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RESPONSE OF SOME WHEAT VRAIETIES TO MINERAL AND ORGANIC NITROGEN FERTILIZERS.

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ABSTRACT

Two field experiments were conducted at the Experimental Research Station in El-Serw, Agricultural Research Center during 2011/2012 and 2012/2013 seasons to study the effect of inorganic nitrogen and organic nitrogen of compost combination treatments on grain and straw yield and N, P, K- uptake in grain and straw of some wheat varieties. The experiments were carried out in a split plot design with three replicates. Main plots were assigned to three wheat cultivars *i.e.,* Sakha 93, Gemmiza 9 and Gemmiza 10. The sub main plots were devoted to nitrogen and compost combination treatments as follows: 100 % inorganic nitrogen (90 kg fed^{-1}), 75 % inorganic nitrogen (67.5 kg fed^{-1}) + 25 % organic nitrogen (22.5 kg fed^{-1}), 50 % inorganic nitrogen (45.0 kg fed^{-1}) + 50 % organic nitrogen (45.0 kg fed^{-1}), 25 % inorganic nitrogen (22.5 kg fed^{-1}) + 75 % organic nitrogen (67.5 kg fed^{-1}) and 100 % organic nitrogen (90 kg fed^{-1}). The results showed that the highest wheat grain and straw yields and N, P and K uptake in grain and straw were Gemmeza 10, Gemmeza 9 and Sakha 93, respectively and 100 % inorganic nitrogen, 75 % inorganic nitrogen + 25 % organic nitrogen, 50 % inorganic nitrogen + 50 % organic nitrogen, 25 % inorganic nitrogen + 75 % organic nitrogen and 100 % organic nitrogen, respectively. 100% inorganic nitrogen for Gemmiza 10 gave the highest wheat grain and straw yields and N, P, and K uptake in grain and straw. While, applying 75% inorganic nitrogen with 25% organic nitrogen could produce economic wheat grain and straw yields for Sakha 93 only. So, it may be saved 25% inorganic nitrogen when applying it as compost.

Keywords: wheat, organic fertilizer, compost, nitrogen fertilizer, fertilizer, cultivars, varieties.

INTRODUCTION

Wheat (*Triticum aestivum*,L.) is one of the most important nutritional cereal crops in Egypt and all over the world. Wheat production is not sufficient for local consumption in Egypt. This calls for greater attention of all the concerned to increase the production to meet the continuous demand and reduce the gap between the production and consumption of wheat. Therefore, great efforts have been made to achieve suitable agronomic practices for obtaining maximum productivity of different wheat varieties with optimum quality properties.

Chosen the high yielding ability cultivars undoubtedly is very important to raise wheat productivity per unit area. For this reason, this study is aiming to evaluate the new promising cultivars with the old traditional ones for scooping light on the best cultivars that can be used under the environmental conditions of study region. El-Metwally *et al.* (2012) found that the highest grain yield was achieved with Sakha 94 and Gemmiza 9. Harb *et*

al. (2012) revealed that Gemmiza 9 cultivar exceeded Sakha 93 cultivar significantly in grain yield fed^{-1}. Atia and Ragab (2013) found that wheat cultivars significantly differed in grain and straw yields as well as protein and potassium contents in grains. Gemmiza 9 cultivar had the highest values of grain and straw yields as well as protein and potassium contents in grains. Seleem and Abd El –Dayem (2013) showed that the highest significant value of grain yield was obtained by Gemmiza 9 followed by Misr 1 then Sakha 94 and Giza 168. Vice versa, the lowest ones resulted from Sakha 93 cultivar.

The continued use of chemical fertilizers causes health and environmental hazards such as ground and surface water pollution by nitrate leaching. So, reducing the amount of nitrogen fertilizers applied to the field without a nitrogen deficiency will be the main challenge in field management. One of the possible options to reduce the use of chemical fertilizer could be recycling of organic wastes. Compost as the organic waste can be a valuable and inexpensive fertilizer and source of plant nutrients. Positive effects of compost on soil structure, aggregate stability and water-holding capacity were reported (Odlare *et al.,* 2008).

Compost has a high nutritional value, with high concentrations of especially nitrogen, phosphorus and potassium, while the contamination by heavy metals and other toxic substances are very low. (Asghar *et al.,* 2006). In order to improve the nitrogen application management, many studies showed that the combination of compost with chemical fertilizer further enhanced the biomass and grain yield of crops (Cheuk *et al.,* 2003; Sarwar *et al.,* 2007; Sarwar *et al.,* 2008).

Mahmoud *et al.* (2006) found that grain and straw yields of wheat and N, P and K uptake in grains and straw as well as crude protein content were increased by application of 75% of N as ammonium sulfate with 25% composting rice straw. Abedi *et al.* (2010) evaluated the effects of different levels of inorganic (0, 80, 160 and 240 kg N ha^{-1}) and organic (0, 30 and 60 Mg ha municipal waste compost ha-1) fertilizers on wheat grain yield and protein content. They reported that the highest wheat grain yield was achieved when the plants were fertilized with 160 kg N ha^{-1} and 30 Mg compost ha^{-1}. The highest amount of seed protein was obtained with 60 Mg compost ha^{-1} at all levels of nitrogen. Antoun, Linda *et al.* (2010) found that the interaction between compost and inorganic nitrogen level had significant effects on grain yield fed^{-1} and N, P and K % in grains. El-Hamdi *et al.* (2012) reported that the combination of compost and nitrogen fertilizer improved yields, yield components and N uptake. The best treatment was 50 kg N fed^{-1} with adding 10 Mg compost fed^{-1}.

Therefore, this investigation was established to determine the effect of nitrogen and compost combination treatments on yield and N, P and K uptake in grain and straw for some wheat cultivars under the environmental conditions of El-Serw district, Damietta Governorate.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Research Station in El-Serw, Agricultural Research Center during the two successive winter seasons of 2011/2012 and 2012/2013. The objective of these experiments was to improve some wheat cultivars productivity under Mineral and organic nitrogen fertilization.

The experiment was carried out in a split plot design with three replicates. The main plots were assigned to three wheat cultivars *i.e.,* Sakha 93, Gemmiza 9 and Gemmiza 10. While the sub main plots were devoted to five nitrogen and compost combination treatments as follows:

1. 100 % inorganic nitrogen (90 kg N fed^{-1}).
2. 75 % inorganic nitrogen (67.5 kg N fed^{-1}) + 25 % organic nitrogen (22.5 kg N fed^{-1}).
3. 50 % inorganic nitrogen (45.0 kg N fed^{-1}) + 50 % organic nitrogen (45.0 kg N fed^{-1}).
4. 25 % inorganic nitrogen (22.5 kg N fed^{-1}) + 75 % organic nitrogen (67.5 kg N fed^{-1}).
5. 100 % organic nitrogen (90 kg N fed^{-1}).

The organic nitrogen in the form of compost was obtained from El-Asria Company for Solid Waste Recycling and added after soil preparation to the experimental units at the previously mentioned rates on soil surface and then turned over via hack. Analysis of used compost was shown in Table (1). The nitrogen fertilizer in the form of ammonium nitrate (33.5 % N) was applied at the aforementioned rates in two equal doses prior the first (25 days from sowing) and the second (46 days from sowing) irrigations. Each experimental unit was 3 × 3.5 m occupying an area of 10.5 m^2. Calculate the amount of compost as needed quantitative inorganic nitrogen in fertilization as following:

$$Amount\ of\ Compost = \frac{Amount\ of\ mineral\ Nitrogen}{Nitrogen\ percentage\ in\ Compost} \times 100$$

Table 1: Chemical analysis of used compost.

parameters	EC dS m^{-1}	pH	Total N%	Total C%	C:N	Total P%	Total K%	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)
Value	3.1	7.7	1.4	22.1	16 : 1	0.7	1.0	1650	35	180	105

Soil samples were taken from the experimental field before conducting from soil layer (0-30cm depth), then air-dried and ground to pass through 2 mm sieve. Soil physical and chemical properties were carried out according to Piper (1950) and Jackson (1967) as shown in Table (2). EC, cations and anions were estimated in 1:5 soil water extract, where pH was measured in soil water suspensions (1:2.5) as shown in Table 2.

Table 2: Physical and chemical soil characteristics at the experimental sites during the two seasons.

Growing season	Particle size distribution%					OM %	$CaCO_3$ %	CEC meq /100g soil	pH	EC dSm^{-1}
	Coarse sand	Fine sand	Silt	Clay	Texture class					
1st	1.12	11.18	21.68	66.02	Clayey	0.77	1.40	43.8	8.1	2.35
2nd	1.44	10.35	22.26	65.95	Clayey	0.86	1.34	42.3	8.0	2.41

Growing season	Cations and anions in the soil water extract (1:5), meq/100 g soil								NPK available ppm		
	Cations				Anions				N	P	K
	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}			
1st	3.05	2.76	11.25	0.26	---	1.45	12.12	3.75	32	8.06	485
2nd	3.11	2.69	11.40	0.28	---	1.70	12.21	3.68	33	7.94	479

Calcium superphosphate fertilizer (15.5% P_2O_5) was added at a rate of 100 Kg fed^{-1} as basal of each plot before ploughing.
Sowing took place on November 18th and 25th in the first and second seasons, respectively. Wheat harvesting was done on 20th April 2012 and 1st May 2013 in both seasons, respectively. Wheat grains at the rate of 75 kg fed^{-1} were. The first irrigation was applied at 25 days after sowing and then plants were irrigated every 21 days till the dough stage. The common agricultural practices for growing wheat according to the recommendations of Ministry of Agriculture were followed, except the factors under study.

After wheat harvest, grain and straw yields and N, P and K uptake, when yield as kg fed^{-1} in grains and straw were recorded, Nutrient element uptake kg fed^{-1} = $\frac{Nutrient\ element\,\% \times Yield}{100}$

The statistical analysis was carried out according to Steel and Torrie (1980) to compare the treatments values.

RESULTS AND DISCUSSION

1- Grain and straw yield

Data presented in Fig (1) and Table (3) showed that wheat varieties were affected by grain and straw yield significantly in both 1st and 2nd seasons, Gimmeza 10 variety had the highest mean value of grain and straw yield followed by, Gimmeza 9, and Sakha 93. Also, data showed that yields significantly were affected by nitrogen combination treatments in both 1st and 2nd seasons and the order of nitrogen combination treatment as follows: A (100% MN), B (75% MN + 25% ON.), C (50% MN + 50% ON.), D (25% MN + 75% ON.) and E (100% ON.), respectively. El-Metwally *et al.* (2012) found that Sakha 94 and Gimmeza 9 respectively gave the highest grain yield.

Also, data showed that the interaction between cultivars and nitrogen combination treatments had a significant effect on grain and straw yield in both 1st and 2nd seasons. Data presented in Table 3 and Fig. 1 showed that, the highest values of grain yield (2.651 and 2.732 Mg fed^{-1}) and straw yield (3.557 and 3.681 Mg fed^{-1}) were obtained when Gemmiza 10 cultivar revived (A=100% MN) 90 kg N fed^{-1} in the first and second seasons, respectively. Also, data in Table 3 showed that no significant effect between A (100 MN)

and B (100% MN + 25% ON.) for both grain and straw yield at 2011/2012 season and grain yield for 2012/2013 season for Sakha 93 variety only. So, it may be saved 25% inorganic nitrogen when applying it as compost. The previous results may be refer to the combination of compost with inorganic nitrogen fertilization further enhanced the biomass, therefore increasing in wheat yield. The similar results were obtained with (Mahmoud *et al.,* 2006 and Abedi, *et al.,* 2010).

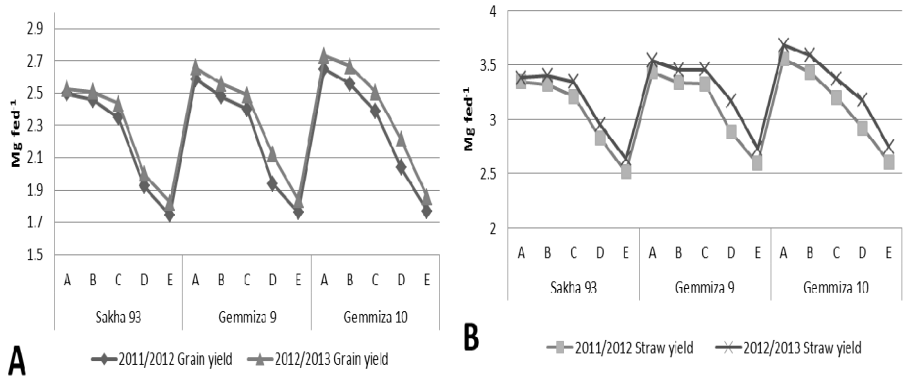

Fig. 1: Effect of combination between organic and inorganic nitrogen fertilizers on grain (A) and straw yield (B) (Mg fed^{-1}) for some wheat varieties in 2011/2012 and 2012/2013 seasons.

Table 3: Grain and straw yield (Mg fed^{-1}) as affected by the interaction between varieties and nitrogen and compost combination treatments during 2011/2012 and 2012/2013 seasons.

Treatment		2011/2012		2012/2013	
Varieties	Minr.*Org.	Grain yield	Straw yield	Grain yield	Straw yield
Sakha 93	A	2.498	3.345	2.526	3.382
	B	2.462	3.322	2.511	3.402
	C	2.348	3.212	2.436	3.346
	D	1.925	2.830	2.001	2.954
	E	1.745	2.518	1.823	2.641
Gemmiza 9	A	2.588	3.433	2.659	3.542
	B	2.481	3.338	2.558	3.456
	C	2.402	3.325	2.489	3.460
	D	1.938	2.883	2.123	3.171
	E	1.763	2.598	1.839	2.733
Gemmiza 10	A	2.651	3.557	2.732	3.681
	B	2.559	3.430	2.668	3.591
	C	2.388	3.202	2.506	3.374
	D	2.042	2.918	2.213	3.175
	E	1.770	2.610	1.857	2.750
F		**	**	**	**
LSD 5%		0.039	0.049	0.030	0.018
LSD 1%		0.054	0.062	0.047	0.024
F	Varieties	**	**	**	**
	Minr.*Org.	**	**	**	**

***Significant at 5% level. ** Significant at 1% level.**
A= 100%MN B=75%MN+25% ON.C= 50%MN + 50% ON. D= 25%MN + 75% ON. E= 100% ON. MN= Inorganic nitrogen ON. = Organic Nitrogen as Compost.

Nitrogen uptake of wheat grain and straw (kg N fed^{-1}).

Data presented in Fig (2) and Table (4) showed that nitrogen uptake was significantly affected in both wheat grain and straw (total nitrogen removed by the crop from the soil in grain and straw) in both seasons by wheat verities. Gimmeza 10 variety had the highest mean value of N uptake in both grain and straw followed by, Gimmeza 9, and Sakha 93. Also, there was significant increase in N uptake in wheat grain and straw in both seasons, by nitrogen combination treatments, the highest mean values of N uptake in grains and straw in 2011/2012 and 2012/2013 seasons were recorded with A (100% MN), B (75% MN + 25% ON.), C (50% MN + 50% ON.), D (25% MN + 75% ON.) and E (100% ON.), respectively.

Also, data in Fig (2) and Table (4) showed that interaction effect between cultivars and nitrogen combination treatments was significant on N uptake in both wheat grain and straw in both seasons. The highest values of N uptake for wheat grains and straw in both seasons, were obtained with variety of Gemmiza 10 and Gemmiza 9 respectively when were applied with (A=100% MN) 90 kg N fed^{-1}. These increases in N uptake values in grain and straw yield could be due to compost fertilization where it has a high nutritional value, with high concentrations of especially nitrogen and to improving physical and chemical soil properties. These results agree with those obtained by (Mahmoud *et al.,* 2006 and El-Hamdi *et al.,* 2012).

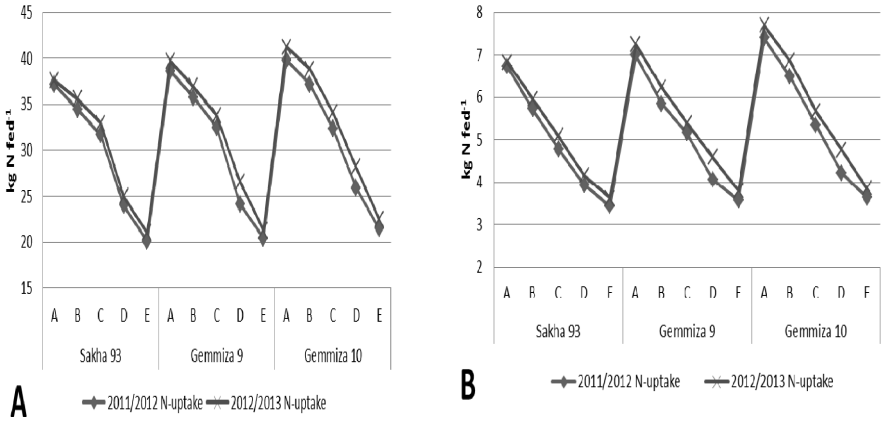

Fig. 2: Effect of combination between compost and inorganic nitrogen fertilizers on Nitrogen Uptake in grain (A) and straw (B) (kg N fed^{-1}) for some wheat varieties in 2011/2012 and 2012/2013 seasons.

Table 4: Nitrogen uptake (kg N fed^{-1}) in grain and straw as affected by the interaction between varieties and nitrogen and compost combination treatments during 2011/2012 and 2012/2013 seasons.

Treatment		2011/2012		2012/2013	
Varieties	Minr.*Org.	Grain	Straw	Grain	Straw
	A	37.220	6.724	37.663	6.832
	B	34.443	5.714	35.631	5.954
Sakha 93	C	31.675	4.786	32.935	5.086
	D	23.986	3.934	24.952	4.165
	E	20.085	3.424	21.019	3.618
	A	38.613	7.003	39.699	7.261
	B	35.776	5.842	36.938	6.221
Gemmiza 9	C	32.475	5.154	33.776	5.398
	D	24.167	4.065	26.538	4.598
	E	20.398	3.559	21.314	3.799
	A	39.845	7.399	41.253	7.693
	B	37.182	6.483	38.819	6.859
Gemmiza 10	C	32.357	5.347	34.107	5.668
	D	25.913	4.231	28.127	4.763
	E	21.435	3.628	22.506	3.850
F		**	**	**	**
LSD 5%		0.497	0.164	0.395	0.146
LSD 1%		0.553	0.224	0.451	0.247
F	Varieties	**	**	**	**
	Minr.*Org.	**	**	**	**

***Significant at 5% level. ** Significant at 1% level.**
A=100%MN B=75%MN +25% ON. C=50%MN + 50% ON. D= 25%MN + 75% ON. E= 100% ON. MN= Inorganic nitrogen ON. = Organic Nitrogen as Compost.

Phosphor uptake of wheat grain and straw (kg P fed^{-1}).

Data in Fig (3) and Table (5) showed that there was significant increase in phosphor uptake in both wheat grain and straw (total phosphor removed by the crop from the soil in grain and straw) in both seasons by wheat verities. Also, as in previous variables, Gimmeza 10 variety had the highest mean value of P uptake in both grain and straw followed by, Gimmeza 9, and Sakha 93. Also, there was significant increment in P uptake in wheat grain and straw in both seasons, by nitrogen combination treatments, the highest mean values of P uptake in grains and straw in 2011/2012 and 2012/2013 seasons were recorded with A (100% MN), B (75% MN + 25% ON.), C (50% MN + 50% ON.), D (25% MN + 75% ON.) and E (100% ON.), respectively.

Also, data in Fig (3) and Table (5) showed that interaction effect between cultivars and nitrogen combination treatments was significant on P uptake in wheat grain in 2011/2012 season and in wheat straw in 2012/2013 season and no significant on p uptake in wheat grain in 2012/2013 season and in wheat straw in 2011/2012 season. The highest values of P uptake for wheat grains and straw in both seasons, were obtained with variety of Gemmiza 10 and Gemmiza 9 respectively when were applied with (A=100% MN) 90 kg N fed^{-1}. Mahmoud *et al.,* 2006 was found similar results for this variance.

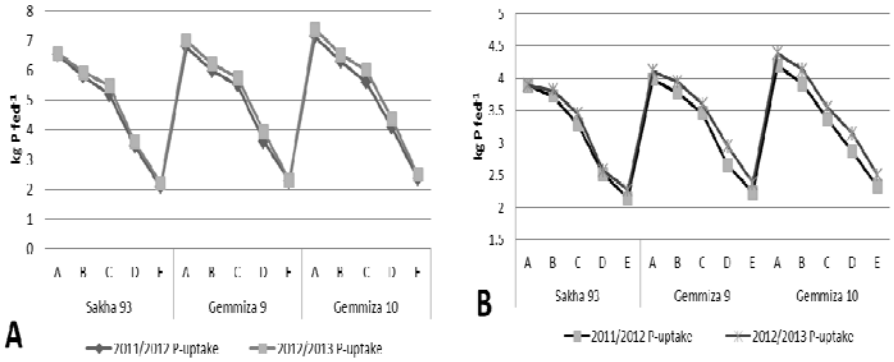

Fig. 3: Effect of combination between compost and inorganic nitrogen fertilizers on Phosphor Uptake in grain (A) and straw (B) (kg N fed-1) for some wheat varieties in 2011/2012 and 2012/2013 seasons.

Table 5: Phosphor uptake (kg P fed^{-1}) in grain and straw as affected by the interaction between varieties and nitrogen and compost combination treatments during 2011/2012 and 2012/2013 seasons.

Treatment		2011/2012		2012/2013	
Varieties	Minr.*Org.	Grain	Straw	Grain	Straw
	A	6.520	3.880	6.567	3.889
	B	5.786	3.721	5.926	3.810
Sakha 93	C	5.189	3.276	5.481	3.446
	D	3.446	2.519	3.602	2.570
	E	2.077	2.140	2.188	2.271
	A	6.781	3.982	6.993	4.109
	B	5.979	3.772	6.216	3.940
Gemmiza 9	C	5.501	3.458	5.750	3.598
	D	3.605	2.652	3.928	2.949
	E	2.257	2.234	2.299	2.378
	A	7.131	4.197	7.377	4.380
	B	6.295	3.910	6.537	4.130
Gemmiza 10	C	5.588	3.362	5.989	3.543
	D	4.064	2.860	4.360	3.143
	E	2.355	2.323	2.488	2.503
F		**	ns	ns	**
LSD 5%		0.064	1.896	0.251	0.119
LSD 1%		0.079	2.012	0.344	0.167
F	Varieties	**	ns	**	**
	Minr.*Org.	**	*	**	**

***Significant at 5% level. ** Significant at 1% level.**
A=100%MN B=75%MN+25% ON. C= 50%MN + 50% ON. D= 25%MN + 75% ON. E= 100% ON. MN= Inorganic nitrogen ON. = Organic Nitrogen as Compost.

Potassium uptake of wheat grain and straw (kg K fed^{-1}).

Data presented in Fig (4) and Table (6) showed that potassium uptake significantly increase in both wheat grain and straw (total potassium removed by the crop from the soil in grain and straw) in both seasons by wheat verities. Also, the highest mean value of K uptake was obtained with Gimmeza 10 variety in both grain and straw followed by, Gimmeza 9, and Sakha 93. Also, there was significant increment in K uptake in wheat grain and straw in both 2011/2012 and 2012/2013 seasons, by nitrogen combination treatments, the highest mean values of N uptake in grains and straw in 2011/2012 and 2012/2013 seasons were recorded with A (100% MN), B (75% MN + 25% ON.), C (50% MN + 50% ON.), D (25% MN + 75% ON.) and E (100% ON.), respectively.

Also, data in Fig (4) and Table (6) showed that interaction effect between cultivars and nitrogen combination treatments was significant on K uptake in wheat grain in 2011/2012 season and in straw in 2012/2013 season. Also data showed that the previous interaction was significant at 5% on K uptake in wheat grain in 2012/2013 season, and it was no significant in wheat straw in 2011/2012 season. The highest values of K uptake for wheat grains and straw in both seasons, were obtained with variety of Gemmiza 10 and Gemmiza 9 respectively when were applied with (A=100% MN) 90 kg N fed^{-1}. These results are confirmed with those obtained by (Mahmoud *et al.,* 2006 and Antoun, Linda *et al.*, 2010).

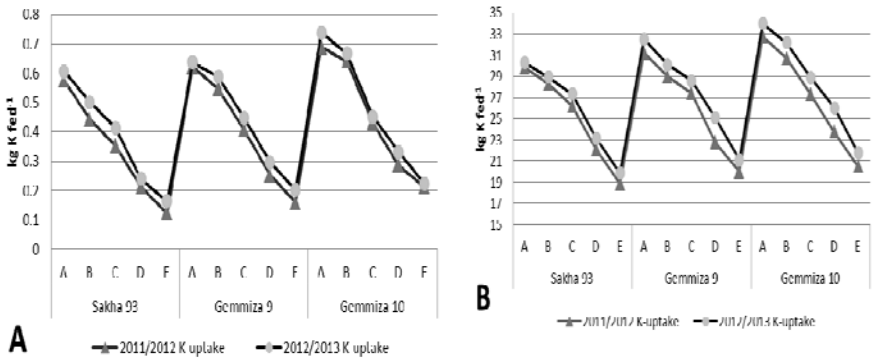

Fig. 4: Effect of combination between compost and inorganic nitrogen fertilizers on potassium uptake in grain (A) and straw (B) (kg N fed^{-1}) for some wheat varieties in 2011/2012 and 2012/2013 seasons.

Table 6: Potassium uptake (kg fed^{-1}) in grain and straw as affected by the interaction between varieties and nitrogen and compost combination treatments during 2011/2012 and 2012/2013 seasons.

Treatment		2011/2012		2012/2013	
Varieties	**Minr.*Org.**	**Grain**	**Straw**	**Grain**	**Straw**
	A	0.575	29.771	0.606	30.269
	B	0.443	28.270	0.502	28.917
Sakha 93	C	0.352	26.178	0.414	27.337
	D	0.212	22.102	0.240	23.159
	E	0.122	18.835	0.164	19.887
	A	0.621	31.206	0.638	32.516
	B	0.546	28.940	0.588	30.102
Gemmiza 9	C	0.408	27.365	0.448	28.580
	D	0.252	22.747	0.297	25.083
	E	0.159	19.979	0.202	21.099
	A	0.689	32.724	0.738	33.976
	B	0.640	30.699	0.667	32.175
Gemmiza 10	C	0.430	27.281	0.451	28.881
	D	0.286	23.723	0.332	26.035
	E	0.213	20.489	0.223	21.752
F		**	ns	*	**
LSD 5%		0.020	1.551	0.050	0.193
LSD 1%		0.037	1.899	0.071	0.234
F	Varieties	**	*	**	**
	Minr.*Org.	**	**	**	**

***Significant at 5% level. ** Significant at 1% level.**
A= 100%MN B=75%MN+25% ON.C= 50%MN + 50% ON. D= 25%MN + 75% ON. E= 100% ON. MN= Inorganic nitrogen ON. = Organic Nitrogen as Compost.

CONCLUSION

It could be concluded that applying 75% inorganic nitrogen (67.5 kg N fed^{-1}) with 25% compost (22.5 kg N fed^{-1}) could produce economic wheat grain and straw yields for Sakha 93 in particular. Also applying organic fertilizer with inorganic nitrogen fertilizers conserves the environment by reducing pollution hazards caused by leaching nitrate in the drainage water and through volatilization of NH_3 gas from $(NH_4)_2 SO_4$ and $CO(NH_2)_2$ fertilizers.

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استجابة بعض أصناف القمح للتسميد النيتروجينى المعدنى والعضوى.

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أجريت تجربتان حقليتان خلال موسمى ٢٠١٠/٢٠١١ و ٢٠١١/٢٠١٢ بمحطة التجارب والبحوث الزراعية بالسرو (محافظة دمياط) - مركز البحوث الزراعية لدراسة تأثير معاملات التسميد النيتروجينى المعدنى والعضوى على محصول الحبوب والقش و امتصاص النيتروجين والفسفور والبوتاسيوم فى الحبوب والقش لبعض أصناف القمح. نفذت كل تجربة فى تصميم القطع المنشقة فى ثلاث مكررات. حيث إشتملت القطع الرئيسية على أصناف القمح وهى؛ سخا ٩٣ ، جميزة ٩ وجميزة ١٠. بينما التحت رئيسية فقد إحتوت على خمسة معاملات للتسميد النيتروجينى المعدنى والعضوى كالتالى؛ (١)- ١٠٠ % نيتروجين معدنى (٩٠ كجم /فدان) ، (٢)- ٧٥ % نيتروجين معدنى (٦٧.٥ كجم/فدان) + ٢٥ % نيتروجين عضوى، (٣)- ٥٠ % نيتروجين معدنى (٤٥.٠ كجم/فدان) + ٥٠ % نيتروجين عضوى، (٤)- ٢٥ % نيتروجين معدنى (٢٢.٥ كجم/فدان) + ٧٥ % نيتروجين عضوى، (٥)- ١٠٠ % نيتروجين عضوى.

تشير النتائج المتحصل عليها على أن أعلى محصول حبوب وقش وكذلك أعلى القيم لامتصاص عناصر النيتروجين والفوسفور والبوتاسيوم فى الحبوب والقش تم الحصول عليها فى أصناف جميزة ١٠ وجميزة ٩ وسخا ٩٣ على التوالى وعند استخدام معاملات ١٠٠ % نيتروجين معدنى، ٧٥ % نيتروجين معدنى + ٢٥ % نيتروجين، ٥٠ % نيتروجين معدنى + ٥٠ % نيتروجين عضوى، ٢٥ % نيتروجين معدنى + ٧٥ % نيتروجين عضوى، ١٠٠ % نيتروجين عضوى على التوالى. كما أعطت معاملة ١٠٠% نيتروجين معدنى مع صنف جميزة ١٠ أعلى النتائج فى كل من محصول الحبوب والقش وكذلك امتصاص عناصر النيتروجين والفوسفور والبوتاسيوم. أيضا استخدام ٧٥% نيتروجين معدنى + ٢٥% نيتروجين عضوى أعطت محصول اقتصادى مع صنف سخا ٩٣ فقط. لذلك يمكن توفير ٢٥% نيتروجين معدنى اذا استخدمناه ككمبوست.

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