INTERACTION EFFECTS OF ORGANIC FERTILIZATION TYPES, NITROGEN AND POTASSIUM APLICATIONS ON YIELD, YIELD COMPONENTS AND NUTRIENT CONTENTS OF WHEAT PLANTS.

Sonbol, H. A. ; Kh. H. El-Hamdi ; A. A. Mosa and Noha R. Hashish
Soils Dept., Fac. of Agriculture, Mansoura Univ., Egypt.

ABSTRACT

Two field experiments were conducted during the two successive seasons of 2009/2010 and 2010/2011 in Sherben District, Dakahlia Governorate to study the interaction effects of organic fertilization types , nitrogen and potassium applications on yield , yield components and nutrient contents of wheat crop (Triticum aestivum L.). Two types of organic fertilizers (FYM and compost) , four levels of N-fertilization (0 , 60, 80 and 100 kg N fed^{-1}) and three levels of K-fertilization (0 , 50 and 100 kg K_2O fed^{-1}) were examined .The experiment was conducted in a split split plot design. The obtained results indicated that the integrated treatment of 100 kg N fed^{-1}+ 50 kg K_2O fed^{-1}and 14 ton fed^{-1} FYM produced the highest means of grain and straw yields and also improved the values of N,P and K concentration in plant tissues ,which could be recommended under the conditions of this experiment.

Keywords: Wheat yield, organic fertilization, NK fertilization, N, P and K concentration in wheat.

INTRODUCTION

Wheat occupies about 33% of the total winter crop area in Egypt and is the major stable crop, consumed mainly as bread. More than one-third of the daily caloric intake of Egyptian consumers and 45% of their total daily protein consumption is derived from wheat. In Egypt, its production doesn't meet the current demand. The Egyptian government is doing more efforts to increase wheat production to reduce the imported percentage to be less than 50% from the total consumption as revealed by Shaaban (2006). Nitrogen is a major nutrient element and it is needed in large amounts to increase growth and yield of plant. Kichey *et al*., (2007) indicated that grain protein concentration may be a useful post-harvest indicator of nitrogen deficiencies for crops that are under nitrogen stress. Potassium is one of the principle plant nutrients underpinning crop yield production and quality determination. Potassium also plays an important role in controlling water status in plant (Shafeek 2005). Ali *et al*., (2005) found a positive response of wheat to K application as it increased tillering ratio, plant height, grains per spike, seed index and grain yield. Several investigation reported the beneficial effect of organic fertilization on enhancing soil fertility and increasing quantitative and qualitative yield characteristics. (Zeidan *et al*., 2005) found that organic manure application significantly enhanced yield quantity and N, P and K uptake by wheat. Meanwhile, available N content of the soil significantly increased with green manuring and FYM treatments. The beneficial effect on organic fertilizers could be attributed to the mineralization of organic N sources to the available N-forms for plant uptake, in addition to modifying the unsuitable conditions of rhizosphere (Yaduvanshi 2001).

The objectives of this work are to determine the positive interaction effects of different types of organic fertilization, nitrogen and potassium applications on yield and yield component nutrient contents of wheat plants.

MATERIALS AND METHODS

Two field experiments were conducted during the two successive seasons of 2009/2010 and 2010/2011 in Sherben District, Dakahlia Governorate to study the effect of organic fertilization and mineral fertilization additions on yield, yield components and nutrient contents of wheat crop (*Triticum aestivum* L.).

Experimental design and treatments:

36 treatments were arranged in a split-split block design, which were the simple possible combination between three treatments of organic fertilizers, four levels of N and three levels of K mineral fertilizers. The total area of the experimental field was (760 m^2). Organic fertilizers were adopted as main plots, and treatment of organic forms control (without organic), compost (38 ton fed^{-1}) and FYM (15 ton fed^{-1}). Nitrogen application levels were arranged as sub plots, and treatments of nitrogen fertilization were arranged as follows:

1- 0 kg N fed^{-1}(control).
2- 60 kg N fed^{-1} (75% of the recommended dose).
3- 80 kg N fed^{-1} (the recommended dose).
4- 100 kg N fed^{-1} (125% of the recommended dose).

Potassium fertilization levels were adopted as sub- sub plots as follows:

1- 0 kg K_2O fed^{-1}.
2- 50 kg K_2O fed^{-1}.
3- 100 kg K_2O fed^{-1}.

Each treatment was replicated three times. Thus, the total numbers of plots used for each season were 108 plots.

Preparation of field:

The plot area was 5.4 m^2 (10.8x0.05m). All agricultural management procedures were carried out according to the recommendation of the Egyptian Ministry of Agric. Soil was analyzed according to the standard methods for some physical and chemical properties as shown in Table1

Soil analysis :

The electrical conductivities of the 1:5 soil-water extracts were measured by EC meter according to the method of US Salinity Lab (1954). Soil reaction (pH) was measured in 1: 2.5 soil-water suspensions as described by Jackson (1967). Mechanical analysis was determined following the international pipette method (Kilmer and Alexander 1949).Total carbonate was determined using Collin's calcimeter method (Piper 1950). Saturation water percentage was determined by the method described by the U. S. Salinity Laboratory Staff (1954). Organic matter content was determined using Walkely and Black rapid titration method (Jackson ,1967). Soluble carbonate and bicarbonate were determined by the titration with a standard HCl solution (Jackson , 1967). Soluble calcium, magnesium and sulfate ions were determined in 1:5 soil water extract by the titration with a standardized versenate solution (Jackson 1967).Soluble sodium and potassium ions were determined by a flame photometer (Jackson 1967). Soluble chloride was determined by titration with a standard silver nitrate solution (Jackson, 1967). Available nitrogen was measured using the conventional method of kjeldahl as described by Bremner and Mulvany (1982). Available phosphorus was extracted by sodium bicarbonate and determined following the method of Olsen *et al*.,(1954). Available potassium was determined by flame photometerically according to Black (1965). Total nitrogen was determined by using micro-Kejeldahl method as described by Pregle (1945).

Table 1: Some Physical and chemical properties of the used soil in both seasons of 2009/2010 and 2010/2011.

Soil properties	1-Physical properties		
	Previous Crop	**Cotton**	**Corn**
Particle Size Distribution (%)	Coarse sand %	2.09	1.88
	Fine sand %	16.75	15.93
	Silt %	31.36	31.44
	Clay %	49.80	50.75
	Soil texture	Clayey	Clayey
	Organic matter %	1.26	1.38
	Real density	2.47	2.53
	Saturation percentage %	59	56
	2-Chemical properties		
$CaCo_3$ %		2.16	1.99
pH(1:2.5)		7.78	7.93
E.C. dSm^{-1}(1:5)		0.61	0.63
Soluble cations (meq/100g soil)	Ca2+	1.85	1.78
	Mg2+	0.66	0.83
	K+	0.09	0.12
	Na+	3.49	3.57
Soluble anions (meq/100g soil)	CO_3^{2-}	-	-
	HCO_3^-	0.98	1.05
	Cl^-	3.63	3.71
	SO_4^{2-}	1.48	1.54
Available Nutrients (ppm)	N	48.6	46.2
	P	4.9	3.7
	K	278	288
Total (ppm)	N	229.6	283.3

Cultivation of Wheat:

Wheat seeds cv. Sakha 93 were planted on 18^{th} November 2009 and 20^{th} November 2010 in hills (20 cm apart on the middle of raw). Irrigation was adjusted at field capacity, and wheat plants got four irrigations after life irrigation in each season until harvesting.

Fertilization:

Organic fertilization:

Farmyard manure and compost were added to each plot two weeks before sowing of wheat grains. Each plot received 20 kg farmyard manure as recommended dose (20 m^3 fed^{-1}) that was equal 15 ton $fed^{-1}$and (50 kg fed^{-1}) compost as recommended doses for wheat plants. Some chemical properties of FYM and compost used are presented in Table 2.

Table 2: Some chemical properties of the farmyard manure and compost used during both seasons of 2009/2012 and 2010/2011.

Sample	FYM		COMPOST	
	1st	2nd	1st	2nd
O.M %	45.9	47.3	38.9	37.2
O.C %	26.7	27.5	22.6	21.6
N %	1.43	1.38	1.04	1.06
P %	0.33	0.37	0.38	0.35
K %	1.09	1.13	0.97	0.92
C/N	1:18.6	1:19.9	1:21.7	1:20.4
pH	7.34	7.41	7.13	7.07
E.C ($Ds.m^{-1}$)	4.13	4.19	4.52	4.59

Mineral fertilization:

Ammonium nitrate (33.5 % N), super phosphate (15.5 % P_2O_5) and potassium sulphate (48 % K_2O) are the mineral fertilizer sources of N, P and K. Treatments of N and K fertilizers were divided into two equal doses. The first dose was added before life watering irrigation (the second irrigation) and the other was added before the next one (the third irrigation).

Plant sampling:

Representative samples of wheat plants were randomly collected from each treatment at harvesting stage (150 days after sowing); six plants were randomly taken during both seasons. Plants were separated into grains and straw. Agronomic yield measurements (i.e. number of grains per spike, weight of 1000 grains, grain and straw yield were recorded.

Plant samples (grain and straw) were oven dried at 70 ^oC till constant weight was reached, then dry weight in gram per plant was recorded.

Plant analysis

The oven dried plant samples of grain and straw were ground and wet digested by a sulfuric-perchloric acid mixture as described by Peterburgski (1968). Total nitrogen (%) was determined according to the methods described by Pregle (1945) using micro-Kjeldahl method. Total phosphorus (%) was determined calorimetrically as described by Jackson (1967). Potassium (%) was determined using a flame photometer according to Black (1965). Crude protein percentage was calculated by multiplying total N concentration by 5.75 according to A.O.A.C. (1970).

Statistical analysis:

The obtained data were subjected to statistical analysis as factorial experiment in a randomized complete block design with three replicates in the both growing seasons according to (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Interaction effects of organic fertilization, nitrogen and potassium applications on yield, yield components and nutrient contents of wheat plants.

1- Yield and its components: -

1-1- Grain and straw yield (g plant $^{-1}$)

Data in Table 3 show that the highest mean values of grain and straw yield (g plant^{-1}) were realized from the plants treated with FYM; 100 kg N fed^{-1} and 100 kg K_2O fed^{-1}, while the lowest one was produced from the control. This trend was true during both seasons. The increment in yields due to nitrogen fertilizers may be attributed to an increase in most correlated yield components, which increased the yield. These findings could be confirmed with those obtained by Ibrahim *et al*., (2008), Badr *et al*., (2009) and Ahmed *et al*., (2011).

It could be observed that increasing organic matter application to w eat plants induced more grain and straw yield. This may be due to the ability of organic manure to support the growth of plants with micro and macro nutrients needed for their growth (Dang *et al*., 2006, Madan and Munjal 2009, Laghari *et al*., 2010 and Ahmed at al., 2011).The increases of the yield components of wheat crop due to the addition of potassium fertilizer may be attributed to the stimulation effect of potassium on nutritional balance and metabolic process of plant. Also, potassium has a synergistic effect on enhancing the absorption of more nitrogen, which is essential for building new cells and production of wheat crop. These results could be supported by those obtained by Wilhelm and white (2004): Baque *et al*., (2006): Gendy *et al*., (2009) and Eldardiry *et al*., (2010).

1-2- 1000-grains weight, number of grains/spike and protein %

Data recorded in Table 4 indicate that, the interactive effect between organic materials, N and K fertilization increased the mean values of 1000-grains (g), No. of grains/spike and protein % with adding organic materials as FYM; 100 kg N fed^{-1} and 50 kg K_2O fed^{-1} as compared with the untreated plants. Application of organic manures not only influenced the growth and yield of wheat, but also increased quality of yield. The enhancement of yield quality parameters was observed in the higher protein content and better sized seeds with these treatment**.** These results could be confirmed with those obtained by Abd El–Hameed and Omar (2006), Munjal (2009) and Laghari *et al*., (2010) and Madan it could be noticed that at the level of 50 kg K_2O , gave the highest values of number of grain per spike and this may be attributed to greater spike length. Similar results were reported by Saifullah *et al*., (2002), Ijaz (2004), Tahir *et al*., (2008) and Tahir *et al*., (2011).

Table 3: Interaction effects of different organic fertilization, nitrogen and potassium application on grain and straw yield (g plant^{-1}) of wheat in two seasons.

Organic Fertilization	N kg fed^{-1}	K_2O kg fed^{-1}	Grain yield g plant^{-1}		Straw yield g plant^{-1}	
			First season	Second season	First season	Second season
Without organic fertilization	0	0	31.56v	33.25a	54.69e	57.52e
		50	32.09uv	32.70a	55.63d	56.58e
		100	33.72t	35.97a	58.47b	62.24c
	60	0	33.18tu	43.06a	57.52c	64.12a
		50	38.62r	46.33a	66.94y	74.50w
		100	43.53p	41.42a	75.44u	80.16u
	80	0	34.27t	36.52a	59.41a	63.18b
		50	34.27t	39.24a	59.41a	67.90z
		100	40.80q	41.97a	70.72w	72.61x
	100	0	36.45s	41.42a	63.17z	71.70y
		50	39.18r	41.43a	67.91x	71.68y
		100	45.70no	50.14a	79.21s	86.75r
Compost	0	0	40.81q	43.06a	70.72w	43.06a
		50	46.78n	32.70a	81.10r	32.70a
		100	53.31jk	50.68a	92.40l	50.68a
	60	0	45.15no	46.86a	78.27t	46.86a
		50	51.67lm	53.41a	89.58o	53.41a
		100	56.58gh	64.31a	98.06j	64.31a
	80	0	41.33q	44.15a	71.66v	44.15a
		50	50.58m	50.14a	87.70q	50.14a
		100	58.20f	63.77a	100.90h	63.77a
	100	0	45.70no	49.05a	79.21s	49.05a
		50	55.49hi	59.95a	96.19k	59.95a
		100	62.56d	65.40a	108.45e	65.40a
FYM	0	0	54.47ij	53.97a	88.64p	93.36o
		50	70.17b	75.21a	121.65c	130.13d
		100	61.47de	64.31a	106.55f	111.27i
	60	0	52.76kl	61.04a	91.47m	105.62l
		50	74.53a	76.85a	129.18b	132.95b
		100	64.19c	69.76a	111.27d	120.70f
	80	0	52.22kl	55.59a	90.53n	96.19n
		50	70.17b	76.30a	121.65c	132.03b
		100	60.38e	67.58a	104.67g	116.93g
	100	0	57.11fg	61.59a	99.02i	106.55k
		50	75.07a	80.66a	130.13a	139.55a
		100	70.19b	73.03a	121.65c	126.35e

Table 4: Interaction effect of different organic fertilization, nitrogen and potassium application on 1000-grains (g), No. of grains/spike and protein % of wheat in two seasons.

Organic Fertilization	N kg fed^{-1}	K_2O kg fed^{-1}	1000-grains (gm)		No. of grains/spike		Protein (%)	
			First season	Second season	First season	Second season	First season	Second season
Without organic fertilization	0	0	36.42d	37.03e	24.72c	25.12d	11.71s	12.42a
		50	37.63c	41.28c	25.54b	28.01b	12.11r	12.71a
		100	36.42d	38.84d	24.72c	26.37c	12.11r	12.80a
	60	0	38.85b	43.70a	26.37a	29.66z	12.73q	13.38a
		50	39.46a	45.53z	26.78z	30.90y	13.76no	14.59a
		100	48.89w	50.98y	32.96v	34.61u	15.03l	16.68a
	80	0	39.46a	42.49b	26.78z	28.84a	12.38r	13.19a
		50	42.47y	43.70a	28.84x	29.66z	13.47op	14.39a
		100	46.74x	47.95x	31.72w	32.55w	14.74l	15.70a
	100	0	39.45a	42.49b	26.78z	28.84a	13.19p	14.53a
		50	41.28z	48.56w	28.02y	32.96v	14.26m	15.81a
		100	52.20t	58.02p	35.43t	36.64s	15.56k	17.14a
Compost	0	0	46.74x	46.13y	31.72w	31.31x	13.90n	14.49a
		50	54.63r	55.24s	37.08r	37.49r	15.03l	16.10a
		100	64.34k	57.67q	43.67k	39.14p	16.16hi	17.27a
	60	0	49.17u	53.43t	33.37u	36.26t	14.32m	15.33a
		50	55.24q	61.91n	37.49q	42.02n	u15.47k	16.77a
		100	68.59i	70.40i	46.56i	47.79i	16.66g	17.79a
	80	0	48.56w	51.05u	32.96v	34.61u	14.03mn	15.14a
		50	55.24q	57.06r	37.49q	38.73q	15.37k	16.64a
		100	63.74l	69.20j	43.26l	46.97k	16.22h	17.61a
	100	0	52.81s	55.23s	35.84s	37.49r	14.82l	15.60a
		50	61.91n	61.91n	42.02n	42.02n	16.14hi	16.91a
		100	71.02g	74.05f	48.20g	50.26f	16.85fg	18.00a
FYM	0	0	46.74x	62.52m	39.96o	42.44m	15.62jk	15.30a
		50	54.63r	84.37d	52.74c	57.27d	18.15cd	19.80a
		100	64.34k	71.63h	45.32j	48.62h	16.92fg	18.15a
	60	0	49.17u	66.17l	43.67k	44.91l	16.06hi	17.44a
		50	55.24q	89.23b	55.21b	60.56b	18.67b	17.77a
		100	68.59i	78.91e	49.85f	53.56e	17.46e	18.59a
	80	0	48.56w	59.49o	39.55p	40.58o	15.89ij	17.25a
		50	55.24q	87.41c	51.91d	59.33c	18.36bc	19.84a
		100	63.74l	72.84g	47.38h	49.44g	16.98f	12.71a
	100	0	52.81s	68.59k	42.44m	46.56j	16.22h	17.67a
		50	61.91n	94.09a	57.68a	63.86a	19.19a	20.60a
		100	71.02g	78.91e	51.50e	53.56e	17.96d	19.30a

2 - N, P and K concentration in wheat grains:

Data in Table 5 indicate that N, P and K % in grains did not significantly affected due to addition of organic fertilization, N application and K fertilization in the first season. However, the average value of N and P% in the second season had a significant effected and the highest value were recorded with adding FYM, 100 kg N fed^{-1}and 50 Kg K_2O fed^{-1}.

Table 5: Interaction effect of different organic fertilization, nitrogen and potassium application on N, P and K concentration of grains in two seasons of wheat plant.

Organic Fertilization	N kg fed^{-1}	K_2O kg fed^{-1}	N% in grain		P% in grain		K% in grain	
			First season	Second season	First season	Second season	First season	Second season
Without organic fertilization	0	0	2.04s	2.16a	0.155y	0.150a	0.73a	0.77a
		50	2.11r	2.21a	0.164x	0.160a	0.78a	0.84a
		100	2.11r	2.23a	0.172w	0.163a	0.83a	0.88a
	60	0	2.21p	2.33a	0.183v	0.174a	0.84a	0.89a
		50	2.39no	2.54a	0.195t	0.184a	0.99a	1.03a
		100	2.61l	2.90a	0.219o	0.210a	1.11a	1.16a
	80	0	2.15r	2.29a	0.174w	0.168a	0.85a	0.85a
		50	2.34op	2.50a	0.190u	0.182a	0.95a	0.99a
		100	2.56l	2.73a	0.210pq	0.203a	1.06a	1.11a
	100	0	2.29op	2.53a	0.184uv	0.176a	0.91a	0.96a
		50	2.48m	2.75a	0.204rs	0.192a	1.03a	1.08a
		100	2.71jk	2.98a	0.235m	0.221a	1.15a	1.19a
Compost	0	0	2.42n	2.52a	0.198st	0.191a	0.93a	1.02a
		50	2.61l	2.80a	0.226n	0.221a	1.08a	1.14a
		100	2.81hi	3.00a	0.249k	0.208a	1.27a	1.29a
	60	0	2.49m	2.67a	0.208qr	0.203a	1.00a	1.06a
		50	2.69k	2.92a	0.241l	0.233a	0.82a	1.23a
		100	2.90g	3.09a	0.260ij	0.250a	1.34a	1.40a
	80	0	2.44mn	2.63a	0.206qr	0.198a	0.95a	1.02a
		50	2.67k	2.89a	0.232m	0.226a	1.14a	1.19a
		100	2.82h	3.06a	0.260ij	0.249a	1.30a	1.36a
	100	0	2.58l	2.71a	0.214op	0.211a	1.05a	1.11a
		50	2.81hi	2.94a	0.240l	0.237a	1.24a	1.32a
		100	2.93fg	3.13a	0.272h	0.262a	1.38a	1.44a
FYM	0	0	2.72jk	2.66a	0.250k	0.246a	1.20a	1.26a
		50	3.16cd	3.44a	0.323c	0.317a	1.60a	1.64a
		100	2.94fg	3.16a	0.285g	0.275a	1.41a	1.47a
	60	0	2.79hi	3.03a	0.265i	0.261a	1.27a	1.35a
		50	3.25b	3.09a	0.334b	0.328a	1.61a	1.70a
		100	3.04e	3.23a	0.300e	0.297a	1.46a	1.56a
	80	0	2.76ij	3.00a	0.259j	0.253a	1.24a	1.29a
		50	3.19bc	3.45a	0.329b	0.324a	1.61a	1.67a
		100	2.95f	2.21a	0.293f	0.280a	1.41a	1.50a
	100	0	2.82h	3.07a	0.273h	0.266a	1.34a	1.44a
		50	3.34a	3.58a	0.341a	0.336a	1.66a	1.76a
		100	3.12d	3.36a	0.314d	0.310a	1.51a	1.63a

3- N, P and K concentration in wheat straw:

According to the data illustrate in Table 6 it could be observed that the interaction effect between organic fertilization, N and K fertilization had no significant effect on the values of these parameter. Such effect was the same during both seasons of the experiment; except for K concentration in the second season, which had a significant effect and recorded the highest value with adding FYM with 100 kg N fed^{-1} in presence of the second level of K.

Table 6: Interaction effect of different organic fertilization, nitrogen and potassium application on N, P and K concentration of straw in two seasons of wheat plant.

Organic Fertilization	N kg fed^{-1}	K2O kg fed^{-1}	N% in straw		P% in straw		K% in straw	
			First season	Second season	First season	Second season	First season	Second season
Without Organic Fertilization	0	0	0.58a	0.62a	0.077a	0.075a	0.70t	0.70a
		50	0.60a	0.64a	0.078a	0.077a	0.73st	0.77a
		100	0.62a	0.67a	0.086a	0.083a	0.75st	0.80a
	60	0	0.63a	0.67a	0.091a	0.066a	0.80qr	0.82a
		50	0.70a	0.76a	0.403a	0.092a	0.92lm	0.94a
		100	0.80a	0.84a	0.111a	0.107a	0.95jkl	0.98a
	80	0	0.64a	0.68a	0.089a	0.082a	0.77rs	0.82a
		50	0.67a	0.71a	0.094a	0.090a	0.87nop	0.92a
		100	0.76a	0.80a	0.106a	0.102a	0.94kl	0.98a
	100	0	0.69a	0.71a	0.092a	0.088a	0.84opq	0.90a
		50	0.76a	0.77a	0.102a	0.064a	0.91lmn	0.96a
		100	0.91a	0.90a	0.116a	0.109a	1.00j	1.05a
Compost	0	0	0.75a	0.80a	0.100a	0.094a	0.80qr	0.88a
		50	0.88a	0.80a	0.110a	0.110a	0.93klm	0.99a
		100	1.02a	0.93a	0.128a	0.125a	1.10hi	1.13a
	60	0	0.81a	0.87a	0.102a	0.102a	0.86op	0.90a
		50	0.94a	1.02a	0.124a	0.122a	0.98jk	1.06a
		100	1.09a	1.17a	0.139a	0.133a	1.17f	1.25a
	80	0	0.77a	0.81a	0.100a	0.100a	0.83pq	0.91a
		50	0.92a	0.94a	0.120a	0.115a	0.93klm	1.00a
		100	1.08a	1.14a	0.138a	0.132a	1.15fg	1.22a
	100	0	0.86a	0.91a	0.108a	0.106a	0.89mno	0.97a
		50	1.01a	1.06a	0.124a	0.124a	1.06j	1.13a
		100	1.14a	1.20a	0.146a	0.144a	1.26e	1.30a
FYM	0	0	0.95a	1.00a	0.129a	0.127a	1.07i	1.15a
		50	1.27a	1.40a	0.160a	0.155a	1.23e	1.35a
		100	1.11a	1.17a	0.142a	0.143a	1.38bc	1.48a
	60	0	1.01a	1.08a	0.139a	0.132a	1.13fgh	1.20a
		50	1.36a	1.45a	0.172a	0.164a	1.33d	1.43a
		100	1.20a	1.27a	0.157a	0.150a	1.41ab	1.50a
	80	0	0.98a	1.02a	0.131a	0.135a	1.12gh	1.21a
		50	1.30a	1.41a	0.164a	0.163a	1.26e	1.38a
		100	1.14a	1.22a	0.148a	0.149a	1.42ab	1.47a
	100	0	1.06a	1.14a	0.140a	0.140a	1.18f	1.24a
		50	1.40a	1.52a	0.169a	0.167a	1.34cd	1.40a
		100	1.26a	1.31a	0.156a	0.153a	1.44a	1.52a

4- N, P and K uptake (mg/plant) by wheat grains and straw .

Concerning the effect of the interaction between organic materials , N and K fertilization in Table 7 and 8 , it could be noticed that, adding organic materials with FYM combined with 100 kg N fed^{-1} at 50 Kg K_2O fed^{-1} gave the highest value of N, P and K uptake (mg $plant^{-1}$) by wheat grains. Such effect had no significance differences between the values of N% in 2nd season and K% in the 1st season.

Table 7: Interaction effect of different organic fertilization, nitrogen and potassium application on N, P and K uptake (mg/plant) of grains in two seasons of wheat plant.

Organic Fertilization	N kg fed^{-1}	K_2O kg fed^{-1}	N-uptake (mg $plant^{-1}$)		P-uptake (mg $plant^{-1}$)		K-uptake (mg $plant^{-1}$)	
			First season	Second season	First season	Second season	First season	Second season
Without Organic Fertilization	0	0	185.95z	233.06a	14.18D	16.15v	66.64a	82.72t
		50	206.25y	231.15a	16.02C	16.74uv	76.36a	88.21st
		100	227.31wx	266.08a	18.56B	19.52st	89.56a	105.16r
	60	0	235.05w	235.71a	19.47A	17.59tuv	89.56a	90.45st
		50	293.90t	307.44a	23.99x	22.34qr	121.17a	124.83q
		100	342.60q	404.25a	28.71u	29.23mn	145.09a	161.24no
	80	0	225.24x	255.01a	18.24B	18.72stu	88.91a	94.52s
		50	264.56v	290.89a	21.41z	21.11rs	107.26a	114.65r
		100	327.60r	380.55a	26.80v	28.34n	135.04a	155.20o
	100	0	281.62u	280.97a	22.64y	19.57st	111.75a	106.74r
		50	362.32p	342.37a	29.76t	23.86pq	150.48a	134.46q
		100	458.24l	440.15a	39.73no	32.69l	194.70a	175.27m
Compost	0	0	296.76st	359.86a	24.36x	27.28no	114.21a	145.18p
		50	381.82o	418.32a	33.07r	33.07l	157.30a	169.82mn
		100	475.74k	448.70a	42.10m	31.02lm	215.01a	192.72l
	60	0	330.68r	389.60a	27.67v	29.61mn	132.80a	154.38op
		50	424.20m	518.00a	38.01p	41.38j	129.38a	219.04j
		100	528.93hi	605.98a	47.48k	48.97h	244.08a	274.25g
	80	0	303.79s	336.54a	25.65w	25.30op	117.85a	130.35q
		50	403.94n	465.83a	35.06q	36.39k	172.76a	192.12l
		100	524.23i	559.37a	48.40j	45.47i	242.29a	247.73h
	100	0	376.46o	418.94a	31.31s	32.63l	152.91a	171.38m
		50	456.64l	512.44a	39.10no	41.31j	201.21a	229.50i
		100	540.00g	613.17a	50.19i	51.26gh	253.71a	281.44g
FYM	0	0	419.46m	436.24a	38.65op	40.40j	184.76a	206.10k
		50	655.00d	822.96a	67.02d	75.68c	331.31a	391.16c
		100	537.45gh	607.97a	52.10h	53.03g	257.46aa	282.47g
	60	0	468.44k	518.70a	44.39l	44.57i	212.98a	231.43i
		50	738.28b	753.92a	75.88b	80.11b	365.36a	415.61b
		100	614.93e	654.76a	60.68f	60.21e	295.64a	315.90e
	80	0	472.53k	532.80a	44.29l	44.99i	212.04a	229.70i
		50	715.63c	795.91a	73.80c	74.82c	360.05a	385.27c
		100	563.79f	447.23a	55.87g	56.63f	269.81a	304.42f
	100	0	510.14j	596.85a	49.33i	51.59g	241.80a	279.01g
		50	792.12a	910.17a	81.03a	85.43a	394.88a	447.89a
		100	648.10d	724.37a	65.09e	66.97d	313.32a	352.47d

8

The increasing of N, P & K concentration and its uptake with organic matter application may be attributed to the mineralization of organic minerals and slow release of minerals in an available form. In addition, this positive effect could be attributed to the production of organic acids during manure decomposition, which increased the availability of plant nutrients . These results are in a good agreement with that obtained by Zeidan *et al*., (2005), Rasool *et al*., (2007), Yassen *et al*., (2010) and Rashad *et al*., (2011)
The beneficial effect of nitrogen fertilizer on nutrient content and its uptake might be due to the effect of nitrogen fertilizer on improving root growth, hence increasing the absorbing area of root and increase of root size. These data are a good harmony with those revealed by Fan *et al*., (2005), Kichey *et al*., (2007) and Laghari *et al*., (2010).

The positive effect of potash on N concentration, this could be attributed to nutrient imbalance at highest level of potassium. As for the increase of K concentration and its uptake of wheat grains and straw with potassium fertilizer treatments might be due to higher uptake of K by plants. Obtained results confirm those with Baque *et al*., (2006), Bahmanyar and Ranjbar (2008).

CONCLUSION

Under the same conditions of this investigation, it could be recommended that the use of FYM as organic materials in presence of mineral fertilization with 100 kg N fed^{-1} and 50 kg K_2O_5 fed^{-1} gave the highest yield of wheat plants with better quality .

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تأثيرالتفاعل بين الأسمدة العضوية المختلفة والتسميد النتروجينى والبوتاسى على المحصول ومكوناته وامتصاص بعض العناصر الغذائيه لنباتات القمح

حسين أحمد سنبل ،خالد حسن الحامدى ،أحمد على موسى و نهى رضا حشيش
قسم الأراضى – كلية الزراعة – جامعة المنصورة

نظرا لما يحمله محصول القمح من أهمية ومكانه لدى الشعب المصرى . قدم هذا البحث دراسه عن كيفية تحسين انتاجية القمح بأضافة السماد العضوى (السماد البلدى) مع السماد الأزوتى و البوتاسى بمعدلات معينه تم ذكرها فى البحث نفذت تجربتان حقليتان فى خلال الموسم الشتوي ٢٠٠٩/ ٢٠١٠ – ٢٠١٠/٢٠١١ فى مركز شربين بمحافظه الدقهليه وذلك لدراسه تأثير التسميد العضوى مع التسميد المعدنى على نبات القمح. اشتملت التجربه على سته وثلاثون معامله فى تصميم قطاعات تحت منشقه وهى تمثل كل التفاعلات الممكنه بين ثلاث معاملات من التسميد العضوى ,واربع معاملات من التسميد النيتروجينى بالاضافه الى ثلاث معاملات من التسميد البوتاسى.

ويمكن تلخيص النتائج كما يلى :-

- السماد البلدى يعمل على زيادة محصول القمح بصوره أفضل من التسميد بالكمبوست .
- تم الحصول على افضل النتائج من المحصول عند اضافة السماد المعدنى (الازوتى والبوتاسى) وخاصه بإضافة معدلات ١٠٠ كجم ن / فدان للسماد الأزوتى و ٥٠ كجم بو$_2$ أ فدان للسماد البوتاسى .
- تم الحصول على أفضل نتائج من محصول القمح عند اضافة السماد البلدى مع السماد الازوتى بمعدل ١٠٠ كجم ن / فدان والسماد البوتاسى بمعدل ٥٠ كجم بو$_2$ أ فدان .

الاستنتاج:

تحت نفس الظروف التى اجريت فيها هذه الدراسه فانه يمكن التوصيه بالآتي :

لتعظيم الاستفاده من السماد العضوى فى وجود السماد المعدنى فان انسب معامله يمكن إضافتها لمحصول القمح هى اضافه السماد البلدى عند استخدام السماد الأزوتى ١٠٠ كجم ن/فدان و ٥٠ كجم بو/فدان وذلك لتحقيق أعلى محصول أمن من القمح.

قام بتحكيم البحث

أ.د / احمد عبد القادر طه	**كلية الزراعة – جامعة المنصورة**
أ.د / عادل رزق احمد	**مركز البحوث الزراعية**

Table 8: Interaction effect of different organic fertilization, nitrogen and potassium application on N, P and K uptake (mg/plant) of straw in two seasons of wheat plant.

Organic Fertilization	N kg fed^{-1}	K_2O kg fed^{-1}	N-uptake (mg $plant^{-1}$)		P-uptake (mg $plant^{-1}$)		K-uptake (mg $plant^{-1}$)	
			First season	Second season	First season	Second season	First season	Second season
Without Organic Fertilization	0	0	52.64u	67.26tu	7.03a	8.13pq	64.22r	75.90w
		50	58.74u	66.60u	7.67a	8.02pq	71.14r	80.54w
		100	67.26t	80.47rs	9.28a	9.88op	80.57q	96.00u
	60	0	66.91t	67.88tu	9.66a	6.71q	84.61q	83.40vw
		50	85.96qr	91.69qr	49.35a	11.11no	112.57o	114.34rs
		100	104.44no	117.56no	14.55a	14.92lm	124.54mn	137.09o
	80	0	66.59t	75.63stu	9.31a	9.08op	80.19q	91.57uv
		50	75.65s	82.89rs	10.61a	10.46o	97.85p	107.29st
		100	97.56op	111.53op	13.59a	14.17lm	120.13no	136.15o
	100	0	84.33r	78.94st	11.34a	9.79op	103.56p	99.71tu
		50	111.05n	95.86q	14.95a	8.00pq	133.44kl	119.10qr
		100	153.51k	132.93lm	19.58a	16.15l	168.74i	154.60mn
Compost	0	0	92.51pq	114.72op	12.28a	13.42m	98.65p	125.67pq
		50	128.57m	120.05no	16.12a	16.38kl	135.38kl	147.40n
		100	172.69i	138.44lm	21.73a	18.62j	186.80h	168.82l
	60	0	108.01n	127.59mn	13.59a	14.95lm	114.65o	131.01op
		50	147.71k	181.75i	19.56a	21.73hi	154.55j	188.84jk
		100	199.04g	229.86fg	25.38a	25.99ef	213.64g	244.22g
	80	0	95.86p	103.09pq	12.45a	12.74mn	102.92p	115.87r
		50	138.51l	151.88k	18.08a	18.57jk	141.03k	161.55lm
		100	200.78g	207.55h	25.59a	24.04fg	214.40g	223.38h
	100	0	126.14m	141.02kl	15.83a	16.37kl	130.03lm	149.77n
		50	163.79j	184.17i	20.23a	21.61i	171.91i	196.96j
		100	210.71f	235.08f	26.97a	28.14de	231.60f	254.01f
FYM	0	0	146.16k	164.54j	19.97a	20.77ij	164.69i	188.60jk
		50	264.21d	335.40c	33.20a	37.04b	255.22e	322.65bc
		100	202.68g	225.98fg	25.93a	27.54e	252.59e	285.04e
	60	0	169.94ij	184.67i	23.31a	22.51ghi	190.06h	205.77i
		50	309.26b	353.81b	39.19a	40.10a	301.69b	348.11a
		100	243.68e	256.50e	31.79a	30.38d	284.85c	304.42d
	80	0	168.15ij	181.75i	22.46a	23.92fgh	191.52h	215.49h
		50	291.32c	325.29c	36.68a	37.53b	281.61c	317.59c
		100	216.99f	247.05e	28.25a	30.11d	271.08d	298.35d
	100	0	191.15h	222.04g	25.27a	27.12e	212.85g	241.46g
		50	333.16a	386.09a	40.20a	42.33a	318.91a	354.76a
		100	262.14d	283.41d	32.30a	33.02c	298.11b	328.02b