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EFFECT OF MINERAL AND BIOLOGICAL NITROGEN AND PHOSPHOROUS FERTILIZATION ON SOME WHEAT CULTIVARS UNDER SALINITY CONDITIONS AT RAS SUDR

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ABSTRACT

This study was carried out at Ras Sudr Experimental Station, South Sinai during 2003/2004 and 2004/2005 growing seasons. Two bread wheat cultivars (Giza 168 and Seds1) were tested with four mineral and biological nitrogen fertilizer and three mineral and biological phosphorous fertilizer treatments under salinity water irrigation conditions. Growth, yield and yield attributes and some chemical components were measured. Results showed that Giza 168 cultivar surpassed significantly Seds1 cultivar in most yield and yield attributes. Increasing mineral nitrogen and phosphorus fertilizers dose increased significantly all growth traits (i.e. plant height and number of tillers/plant), yield and yield attributes (i.e. spike length, number of spikelets/spike, number of grains/spike, spike weight, grains weight/plant, 1000 grains weight, number of spikes/m^2, grain yield/fed., straw yield/fed., biological yield/fed.) and some chemical components (i.e. %protein and %total carbohydrate) of the two wheat cultivars. Giza 168 cultivar fertilized with 100 kg/N/fed., and 31 kg/P/fed., produced the highest significant values of spike length, number of spikelets/spike, number of grains/spike and 1000-grains weight. Meantime, Seds1 cultivar fertilized with 100 kg/N/fed. and 31 kg/P/fed. had high significant values of grains weight/plant., grain yield/fed., and straw yield/fed. traits. Using N biofertilizer (Ceraline) produced about 78% of wheat grain yield compared with using 100 kg /N/ fed. On the other hand using P biofertilizer produced about 84% of wheat grain yield compared with using 31 kg /P/ fed.

Keywords: Wheat cultivars, Nitrogen, Phosphorus, Bio-fertilizer and Salinity

INTRODUCTION

With the global population expected to reach 10 billions by the year 2050, increasing food demands will necessitate the use of more marginal lands to increase wheat production. This could be achieved by cultivate promising wheat cultivars in the new reclaimed areas. Under salinity conditions the choice of the most adapted wheat cultivar(s) is very important to increase the productivity. Intervarietal variation for salt tolerance in wheat is controlled by genes, which could be transferred to sensitive genotypes to improve their tolerance (Salam *et al.* 1999). Although nitrogen is an important nutrient in different soil types, its application has economic burdens and environmental risks. Thus, use of biological nitrogen fixation by living N -fixers will help to minimize the amount of chemical nitrogen fertilizer to be added and to improve plant growth to decrease the production cost and environmental risk (Bhattarai and Hess 1998; EL-Hawary *et al.* 1998 and Aly *et al.* 1999). The cost of nitrogenous fertilizers is very high; hence, it becomes imperative to substitute nitrogen by some other cheaper sources, such as *Azospirillum* and/or *Azotobacter* promoted root growth and more nitrogen fixation in soil, which may partially meet the nitrogen requirement of the crop, Abd-Alla *et al.,* 1994 and Parasuraman, 2000. The role of biological nitrogen fixation (BNF) in supplying plants with needed N, which can make agriculture more productive and sustainable without harming the environment, has to be harnessed efficiently, Tran Thi *et al.* 2006. Adding the fitting doses of nitrogen and phosphorus fertilization meantime reduce the environmental pollution throught using free living bacteria can fix atmospheric nitrogen (i.e. *Azotobacter* and *Azospirillum* which commercially known as Cyrialin). Lynch and White 1977 indicated that the beneficial effects of *Azotobacter chroococcum* on plant development can promote substances like gibberellins and other compounds of auxin type which gave a positive effect on plant growth. The mechanism for successful inoculation is still unknown, although some avenues have been suggested in the experiments (Okon 1985). Therefore it is practically impossible to simulate the exact conditions and factors affecting field experiment results. Additionally, root colonization can not yet be enhanced by external application of beneficial bacteria ((Bashan, 1986 and Dobbelaere *et al.* 1999), because the soil acts as a biological buffer against most of the nonresident bacteria. Dobereiner (1978) reported that *Azospirillum* forms biologically active compounds capable of imparting beneficial effects on germination , root elongation and ultimately increasing crop yield . Furthermore, Patil and Rennie (1983) demonstrated that increases in N – concentration, uptake and growth of wheat inoculation with *Azotobacter* are attributed to nitrogen fixation. Phosphorus is one of the major plant nutrients limiting plant growth. Most agricultural soils contain large reserves of P, a considerable part of which has accumulated as a consequence of regular applications of chemical fertilizers. However, a large proportion of soluble inorganic phosphate added to soil is rapidly fixed as insoluble forms soon after application and becomes unavailable to plants. Phosphorus fixation and precipitation in soil is generally highly dependent on pH and soil type. In acid soils, free oxides and hydroxides of Al and Fe fix P, while in alkaline soils it is fixed by Ca, causing a low efficiency of soluble P fertilizers. The calcium superphosphate fertilizer, which contains about 15% of phosphorus pentoxide, normally loses its available P proportion when it comes in contact with soil minerals containing calcium carbonates (Jose *et al.* 2001). Many soils throughout the world are P deficient because the free phosphorus concentration (the form available to plants) even in fertile soil is generally not higher than 10 µM even at pH 6.5 where it is most soluble (Gyneshwar *et al.* 2002). To circumvent the problem of P deficiency, chemical fertilizers are added to the soils but cost of chemical phosphatic fertilizers is high (Goldstein *et al.* 1993) and low efficiency (<0.1%) (Scheffer and Schachtschabel, 1992). Phosphorus biofertilizers in the form of micro-organisms, especially phosphatesolubilizing bacteria in rhizosphere, can help in increasing the availability of accumulated phosphates for plant growth by solubilization (Richarson, 1994 and Nautiyal *et al.*, 2000). In addition, the micro-organisms involved in P solubilization as well as better scavenging of soluble P (P biofertilizer) can enhance plant growth by increasing the efficiency of biological nitrogen fixation (BNF), enhancing the availability of other trace elements such as Fe, zinc (Zn), etc. and by production of plant growth promoting substances (Kucey *et al.* 1989) and these bacteria also produced indole-3-acetic acid, a phytohormone is known to be involved in root initiation, cell division and cell enlargement, very commonly (Barazani and Friedman, 1999). This study was conducted to study the response of tow different wheat genotypes to mineral and biological of nitrogen and phosphorus fertilization under salinity water irrigation condition at South Sinai

MATERIALS AND METHODS

Two field experiments were carried out at Wadi Sudr Experimental Station of Desert Research Center (DRC), South Sinai during growth seasons of 2003/2004 and 2004/ 2005 to study the effect of mineral and biological nitrogen and phosphorous fertilization on the productivity of some wheat cultivars. The present experiment included 24 treatments which were distributed in split-split plot design with four replicates. The main plots were allocated to the two wheat cultivars Giza 168 and Seds1, sub-plots were occupied with the four nitrogen fertilizer treatments i.e. 60, 80 and 100 kg N/fed., (nitrogen fertilizer levels used in the from of Amonium Nitrate (33.5% N) and applied in three equal portions with the first watering, 35 days after sowing date and before heading respectively) and biofertilization with Cerealine (*Azotobacter* and Azospirllum bacteria as a commercial packet was inoculated with grains before planting).Wheat grains were inoculated with Cerealine as biofertilizer before sowing at a rate of 1 kg / 60 kg of grains. While the sub-sub plots represented the two levels of phosphorus fertilizer and biofertilization with Phosphorin. Phosphorus fertilizer was applied at the rates of 15.5 and 31 kg P_2O_5/fed., which mixed with the upper layer (30 cm depth) of the soil before sowing. The sub-sub plot area was 9 m^2 (3× 3 m) containing 10 rows (3m long and 30 cm apart). Phosphorin as biofertilizer was added before sowing at the rate of 1 kg / 60 kg of grains. Cerealine and Phosphorin were supplied from the Agriculture Research Centre, Giza. Wheat *(Triticum aestivum,L)* grains were sown on 15 November, 2003 and 20 November, 2004 at a rate of 100 kg/fed. Grains of the two wheat cultivars were soaked with tap water for 12 hours before planting. The organic matter as farmyard manure (FYM) was used at the rate of 20 m^3/ fed., and was mixed with in the upper layer (30 cm depth) of the soil before cultivation, potassium sulphate was added at heading stage at the rate of 24 kg K_2O/fed. Physical and chemical analysis of the experimental field soil was determined as shown in Table (1).

Table (1) Mechanical and chemical properties of the soil

Physical analysis										
Particle size distribution %									Texture	
Sand			Silt			Clay			Class	
58.41			20.23			21.36			Sandy loam	
Chemical analysis										
Cations (mg/L)						Anions (mg/L)				
P^h	(ppm)	Ca^{++}	Mg^{++}	Na^+	K^+	$CO3^-$	$Hco3^-$	Cl^-	$SO4^-$	$CaCO3^-$
7.84	5510	19.01	47.31	18.32	0.67	-	6.51	51.03	27.47	49.37

Mechanical analysis was carried out according to Jackson (1958). Chemical analysis was carried out according to Jackson (1958) and Chapman and Pratt (1961). Water analysis was performed to determine the content of anions and cations in underground well water which was used for irrigation at Wadi Sudr as shown in (Table 2).

Table (2) Chemical analysis of irrigation water

Cations (mg/l)						Anions (mg/l)			
P^h	(ppm)	Ca^{++}	Mg^{++}	Na^+	K^+	$CO3^-$	$Hco3^-$	Cl^-	$SO4^-$
8.56	3700	40	75	33	0.28	-	8.0	65.51	74.01

Wheat (*Triticum aestivum,L*) plants were harvested after 155 days from sowing date and the following traits were recorded: Plant height (cm) , No. of tillers/ plant, spike length (cm). No. of spikelets / spike, No. of grains / spike, grains weight / spike (g), grains weight / plant (g), 1000–grains weight (g), No. of spikes / m^2, grain yield/ ton / fed., straw yield/ ton / fed., and biological yield/ton / fed. Protein content % using micro-kjeldahl method was used to determine grain nitrogen content which was multiplied by factor 5.75 to obtain the percentage of crude protein according to A.O.A.C. (1980). Carbohydrate content % was determined according to Dubois *et al.* (1956). Data were statistically analyzed according to the methods of the analysis of variance. Least significant difference (LSD) was calculated as described by Steel and Torrie (1980) to detect the differences among treatment means.

RESULTS AND DISCUSSION

1- Wheat varietal differences:

Results in Table (3) show that, wheat cultivars i.e. Giza 168 and Seds1 differed significantly in growth traits, yield and yield attributes, and some chemical components under salinity conditions, where Giza 168 cultivar surpassed significantly Seds1 cultivar in plant height, spike length, number of spikelets/spike, number of grains/spike, grains weight / spike, 1000-grains weight and protein (%). Whereas, the reverse was true for number of tillers/plant, grains weight / plant, grain yield, straw yield, biological yield and total carbohydrate (%).

Table (3) Varietal differences in some growth, yield, yield attributes and chemical components of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Wheat cultivars	Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets /spike	No. grains/spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes /m^2	Grain yield ton/fed.	Straw yield ton/fed.	Biological yield ton/fed.	Total Carbohydrate (%)	Protein (%)
Giza 168	77.23	2.81	11.35	17.92	49.25	1.77	3.37	38.34	274.8	1.41	2.07	3.47	67.61	12.38
Seds 1	71.57	3.10	10.63	17.42	47.08	1.67	3.71	37.29	293.5	1.53	2.31	3.83	68.80	11.70
L.S.D	0.567	0.004	0.038	0.048	0.170	0.004	0.004	0.038	N.S	0.096	0.042	0.133	0.222	0.139

On the other hand there was no significant difference between the two wheat cultivars in number of spikes / m^2. The variation between the two studied cultivars may be due to their different genetic constitutions and their response to the prevailing environmental conditions .In this respect, Abd EL-Maksoud (2002) reported that there were varietal differences between Giza 168 and Seds1 in growth traits. Giza 168 has superiority in leaf area /plant, number of total tillers/ plant, number of productive tillers /plant, total dry weight /plant and number of grains /spike. Hassanein, (2001) demonstrated that wheat cultivars i.e. (Sids 6, Sids 7, Sids 8, Sakha 69 and Giza 158) significantly differed in growth traits at 120 days after sowing except dry weight of spikes / plant. Regarding protein contents, Abo-Shataia, *et al.* (2001) found that Sids 1 cultivar surpassed Sids 7 and Sakha 69 in grain protein content. Raghav and Pal, 1994 recorded significant differences between five bread wheat in plant height, tiller numbers, spike length, 1000-grains weight and grain and straw yields under salinity conditions. Moreover, Munns *et al.*, 1995 reported that wheat cultivars greatly differed in salt tolerance and that differences in salt tolerance could be due to their ability to exclude salt or tolerate high internal salt concentrations for some period of time in saline conditions.

2-Effect of nitrogen fertilizer treatments

Data in Table (4) reflect that increasing mineral nitrogen fertilizer rate increased significantly all studied growth traits, yield and yield attributes and some chemical components of the two wheat cultivars. Where, adding 100 kg nitrogen / fed., produced higher significant values of plant height, number of tillers/plant, spike length, number of spikelets/spike, number of grains/spike, grains weight / spike, grains weight / plant, 1000-grains weight, number of spikes / m^2, grains yield / fed., straw yield/ fed., biological yield/ fed., protein (%) and total carbohydrate (%) compared with others rates of the mineral nitrogen fertilizer treatments. Whereas, nitrogen biofertilizer (Cerealine) treatment, recorded lower significant values of all aforementioned traits. This may be due to the negative effects of water and soil salinity on the activity of bacteria organism compared with adding mineral nitrogen fertilizer treatments.

Table (4) Effect of nitrogen fertilizer treatments on some growth, yield, yield attributes and chemical components of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Nitrogen Fertilizer treatments	Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets /spike	No. grains /spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes /m^2	Grain yield ton/fed.	Straw yield ton/fed.	Biological yield ton/fed.	Total Carbohydrate (%)	Protein (%)
Cerealine	70.33	2.66	9.97	17.20	47.02	1.64	3.05	35.89	247.7	1.26	1.86	3.12	65.30	10.69
60kgN/fed.	72.59	2.86	10.57	17.50	47.61	1.69	3.61	36.96	270.8	1.45	2.11	3.54	68.03	11.73
80kg N/fed.	76.32	3.05	11.27	17.84	48.50	1.74	3.67	38.79	303.4	1.55	2.34	3.89	69.53	12.72
100kgN/fed	78.36	3.25	12.14	18.13	49.51	1.80	3.85	39.62	314.7	1.62	2.44	4.06	69.96	13.03
L.S.D	0.138	0.005	0.057	0.043	0.076	0.005	0.005	0.174	5.528	0.022	0.030	0.057	0.248	0.197

Using N biofertilizer (Ceraline) produced 86.9%, 81.3% and 77.8 % of wheat grains yield compared with using 60, 80 and 100 kg /N/ fed., respectively. El-Bagoury *et al.* 1998 showed that increasing nitrogen application from 40 to 160 kg N/fed., gradually and significantly increased total carbohydrates in plants at both tillering and heading stages and also in grains. They also found that protein, phosphorus, and potassium, contents gradually increased by increasing N-supply up to 120 kg N/fed. Abdel-Monem *et al.* 2001 revealed that using *Azotobacter brasilense* or commercial biofertilizer Cerealin with half N rate (144 kg N/ha) resulted in a significant increase in yield. Abd EL-Maksoud, 2002 reported that increasing nitrogen fertilizer level from 40 to 80 kg N/fed., significantly increased growth, yield and yield attributes. Extending the ability of these bacteria to fix N_2 in non-legumes such as cereals would be a useful technology for increasing crop yields among resource-poor farmers. Although some inoculation attempts have resulted in nodule formation in cereal plants, there was no evidence of N_2 fixation (Viviene and Felix 2004).

3-Effect of phosphorous fertilizer treatments

The two wheat cultivars fertilized with 31 kg of mineral phosphorous/fed., produced the higher significant values of plant height, number of tillers/plant, spike length, number of spikelets/spike, number of grains/spike, grains weight / spike, grains weight / plant, 1000-grains weight, number of spikes / m^2, grains yield / fed., straw yield/ fed., biological yield/ fed., protein (%) and total carbohydrate (%) compared with 15.5 kg/P/fed. as shown in Table (5). This may be as a result of the positive effect of phosphorus application on cation exchange capacity (CEC) of wheat roots grown on saline-sodic soil and water, Tripathi and Gehlot, 1999. Meantime, Baalbaki *et al.* 1995 observed that increasing phosphorus had a positive effect on number of tillers/plant, stem fresh and dry weight of four wheat cultivars. On the other hand using phosphorine (biofertilizer) produced lower significant values of all studied traits. Data in Table (5) reflected that using P biofertilizer produced about 94% and 84% of wheat grains yield compared with using 15.5 and 31 kg /P/ fed., respectively.

Table (5) Effect of phosphorus fertilizer on some growth, yield, yield attributes and chemical components of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Phosphorus fertilizer	Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets /spike	No. grains /spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes /m^2	Grain yield ton/fed.	Straw yield ton/fed.	Biological yield	Total carbohydrate (%)	Protein (%)
15.5 kg P/fed.	74.36	2.96	10.97	17.63	48.03	1.73	3.56	37.52	283.0	1.39	2.17	3.60	67.84	12.02
31 kg P/fed.	75.76	3.02	11.31	17.87	48.68	1.75	3.90	39.76	295.5	1.56	2.38	3.97	70.28	12.84
Phosphorine	73.08	2.89	10.68	17.51	47.78	1.66	3.17	36.16	273.9	1.31	2.02	3.38	66.49	11.26
L.S.D	0.212	0.004	0.031	0.038	0.078	0.004	0.004	0.133	4.349	0.004	0.022	0.40	0.219	0.036

4-Effect of the interaction between wheat cultivars and nitrogen fertilizer treatments

Results in Table (6) illustrate that the response of the two wheat cultivars under investigation to nitrogen fertilizer significantly differed in plant height, number of tillers/plant, spike length, number of spikelets/spike, number of grains/spike, grains weight / spike, grains weight / plant, number of spikes /

m^2, straw yield/ fed., and total carbohydrate (%).Generally, adding 100 kg /N/fed., produced the highest values of the above traits. This is could be due to genetic variation of the two wheat cultivars where Giza 168 cultivar surpassed significantly Seds1 cultivar in most growth traits. Regarding this, El-Bagoury *et al.* 1998 showed that increasing nitrogen application from 40 to 160 kg N/fed., gradually and significantly increased total carbohydrates in plants at both stages (tillering and heading) and also in grains. They also found that protein, phosphorus, and potassium, contents gradually increased by increasing N-supply up to 120 kg N/fed. The reverse was true for applying Cerealine treatment, which recorded the lowest values. Whereas, there were no significant differences in 1000-grains weight, grain yield / fed., biological yield/ fed., protein (%)

5-Effect of the interaction between wheat cultivars and phosphorous fertilizers

Data in Table (7) show that the highest grain yield was recorded with Seds1 cultivar with adding 31.0 kg /P/fed., which produced the highest values of number of tillers/plant, grains weight / plant and number of spikes / m^2. The lowest grain yield was given with cultivar Giza 168 applying Phosphorine treatment. Whereas, there were no significant differences between the two wheat cultivars in grains weight / spike, total carbohydrate (%) and protein (%) overall phosphorous fertilization. It be noticed that mineral phosphorus application surpassed phosphorine treatment. It may due to the more effective of uptake of mineral phosphorus than phosphorine. In this respect, Mukherjee and Rai, 2000 reported that application of mineral phosphorus did exhibit perceptible influence on yield of the crops. They added that both biofertilizer and phosphorus nutrition interaction showed significant influence on growth and phosphorus uptake by wheat compared with either of the components applied separately.

6-Effect of the interaction between nitrogen and phosphorous fertilization treatment

Results in Table (8) reflect that the interaction between nitrogen and phosphorous fertilization treatments affected significantly plant height, number of tellers, spike length, number of spikelets/spike, grains weight/plant, 1000-grains weight, grain yield/fed., straw yield/fed., biological yield/fed., and total carbohydrates (%). Whereas, there were no considerable differences in number of spikes/m^2 and protein (%). Where adding 100 kg/N/fed., with 31kg/P/fed., produced the highest significant values of the yield and yield attributes. On the other hand the lower significant values of the growth traits, yield and yield attributes were recorded by adding only Cerealine and phosphorien treatments. This may be due to the more effective uptake of mineral nitrogen and phosphorus fertilizers comparing with Cerealine and phosphorien fertilizers.

Table (6) Effect of the interaction between wheat cultivars and nitrogen fertilizer treatments on some growth, yield , yield attributes and chemical components of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Treatments		Plant height (cm)	No. Tillers /plant	Spike Length (cm)	No. spikelets /spike	No. grains /spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes $/m^2$	Grain yield ton/fed.	Straw yield ton/fed.	Biological Yield ton/fed.	Total Carbohydrate (%)	Protein (%)
Giza 168	Cerealine	73.22	2.53	10.16	17.40	47.57	1.70	2.97	36.42	243.5	1.18	1.75	2.93	64.68	10.96
	60 kg /fed.	75.70	2.72	10.79	17.71	48.63	1.74	3.39	37.41	254.1	1.39	2.01	3.40	67.77	12.06
	80kg N/fed.	78.98	2.89	11.87	18.07	49.79	1.78	3.46	39.29	296.2	1.49	2.20	3.69	68.80	13.07
	100kg N/fed.	81.02	3.10	12.56	18.48	50.99	1.84	3.67	40.22	305.5	1.57	2.31	3.85	69.19	13.43
Seds 1	Cerealine	67.44	2.80	9.78	17.01	46.47	1.58	3.13	35.35	251.8	1.33	1.97	3.30	65.92	10.41
	60 kg /fed.	69.47	3.01	10.35	17.30	46.59	1.64	3.83	36.52	287.4	1.51	2.22	3.68	68.29	11.41
	80kg N/fed.	73.67	3.21	10.67	17.61	47.21	1.69	3.88	38.28	310.7	1.60	2.49	4.09	70.25	12.36
	100kg N/fed.	75.71	3.40	11.72	17.78	48.03	1.75	4.03	39.01	323.9	1.67	2.58	4.26	70.74	12.62
L.S.D		0.195	0.007	0.081	0.061	0.108	0.007	0.007	N.S	7.817	N.S	0.043	N.S	0.351	N.S

Table (7) Effect of the interaction between wheat cultivars and phosphorus fertilizer treatments on some growth, yield , yield attributes and chemical components traits of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Treatments		Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets /spike	No. grains /spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes $/m^2$	Grain yield ton/fed.	Straw yield ton/fed.	Biological yield ton/fed.	Total Carbohydrate (%)	Protein (%)
Giza	15.5 kg P/fed.	77.17	2.81	11.35	17.90	49.19	1.78	3.40	37.96	272.3	1.37	2.02	3.38	67.23	12.38
	31 kg P/fed.	78.74	2.87	11.65	18.11	49.75	1.81	3.71	40.44	283.3	1.56	2.25	3.81	69.56	13.22
	Phosphorine	75.78	2.75	11.04	17.72	48.81	1.71	3.00	36.61	268.9	1.30	1.92	3.21	66.04	11.55
Sed	15.5 kg P/fed.	71.56	3.11	10.59	17.37	46.87	1.68	3.72	37.07	293.7	1.50	2.31	3.82	68.44	11.66
	31 kg P/fed.	72.78	3.18	10.97	17.62	47.60	1.70	4.09	39.10	304.8	1.66	2.51	4.13	71.01	12.46
	Phosphorine	70.37	3.02	10.32	17.29	46.76	1.61	3.34	35.71	278.9	1.42	2.12	3.55	66.95	10.97
L.S.D		0.299	0.006	0.044	0.054	0.111	N.S	0.006	0.188	5.151	0.006	0.031	0.057	N.S	N.S

Table (8) Effect of the interaction between nitrogen and phosphorus fertilizers on some growth, yield , yield attributes and chemical components of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Treatments		Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets/ spike	No. grains/ spike	Grains weight / spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes $/m^2$	Grain yield ton/fed.	Straw yield ton/fed.	Biological Yield ton/fed.	Total Carbohydrate (%)	Protein (%)
Cerealine	15.5kg P/fed.	70.37	2.66	9.96	17.10	46.69	1.65	2.98	35.43	245.3	1.25	1.83	3.08	65.26	10.72
	31kg P/fed.	72.01	2.72	10.19	17.42	47.83	1.68	3.27	37.59	262.1	1.35	2.01	3.36	66.32	11.02
	Phosphorine	68.61	2.60	9.77	17.08	46.54	1.59	2.89	34.63	235.6	1.17	1.74	2.91	64.31	10.31
60kgN /fed.	15.5kg P/fed.	72.57	2.88	10.56	17.45	47.58	1.71	3.61	36.72	268.2	1.43	2.11	3.54	66.80	11.60
	31kg P/fed.	74.06	2.94	10.90	17.64	47.97	1.73	3.92	38.61	281.5	1.58	2.29	3.78	71.36	12.73
	Phosphorine	71.13	2.77	10.25	17.42	47.29	1.64	3.29	35.57	262.5	1.34	1.94	3.28	65.93	10.87
80kgN fed.	15.5kg P/fed.	76.22	3.06	11.22	17.82	48.41	1.75	3.73	38.61	301.3	1.50	2.32	3.83	69.35	12.56
	31kg P/fed.	77.52	3.10	11.60	18.02	49.01	1.77	4.09	40.99	310.4	1.70	2.56	4.26	71.89	13.75
	Phosphorine	75.23	2.99	11.00	17.68	48.09	1.69	3.19	36.77	298.6	1.43	2.14	3.57	67.34	11.84
100kgN /fed.	15.5kg P/fed.	78.31	3.24	12.15	18.17	49.42	1.81	3.90	39.29	317.1	1.57	2.41	3.94	69.94	13.20
	31kg P/fed.	79.45	3.34	12.56	18.38	49.90	1.84	4.33	41.87	328.1	1.81	2.67	4.48	71.56	13.86
	Phosphorine	77.33	3.18	11.71	17.84	49.21	1.73	3.30	37.68	298.9	1.49	2.25	3.75	68.39	12.02
L.S.D		0.423	0.008	0.062	0.077	0.157	0.008	0.008	0.266	N.S	0.008	0.044	0.080	0.439	N.S

Table (9) Effect of the interaction between wheat cultivars, nitrogen and phosphorus fertilizers on some growth characters, yield , yield attributes and chemical components of two wheat cultivars (Average of 2003/2004 and 2004/2005 growing seasons)

Treatments			Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets /spike	No. grains /spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes /m²	Grain yield ton/fed.	Straw yield ton/fed.	Biological yield ton/fed.	Total carbohydrate (%)	Protein (%)
Giza 168	Cerealine	15.5kg P/fed.	73.15	2.53	10.13	17.33	47.50	1.72	2.90	35.90	239.8	1.17	1.73	2.90	64.64	10.78
		31 kg P/fed.	75.13	2.58	10.37	17.67	47.95	1.74	3.19	28.22	258.2	1.28	1.88	3.15	65.66	11.44
		Phosphorine	71.37	2.47	9.98	17.20	47.27	1.65	2.81	35.15	232.5	1.10	1.65	2.75	63.71	10.67
	60kgN /fed.	15.5kg P/fed.	75.77	2.73	10.83	17.67	48.55	1.76	3.36	37.08	253.3	1.37	1.98	3.35	70.75	12.02
		31 kg P/fed.	77.52	2.77	11.13	17.88	49.10	1.78	3.69	39.20	263.0	1.51	2.16	3.67	65.85	13.14
		Phosphorine	73.82	2.65	10.40	17.57	48.25	1.69	3.11	35.93	246.0	1.29	1.88	3.16	68.74	11.03
	80kgN /fed.	15.5kg P/fed.	78.75	2.89	11.83	18.08	49.65	1.79	3.59	38.83	291.0	1.43	2.14	3.57	70.89	13.03
		31 kg P/fed.	80.33	2.94	12.20	18.22	50.52	1.82	3.80	41.80	296.0	1.68	2.44	4.12	66.77	14.07
		Phosphorine	77.87	2.82	11.58	17.90	49.22	1.73	2.98	37.25	301.5	1.36	2.01	3.37	68.83	12.10
	100kgN /fed.	15.5kg P/fed.	81.00	3.08	12.60	18.53	51.05	1.86	3.74	40.02	304.9	1.51	2.24	3.68	70.92	13.68
		31 kg P/fed.	81.98	3.18	12.90	18.68	51.43	1.89	4.16	42.53	315.9	1.76	2.54	4.31	67.81	14.22
		Phosphorine	80.07	3.05	12.18	18.23	50.50	1.78	3.10	38.12	295.6	1.44	2.14	3.57	67.81	12.39

Contenue.. (Table 9)

Treatments			Plant height (cm)	No. tillers / plant	Spike length (cm)	No. spikelets /spike	No. grains /spike	Grains weight /spike (g)	Grains weight /plant (g)	1000 grains weight (g)	No. Spikes $/m^2$	Grain yield ton/fed.	Straw yield ton/fed.	Biological yield ton/fed.	Total carbohydrate (%)	Protein (%)
Seds 1	Cerealine	15.5 kg P/fed.	67.58	2.79	9.78	16.87	45.88	1.59	3.07	34.97	250.7	1.33	1.92	3.25	65.88	10.66
		31 kg P/fed.	68.88	2.86	10.02	17.18	47.72	1.61	3.35	36.97	266.0	1.42	2.15	3.57	66.98	10.60
		Phosphorine	65.85	2.73	9.55	16.97	45.82	1.52	2.96	34.12	238.7	1.24	1.84	3.08	64.89	9.95
	60kgN /fed.	15.5 kg P/fed.	69.37	3.02	10.28	17.23	46.62	1.66	3.86	36.35	283.1	1.50	2.24	3.73	66.88	11.18
		31 kg P/fed.	70.60	3.11	10.67	17.40	46.83	1.68	4.14	38.02	300.0	1.65	2.42	3.90	71.97	12.32
		Phosphorine	68.45	2.89	10.10	17.27	46.33	1.59	3.48	35.20	279.1	1.39	2.00	3.39	66.01	10.71
	80kgN /fed.	15.5 kg P/fed.	73.68	3.23	10.60	17.55	47.17	1.71	3.87	38.38	311.7	1.57	2.50	4.08	69.95	12.08
		31 kg P/fed.	74.72	3.25	11.00	17.82	47.50	1.72	4.37	40.18	324.7	1.72	2.68	4.40	72.89	13.43
		Phosphorine	72.60	3.16	10.42	17.47	46.97	1.64	3.39	36.28	295.7	1.50	2.28	3.78	67.91	11.54
	100kgN /fed.	15.5 kg P/fed.	75.62	3.59	11.70	17.81	47.80	1.77	4.06	38.57	329.3	1.62	2.58	4.21	71.06	12.73
		31 kg P/fed.	76.92	3.50	12.22	18.08	48.37	1.80	4.51	41.22	340.4	1.87	2.79	4.66	72.20	13.49
		Phosphorine	74.60	3.31	11.23	17.45	47.92	1.68	3.51	37.25	302.1	1.54	2.36	3.93	68.97	11.65
L.S.D			N.S	0.011	0.088	0.108	0.222	N.S	0.011	0.376	N.S	0.011	0.062	N.S	N.S	N.S

Effect of the interaction between wheat cultivars, nitrogen and phosphorous fertilization treatments

Results given in Table (9) revealed that the interaction between wheat cultivars, nitrogen and phosphorous fertilization significantly affected number of tillers/plant, spike length, number of spikelets/spike, number of grains/spike, grains weight/plant, 1000-grains weight, grain yield/fed., and straw yield/fed. Whereas, this interaction did not significantly affect plant height, grains weight/spike, number of spikes/m^2, biological yield/fed., and the chemical components i.e. total carbohydrate and protein percentages. Giza 168 cultivar fertilized with 100 kg/N/fed., and 31 kg/P/fed., produced the high significant values of spike length, number of spikelets/spike, number of grains/spike and 1000-grains weight traits. Meantime, Seds1 cultivar fertilized with 100 kg/N/fed., and 31 kg/P/fed., had the high significantly values of grains weight/plant., grain yield/fed., and straw yield/fed., traits. These results are in harmony with that obtained by El-Bagoury *et al.* 1998. On the other hand the highest value of number of tillers/plant was recorded by Seds1 culivar treated with 100kg/N/fed., and 15.5 kg/P/fed. The lower significant values of number of tillers/plant, grains weight/plant, grain yield/fed., and straw yield/fed., were recorded by Giza 168 cultivar fertilized with cerealine and phosphorine treatment. Whereas Seds1 cultivar fertilized with cerealine and phosphorine had the lowest values of spike length and number of grains/spike traits. On the other hand the lowest significant value of 1000-grains weight was recorded by Giza 168 cultivar treated with cerealine 31kg/P/fed. Meantime, Seds1 cultivar had the lowest significant value of number of spikelets/spike with adding cerealine and 15.5 kg/P/fed., treatment.

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تأثير التسميد المعدني والحيوي للنيتروجين والفوسفور علي إنتاجية بعض أصناف القمح تحت ظروف الملوحة برأس سدر

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أقيمت تجربتان حقليتان بمحطة بحوث جنوب سيناء براس سدر خلال موسمى٢٠٠٣/٢٠٠٤، ٢٠٠٤/٢٠٠٥ لدراسة تاثير مسئويات مختلفة من السماد الازوتى والفوسفاتى المعدنى والحيوى علي انتاجية بعض اصناف القمح تحت ظروف الملوحة بمنطقة رأس سدر وكان التصميم المستخدم هو قطاعات منشقة مرتين وقد أشتملت القطع الرئيسية على صنفى القمح جيزة ١٦٨ و سدس ١ والمنشقة الاولىتشمل مستويات التسميد الأزوتى المعدني والحيوي ٦٠، ٨٠، ١٠٠كجم/فدان والسماد الحيوى السريالين والمنشقة الثانية تشمل مستويات التسميد الفوسفاتى المعدنى والحيوى ١٥،٥ ، ٣١ كجم /فدان والسماد الحيوى الفوسفورين

ويمكن تلخيص أهم النتائج فيما يلى:

١- تفوق الصنف سدس ١ عن الصنف جيزة ١٦٨ حيث أظهر أنة أكثر تحملا للملوحة فى كل من صفات الحاصل ومكوناته وأظهرت علاقة موجبة.

٢- تفوق معدل التسميد الازوتى ١٠٠كجم/فدان عن المعدل ٨٠، ٦٠كجم/فدان كما تفوق علي التسميد الحيوى السريالين فى كل من صفات الحاصل ومكوناته وأظهرت علاقة موجبة.

٣- تفوق معدل التسميد الفوسفاتى ٣١كجم/فدان عن المعدل ١٥،٥كجم/فدان كما تفوق عن التسميد الحيوى الفوسفورين فى كل من صفات الحاصل ومكوناته وأظهرت تأثير معنوى.

٤- أظهرت التفاعل بين الأصناف والتسميد الازوتى علاقة موجبة فى كل صفات حاصل ومكوناتـه بينما أظهر وزن الألف حبة جم وحاصل الحبوب طن/ فدان وحاصل البيولوجى طن/فدان ونسبة البروتين% عدم معنوية وقد بينت الدراسة تفوق الصنف سدس ١ تحت مستوى التسميد ١٠٠كجم نتروجين/فدان.

٥- أظهر التفاعل بين معدلات التسميد الفوسفاتي المعدني والحيوي والأصناف علاقة موجبة فى كل من صفات والحاصل ومكوناته بينما أظهر صفة وزن حبوب السنبلة/جم والنسبة المئوية للكربوهيدرات والنسبة المئوية للبروتين عدم معنوية وقد أظهرت الدراسة تفوق الصنف سدس ١ مستوى التسميد ٣١كجم فسفور/ فدان.

٦- بينت الدراسة نتيجة التفاعل بين معدلات التسميد النتروجينى والفوسفاتى وجود علاقة موجبة فى معظم صفات الحاصل ومكوناتة بينما أظهرت صفة عدد السنابل/م٢ ونسبة البروتين % عدم معنوية وقد بين التفاعل أن أفضل النتائج ١٠٠كجم نتروجين/فدان +٣١كجم فوسفور/فدان لاعطاء أعلا محصول.

٧-أظهر التفاعل بين صنفي القمح سدس ١ و جيزة ١٦٨ ومعدلات التسميد النتروجينى المعدنى والحيوى ومعدلات التسميد الفوسفاتى المعدنى والحيوى فى معظم صفات الحاصل ومكوناتة تأثير معنويا بينما كان له تأثير غيرمعنويا فى طول النبات، ووزن حبوب السنبلة جم وعدد السنابل/ م٢ و الحاصل البيولوجىطن/ فدان،ونسبة الكربوهيدرات%ونسبةالبروتين %.

٨-أظهر التفاعل بين صنفي القمح سدس ١ و جيزة ١٦٨ ومعدلات التسميد النتروجينى المعدنى والحيوى ومعدلات التسميد الفوسفاتى المعدنى والحيوى فى معظم صفات الحاصل ومكوناتة تأثير معنويا بينما كان له تأثير غيرمعنويا فى طول النبات، ووزن حبوب السنبلة جم وعدد السنابل/ م٢ و الحاصل البيولوجىطن/ فدان،ونسبة الكربوهيدرات%ونسبةالبروتين %.

من خلال الدراسة يمكن التوصية بزراعة أصناف القمح الاكثر تحملا للملوحة خاصة الصنف سدس ١ فى منطقة راس سدر والمناطق المشابهة بجنوب سيناء والحد من استخدام الاسمدة المعدنية باستخدام البدائل البيولوجية للمحافظة علي منع التلوث البيئي خاصة للمناطق التي لم يتم زراعتها من قبل .