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RESPONSE OF WHEAT GROWN IN NEWLY ECLAIMED SANDY SOIL TO POULTRY MANURE AND NITROGEN FERTILIZATION

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ABSTRACT

A field experiment was conducted at the experimental Farm of Minia University in newly reclaimed sandy soil during 2000/ 2001 and 2001/ 2002 seasons. This study aimed to investigate the effect of poultry manure (0.3 and 6 ton/ fed. and untreated), N- fertilization levels (0, 40, 60, 80, and 100 kg N/fed.) and their interaction on grain yield, yield components and N P K nutrients uptake of wheat (Sakha 69 cv.).

The obtained results indicated that plant height, spike length, number of spikes/ m^2, number of grains/spike, 1000- kernel weight, grain and straw yields/fed. as well as N P K nutrients uptake were significantly increased with applying poultry manure, reaching their maximum with applying 6 ton/ fed. poultry manure in both seasons.

Increasing N fertilization levels increased significantly above- mentioned traits. Application of 100 kg N/ fed. gave the highest values of all studied characters in the two growing seasons.

The maximum grain yield, yield components and N P K uptake were achieved with application poultry manure at the rate of 6 ton/ fed. associated with 100 kg N/ fed. under newly reclaimed sandy soil.

INTRODUCTION

It is well known that(Triticum aestivum, L.) is one of the most important major cereal crops all over the world. In Egypt, it is used as stable food grain for urban, rural and beduin societies and as a major source of straw for animal feeding. The total national wheat production reached 6.3 million tons which represents more than 55% of staff sufficient for local needs (Gomaa, 1992). Increasing production per unit area appears to be one of the important factors for narrowing the wheat production gap. Recently, newly reclaimed desert land proved to be more promising in wheat production by using classical and modern techniques for higher yielding ability under such environments.

It is quite known that N- fertilization greatly affects wheat crop production. Even though, results of many research work in Egypt stressed that the optimum N- fertilization level for wheat, vary widely in amounts ranged between 80 up to 160 kg N/fed. (El- Ghareib & El- Monoufi, 1988 and Fayed, 1992). Moreover, results of some investigations showed that wheat cultivars differed in their response to N- fertilization levels (Bassiouny, 1993 ; Abdel- Gawad *et al.* 1994; Aly & El- Bana, 1994; Moselhy, 1995 and Abdul Galil, *et al.* 1997). Sandy soils represent the main part of the desert in Egypt. As they are infertile and low in water retention, they require the addition of organic manure. Maintaining or improving soil organic matter has high priority

in the agricultural practice of its beneficial effects on soil physical, chemical and biological properties (Mekail, 1998 and 2000-1). The role of organic manure is very important for plant growth and yield as it is a source of nutrients (Mowafy, 2002 and Hassan & Mohey El- Din, 2002). Modest improvements in the nitrogen availability in organic manures could result in a major cost saving for the farmer by reducing the requirement for in organic nitrogen fertilizers, and reduce the risk of environmental pollution (Nicholson *et al.*, 1999).

The main objectives of the present work were to study the effect of application of poultry manure and nitrogen fertilization levels on yield, yield components and some nutrients uptake of wheat.

MATERIALS AND METHODS

Field experiments were carried out in newly reclaimed sandy soil at the Experimental Research Center of Minia University during 2000 and 2001 seasons, to study the effect of three rates of poultry manure (3, 6 ton/ fed. and untreated treatment) and five levels of nitrogen (0, 40, 60, 80 and 100 kg N/ fed.).

A split- plot design with four replicates was used. The three rate of poultry manure were assigned to the main- plots, while the five levels of nitrogen fertilizer distributed randomly in the sub- plots. The sub-plot consisted of 20 rows, 3.5m in long and 15 cm apart (plot area = 3.5 x 3 = 10.5m^2). The main plots were treated with poultry manure, 15 days prior wheat sowing and irrigated twice during this period. By the end of this period, each main plot was divided into five sub-plot.

Each of the studied N- level added in four equal doses at sowing, tillering, elongation and booting stages. Irrigation was scheduled at 10 days intervals. Calcium super phosphate (15.5% P_2O_5) at the rate of 200 kg/fed. and potassium sulphate (48% K_2O) at the rate of 100 kg/fed. were added in three equal doses at sowing, tillering and elongation stages, in respective order. Sowing was done on November 15th in the two seasons. Grains were drilled using drill hand machine, at rate of 60 kg/fed.

Other cultural practices were applied as recommended for wheat in such areas .

At harvest, ten guarded plants were randomly taken from the inner rows of each sub-plot to determine plant height (cm), spike length (cm) and number of grains/ spike. One m^2 from the middle rows of each sub-plot was harvested to determine number of spikes/ m^2, 1000-kernel weight, grain and straw yields/ fed. The uptake of N, P and K nutrients was computed on the basis of grains plus straw (biological yield). Soil and Poultry manure analysis according to Black (1980) & Chapman and Pratt (1961), respectively are given in Table (1).

Data collected in each season were subjected to statistical analysis according to the methods outlined by Steel and Torrie (1980). The comparison among treatment means were done using LSD at 5% level of probability.

Table (1): Some analytical data of the tested soil and poultry manure.

Traits	Soil	Poultry manure
Texture grade	Sandy	--------
PH (1 : 2.5)	8.09	7.19
E.C (ds/m)	0.35	11.60
Organic matter (%)	0.512	50.20
$CaCO_3$	5.70	--------
Total N(%)	0.040	1.8
Available P (mg/ kg)	8.0	0.17
Available K (m/ 100g)	0.18	3.40

RESULTS AND DISCUSSION

(A) Plant height and spike length :

Results presented in tables(2 and 3) illustrated the response of plant height and spike length to the addition of poultry manure, nitrogen fertilization and their interaction in both seasons.

Table (2): Effect of poultry manure, nitrogen fertilization and their interaction on yield and yield components of wheat in 2000/ 2001 season.

Treatments		Plant height, cm	Spike length, cm	No. of spikes/m 2	No. of grains/ spike	1000-Kernel weight gm	Grain yield ard./ fed.	Straw yield, ton/ fed.
Poultry manure ton/fed. (A)	N levels kg/fed. (B)							
0	0	58	7.5	120	30.0	31.0	3.15	0.45
0	40	69	7.7	138	37.0	33.5	4.80	0.73
0	60	76	8.0	143	38.1	35.3	5.35	0.81
0	80	80	8.2	149	39.6	37.4	6.21	0.94
0	100	85	8.3	161	41.3	39.6	7.37	1.12
Mean		73.6	7.94	142.2	37.2	35.36	5.38	0.81
3	0	86	8.8	169	40.6	39.6	7.67	1.15
3	40	92	8.9	176	41.0	43.1	8.69	1.29
3	60	97	9.0	187	42.0	46.1	10.15	1.54
3	80	99	9.2	192	44.1	48.0	11.73	1.71
3	100	103	9.3	195	44.3	49.3	11.95	1.83
Mean		95.4	9.04	183.8	42.4	45.22	10.04	1.50
6	0	95	9.8	176	42.3	44.3	9.25	1.41
6	40	100	9.9	193	44.5	48.4	11.65	1.72
6	60	103	10.2	200	44.9	50.7	12.75	1.92
6	80	109	10.5	205	45.7	53.1	13.91	2.13
6	100	113	10.8	209	46.8	54.3	14.84	2.23
Mean		104.0	10.24	196.6	44.8	50.16	12.48	1.88
Over all mean of B	0	79.67	8.70	155.0	37.6	38.3	6.69	1.00
	40	87.0	8.83	165.0	40.8	41.67	8.38	1.25
	60	92.0	9.07	176.7	41.7	44.03	9.42	1.42
	80	96.0	9.30	182.0	43.1	46.17	10.62	1.59
	100	100 33	9.47	188.3	44.1	47.73	11.39	1.73
L.S D 0.05 for	A	3.1	0.11	2.00	0.12	0.27	0.21	0.18
	B	4 3	0.13	3.40	0.15	0 35	0.28	0.20
	A x B	6.4	0 21	5.21	0.38	0.59	0.51	0.35

Table (3): Effect of poultry manure, nitrogen fertilization and their interaction on yield and yield components of wheat in 2001/ 2002 season.

Treatments		Plant height, cm	Spike length, cm	No. of spikes/m 2	No. of grains/ spike	1000-Kernel weight gm	Grain yield ard./ fed.	Straw yield, ton/ fed.
Poultry manure ton/fed.	N levels kg/fed.							
0	0	55	7.3	119	31.0	30.0	3.11	0.49
0	40	65	7.6	137	37.9	33.2	4.89	0.27
0	60	72	7.6	140	38.0	35.0	5.15	0.80
0	80	79	8.1	150	40.0	38.1	6.39	0.96
0	100	83	8.3	162	41.4	39.9	7.50	1.14
Mean		70.8	7.78	141.8	37.66	35.24	5.41	0.822
3	0	84	8.6	171	40.8	39.8	7.77	1.17
3	40	86	8.8	177	41.5	43.3	8.90	1.33
3	60	93	8.9	186	42.1	45.5	10.0	1.51
3	80	98	9.1	192	44.6	48.5	11.63	1.72
3	100	100	9.2	196	44.8	49.5	12.20	1.87
Mean		92.2	8.92	184.4	42.76	45.32	10.10	1.52
6	0	94	9.6	174	42.0	44.0	9.01	1.39
6	40	98	9.8	195	44.3	49.0	11.83	1.80
6	60	101	10.2	203	45.1	50.9	13.05	1.97
6	80	106	10.4	206	46.1	52.7	14.00	2.11
6	100	110	10.7	211	46.6	54.4	14.95	2.27
Mean		101.8	10.14	197.8	44.82	50.20	12.57	1.908
Over all mean of B	0	77.67	8.50	154.67	37.93	37.93	6.63	1.02
	40	83.0	8.73	169.67	41.23	41.83	8.54	1.28
	60	88.67	8.90	176.33	41.73	43.80	9.40	1.43
	80	94.33	9.20	182.67	43.57	46.43	10.67	1.60
	100	97.67	9.40	189.67	44.27	47.93	11.55	1.76
L.S.D 0.05 for	A	3.0	0.11	2.10	0.14	0.25	0.23	0.19
	B	4.2	0.13	3.50	0.18	0.36	0.29	0.21
	A x B	6.2	0.22	5.28	0.41	0.61	0.55	0.37

Application of poultry manure increased significantly plant height and spike length, reaching the its maximum with applying 6 ton/fed. in both seasons. These results are confermed by Atalla, 1996 and Yakout *et al*, 1998 who found that plant height and spike length was increased due to addition farmyard manure in sandy soil conditions.

Tables (2 and 3) show the effect of N- fertilization on plant height and spike length in the two growing seasons. The increase of N level up to 100 kg N/ fed. resulted in significant increases in plant height and spike length. The soil of the experimental field is sandy and has low content of organic matter (0.51%) and N (0.04%), there by it suffers from poor fertility level. Similar results were obtaind by El- Karamity and Salem (1993); Abdul Galil *et al.* (1997), Attallah and El- Karamity (1997) and Yakout *et al.*, (1998).

Concerning plant height and spike length as affected by poultry manure application associated with nitrogen fertilizer, it could be concluded that application 6 ton poultry manure with 100 kg N/fed. gave maximum plant height and spike length in both seasons.

(B) Grain yield and yield components:

Results presented in tables (2 and 3) show the responses of number of spikes /m^2, number of grains/ spike, 1000- kernel weight, grain and straw yields/ fed. to addition of poultry manure and nitrogen fertilization levels.

Application of the poultry manure increased significantly number of spikes/m^2, number of grains/ spike, 1000- kernel weight, grain and straw yields, reaching their maximum with adding 6 ton /fed. in both seasons.

The increases in grain yield are mainly due to the increases in spike length, number of spikes/ m^2, number of grains/ spike and 1000-kernel weight (Tables 2 and 3). However, the increases in yield components of wheat due to poultry manure may be attributed to the favourable impact of poultry manure on soil hydrophysical, physico- chemical and nutritional properties of the treated soils. These results are in agreement with those obtained by Radwan and Hussein, (1996) Yakout *et al.*, (1998) and Hassan & Mohey El-Din (2002).

Data recorded in tables (2 and 3) show that number of spikes/ m^2, number of grains/ spike, 1000-kernel weight, grain and straw yields/ fed. were significantly increased with increasing rates of N fertilization up to 100 kg/fed. in both seasons. Grain yield was increased from 6.69 to 11.39 and 6.63 to 11.55 ardab/fed. in the first and second seasons, respectively, due to increasing nitrogen levels from zero to 100 kg N/ fed. while, straw yield was increased from 1.00 to 1.73 and 1.02 to 1.67 ton/ fed. These results reflecting the role of addition N up to 100 kg/ fed. in increasing photosynthetic area of wheat without harmful shading effect in sandy soil which have lower N-content.

Under sandy soil conditions, El- Karamity and Salem (1993); El-Bana and Aly (1993 ؛(Abdul Galil ،*et al.*, (1997), Atta Allah and El- Karamity (1997) and Yakout et al., (1998) found that grain yield was increased due to the addition of nitrogen at rate between 90 and 100 kg N/ fed.

As shown in tables (2 and 3) all studied data also, indicated that grain and straw traits were significantly affected by the interaction between poultry manure application and nitrogen fertilization levels in both seasons. The highest values for their traits were recorded for plots received 6 ton/ fed. poultry manure and 100 kg N/ fed. So, addition of 6 ton/ fed. poultry manure with 100 kg N/ fed. to wheat in sandy soil is highly recommended for maximizing the productivity of such crop.

(C) Nutrients uptake:

Data in table (4) reveal that N, P and K uptake by wheat plants as affected by poultry manure, N fertilization levels and their interactions in both seasons.

N, P and K-uptake:

It is shown in table (4) that N, P and K-uptake in biological yield of wheat were significantly increased with increasing rates of poultry manure from zero to 6 ton/fed. The greatest N, P and K- uptake occurred in plants receiving the highest rate of poultry manure under sandy soil conditions.

This result may be due to the adequate supplying of nitrogen from poultry manure decomposition as well as symbolic nitrogen fixation, increase soil microbial population and available phosphorus immobilization. Such a trend could be attributed to the function of the poultry manure in reducing the bonding strength for potassium and the exchangeable potassium level, which moved to the roots, tends to increase as a result of root interception, mass flow of nutrients by movement of soil moisture and diffusion of the nutrients to root surface.

Table (4): Some nutrients uptake by biological yield of wheat as affected by poultry manure, nitrogen fertilization and their interaction in 2000/ 2001 and 2001/2002 seasons.

Treatments		Nutrients uptake, kg/ fed.					
Poultry manure ton/fed.	N levels kg/fed.	N		P_2O_5		K_2O	
		2000/2001	2001/ 2002	2000/2001	2001/ 2002	2000/2001	2001/ 2002
0	0	13.10	12.7	2.95	2.83	10.35	10.15
0	40	19.3	19.1	4.81	4.65	18.95	18.50
0	60	21.6	21.0	5.25	5.10	22.19	21.90
0	80	25.1	26.1	6.38	6.26	27.30	28.41
0	100	29.4	30.2	7.03	7.01	33.10	34.50
Mean		21.70	21.82	5.28	5.17	22.38	22.69
3	0	30.4	31.1	9.15	9.01	37.40	38.00
3	40	34.5	35.5	10.13	10.50	41.31	42.25
3	60	41.0	40.7	12.95	12.51	44.90	45.05
3	80	45.8	46.1	13.81	13.99	49.20	51.00
3	100	48.5	49.6	15.25	16.00	53.15	54.20
Mean		40.04	40.60	12.26	12.40	45.19	46.10
6	0	37.2	36.7	12.31	12.0	40.95	40.13
6	40	45.8	47.1	15.92	16.31	48.30	51.35
6	60	50.9	52.0	17.30	17.95	55.10	57.31
6	80	56.1	56.0	19.15	19.20	61.75	60.75
6	100	59.5	60.1	20.45	21.00	64.90	65.95
Mean		49.9	50.38	17.03	17.29	54.20	55.10
Over all mean of B	0	26.90	26.83	8.14	7.95	29.57	29.43
	40	33.20	33.90	10.29	10.49	31.78	37.37
	60	37.83	37.90	11.83	11.85	40.73	41.42
	80	42.33	42.73	13.11	13.15	46.08	46.72
	100	45.80	46.63	14.24	14.67	50.38	51.55
L.S.D 0.05 for	A	1.60	1.8	1.10	1.25	2.01	2.11
	B	2.00	2.2	1.18	1.19	2.30	2.40
	A x B	5.10	6.7	1.60	1.69	6.15	6.85

Data also indicated that N, P and K- uptake was significantly increased with increasing rate of N- fertilization up to 100 kg/ fed. N, P and K- uptake were increased from 26.90 to 45.80 and 26.83 to 46.63; 8.14 to 14.24 and 7.95 to 14.67; 29.57 to 50.38 and 29.43 to 51.55 kg/ fed. with increasing N- fertilization rates from zero to 100 kg/fed. in the first and second, seasons , for the same allowed order.

Application of poultry manure associated with N- fertilizer resulted in an increase in N, P and K- uptake. The greatest N- uptake was obtained with applying 6 ton/ fed. poultry manure and 100 kg N/ fed.

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استجابة نباتات القمح النامية في الأراضي الرملية حديثة الاستصلاح لإضافة سماد الدواجن والتسميد الآزوتي

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***قسم المحاصيل- كلية الزراعة – جامعة المنيا**

****معهد بحوث الأراضي والبيئة- مركز البحوث الزراعية – الجيزة**

أجريت هذه الدراسة بمزرعة جامعة المنيا في الأراضي الرملية حديثة الاستصلاح خلال موسمي ٢٠٠٠/٢٠٠١ و ٢٠٠١/٢٠٠٢ . ويهدف البحث لدراسة تأثير ثلاث معاملات من سماد الدواجن (بدون إضافة ، ٣ ، ٦ ، طن/ فدان) وخمس معدلات من التسميد الأزوتي (صفر ، ٤٠ ، ٦٠ ، ٨٠ ، ١٠٠ كجم/فدان) على محصول الحبوب ومكوناته وكمية العناصر الممتصة (نتروجين – فوسفور – بوتاسيوم) في نباتات القمح صنف سخا ٦٩ وكانت أهم النتائج هي :

١-إضافة سماد الدواجن إلى زيادة معنوية في طول النبات وطول السنبلة وعدد السنابل في المتر المربع وعدد حبوب السنبلة ووزن ١٠٠ حبة ومحصول الحبوب والقش وكمية العناصر الممتصة (ن ، فو٢أ٥ ، بو٢أ) ووصلت هذه الصفات الحد الأقصى لها بإضافة ٦ طن/ فدان في موسمي النمو .

٢-زادت الصفات السابقة الذكر زيادة معنوية بزيادة معدلات التسميد الأزوتي وأعطى التسميد بمعدل ١٠٠كجم نتروجين/فدان أعلى قيم للصفات تحت الدراسة في موسمي النمو وأمكن الحصول على أعلى القيم للمحصول ومكوناته وكمية العناصر الممتصة (ن ، فو٢أ٥ ، بو٢أ) بإضافة سماد الدواجن بمعدل ٦طن/ فدان مع السماد الأزوتي بمعدل ١٠٠ كجم نتروجين/فدان تحت ظروف الأراضي الرملية الحديثة الاستصلاح .