed.	0.24	0.25	1.21	1.91	0.57	0.24	0.22	0.21	1.18	1.87	0.57	0.21
CCM (100 kg N/fed.) + 24 kg/fed.	0.30	0.25	1.24	1.96	0.58	0.26	0.28	0.23	1.21	1.94	0.58	0.22
CCM (100 kg N/fed.) + 48 kg/fed.	0.31	0.28	1.28	2.05	0.60	0.28	0.28	0.26	1.25	2.01	0.60	0.25
MF (50 kg N/fed.) + FSC +24 kg/fed.	0.32	0.28	1.29	2.13	0.60	0.26	0.29	0.23	1.22	2.09	0.57	0.22
MF (50 kg N/fed.) + FSC +48 kg/fed.	0.32	0.31	1.29	2.18	0.62	0.28	0.32	0.26	1.25	2.16	0.59	0.26
MF (50 kg N/fed.) + SCD +24 kg/fed.	0.30	0.29	1.25	2.07	0.62	0.31	0.28	0.24	1.20	2.06	0.58	0.23
MF (50 kg N/fed.) + SCD +48 kg/fed.	0.32	0.33	1.27	2.21	0.66	0.275	0.30	0.28	1.21	2.10	0.63	0.24
CCM (50 kg N/fed.) + FSC +24 kg/fed.	0.38	0.38	1.33	2.22	0.63	0.28	0.32	0.24	1.25	2.13	0.60	0.25
CCM (50 kg N/fed.) + FSC +48 kg/fed.	0.38	0.29	1.33	2.27	0.66	0.29	0.36	0.28	1.28	2.23	0.64	0.29
CCM (50 kg N/fed.) + SCD +24 kg/fed.	0.34	0.31	1.29	2.17	0.68	0.27	0.30	0.25	1.23	2.10	0.63	0.25
CCM (50 kg N/fed.) + SCD +48 kg/fed.	0.36	0.38	1.30	2.21	0.69	0.28	0.32	0.30	1.25	2.18	0.69	0.28
L.S.D	N.S.	0.08	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

3- Nitrite and nitrate in grain and straw

Data available in Table (6) show clearly that nitrite and nitrate in grain and straw of wheat plant were significantly affected by organic and inorganic nitrogen fertilizers, the reverse trend of such components were obtained in comparison with previous data in Tables (3, 4 and 5) . Sole mineral fertilizer increased significantly nitrite and nitrate in grains and straw of wheat plant in both seasons. Whereas, compost of chicken manure (CCM) with addition of soaking compost with drip irrigation (SCD) or/and foliar application of soaking compost (FSC) on wheat plant decreased significantly the same ones in two seasons. In this connection, Clark et al. (1999) found that nitrate content in tomato fruits was lowest in the organic system and highest in the conventional system as the differences were highly significant.

As regard the effect of potassium levels on nitrite and nitrate in grain and straw of wheat plant , data presented in Table (6), apparently show that the lowest level of potassium fertilizer increased significantly nitrate in grain in the first season and nitrite in straw in the second one compared to high level of potassium . While, other parameters in Table (6) weren’t significantly affected by potassium level in two seasons.

The interaction effect between nitrogen and potassium fertilizers was insignificant in both seasons.

Table (6): Effect of the applied treatments on nitrite and nitrate content in wheat plants

Treatments	Season 2006/2007				Season 2007/2008			
	Straw		Grains		Straw		Grains	
Nitrogen fertilizer	NO_2	NO_3	NO_2	NO_3	NO_2	NO_3	NO_2	NO_3
	(ppm)							
MF (100 kg N/fed.)	0.47	10.70	4.55	13.62	0.45	10.53	4.47	13.45
CCM (100 kg N/fed.)	0.38	9.86	3.41	10.70	0.34	9.84	3.28	10.89
MF (50 kg N/fed.) + FSC	0.29	8.52	2.68	10.31	0.24	8.15	2.56	10.19
MF (50 kg N/fed.) + SCD	0.31	8.84	2.91	10.50	0.27	8.64	2.77	10.41
CCM (50 kg N/fed.) + FSC	0.20	6.59	2.44	7.43	0.15	6.50	2.30	6.69
CCM (50 kg N/fed.) + SCD	0.26	8.36	2.51	8.42	0.19	6.54	2.39	8.17
L.S.D	0.13	0.42	0.35	0.22	0.08	0.67	0.36	0.82
Potassium levels								
24 kg/fed.	0.33	8.85	3.10	10.28	0.28	8.47	2.98	10.00
48 kg/fed.	0.31	8.77	3.07	10.05	0.27	8.27	2.94	9.93
F test	—	—	—	*	*	—	—	—
N. fertilizer * K levels								
MF (100 kg N/fed.) + 24 kg/fed.	0.48	10.72	4.58	13.67	0.45	10.55	4.48	13.48
MF (100 kg N/fed.) + 48 kg/fed.	0.46	10.68	4.51	13.56	0.44	10.51	4.45	13.41
CCM (100 kg N/fed.) + 24 kg/fed.	0.40	9.89	3.42	10.92	0.34	9.92	3.31	10.96
CCM (100 kg N/fed.) + 48 kg/fed.	0.36	9.83	3.40	10.48	0.33	9.75	3.25	10.82
MF (50 kg N/fed.) + FSC +24 kg/fed.	0.30	8.55	2.68	10.36	0.24	8.15	2.56	10.20
MF (50 kg N/fed.) + FSC +48 kg/fed.	0.28	8.48	2.67	10.25	0.23	8.15	2.56	10.18
MF (50 kg N/fed.) + SCD +24 kg/fed.	0.32	8.90	2.95	10.51	0.28	8.65	2.79	10.43
MF (50 kg N/fed.) + SCD +48 kg/fed.	0.29	8.77	2.87	10.48	0.26	8.63	2.74	10.39
CCM (50 kg N/fed.) + FSC +24 kg/fed.	0.20	6.63	2.44	7.64	0.15	6.85	2.34	6.72
CCM (50 kg N/fed.) + FSC +48 kg/fed.	0.19	6.55	2.44	7.22	0.15	6.15	2.25	6.65
CCM (50 kg N/fed.) + SCD +24 kg/fed.	0.26	8.42	2.51	8.56	0.19	6.68	2.41	8.22
CCM (50 kg N/fed.) + SCD +48 kg/fed.	0.26	8.30	2.50	8.28	0.19	6.40	2.37	8.12
L.S.D	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

4- Nitrogen fractions in soil after harvest

Results tabulated in Table (7) point out that the addition of mineral nitrogen fertilizer alone increased significantly NO^-_2 and NO^-_3 contents in soils after harvest, while NH^+_4 and total nitrogen were improved significantly when compost of chicken manure (CCM) alone was added in both seasons. On the other hand, compost of chicken manure (CCM) + foliar application of soaking compost (FSC) gave the lowest significant values of nitrite and nitrate, whereas, NH4 and total nitrogen were decreased significantly when half amount of mineral nitrogen + foliar application of soaking compost (FSC) was applied in the two seasons. Similar trend was obtained by Amanullah et al., (2006) who found that composting process immobilizes N in the manure and produces humus that can be used as source of organic materials and slow the release of nutrients. Increased soil organic matter and cation exchange capacity from compost of poultry manure applications may improve nutrient retention in soils. Also, Chang, and Janzen, (1996) found that the slow release of nutrients from composted poultry manure may lessen leaching of N in runoff from farmlands.

Regarding the effect of potassium levels on nitrogen fraction in soil after harvest, data in Table (7) reveal that the nitrite, nitrate, ammonium and total nitrogen in soils after harvest weren’t affected by potassium levels in both seasons.

Data in Table (7) reveal that there were no significant differences between the interacted factors on NO_2, NO_3, NH_4 and total nitrogen in soils after harvest in both seasons.

Table (7): Effect of the applied treatments on nitrogen forms in soil after harvest

Treatments	Season 2006/2007				Season 2007/2008			
Nitrogen fertilizer	NO_2	NO_3	NH_4	Total	NO_2	NO_3	NH_4	Total
	(ppm)							
MF (100 kg N/fed.)	6.52	15.45	9.49	31.47	6.07	14.07	8.18	28.32
CCM (100 kg N/fed.)	4.13	11.62	22.87	38.61	3.92	10.52	20.92	35.35
MF (50 kg N/fed.) + FSC	4.30	12.10	5.93	22.32	4.14	11.29	5.17	21.85
MF (50 kg N/fed.) + SCD	4.93	12.92	6.46	24.43	4.41	11.85	6.14	22.39
CCM (50 kg N/fed.) + FSC	2.65	10.20	14.39	27.24	2.49	9.38	13.98	26.34
CCM (50 kg N/fed.) + SCD	2.91	11.04	15.59	29.54	2.64	9.86	15.24	27.74
L.S.D	0.19	0.19	0.17	0.30	0.25	0.18	0.17	1.95
Potassium levels								
24 kg/fed.	4.23	12.24	12.41	28.92	3.98	11.20	11.55	27.10
48 kg/fed.	4.25	12.20	12.49	28.95	3.91	11.12	11.66	26.90
F test	—	—	—	—	—	—	—	—
N. fertilizer * K levels								
MF (100 kg N/fed.) + 24 kg/fed.	6.53	15.48	9.44	31.45	6.10	14.10	8.12	28.32
MF (100 kg N/fed.) + 48 kg/fed.	6.51	15.41	9.53	31.50	6.04	14.04	8.23	28.31
CCM (100 kg N/fed.) + 24 kg/fed.	4.15	11.64	22.81	38.60	3.96	10.55	20.88	35.39
CCM (100 kg N/fed.) + 48 kg/fed.	4.10	11.60	22.92	38.62	3.87	10.48	20.96	35.31
MF (50 kg N/fed.) + FSC +24 kg/fed.	4.30	12.10	5.91	22.31	4.17	11.32	5.13	21.87
MF (50 kg N/fed.) + FSC +48 kg/fed.	4.30	12.09	5.94	22.33	4.11	11.25	5.21	21.82
MF (50 kg N/fed.) + SCD +24 kg/fed.	4.83	12.93	6.40	24.41	4.44	11.89	6.08	22.41
MF (50 kg N/fed.) + SCD +48 kg/fed.	5.03	12.90	6.51	24.44	4.37	11.81	6.19	22.37
CCM (50 kg N/fed.) + FSC +24 kg/fed.	2.66	10.21	14.35	27.22	2.51	9.42	13.9	26.83
CCM (50 kg N/fed.) + FSC +48 kg/fed.	2.64	10.18	14.43	27.26	2.47	9.33	14.05	25.85
CCM (50 kg N/fed.) + SCD +24 kg/fed.	2.93	11.05	15.55	29.53	2.68	9.91	15.17	27.76
CCM (50 kg N/fed.) + SCD +48 kg/fed.	2.89	11.03	15.62	29.54	2.60	9.80	15.31	27.71
L.S.D	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

From the aforementioned results, it could be concluded that the concentration of nitrite, nitrate, ammonium and total nitrogen in soil after harvest gave the opposite trend of the yield and its components results as well as macronutrients in wheat grain and straw yield. Consequently, recycling of organic wastes and chicken manure can be effectively used by composting to increase the available soil macro and micro nutrients progressively thus, enabling the manure to release the nutrients steadily and make it available to the plants for a longer period of time without much loss. Also, data reveal that possibility of soaking of compost (Tea compost) to in injection with drip irrigation or foliar application to improve the efficiency of fertilization and decreased the hazard of chemical fertilizers.

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تأثير التسميد بالنيتروجين العضوى و غير العضوى ومعدلات البوتاسيوم على نبات القمح المنزرع فى الاراضى حديثة الاستصلاح

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أقيمت تجربتان حقليتان فى محطة البحوث الزراعية بالعريش التابعة لمركز البحوث الزراعية- محافظة شمال سيناء.خلال الموسمين الشتويين 2006 /2007 و 2007 /2008 بهدف دراسة تأثير التسميد الازوتى العضوى والمعدنى وكذلك معدلات البوتاسيوم (24 – 48 كجم بو $_2$ أ / فدان) على مكونات المحصول ومحصولى الحبوب والقش و التركيب الكيميائي لنبات القمح النامي فى الاراضى الجيرية

وكانت أهم النتائج كما يلى :-

1- عموما وفى معظم الحالات كانت معاملة كمبوست سماد الدواجن مع إضافة منقوع الكمبوست في مياه الري (ري بالتنقيط) أو الرش بمنقوع الكمبوست على نبات القمح قد أعطى تفوقا معنويا لكل الصفات المدروسة في هذه الدراسة في كلا الموسمين. ومن ناحية أخرى فقد سجلت أقل القيم معنويا عند استخدام السماد المعدني منفردا في كلا الموسمين.

2- إن المعدل العالي من البوتاسيوم قد أعطى تفوقا معنويا ملحوظا لقيمة ارتفاع النبات في الموسم الأول ومحصولي الحبوب والقش وكذلك النسبة المئوية للنيتروجين فى الحبوب فى كلا الموسمين بالإضافة إلى النسبة المئوية للبوتاسيوم والفوسفور فى الحبوب والقش فى الموسم الثاني، هذا مقارنة بالمعدل الأقل من البوتاسيوم.

3- فى معظم الحالات لم يكن للتفاعل بين التسميد العضوي والمعدني بالنيتروجين معنويا وكذلك معدلات البوتاسيوم أي تأثير معنوي على كل الصفات المدروسة فى هذا البحث فى كلا الموسمين.

4- اما بالنسبة لصور النيتروجين(نيتريت ونترات وامونيوم) فى التربة بعد الزراعة وكذلك النيتريت والنترات فى الحبوب والقش فقد أعطت النتائج اتجاها معاكسا لما جاء فى الصفات السابقة (المحصول ومكوناته والنسبة المئوية للعناصر الكبرى فى النبات) حيث أعطى التسميد المعدني منفردا أعلى القيم معنويا فى معظم الحالات. فى حين سجلت أقل القيم عند استخدام معاملة كمبوست سماد الدواجن مع إضافة منقوع الكمبوست في مياه الري (ري بالتنقيط) أو الرش بمنقوع الكمبوست على نبات القمح.