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EFFECT OF DIFFERENT NITROGEN AND PHOSPHORUS SOURCES ON WHEAT YIELD, ITS COMPONENTS AND CHEMICAL CHARACTERISTICS UNDER DIFFERENT SOIL CONDITIONS

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ABSTRACT

A field experiment was conducted in two locations at Bahtim Agricultural Research Station, Kaluobia Governorate during the winter growing season, 2006/2007 to study the effect of different phosphorus sources, i.e., single superphosphate & triple superphosphate and different nitrogen fertilizers sources (ammonium sulphate, calcium nitrate and urea) on grain, straw and biological yields as well as nutrients uptake of wheat plant variety (Giza 168).
Results can be summarized as follows:

Generally, the grain, straw and biological yield of wheat plants grown on non-saline soil was twice or more than that resulted from saline soil.

In non-saline soil, there was a significant higher for single superphosphate on biological yield, while triple superphosphate achieved high values of P and Mn uptake in biological yield. Meanwhile, no significant differences were observed between sources of phosphorus fertilizer on the other nutrients uptake in biological yield. The source of phosphorus fertilizer had no significant effect on grain and straw yields of wheat plants as well as nitrogen uptake & protein % in grain, also, N, P and K uptake in straw yield. While, there was a significant increase due to the application of triple superphosphate on P, K, Fe, Zn and Mn in grain yield as well as Mn uptake in straw yield. Regarding the interaction effect of phosphorus and nitrogen fertilizer sources, there was no clear trend due to most cases of nutrients uptake by grain and straw yield.

In saline soil, triple superphosphate gave the highest significant values in all parameters under study compared to single superphosphate. Concerning of nitrogen fertilizer sources, ammonium sulphate gave the highest significant values in most parameters under study compared to other nitrogen sources. Regarding the interaction effect between phosphorus and nitrogen fertilizer sources, triple superphosphate with ammonium sulphate gave the highest values for the most parameters compared to other treatments.
Keywords: wheat; yield component; P and N sources; P, N and Salinity interactions.

INTRODUCTION

Wheat is one of the most important cereal crops in Egypt, which its demand is increasing in all countries for animal and human consumption. Therefore, a great attention should be given to increase its productivity and improve its quality. Considerable researches have been reported on the salt tolerance of wheat cultivars over the past years (Epstein, 1985, François *et al.*, 1986, Epstein and Rains, 1987).The growing increase of salt-affected soils in Egypt needs substantial investigations to identify the optimal fertilizer programs that could be applied to minimize the adverse effect of salinity on crop yields. In spite of the fact that P utilization by the growing plants in soils is usually limited (Jungk *et al.*, 1993) and did not exceed 10% (Schenk and Barber, 1979), increasing P fertilization has been intensively practiced to stimulate yield potential and to alleviate growth inhibition under salt-stressed condition. Soil salinzation is one of the most common land degradation processes in arid and semi-arid regions, where precipitation exceeds over evaporation. Under such climatic conditions, soluble salt are accumulated in the soil, influencing soil properties and environment with ultimate decline in soil productivity (Abdelfattah *et al.*, 2009).

Reported data on the salinity-phosphorus interaction have shown that P fertilization in salt- affected soils may be beneficial in reducing the depressing effects on yield as long as the salinity level is low or in medium range (Bermstein *et al.*, 1974).

Salt stress is an important constraint that affects crop production in arid and semiarid regions. However, improved nitrogen (N) and phosphorus (P) nutrition may enhance the performance of salt stressed crop plants (Soliman and Doss, 1992). Soliman *et al.*, (2004) revealed that salt stress progressively inhibited wheat plant growth in terms of straw and grain yields. At low salinity (4.0 dS m^{-1}), straw and grain yields were reduced by 10 % and 14 %, respectively, as compared to the control treatment. Higher salinity levels led to decrease straw yield by 40 and 60 % and grain yield by 40 and 52 % at 8.2 and 12.5 dSm^{-1}, respectively.

The form of N supply is known to influence the availability of other plant nutrients, notably phosphorus, through its effect on soil pH in the rhizosphere. In general, pH decreases when ammonium was used as N fertilizer and pH increases with the application of nitrate nitrogen (Youssef, and Chino, 1988). Gahoonia *et al.* (1992) also showed that the soil pH of the root surface of ryegrass decreased and that Ca-P of luvisol was dissolved when N was applied as NH_4. Plants may change soil pH in the vicinity of their roots, Zhang *et al.* (2004) and thus affect the availability of phosphate. In addition, Irshad *et al.* (2002) found that the Plant growth and nutrient uptake were influenced by both salinity and source of N. As expected, increasing salinity decreased dry matter production of shoot and root, whereas N application increased plant growth across all levels of salinity. The total dry biomass (shoot and root) of wheat was significantly higher in combined N treatments than in single sources. Irrespective of N forms most of the nutrient concentrations in the shoot was increased with increasing level of salinity. Among the fertilizers the concentration, cation was higher in nitrate-treated plants than in other forms of N. Ammonium-N and urea-N tended to inhibit the uptake of cations compared to nitrate-N under saline conditions. The trend for P and Cl concentrations was almost opposite to that of cations concentration in the shoot.

The aim of this work is to study the effect of different phosphorus and nitrogen sources fertilizers on grain, straw and biological yields as well as nutrients uptake of wheat plant under different soil conditions.

MATERIALS AND METHODS

The current work was carried out at Bahtim Agricultural Research Station during the winter seasons of 2006/2007 to study the effect of phosphorus and nitrogen fertilizers sources on on grain and straw yields as well as nutrients uptake of wheat plant variety (Giza 168),. The site for laying out the trials was chosen at two locations having different soil salinity level.

Soil of the experimental field was sampled to certain the soil particle size distribution and chemical analysis before planting according to the standard methods of Ryan *et al.* (1996). The results of these analyses are presented in Table (1, a and 1, b)

Table (1, a): Some physical and chemical properties of the studied soils

Soils	pH	EC dSm	OM	$CaCO_3$	S.P	Sand	Silt	Clay	Soil texture
			%						
1st location	7.6	1.8	1.4	2.6	64	15	33	52	Clay
2nd location	8.2	8.5	1.1	3.4	59	14	28	58	Clay

Table (1, b): Cation and anion as well as nutrient concentration in a paste extract of the studied soil samples

Soils	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-}	HCO_3^{-}	Cl^{-}	SO_4^{-}	N	P	K	Fe	Mn	Zn
	Mmol/l								Available (ppm)					
1st location	7.9	6.1	7.5	1.3	0.0	2.6	6.1	14.1	37.4	7.4	345	9	2.2	3.1
2nd location	9.3	4.6	59.2	0.8	0.0	3.2	3.2	67.5	38.7	6.2	360	8	2.4	3.8

Wheat grains (Giza 168), were planted at the rate of 70 kg/fed. On20 November, 2006.

Experiment in both locations was arranged in a split plot design with three replications of 10.5 m^2 (1/400 fed.) in which the main treatments were devoted for source of phosphorus fertilizer, while the sub-ones included source of nitrogen fertilizer. Such treatments were as follows:-

1- Phosphorus fertilizer sources.
- Triple superphosphate (TSP).
- Single superphosphate (SSP).

2- Nitrogen fertilizer sources:
- Ammonium Sulphate (20.6 % N).
- Calcium Nitrate (33.5 % N).
- Urea (46.5% N).

The fertilizer was applied in three equal portions, i.e., before planting, first and second irrigation, 21 and 43 days from planting, respectively.

A basal application of 48 kg K_2O /fed. as potassium sulphate (48% K_2O) was applied to all experimental plots after 18 and 31 days of planting. All cultural practices were carried out according to usual methods being adopted for such crop. The crop was harvested at full maturity on the 15th of May, 2007. Grain, straw and biological yields were recorded. Random samples of grain and straw representing each replicate of all treatments were collected, oven dried, digested and assigned for analyzing N, P, K, Fe, Mn, and Zn.

Nitrogen was determined using modified Kjeldahl method, the grains protein percentage was calculated by multiplying N % X 5.75. Phosphorous was determined colorimetrically using ammonium molybdate and ammonium metavanadate according to the procedure outlined by Ryan *et al.* (1996).Potassium was determined using the flame spectrophotometry method (Black, 1982).Micronutrients (Fe, Mn, and Zn) were determined using atomic spectrophotometer absorption, Perkin-Elmer 372 according to the procedure outlined by Ryan *et al.* (1996).

Results were statistically analyzed using M-stat computer package to calculate F ratio according to Snedecor and Cochran (1980). Least significant differences method (L.S.D) was used to differentiate means at the 0.05 level (Waller and Duncan, 1969).

RESULTS AND DISCUSSION

1. Yield

The effect of phosphorus and nitrogen fertilizer sources and their interaction on grain, straw and biological yield of wheat plant grown on non-saline soil are shown in Tables (2, 4 and 6), while such effect for saline soil is presented in Tables (3, 5 and 7). It is interesting to note that grain, straw and biological yield of wheat plants grown on non-saline soil was twice or more than that resulted from saline soil. This result indicates that wheat plants is severe strongly affected under saline soil as a result of the harmful effect of salinity hazard. Results also revealed that the source of phosphorus fertilizer had no significant effect on wheat grain and straw yields for grown on non-saline soil, while biological yield was significantly affected by such source. This result agree with those obtained by El-Etreiby (2002) and Aboushal and EL-Ashtar (2006), who concluded that the reduction of wheat grain yield resulted from increasing salinity was attributed mainly to a reduction in number of spikes/pot and 100-grain weight. On the contrary, grain, straw and biological yield were significantly affected by phosphorus fertilizer source where such yields were significantly higher by using triple superphosphate than those resulted from the addition of single superphosphate. The insignificant influence of P fertilizer sources on grain and straw yield of wheat plant grown on non-saline soil could be elucidated to the suitable growth conditions of the non-saline soil, which create good physical and chemical properties of soil and that reflected on nearly equal grain and straw yield of wheat plant.

Concerning the effect of the source of nitrogen fertilizer, various trends of yield, i. e., grain, straw and biological one of wheat plants grown on both soils were noticed. Results indicated that grain yield of wheat plants grown on both soils was significantly affected by nitrogen source, where ammonium sulphate had significantly surpassed the others. This result may be due to the good buffer effect of ammonium sulphate which is considered as fertilizer having acidic physiological effect especially in saline soil, which could be gone towards alkalinity state. Similar results were obtained by Taalab and Badr (2007) who concluded that rhizosphere soils increase with the addition of $(NH_4)_2SO_4$ than with Ca $(NO_3)_2$ at same rates of application. On the other hand, the effect of nitrogen source took different trend in both soil under study, whereas such effect was insignificant in saline soil, while it is opposite in non-saline soil, where it was significant.

Table (2): Effect of phosphorus and nitrogen fertilizer sources on grain yield, macro and micro nutrients uptake as well as protein percentage on wheat plant grown in non saline soil

Treatments	Grain yield	N	P	k	Fe	Zn	Mn	Protein
	Ton/ fed	Uptake (Kg/ fed)			Uptake (g/ fed)			%
Triple superphosphate (TSP)	2811	53.47	7.83**	8.22**	831.77**	321.69**	99.99 *	10.91
single superphosphate (SSP)	2875	54.15	6.91	6.94	806.71	272.61	87.36	10.93
LSD at 5%	NS	NS						NS
Ammonium Salphate	2937	59.60	7.86	6.56	881.3	293.5	100.3	11.68
Calcium Nitrate	2805	52.67	7.12	8.49	910.9	298.9	91.09	10.80
Urea	2760	49.15	7.14	7.68	665.5	299.1	89.63	10.24
LSD at 5%	147.4	2.91	0.50	0.56	45.13	NS	NS	0.61
(TSP) Ammonium Salphate	2927	61.65	8.25	6.19	751.1	331.8	107.3	12.12
(TSP)+ Calcium Nitrate	2775	52.89	7.58	10.68	971.1	333.0	97.11	10.96
(TSP) + Urea	2730	45.87	7.67	7.78	773.0	300.3	95.56	9.66
(SSP) + Ammonium Salphate	2946	57.55	7.46	6.93	1012.0	255.2	93.33	11.23
(SSP) Calcium Nitrate	2835	52.45	6.66	6.30	850.6	264.8	85.06	10.64
(SSP) + Urea	2790	52.44	6.60	7.57	558.0	297.8	83.70	10.81
LSD at 5%	208.5	4.12	0.71	0.79	76.55	50.82	18.81	0.87

Table (3): Effect of phosphorus and nitrogen fertilizers sources on grain yield, macro and micro nutrients uptake as well as protein percentage of wheat plant grown in saline soil

Treatments	Grain yield	N	P	k	Fe	Zn	Mn	Protein
	Ton/ fed	Uptake (Kg/ fed)			Uptake (g/ fed)			%
(TSP) Triple superphosphate	1.363*	26.64*	3.82*	4.69*	357.26*	167.41*	54.51*	11.19
(SSP)single superphosphate	1.061	20.27	2.57	3.66	281.99	116.15	35.50	10.98
LSD at 5%								NS
Ammonium Salphate	1.389	28.03	3.76	4.67	348.6	162.9	53.66	11.56
Calcium Nitrate	1.132	21.82	2.93	4.08	275.9	121.1	41.17	11.13
Urea	1.116	20.51	2.90	3.78	334.4	141.4	40.19	10.57
LSD at 5%	0.125	1.91	0.51	0.41	16.81	18.01	7.59	0.60
(TSP) Ammonium Salphate	1.648	33.93	4.65	5.60	471.3	197.7	65.91	11.84
(TSP)+ Calcium Nitrate	1.277	24.27	3.53	4.47	255.3	153.2	51.07	10.98
(TSP) + Urea	1.164	21.71	3.27	4.00	345.1	151.3	46.56	10.74
(SSP) + Ammonium Salphate	1.129	22.14	2.86	3.74	225.9	128.0	41.41	11.27
(SSP) Calcium Nitrate	0.988	19.37	2.32	3.69	296.4	88.92	31.28	11.27
(SSP) + Urea	1067 C	19.31	2.52	3.56	323.7	131.6	33.82	10.41
LSD at 5%	0.176	2.70	0.72	0.58	23.77	25.47	10.74	0.85

Apparently, grain and straw yields of wheat plants grown on non-saline soil were significantly increased due to the use of ammonium sulphate fertilizer compared to those treated with the other fertilizers (Calçium nitrate or Urea). In this connection, El- Sherief *et al.* (2008) found that, the maximum maize yield has been obtained with ammonium sulphate and the lowest one was recorded with ammonium nitrate and urea.

Regarding the interaction effect between the studied factors, results revealed that grain, straw and biological yields were significantly affected by interacted treatments. Wheat plants grown on non-saline or saline soil and fertilized with triple superphosphate combined with ammonium sulphate yielded significantly higher grain, straw and biological yields. This result could be attributed to the individual effect mentioned previously, of the factors under study. In this respect, Fawzy *et al.* (1983) noted that fertilization improves soil productivity but under saline conditions, it does not directly seem to help in increasing crop production. But indirectly it decreases the harmful effect of salinity by providing nutrients to the plants for their functions.

2. Nutrients uptake

Macro and micro nutrients uptake by wheat plants grown on non-saline and/ or saline soils as affected by different phosphorus and nitrogen fertilizer sources and their interaction are presented in Tables (2, 3, 4, 5,6 and 7) . Regarding nutrients uptake by grain, data showed that there was a positive significant effect of phosphorus fertilizer sources on macro and micro- nutrients uptake under study in both saline and non-saline soils except for nitrogen uptake in non-saline soil. Moreover, the triple superphosphate, mostly, resulted in higher values of macro and micro-nutrients uptake by grains compared to those produced by single superphosphate. From the logic point of view, the state of nutrients uptake by grains was better and higher in non-saline soil compared to saline one. In this respect, El- Dewiny *et al.* (2005) found that the single superphosphate addition gave the lowest value of macronutrients uptake at different parts of sorghum plants compared with other treatments. It was noticed that the addition of TSP enhanced the macronutrients uptake through improving the nutrient supply.

As for nutrients uptake in grains due to different nitrogen fertilizer sources, results indicated that there was a positive significant effect between the treatments where ammonium sulphate was the best source in both non saline and saline soils. The exception may be noticed here that Zn and Mn uptake was insignificant in non-saline soil. Also, the nutrient uptake condition in non-saline soil was better than that of saline one. Similar results were obtained by Taalab and Badr (2007).

With regard to the interaction between different phosphorus and nitrogen fertilizer sources on nutrients uptake in grains, it is strongly concluded that the combined treatment of both TSP and ammonium sulphate recorded the best significant response compared to the other reacted treatments. This effect was more pronounced in case of saline soils. This may be due to the physiological acidic effect of both TSP and ammonium sulphate fertilizers, which might create better condition for wheat plants to absorb nutrients in saline soils.

Tables (4 & 5) show the main effect of phosphorus fertilizer sources on macro and micro-nutrients uptake in straw of wheat plants grown on non-saline and saline soils. There was insignificant effect of both TSP and SSP on N, P and K uptake in non-saline soils, but the positive significant trend was denied for micronutrients, where SSP has significant and higher values of Fe and Zn uptake, while TSS had the opposite trend for Mn uptake.

Concerning the main effect of different nitrogen fertilizer sources, as general, i.e., ammonium sulphate was superior to calcium nitrate and urea as for macro and micronutrients uptake with clear significant difference in non-saline soils. The exception was shown for Fe uptake in straw where calcium nitrate and urea was similar with significant and higher difference compared to ammonium sulphate (Table 4). However, ammonium sulphate achieved the same trend, to some extent, in saline soils for N, P, Fe and Mn uptake in wheat straw. There was insignificant difference between nitrogen fertilizer sources under study on K and Zn uptake (Table, 5). Similar results were obtained by Zhang *et al.* (2004) and Irshad *et al.* (2002)

The interaction between p and N fertilizer sources on nutrients uptake in straw had different effects in case of non-saline soils compared to saline one. In non-saline soils, the combined treatment of TSS and ammonium sulphate recorded the best significant values regarding N, P, and Mn uptake. Meanwhile, the treatment of TSP+ urea achieved the highest and significant value for K uptake. In addition, the combined treatment of SSP+ ammonium sulphate had recorded the highest and significant values for Fe and Zn uptake (Table 4). The latter result may be explained as SSP contains such contaminated amounts of Fe and Zn beside the conditioning effect of ammonium sulphate. Similar results were obtained by Mitchell (1964) reported that SSP could contain as high as 100mg Zn, 100mg Cu and 5000 Mn (along with some others) per one kg of fertilizer material. In saline soil, the combination between TSS and ammonium sulphate caused significantly the highest values of all macro and micronutrients absorbed by straw (Table 5).

Data of macro and micro-nutrients uptake in biological yield of wheat plant grown on non-saline and / or saline soil are presented in Tables (6 & 7). The main treatments of P- fertilizer sources affected insignificantly N, K. Fe and Zn uptake. Meanwhile, K and Mn uptake in biological yield responded significantly in positive trend as a result of such main treatments in non-saline soil (Table, 6). In saline soil, it is clear that the main effect of P- fertilizer sources had also significant effect on all nutrients uptake in biological yield similar to that occurred in grain and straw yields emphasizing the priority of TSP than SSP (Table, 7). In this respect Taalab and Badr (2007) found that the dry matter yield of sorghum plants received $(NH_4)_2SO_4$ and compacted rock phosphate was appreciably higher than plants received the rock phosphate along with NO_3 at both rates of application. Increasing P: N ratio significantly increased dry matter production due to NH_4 nutrition but not with NO_3 nutrition

The main effect of nitrogen fertilizer sources on nutrients uptake in biological yield had the same trend in both non-saline and saline soils where all nutrients uptake responded significantly in a positive trend as a result of such nitrogen sources in exception of K uptake. Moreover, ammonium sulphate was the best fertilizer source.

Data of the interaction between phosphorus and nitrogen fertilizer sources treatments showed that also the significance was clear for all nutrients uptake in wheat biological yield grown on both non-saline and saline soils. Triple superphosphate added with ammonium sulphate recorded generally the best results of nutrients uptake. Similar finding was obtained by Taalab and Badr (2007)

Table (4): Effect of phosphorus and nitrogen fertilizer sources on straw yield, macro and micro nutrients uptake as well as protein percentage of wheat plant grown in non saline soil

Treatments	Straw yield	N	P	k	Fe	Zn	Mn
	Ton/ fed	Uptake (Kg/ fed)			Uptake (g/ fed)		
(TSP) Triple superphosphate	5.583	57.65	3.48	175.37	2253.7	478.86	207.76*
(SSP)single superphosphate	5.626	58.93	3.18	174.86	2462.2*	581.71*	165.95
LSD at 5%	NS	NS	NS	NS			
Ammonium Salphate	5.845	65.87	3.49	161.9	2705	583.9	214.5
Calcium Nitrate	5.432	53.99	3.14	181. 5	2164	524.2	184.4
Urea	5.537	55.02	3.34	181.9	2205	482.8	161.6
LSD at 5%	0.231	9.78	0.34	9.37	103.8	73.45	23.51
(TSP) Ammonium Salphate	5.905	66.13	3.65	163.6	2479	511.6	245.8
(TSP)+ Calcium Nitrate	5.213	49.96	3.11	172.9	2067	521.3	208.5
(TSP) + Urea	5.632	56.87	3.68	189.7	2215	403.6	169.0
(SSP) + Ammonium Salphate	5.786	65.61	3.34	160.3	2932	656.1	183.2
(SSP) Calcium Nitrate	5.651	58.01	3.19	190.2	2261	527.1	160.3
(SSP) + Urea	5.442	53.16	3.01	174.1	2195	562.0	154.3
LSD at 5%	0.326	13.83	0.45	13.26	146.8	103.9	33.24

Table (5): Effect of phosphorus and nitrogen fertilizer sources on straw yield, macro and micro nutrients uptake as well as protein percentage of wheat plant grown in saline soil

Treatments	Straw yield	N	P	k	Fe	Zn	Mn
	Ton/ fed	Uptake (Kg/ fed)			Uptake (g/ fed)		
(TSP) Triple superphosphate	3.319*	36.28*	1.47*	25.17*	2065*	337.4*	149.69*
(SSP)single superphosphate	2.354	24.58	0.96	18.11	1348	274.7	102.73
LSD at 5%							
Ammonium Salphate	3.182	33.81	1.46	21.27	2017	352.7	154.4
Calcium Nitrate	2.627	25.67	1.03	22.57	1661	295.0	109.5
Urea	2.701	31.80	1.15	21.08	1441	270.5	114.7
LSD at 5%	NS	6.84	0.38	NS	532	NS	31.28
(TSP) Ammonium Salphate	3.557	39.84	1.69	27.00	2302	368.6	177.9
(TSP)+ Calcium Nitrate	3.383	33.15	1.45	27.18	2224	372.2	140.8
(TSP) + Urea	3.016	35.83	1.27	21.32	1668	271.5	130.4
(SSP) + Ammonium Salphate	2.807	27.79	1.23	15.53	1731	336.8	131.0
(SSP) Calcium Nitrate	1.871	18.19	0.61	17.95	1098	217.8	78.17
(SSP) + Urea	2.385	27.76	1.04	20.84	1214	269.6	98.99
LSD at 5%	1.067	9.68	0.53	9.48	752.4	118.3	44.23

Table (6): Effect of phosphorus and nitrogen fertilizer sources on biological yield, macro and micro nutrients uptake of wheat plant grown in non saline soil

Treatments	biological yield	N	P	k	Fe	Zn	Mn
	Ton/ fed	Uptake (Kg/ fed)			Uptake (g/ fed)		
(TSP) Triple superphosphate	8.394	111.13	11.35*	183.59	3085.50	800.53	307.74*
(SSP)single superphosphate	8.483*	113.07	10.09	179.58	3268.94	854.31	253.31
LSD at 5%		NS		NS	NS	NS	
Ammonium Salphate	8.782	125.5	11.36	168.5	3586	877.4	314.8
Calcium Nitrate	8.237	106.7	10.31	186.7	3075	823.1	275.5
Urea	8.297	104.2	10.48	189.6	2870	781.8	251.3
LSD at 5%	0.218	10.55	0.50	12.50	118.7	85.81	15.06
(TSP) Ammonium Salphate	8.832	127.8	11.91	169.7	3230	843.4	353.0
(TSP)+ Calcium Nitrate	7.988	102.9	10.78	183.6	3038	854.3	305.6
(TSP) + Urea	8.363	102.7	11.35	197.4	2988	703.9	264.5
(SSP) + Ammonium Salphate	8.732	123.1	10.80	167.2	3943	911.3	276.6
(SSP) Calcium Nitrate	8.487	110.5	9.85	189.8	3111	791.8	245.4
(SSP) + Urea	8.232	105.6	9.62	181.7	2753	859.8	238.0
LSD at 5%	308.8	14.91	0.71	17.67	167.9	121.4	21.30

Table (7): Effect of phosphorus and nitrogen fertilizer sources on biological yield, macro and micronutrients uptake of wheat plant grown in saline soil

Treatments	biological yield	N	P	k	Fe	Zn	Mn
	Ton/ fed	Uptake (Kg/ fed)			Uptake (g/ fed)		
(TSP) Triple superphosphate	4.682*	62.91*	5.29*	29.85*	2410*	504.83*	204.20*
(SSP)single superphosphate	3.416	44.85	3.53	21.77	1630	390.86	138.23
LSD at 5%							
Ammonium Salphate	4.570	61.84	5.21	25.93	2347	515.6	208.1
Calcium Nitrate	3.759	47.49	3.96	26.64	1937	416.0	150.7
Urea	3.816	52.30	4.05	24.85	1775	411.9	154.9
LSD at 5%	NS	8.19	0.81	NS	524.8	98.30	33.66
(TSP) Ammonium Salphate	5.205	73.77	6.34	32.59	2737	566.3	243.8
(TSP)+ Calcium Nitrate	4.660	57.43	4.97	31.65	2480	525.4	191.9
(TSP) + Urea	4.180	57.54	4.54	25.31	2013	422.8	177.0
(SSP) + Ammonium Salphate	3.936	49.92	4.09	19.27	1957	464.8	172.4
(SSP) Calcium Nitrate	2.859	37.56	2.93	21.64	1395	306.7	109.5
(SSP) + Urea	3.452	47.06	3.57	24.39	1538	401.1	132.8
LSD at 5%	1.206	11.58	1.14	9.75	742.2	139.0	47.61

3-Protein percentage in grains

Data presented in Tables (2 and 3) showed that there was insignificant differences between phosphorus sources on protein percentage in wheat grains grown in both soils. Meanwhile, results revealed that the ammonium sulphate gave the highest significant protein percentage in two locations compared to the other treatments. Regarding the effect of interaction between the studied factors, the ammonium sulphate + triple superphosphate achieved the highest significant protein % in both soils compared with the other treatments. Similar finding was obtained by Taalab and Badr (2007)

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تأثير التسميد بمصادر الفوسفور والنتروجين المختلفة على محصول القمح ومكوناته والخواص الكيميائية تحت ظروف تربة مختلفة

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أقيمت تجربة حقلية فى موقعين بمحطة البحوث الزراعية ببهتيم محافظة القليوبية خلال الموسم الشتوى ٢٠٠٦/٢٠٠٧ لدراسة تاثير مصدرين من التسميد الفوسفاتى (التربل سوبرفوسفات والسوبر فوسفات العادى ومصادر من التسميد الازوتى (كبريتات الامونيوم ونترات الكالسيوم واليوريا) على محصول الحبوب والقش والبيولوجى وكذلك للممتص من العناصر الكبرى والصغرى لمحصول القمح صنف جيزة ١٦٨.

ويمكن تلخيص النتائج على النحو التالي :

عموما اعطى محصول الحبوب والقش والبيولوجى للقمح النامى فى الاراضى غير الملحية اكثر من الارض الملحية بحوالى اكثر من الضعف.

فى الاراضى غير الملحية، كانت افضل النتائج للمحصول البيولوجى عند استخدام السوبر فوسفات العادى، بينما اعطى التربل سوبرفوسفات اعلى قيمة من الفوسفور والمنجنيز الممتص. فى حين لم تكن هناك اختلافات معنوية بين مصادر التسميد الفوسفاتى على باقى الممتص من العناصر فى المحصول البيولوجى. لم تكن هناك اختلافات معنوية بين مصادر التسميد الفوسفاتى على محصول الحبوب والقش لنبات القمح وكذلك الممتص من النتروجين والنسبة المئوية للبروتين، ايضا الممتص من النيتروجين والفوسفور والبوتاسيوم فى محصول القش. بينما وجد زيادة معنوية فى الممتص من الفوسفور والبوتاسيوم والحديد والزنك والمنجنيز فى محصول الحبوب وكذلك المنجنيز فى القش عند استحدام التربل سوبرفوسفات.اما بخصوص التأثير المتبادل للتسميد الفوسفاتى والازوتى فلم يكن هناك اتجاه واضح فى معظم الممتص من العناصر فى محصول الحبوب والقش.

فى الاراضى الملحية، اعطى سماد التربل سوبرفوسفات اعلى زيادة معنوية فى كل الصفات تحت الدراسة مقارنة بالسوبر فوسفات. اعطى سماد كبريتات الامونيوم اعلى القيم معنويا فى معظم الصفات تحت الدراسة مقارنة بباقى الاسمدة الازوتية . اما بخصوص التأثير المتبادل للتسميد الفوسفاتى والازوتى فقد اعطى سماد التربل سوبرفوسفات مع كبريتات الامونيوم افضل القيم معنويا فى معظم الصفات تحت الدراسة مقارنة بباقى المعاملات.