J. Agric. Sci. Mansoura Univ., 27 (12): 8061 - 8071, 2002

RESPONSE OF SOME WHEAT VARIETIES TO BIOFERTILIZER UNDER DIFFERENT NITROGEN LEVELS IN SALINITY SOIL

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ABSTRACT

Two field experiments were conducted in saline sandy silt soils at Tag El-Eiz, Agricultural Research Station, Dakahlia Governorate, during the two successive growing seasons. 1999/2000 and 2000/2001. The objective of this work was to study the response of three wheat varieties namely Gemmeiza 7, Sakha 69 and Sakha 8 to inoculation with serealen (Bacteria *Bacillus polymyxa*) as a biofertilizer under four nitrogen levels used in this study, 20, 40, 60 and 80 kg The results indicated that wheat variety Gemmeiza7 gave the higest value of plant height, spike length, number of spikelets/ spike, number of grains/ spike, grains weight/ spike, 1000-grain weight, grain yield, straw yield and protein percentage, whereas Sakha 8 gave the highest value of number of spikes/ m^2 Increasing nitrogen fertilizer levels from 20 to 80 kg N/ fad significantly increased plant height, number of spikes/ m^2, spike length, number of spikelets/ spike, number of grains/ spike, grain weight/ spike, grain yield (ardab/ fad), straw yield (ton/ fad) and grain protein in both seasons. But application of 40 kg N/ fad in the first season and 20 kg N/ fad in the second season gave the highest value of 1000-grain weight.Wheat plants inoculated with serealin showed a significant increase for all studied treaits except for grain weight/ spike in the second season,1000-grain weight, grain yield (ardab/ fad), straw yield (ton/ fad) and protein percentage in both seasons.The results showed that the interaction between wheat varieties and biofertilizer was significantly affected the number of grains/ spike in the first season and spike length (cm), number of grains/ spike and grains weight (g) in the second season. On the other hand ,the interaction between nitrogen fertilizer and biofertilizer had a significant influence on plant height and grain weight/ spick (g) in the second season.

INTRODUCTION

Wheat is one of most important cereal crops in Egypt. Egypt imports a large amounts of wheat to cover the gab between production and consumption. Increasing wheat yield may be realized by introducing and selecting a new cultivars which give a great yield per unit area. Eassa (1990) reported that Sakha 69 variety has produced the high grain and straw yields, longer spike, heavier seeds and higher protein content than Sakha 8. El-Kalla *et. al.* (1992) reported that Sakha 69 exceeded Sakha 8 in spike length (cm), number of spikes/ m^2, number of spikelets and grains/ spike, weight of grains per spike and per plant(g). 1000-grain weight (g) and grain yield/ fad. Gabr (1988) found that Sakha 69 variety surpassed Sakha 8 in plant height, number of spikes/ plant as well as per m^2, spike length(cm),number of spikelets/ spike and grain weight/ spike and 1000-grain weight (g).

Some research workers studied the effect of different nitrogen fertilizer levels on wheat yield and yield components. Bassilious (1992) stated that Sakha 69 cultivar received 75 kg N/ fad produced the highest grain and

straw yields and its components. Awasthi and Bhans (1993) reported that grain yield resulted from application of 60 kg N/ ha which was significantly higher than that obtained with 0, 20, 40, kg N/ ha. Mazureik *et. al.* (1994) found that grain yield increased significantly with the application of nitrogen up to 90 kg N/ ha. El-Kayati *et. al.* (1995) found that grain yield was significantly increased by increasing N supply more than 60 kg N/ fad.

Recently some workers studied the possibility of using N-fixing bacteria to supply wheat plants with part of N-requirement to reduce the amount of N-chemical fertilizer and production costs, the environmental pollution. Pandy and Shende (1991) found that wheat grain yield significantly increased by application of nitrogen fertilizers and Azotobacter inoculation. Ahmed (1995) found that Azotobacers enhanced wheat plant height (cm), tillering, yield components, grain and straw yields/ fad. Rable *et. al.* (1995) reported that grain of wheat inoculated with *Azotobacter chrooccum* and/ or *Azospirllum brasilens* increased plant height (cm), percentage of fruit full tillers, number of spikes/ m^2 and grain yield/ plant. The objective of this work is to study the response of some wheat varieties i.e. Gemmeiza 7, Sakha 69 and Sakha 8 to inoculation with serealen (Bacteria *Bacillus polymyxa*) as a biofertilizer under four nitrogen fertilizer levels in salinity soils.

MATERIALS AND METHODS

Two field experiments were conducted in salinie soil silt soils, at Tag El-Eiz, Agricultural Research Station, Dakhlia Governorate during the two successive growing seasons. of 1999/2000 and 2000/2001 . Mechanical and chemical analysis of the two soils are presented in Table (1). A split-split plot design with four replicates was adopted. Each experiment includes twenty four treatments. The main plots were allocated for three wheat varieties. (Gemmiza 7, Sakha 69 and Sakha 8) . The sub plots were accupied with four nitrogen levels (20, 40, 60 and 80 kg N/fad).

Nitrogen fertilizer in the form of amonium nitrate (33.5%N) was splitted in two portions, the first was applied before the first irrigation while the second portion was applied before the second irrigation. The sub-sub plots included the two treatments (non and inoculation with serealin as the biofertilizer before sowing at rate of 1 Kg/ 60 kg seeds. Serealen was supplied from Agricultural Research Center, Giza. The field was ploughed and calcium super phosphate (15.5% P_2O_5) was incorporated in the soil during tillage operation at the rate of 30 kg P_2O_5/ fad. Each sub -sub plot was 3.5 m long and 3.0 m wide, occupying an area of 10.5 m^2, ie 1/ 400 fad. Wheat seeds were sown on 17th November in both seasons. Weeds were chemically controlled by using Arilon with the rate of 1.5 litter/ fad, dissolved in 200 litter water and sprayed after 30 days from sowing. At harvest, ten plants at random from each plot were taken to determine the following characters; Plant height (cm), spike length (cm), number of spikletes/ spike, number of grains/ spike, grain weight/ spike and 1000-grain weight (g) . From the center of each plot, tillers of one square miter were counted to measure the number of spikes/ m^2. All plants of each plot were harvested and threshed, grain and straw yield were weighted in kilogram to estimate grain yield (ardab/ fad).

Table (1): Mechanical and chemical analysis of soils used in 1999/2000 and 2000/2001seasons.

Variables	Seasons	
	1999/ 2000	2000/ 2001
Mechanical analysis:		
Sand %	48.42	50.13
Silt %	31.83	31.56
Clay %	9.75	8.31
$CaCO_3$	7.7	7.2
Soil textural	sandy	sandy
Chemical analysis:		
Organic matter	2.00	2.00
Available N (ppm)	67.75	55.41
Available P (PPm)	7.4	7.4
Available K (ppm)	630	630
Soil reaction pH (1:2.5)	7.70	7.75
EC dS/ m^{-1}	4.64	4.40

Grain crude protein content was estimated according to A.O.A.C.Methods (1980) and crude protein percentage was computed by multiplying the total N by 5.70.

All collected data were subjected to the statistical analysis reported by Snedecor and Cochran (1969).

RESULTS AND DISCUSSION

1- Response of wheat varieties:

Data presented in Tables (2) and (3) show that number of spikes/ m^2, spike length, number of spikelets/ spike and 1000-grain weight in the first season and plant height, number of spikes/ m^2, spike length, grain weight/ spike, 1000-grain weight and grain yield in the second season were significantly affected by wheat varieties. Gemmeiza 7 gave the highest value in all characters except number of spikes/m^2 in both seasons. While Sakha 8 gave the lowest values in both seasons. On the other hand, wheat varieties showed insignificant differences in plant height (cm), number of grains/ spike, grain weight/ spike, grain yield and straw yield in the first season and number of spikelets/ spike, number of grains/spike and straw yield in the second season.The variation between the three studied varieties may be due to their different genetic constitutions and their response to the prevaling environmental conditions. These results are in harmony with those obtained by Gabr (1988), Eassa (1990) and El-Kalla *et. al.* (1992) .

2-Effect of nitrogen fertilizer levels:

Data collected in Tables (2) and (3) show the effect of nitrogen fertilizer levels in both seasons, it is clear that nitrogen had a significant effect on all characters in both seasons, increasing nitrogen levels from 20 to 80 kg

N/ fad significantly increased plant height (cm), no.of spikes/ m^2, spike length (cm), number of spikelets/ spike, number of grains/ spike, grain weight/ spike, grain yield and protein percentage in both seasons. These results may be due to the increase in meristematic activity, stimulation of cell elongation and auxin production.Thus yielding capacity increased with the increase nitrogen levels .Concerning the effect of nitrogen fertilizer levels on 1000-grain weight in both seasons, data in Table (3) show that with the Increase in nitrogen levels,1000-grain weight (g) was decreased in the two seasons. These results may be due to decreasing of grain size with increasing nitrogen levels. Similar results were obtained by Kheiralla *et al.* (1993) and Moustafa *et al.* (1997) .

3-Effect of biofertilizer:

Data presented in Tables (2) and (3) show that inoculation with serealen as the source of bacteria *Bacillus polymaxa* was significantly affected plant height (cm), number of spikes/ $m^{2,}$ spike length (cm), number of spikelets/ spike, number of grains/ spike in both season and on grain weight/ spike (g) and grain yield in one season only. While, no significant effect on 1000-grain weight (g) , straw yield and protein content in both seasons. These results may be due to quantity of nitrogen fixation by bacteria *Bacillus polymaxa* which found in serealen. These results are in general agreement with those obtained by Rai and Gaur (1982), Abd El-Aleem and Sabry(1994) and Attallah and El-Karamity (1997).

4-The interactions

Data in Fig. (1,2,3,4,5 and 6) showed that the interaction between wheat varieties and biofertilizer recorded a significant increase and as a result there was an increase in number of grains / spike in the first season and spike length (cm), number of grains/ spike and grain weight/ spike (g) in the second season. On the other hand, the interaction between nitrogen fertilizer levels and biofertilizer recorded a significant increase the plant height (cm) and grain weight/ spike (g) in the second season. These results are in harmony with those obtained by Rai and Gaur (1982).

Generally, from the obtained results, it could be concluded that wheat variety Gemmeiza7 and nitrogen fertilizer level 80 kg N/ fad with seed inoculation by serealen as a biofertilizer gave the highest value of yield at Tag El-Eiz Agricultural Research Station. Dakahlia Governorate.

table 2

Table 3

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Fig

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استجابة بعض أصناف القمح للتسميد الحيوى تحت مستويات مختلفة من التسميد الأزوتى فى الأراضى الملحية

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أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بتاج العز-بمحافظة الدقهليه خلال موسمى ١٩٩٩ /٢٠٠٠ م ، ٢٠٠٠ /٢٠٠١ م وذلك لدراسة استجابة بعض أصناف القمح (جميزة ٧, سخا ٦٩, سخا ٨) للتسميد الحيوى تحت مستويات مختلفة من التسميد الآزوتى فى الأراضى الملحية وكانت أهم النتائج المتحصل عليها من هذة الدراسة مايلى :

١- تفوق الصنف جميزة ٧ معنويا على الصنفين سخا٦٩, سخا ٨ فىكل من طول النبات, طول السنبلة, عدد السنيبلات فى السنبلة, عدد ووزن حبوب السنبلة, وزن ال١٠٠٠ حبة, محصول الحبوب و التبن و النسبة المئوية للبروتين فى الحبوب بينما تفوق الصنف سخا ٨ فى عدد السنابل للمتر المربع .

٢- أدت زيادة مستويات التسميد الآزوتى من ٢٠ الى ٨٠ كجم ن /ف الى زيادة معنوية فى طول النبات, عدد السنابل /م٢ ,طول السنبلة, عدد السنيبلات فى السنبلة, عدد ووزن حبوب السنبلة, محصولا الحبوب , التبن /فدان و النسبة المئوية للبروتين فى الحبوب فى كلا الموسمين. وقد أظهرت الدراسة أن استخدام ٤٠ كجم ن /فدان فى الموسم الأول و ٢٠كجم ن /فدان فى الموسم الثانى أدى الى زيادة معنوية قى وزن ال١٠٠٠ حبة.

٣-اعطت معاملة حبوب القمح بالسريالين زيادة فى معظم صفات المحصول فيما عدا محصول حبوب السنبلة فى الموسم الثانى و وزن ال١٠٠٠ حبة و محصول الحبوب و التبن و النسبة المئوية للبروتين فى الحبوب فى كلا الموسمين.

٤- سجل التفاعل بين أصناف القمح و التسميد الحيوى زيادة معنوية نى عدد حبوب السنبلة فى كلا الموسمين و طول السنبلة ووزن حبوب السنبلة فى الموسم الثانى . ومن ناحية أخرى سجل التفاعل بين مستويات التسميد الآزوتى و التسميد الحيوى زيادة معنوية فى طول النبات ووزن حبوب السنبلة فى الموسم الثانى.

٥ - من خلال نتائج هذه الدراسة يمكن التوصية بمعاملة حبوب القمح عند الزراعة بالسريالين كسماد حيوي وذلك بهدف تقليل التلوث الناتج من الأسمدة الكيماوية وخفض تكاليف الإنتاج.

Table (2): Response of wheat varieties, nitrogen fertilizer levels and inoculation with serealen on some growth, yield components characters in 1999/2000 and 2000/2001 seasons.

Treatments	Plant height (cm)		No. of spikes / m^2		Spike length (cm)		No. of spikelets/ spike		No. of grains/ spike	
	99/2000	00/2001	99/2000	00/2001	99/2000	00/2001	99/2000	00/2001	99/2000	00/2001
A- Wheat varieties										
1- Gemmeiza 7	108.40	113.69	374.81	475.37	10.35	12.74	18.39	19.43	46.50	56.78
2- Sakha 69	106.28	109.37	416.62	525.37	9.80	10.66	18.15	19.07	44.33	48.78
3- Sakha 8	103.75	109.12	460.37	584.75	8.85	10.33	16.85	18.72	44.05	50.52
L.S.D 5%	NS	4.24	140.60	62.65	1.21	1.35	1.28	NS	NS	NS
L.S.D 1%	NS	9.00	NS	133.10	2.58	2.87	2.73	NS	NS	NS
B- Nitrogen levels										
1- 20 kg N/ fad.	97.54	105.66	352.83	489.83	8.87	10.53	16.07	18.04	38.24	46.85
2- 40 kg N/ fad.	105.50	110.21	419.25	520.66	9.49	11.32	17.87	18.87	44.74	52.17
3- 60 kg N/ fad.	107.20	112.37	431.50	535.16	10.03	11.49	18.36	19.50	47.12	53.57
4- 80 kg N/ fad.	114.33	114.67	465.50	568.33	10.35	11.64	18.88	19.88	49.61	55.52
L.S.D 5%	8.95	5.88	65.66	60.39	0.77	0.85	1.15	1.29	5.58	5.12
L.S.D 1%	13.90	9.13	102.04	93.85	1.19	1.32	1.79	2.00	8.67	7.96
C- Biofertilizer										
1- With serilien.	108.45	113.56	438.66	543.00	9.96	11.75	18.00	19.87	46.99	53.20
2- Without serilien.	103.83	107.89	395.87	514.00	9.37	10.74	17.60	18.27	42.86	50.05
F. test	*	**	**	*	**	**	*	**	**	*

Table (3): Response of wheat varieties, nitrogen fertilizer vels and inoculation with serealen on some yield components characters in 1999/2000 and 2000/2001 seasons.

Treatments	Grain weight (g)/spik		1000- Grain weight (g)		Grain yield (ardab/ fad.)		Straw yield (ton/ fad.)		Protein (%)	
	99/2000	00/2001	99/2000	00/2001	99/2000	00/2001	99/2000	00/2001	99/2000	00/2001
A- Wheat varieties										
1- Gemmeiza 7	2.30	2.84	49.86	51.35	17.58	19.62	4.97	6.41	9.40	8.28
2- Sakha 69	2.21	2.10	50.30	43.27	17.54	18.50	5.08	6.18	8.11	8.25
3- Sakha 8	2.00	2.03	44.80	41.35	17.13	18.07	4.53	6.17	7.50	8.08
L.S.D 5%	NS	3.63	7.38	5.53	NS	1.79	NS	NS	NS	NS
L.S.D 1%	NS	3.86	NS	11.76	NS	NS	NS	NS	NS	NS
B- Nitrogen levels										
1- 20 kg N/ fad.	2.02	2.18	48.52	46.19	13.07	16.03	3.92	5.80	7.74	7.56
2- 40 kg N/ fad.	2.18	2.33	49.34	45.42	16.64	18.20	4.96	6.17	8.23	8.00
3- 60 kg N/ fad.	2.13	2.37	48.00	45.72	19.15	19.37	5.08	6.26	8.53	8.29
4- 80 kg N/ fad.	2.36	2.43	47.44	43.97	20.81	21.31	5.48	6.78	8.83	8.98
L.S.D 5%	0.30	NS	NS	NS	2.29	2.45	0.80	0.62	NS	NS
L.S.D 1%	NS	NS	NS	NS	4.02	3.80	1.24	0.96	NS	NS
C- Biofertilizer										
1- With	2.27	2.36	48.45	45.43	17.54	19.21	5.02	6.26	8.68	8.30
2- Without	2.07	2.29	48.19	45.22	17.29	18.25	4.70	6.24	7.98	8.11
F. test	**	NS	NS	NS	NS	*	NS	NS	NS	NS