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EFFECT OF ORGANIC FERTILIZERS AS SUBSTITUTIONS OF MINERAL NITROGEN FERTILIZER APPLIED AT PLANTING ON YIELD AND QUALITY OF WHEAT

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ABSTRACT: *Two field experiments in a split plot design were carried out at Shandaweel Agricultural Research Station during two successive growing seasons, 2001/2002 and 2002/2003. The study aimed to investigate the productivity of two wheat cultivars (Giza 160 and Giza 165) as affected by organic fertilizers as substitutions of all or part of the mineral nitrogen fertilizer dose at planting compared to the mineral nitrogen fertilizer. The fertilizer treatments at planting were; (1) 23kg N/fed as mineral fertilizer. (2) Adding 30m^3/fed of FYM only. (3) Adding 10m^3/fed of chicken manure only. (4) Adding 15m^3/fed FYM combined with 11.5 kg N/fed chemical fertilizer. (5) Adding 5m^3/fed chicken manure combined with 11.5 kg N/fed chemical fertilizer. The obtained results can be summarized as follows:*

- The differences between Giza 160 and Giza 165 were insignificant for number of spikes/m^2 and grain and straw yields per fad as well as protein %, N %, N-uptake, K%, K-uptake, P% and P-uptake in grains, while Giza 165 was significantly higher than Giza 160 for 1000-grain weight and harvest index.

- Addition of 30 m^3/fed FYM produced the highest values of number of spikes/m^2, 1000-grain weight, grain and straw yields/fad.

- Adding the mineral nitrogen fertilizer (only 23 kg N/fed) increases harvest index compared to that obtained by different organic manures at any dose at planting.

- Addition of 10 m^3/fed chicken manure at planting gave the highest levels of N, P and K percentages in grains and protein % in grains, as well as N, P and K uptake in grains/fed.

In conclusion, addition of 30 m^3/fed FYM can be used as a substitution of all the dose of mineral N dose (23 kg N/fed) at planting to obtained the high grain yield/fed and quality of wheat.

Key words: *Wheat, Nitrogen and organic fertilizers, varieties, yield chemical composition.*

INTRODUCTION

Wheat is one of the most important cereal crops since, it consider the main food in the Egyptian diet. Wheat is normally fertilized with mineral

fertilizers, which may have hazardous effect on the environment and may induce poor quality. Adaptation and developing a fertilizers management that minimized these adverse effects has a renewed the interest in using of organic manure to supply part or all of plant nutrients need of subsequent crops (Saleh and Abd EL-Fattah, 1997). Organic manures serve two purposes in soil, it supply both macro and micro nutrients for plant and microorganisms. It also improve the soil physical condition (Cook, 1980; Abd EL-Nasser and Hussein, 2001 and Mowafy, 2002).

EL-Sherbieny *et al* (1991) found that the residual effect of organic manures led to highly significant increase in N uptake by barley plants. Whalen *et al* (2000) and Abd EL-Nasser and Hussein (2001) concluded that application of the organic manures to the soil increased the available soil nutrients, i.e. N, P, K, Ca, Mg, Fe, Mn, Cu and Zn. Hassan and Mohy EL-Din (2002) reported that N, P and K uptake by grains of wheat was increased due to the application of organic manures.

The present study was designed to evaluate the application of farm yard manure (FAM) and chicken manure as substation of mineral N doses to wheat crop.

MATERIALS AND METHODS

Two field experiments were carried out at Shandaweel Agricultural Research Station, Sohag Governorate during 2001/2002 and 2002/2003 growing seasons. The main objective of this study was to evaluate the application of farm yard manure (FYM) and chicken manure as a substitution of all or part of mineral N fertilizer at planting for two wheat varieties.

Soil characterization for the two experiment sites during 2001/2002 and 2002/2003 seasons are listed in Table 1.

Table 1: Soil characterization of the experimental sites.

Analysis / Seasons	Texture	pH 1:2.5	O.M %	Available nutrients (ppm)		
				N	P	K
2001/2002	Clay loam	7.9	1.3	17.0	14.0	20.2
2002/2003	Clay loam	7.8	1.2	18.0	14.0	22.1

The experiment was designed in split plot design with four replications. The main plots were occupied by wheat cultivars (Giza 160 and Giza 165), while the mineral nitrogen fertilizer as ammonium nitrate 33.5% N, farm yard manure and chicken manure were distributed in the sub plots. The fertilizer treatments were as follows :

Fert. Treatments	Fertilizers at planting			Mineral fertilizer after planting (kg N/fed)	
	Mineral fertilizer (kg N/fed	FYM (m^3/fed)	Chicken manure (m^3/fed)	At 1st irrigation	At 2nd irrigation
1	23	-	-	23	23
2	-	30	-	23	23
3	-	-	10	23	23
4	11.5	15	-	23	23
5	11.5	-	5	23	23

The chemical composition of farm yard manure (FYM) and chicken manure are presented in Table 2.

Table 2: Chemical composition of the organic manures.

Organic manures	pH 1:2.5	O.M %	C %	N %	C:N ratio	P %	K %
Farm yard manure	7.73	20.02	11.61	0.49	23.69:1	0.24	1.10
Chicken manure	7.20	49.65	28.80	1.47	19.59:1	0.68	1.95

Organic matter was calculated by multiplying the organic carbon values by 1.724. The C/N ratios were calculated from the carbon and nitrogen data of the organic manures.

Phosphorous fertilizer (15 kg P_2O_5/fed) as calcium super-phosphate (15% P_2O_5) was added with land preparation. Potassium fertilizer 24 kg K_2O/fed was added as potassium sulphate (48% K_2O) before the 1st irrigation.

The plot size was 1/400 feddan. Grains were broadcasted on the 7th and 10th November 2001 and 2002 seasons, respectively using 60 kg grains/fed.

At the time of harvesting, the following characteristics were estimated:

1- Number of spikes/m^2.
2- 1000-grain weight (g).
3- Grain yield (ard./fed), Ardab = 150 kg.
4- Straw yield (ton/fed).
5- Harvest index.
6- Protein % in grains.
7- N % in grains.
8- N-uptake in grains (kg/fed).
9- K % in grains.
10- K- uptake in grains (kg/fed).
11- P % in grains.
12- P- uptake in grains (kg/fed).

Total nitrogen percentage was determined using micro-kjeldahl method, as described by A.O.A.C (1985). Phosphorus was determined colorimetrically using Spectrophotometer according to Zinzade (1935). Potassium was determined using the Flamephotometer according to Herrmann and Alkemade (1963)

Protein content in grains was calculated by multiply N content by 5.75 according to Tkachuk (1966).

The data were subjected to statistical analysis and main comparison was carried out using L.S.D 5% according to Snedecor and Cochran, 1967.

RESULTS AND DISCUSSION

1- Number of spikes/m^2:

Table (3) includes the data of number of spikes/m^2 which clearly shows insignificant differences between the two tested cultivars. Adding 30 m^3 farm yard manure (FYM) at planting produced the highest number of spikes/m^2, i.e. 365 and 378.3 in 2001/2002 and 2002/2003 seasons, respectively. The differences between this treatment and the other treatments were significant. Fertilizing Giza 165 cultivar in the first season and Giza 160 cultivar in second one with 30 m^3 FYM produced the highest and significant number of spikes/m^2. This may be attributed to the effect of organic fertilizers which supply the crop with suitable rates of NPK and in proper time (Mohamed and Gamie, 1999).

2- 1000-grain weight (g):

As shown in Table (3), the highest 1000-grain weight was obtained by adding 30 m^3/fed FYM followed by adding 23 kg N/fed of mineral fertilizer at planting. The lowest weight of 1000-grain was found by adding chicken manure at a rate of 10 m^3/fed. Generally, Giza 165 cultivar gave 1000-grain weight higher than that of Giza 160 cultivar especially when it was fertilized with 30 m^3 FYM at planting. This may attributed to the importance of FYM supplying with the available macro and micronutrients in suitable rates at the time of grain filling. Mengel (1980) and Abd EL-Gawad *et al* (1994) reported that suitable rates of nutrients increase sugar and starch synthesis, carbohydrate and protein translocation and assist well grain filling.

3- Grain yield (ard/fed) and straw yield (ton/fed):

As it could be seen from Table (4), Adding fertilizers at different sources at planting was affected significantly grain yield. Adding 30m^3 FYM at planting only produced the highest grain yield (19.95 and 21.48 ard/fed) during 2001/2002 and 2002/2003 seasons, respectively. However, fertilizing with 23 kg N/fed as a mineral fertilizer at planting produced the lowest yield. Increases in grain yield/fed were amounted by 5.06 and 18.22% more than those obtained by mineral N-fertilizer during 2001/2002 and 2002/2003 seasons, respectively. The effect of both wheat cultivars and the interaction between fertilizers and cultivars were insignificant.

As shown in Table (4), straw yield (ton/fed) had the same trend of grain yield where it was affected significantly by adding organic or inorganic fertilizers. Adding 30 m^3/fed FYM produced the highest straw yield (5.82 and 6.46 ton/fed) during the first and second seasons, respectively, compared to the other treatments. The increases in straw yield/fed by adding FYM were amounted to 16% and 31% more than that obtained by mineral nitrogen fertilizer during first and second seasons, respectively.

Table (3): Effect of mineral nitrogen and organic fertilizers at planting, on number of spikes/m^2 and 1000-grain weight of wheat during 2001/2002 and 2002/2003 seasons.

Fertilizers at planting			Number of spikes / m^2						1000-grain weight (g)					
			2001/2002			2002/2003			2001/2002			2002/2003		
Mineral-N (kg/fed)	FYM (m^3/fed)	Chicken manure (m^3/fed)	Cultivars						Cultivars					
			Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean
23	--	--	354.5	335.0	344.8	367.0	327.0	347.0	41.92	43.41	42.67	40.13	41.83	40.98
--	30	--	343.0	387.0	365.0	380.5	376.0	378.3	41.85	45.36	43.61	40.48	41.99	41.24
--	--	10	364.0	330.0	347.0	341.0	331.0	336.0	40.28	41.17	40.73	38.00	37.47	37.74
11.5	15	--	349.0	342.0	345.5	335.0	343.0	339.0	41.07	43.70	42.39	40.17	41.15	40.66
11.5	--	5	353.0	342.0	347.5	360.0	350.0	355.0	41.22	41.76	41.49	37.86	38.62	38.24
Mean			352.7	347.2	350.0	356.7	345.4	351.2	41.27	43.08	42.18	39.33	40.21	39.77
L.S.D 5% level		Var.		N.S			N.S			1.56			0.85	
		Fert.		9.9			13.58			1.10			0.92	
		V x F		14.0			19.21			N.S			N.S	

Table (4): Effect of mineral nitrogen and organic fertilizers at planting, on grain yield (ard/fed) and straw yield (ton/fed) of wheat during 2001/2002 and 2002/2003 seasons.

Fertilizers at planting			Grain yield (ard/fed)						Straw yield (ton/fed)					
			2001/2002			2002/2003			2001/2002			2002/2003		
Mineral-N (kg/fed)	FYM (m^3/fed)	Chicken manure (m^3/fed)	Cultivars			Cultivars			Cultivars			Cultivars		
			Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean
23	--	--	18.93	19.05	18.99	18.30	18.03	18.17	5.26	4.74	5.00	5.19	4.66	4.93
--	30	--	19.78	20.12	19.95	21.24	21.71	21.48	5.88	5.75	5.82	6.42	6.50	6.46
--	--	10	19.37	19.78	19.58	20.88	21.34	21.11	5.64	5.51	5.58	5.95	6.24	6.10
11.5	15	--	19.21	19.46	19.33	19.92	20.28	20.10	4.88	5.19	5.04	5.84	5.35	5.60
11.5	--	5	19.20	19.71	19.45	20.88	20.28	20.58	4.92	5.02	4.97	6.08	5.51	5.80
Mean			19.30	19.62	19.46	20.24	20.33	20.29	5.32	5.24	5.28	5.89	5.65	5.78
L.S.D 5% level	Var.			N.S			N.S			N.S			N.S	
	Fert.			0.60			1.05			0.50			0.56	
	V x F			N.S			N.S			N.S			N.S	

The effect of organic manure on the increasing of both grain and straw yields might be attributed to its beneficial effects on soil physical, chemical and biological properties (Herron and Erhart, 1965; and Rosmussen and Rhode, 1988). In this concern, Whalen *et al* (2000) and Abd EL-Nasser and Hussein (2001) concluded that application of the organic manures to the soil increased the available soil nutrients such as N, P, K, Ca, Mg, Fe, Mn, Cu and Zn. Also, Mowafy (2002) noted that the role of organic manure is very important as a source of nutrients for plant growth and yield of wheat.

4- Harvest index % :

Table (5) showed that harvest index had higher and significant values when adding all nitrogen mineral fertilizer level (23 kg N/fed) then adding 30 m^3 or 10 m^3 of FYM and chicken manure fertilizer separately, during the two seasons. These results may be due to the effect of organic manure in delaying crop maturing and encourage growth of straw relative to grain production. Schlehuber and Tucker (1967) indicated that organic source of N may have advantage over mineral source of N. At the second season, harvest index for Giza 165 cultivar was significantly higher than those obtained by Giza 160 cultivar.

5- Protein % in grains:

Data in Table (5) showed that the highest value of protein % in grains was significantly obtained by adding 10 m^3 chicken manure at planting as compared with the other tested treatments during both growing seasons. This superiority may be due to the effect of chicken manure on improving soil properties. Fast release of nitrogen during the degradation of this organic manure, increase the soil microflora activity which could in turn encourage fixed-air-nitrogen which can be used by the plant roots through specific manure (Abd EL-Malek, 1971). The highest values of protein % in grain obtained by the application of chicken manure may be due to the highest content of macro and micro nutrients in chicken manure compared to those of FYM.

Neither cultivars nor their interactions with fertilizers (organic or inorganic) had no significant effects on protein percentage in grains.

6- Nitrogen % and nitrogen uptake in grains (kg N/fed):

The data of nitrogen percentage and nitrogen uptake in grains are listed in Table (6). These data indicated that both nitrogen percentage and nitrogen uptake in grains were significantly affected with adding fertilizers. However, the effect of the two tested cultivars (Giza 160 and Giza 165) and their interactions with fertilizers were insignificant.

Table (5): Effect of mineral nitrogen and organic fertilizers at planting, on harvest index (%) and protein (%) in wheat grains during 2001/2002 and 2002/2003 seasons.

Fertilizers at planting			Harvest index (%)						Protein (%)					
			2001/2002			2002/2003			2001/2002			2002/2003		
			Cultivars						Cultivars					
Mineral-N (kg/fed)	FYM (m^3/fed)	Chicken manure (m^3/fed)	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean
23	--	--	35.15	37.63	36.39	34.81	36.76	35.79	14.17	12.17	13.17	14.00	12.19	13.09
--	30	--	33.63	34.73	34.18	33.26	33.52	33.39	13.57	11.27	12.42	12.91	11.87	12.39
--	--	10	34.09	35.10	34.60	34.60	34.04	34.32	13.97	15.16	14.57	14.34	14.30	14.32
11.5	15	--	37.17	35.96	36.57	33.84	36.29	35.07	11.77	11.67	11.72	13.60	12.37	12.27
11.5	--	5	36.93	37.06	37.00	34.17	35.79	34.98	14.17	13.47	13.82	14.23	13.80	14.02
Mean			35.39	36.10	35.75	34.14	35.28	34.71	13.53	1275	13.14	13.81	12.90	13.36
L.S.D 5% level		Var.		N.S			0.63			N.S			N.S	
		Fert.		1.16			1.17			1.58			1.45	
		V x F		1.63			1.65			N.S			N.S	

Table (6): Effect of mineral nitrogen and organic fertilizers at planting, on N (%) and N uptake (kg/fed) in wheat grains during 2001/2002 and 2002/2003 seasons.

Fertilizers at planting			N (%) in grains						N uptake in grains (kg/fed)					
			2001/2002			2002/2003			2001/2002			2002/2003		
			Cultivars			Cultivars			Cultivars			Cultivars		
Mineral-N (kg/fed)	FYM (m^3/fed)	Chicken manure (m^3/fed)	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean
23	--	--	2.49	2.14	2.32	2.46	2.14	2.30	70.66	61.07	65.87	67.12	57.79	62.46
--	30	--	2.38	1.98	2.18	2.27	2.08	2.18	70.60	59.61	65.11	72.23	67.85	70.04
--	--	10	2.45	2.66	2.56	2.52	2.51	2.52	71.21	79.04	75.13	79.16	80.36	79.76
11.5	15	--	2.07	2.05	2.06	2.14	2.17	2.16	59.53	59.86	59.70	63.86	66.28	65.07
11.5	--	5	2.49	2.36	2.43	2.50	2.42	2.46	71.45	69.78	70.62	78.61	73.66	76.14
Mean			2.38	2.24	2.31	2.38	2.26	2.32	68.69	65.87	67.29	72.20	69.19	70.69
L.S.D 5% level	Var.			N.S			N.S			N.S			N.S	
	Fert.			0.28			0.25			8.11			9.46	
	V x F			N.S			N.S			N.S			N.S	

The highest nitrogen percentage in grains were produced by adding 10m^3 chicken manure at planting compared to the other tested treatments in both seasons. The same trend was found in nitrogen uptake in grains where the highest amounts were 75.13 and 79.76 kg N/fed during 2001/2002 and 2002/2003 seasons, respectively. Hassan and Mohey EL-Din (2002) reported that N uptake in grains was increased due to the application of organic manures. Abd EL-Malek (1971) noted that release of nitrogen during the degradation of the organic manure, increased soil microflora activity (Azotobacter as well as Azotspirillium and other microorganism), which could in turn encourage fixed-air-nitrogen used by the plant roots.

7- Phosphorus % and phosphorus uptake (kg N/fed):

Table (7) showed that neither cultivars nor their interaction with fertilizer had any significant effect on P% or P uptake in grains during the two seasons.

Concerning adding organic or inorganic fertilizers, it could showed that adding 15 m^3/fed FYM combined with 11.5 kg N/fed as a mineral fertilizer had the lowest values of P % and P uptake in grains during the two seasons. The differences in both P % and P uptake in grains were only significant between this treatment and other treatments. However, adding 10 m^3/fed chicken manure only at planting gave the highest P % (0.583 and 0.577%) and highest P uptake in grains (17.14 and 18.26 kg N/fed) in the first and second seasons, respectively. This may be due to the ability of wheat plants to absorb P not only as a mineral form but also the part released from the organic matters. Also, the carbon dioxide produced during the decomposition of organic matters had a role in increasing phosphorus availability (Tisdale and Nelson, 1975).

8- Potassium % and potassium uptake (kg N/fed) in grains:

As shown in Table (8), neither cultivars nor their interaction with organic or inorganic fertilizers had significant effect on K % and K uptake in wheat grains.

The addition of FYM or chicken manure only or combined with mineral nitrogen fertilizer at planting gave amounts of K % or K uptake in grains more than that obtained by adding mineral-N-fertilizer only. The highest values of K % in grains (0.767 and 0.745%) and K uptake in grains (22.5 and 23.61 kg N/fed) were obtained by adding 10 m^3/fed chicken manure during the first and second seasons, respectively. The increases in K % and K uptake in wheat grains by adding organic manure may be attributed to the function of the organic manures in reducing the bounding strength of exchangeable potassium. Available K moved to the root by the movement of soil moisture and diffusion of the nutrient to the root surface (Tisdale and Nelson, 1975).

Table (7): Effect of mineral nitrogen and organic fertilizers at planting, on P (%) and P uptake (kg/fed) in wheat grains during 2001/2002 and 2002/2003 seasons.

Fertilizers at planting			P (%) In grains						P uptake in grains (kg/fed)					
Mineral-N (kg/fed)	FYM (m^3/fed)	Chicken manure (m^3/fed)	2001/2002			2002/2003			2001/2002			2002/2003		
			Cultivars			Cultivars			Cultivars			Cultivars		
			Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean
23	--	--	0.575	0.580	0.578	0.580	0.570	0.575	16.40	16.75	16.68	15.93	15.42	15.68
--	30	--	0.548	0.543	0.546	0.530	0.548	0.539	15.98	16.14	16.06	16.89	17.84	17.37
--	--	10	0.575	0.590	0.583	0.595	0.558	0.577	16.86	17.41	17.14	18.64	17.88	18.26
11.5	15	--	0.530	0.495	0.513	0.535	0.525	0.530	15.02	14.48	14.75	15.58	15.66	15.62
11.5	--	5	0.580	0.540	0.560	0.575	0.550	0.563	16.50	16.26	16.38	17.94	16.78	17.36
Mean			0.562	0.550	0.556	0.563	0.550	0.557	16.15	16.21	16.18	17.00	16.70	16.86
L.S.D 5% level		Var.		N.S			N.S			N.S			N.S	
		Fert.		0.043			0.028			1.33			1.24	
		V x F		N.S			N.S			N.S			N.S	

Table (8): Effect of mineral nitrogen and organic fertilizers at planting, on K (%) and K uptake (kg/fed) in wheat grains during 2001/2002 and 2002/2003 seasons.

Fertilizers at planting			K (%) in grains						P uptake in grains (kg/fed)					
Chem-N kg/fed	FYM m^3/fed	Chicken manure m^3/fed	2001/2002			2002/2003			2001/2002			2002/2003		
			Cultivars						Cultivars					
			Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean	Giza 160	Giza 165	Mean
23	--	--	0.625	0.720	0.673	0.688	0.625	0.657	17.75	20.55	19.15	18.82	16.91	17.87
--	30	--	0.720	0.728	0.724	0.685	0.738	0.712	21.38	21.98	21.68	21.82	24.02	22.92
--	--	10	0.765	0.768	0.767	0.750	0.740	0.745	22.22	22.77	22.50	23.50	23.72	23.61
11.5	15	--	0.678	0.688	0.683	0.703	0.665	0.684	19.55	20.07	19.81	21.03	20.14	20.59
11.5	--	5	0.663	0.738	0.701	0.683	0.700	0.692	19.08	21.82	20.45	21.29	21.28	21.29
Mean			0.690	0.728	0.710	0.702	0.694	0.698	20.00	21.44	20.72	21.29	21.21	21.26
L.S.D 5% level		Var.		N.S			N.S			N.S			N.S	
		Fert.		0.038			0.055			1.41			1.83	
		V x F		N.S			N.S			N.S			N.S	

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تأثير الأسمدة العضوية كبدائل للسماد النتروجيني المعدني المضاف عند الزراعة على محصول وجودة القمح

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الملخص العربي:

أقيمت تجربتان حقليتان بمحطة البحوث الزراعية بشندويل خلال موسمي الزراعة ٢٠٠١/٢٠٠٢ & ٢٠٠٢/٢٠٠٣م لدراسة إنتاجية صنفي القمح جيزة ١٦٠، جيزة ١٦٥ تحت ظروف التسميد العضوي كبديل لكل أو جزء من الجرعة المنشطة للسماد النتروجيني المعدني المضافة عند الزراعة. وكانت المعاملات السمادية المضافة عند الزراعة كما يلي:

(١) ٢٣ كجم نتروجين معدني / فدان .

(٢) ٣٠ م٣ / فدان من السماد البلدي .

(٣) ١٠ م٣ / فدان من سماد زرق الطيور .

(٤) ١٥ م٣ / فدان من السماد البلدي + ١١,٥ كجم نتروجين معدني / فدان .

(٥) ٥ م٣ /فدان من سماد زرق الطيور + ١١,٥ كجم نتروجين معدني / فدان .

هذا وقد استخدم تصميم القطع المنشقة في تنفيذ التجربة حيث شغلت الأصناف القطع الرئيسية والمعاملات السمادية القطع الفرعية.

ويمكن إيجاز أهم النتائج المتحصل عليها كما يلي:-

١- لم يكن بين صنفي القمح جيزة ١٦٥ وجيزة ١٦٠ أى فروق معنوية لصفات عدد السنابل في المتر المربع، محصولي الحبوب والقش للفدان، النسب المئوية لكل من البروتين والنيتروجين والبوتاسيوم والفوسفور في الحبوب وكذلك الكمية الممتصة لكل من النيتروجين والفوسفور والبوتاسيوم في الحبوب بالفدان، بينما أظهر صنف جيزة ١٦٥ تميزاً معنوياً في صفتي وزن الألف حبة ودليل الحصاد.

٢- أعطت إضافة ٣٠ م٣ / فدان من السماد البلدي أعلى إنتاجية في كل من عدد السنابل في المتر المربع ووزن الألف حبة ومحصول الحبوب ومحصول القش للفدان.

٣- أعطت إضافة ١٠ م٣ / فدان من سماد زرق الطيور أعلى نسبة مئوية لتركيز النتروجين والفوسفور والبوتاسيوم في الحبوب وكذلك أعلى كمية ممتصة من النتروجين والفوسفور والبوتاسيوم في الحبوب للفدان.

٤- أدى تسميد القمح بالتسميد النتروجينى المعدني بمعدل ٢٣ كجم نتروجين /فدان عند الزراعة إلى زيادة في دليل الحصاد مقارنة ببقية المعاملات الأخرى.