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Response of Some Barley Cultivars to Nitrogen Sources and Rates Grown in Alkaline Sandy Soil

Zeidan, M.S.

Field Crops Research Department, National Research Centre, Cairo, Egypt.

Abstract: Two field experiments were carried out during the two winter seasons of 2003\2004and 2004\2005 at Private Farm of Manshiat El –Gamal El-Fayoum Governorate , Egypt to study the response of four barley cultivars namely, Giza 123,124,12 and Giza 2000 to nitrogen rates of 30,50,and70Kg N/fed. and three sources of nitrogen namely ammonium nitrate 33.5%N, ammonium sulphate 21.5%N and urea 46.0% N. The results revealed that Giza 123 surpassed the other varieties in plant height, flag leaf area, number of spikes/m2 number of grains/ spike,1000 grains weight and grain yield ardab/ fed.Ammonium nitrate as a source of nitrogen gave the best result as compared with the two other sources of nitrogen. Increasing N-rates from (30 to70)Kg N –fed resulted in increasing plant height, flag leaf area, number of spikes/m2 1000-grain weight, grain yield ardeb/fed. and protein content. Interaction between treatments indicated that the combination of Giza2000 and 70 kgN/fed. surpassed the other combination, while Giza123 with 30kgN/fed was the lowest one.Results also indicated that Giza 2000 with ammonium nitrate gave the best result, on the other hand Giza12 with urea was the lowest one. Results indicated that combination of Giza 2000 cv and N-rates of 70 kg N/fed. applied as ammonium nitrate as a source of nitrogen gave the best among the other treatments combinations under the alkaline sandy soil condition.

Keywords: Barley cultivars, nitrogen sources and rates

INTRODUCTION

Barley is the most important grain crop for newly reclaimed saline and alkaline soils, barley grains used for many purposes such as malting and brewing industry, animal feeding, bread making

Abd El-latif and Salamah,[21], Weight of 1000 grain El-Hag, grain yield and protein content[2] Zaki,1989 and Polisetty *et al.,*[17] concerning the effect of nitrogen source many investigators including Cheryava *et al,*[11] reported that nitrogen in the form of ammonium nitrate produced high grain yield and improved most of the yield components such as number of spikes/m2, number of grains / spike, 1000- grain weight etc. Moreover, other studies revealed that nitrogen in the form of ammonium nitrates improve protein content of barley grains[14,24,5] found the same results.

Several workers reported that barley cultivars vary in plant height[16] number of spike/m2[19], flag leaf area[18] and protein content of grain[17,23].

The objective of this study was to investigate the effect of nitrogen source as well as N rates on yield of four barley cultivars in newly reclaimed area of alkaline sandy soil.

MATERIALS AND METHODS

Two field experiments were carried out during the two winter seasons 2003/ 2004 and 2004/ 2005) at Manshiat El- Gamal, El- Fayoum Governorate, Egypt to study the response of some barley cultivars i. e. (Giza 123, 124, 12 and 2000.) to nitrogen source and rates. The soil characteristics was evaluated for the two growing seasons respectively where it was found that the soil was sandy poor in nitrogen (1.47 and 1.58 ppm) pH of (8.75 and 8.49) CaCo3 of (4.21 and 4.55%). The experiment included thirty six treatments, were arranged in a split- split plot design with four replicates. These treatments were the combination of four barley cultivars (Giza 123, 124, 12 and Giza 2000) as main plot, three nitrogen sources (ammonium nitrate 33.5%N, ammonium sulphate 21.5 %N and urea 46.5% N) as sub plots and three nitrogen levels (30, 50 and 70 Kg N/fed) as sub plots. Nitrogen in different forms and rates was added as two equal portions at 20 and 30 days after planting, Barley grains were sown at the rate of 60 Kg /fed on first of December during both seasons other agriculture practices were applied as usual, plants were harvested at the end of May in both seasons. plot area was 3*3.5m (1/400 fed).

Corresponding Author: Zeidan, M.S., Field Crops Research Department, National Research Center Dokki Egypt.

Plant height after maturity, flag leaf area before maturity number of spikes /m2, number of grains /spike before harvest 1000- grain weight grain yield ardab /fed and grain protein contents according[10].

The obtained data were subjected to proper statistical analysis of variance as described by[13].

Means of treatments were compared by (LSD) at 5% probability.

RESULTS AND DISCUSSIONS

Effect of Variety: Combined analysis showed significant differences among the studied four varieties for yield and its components, (Table 1). Giza 2000was the highest for plant height, flag leaf area, number of spikes /m2,number of grains / spike, 1000- grain weight, grain yield ardab/fed and protein contents followed by Giza 123 and 124, while Giza 12 gave the least values. The differences between varieties might be attributed to variation in translocation rate of photosynthates from leaves to storage organs to the grain. These results agree with those of, Shaaban *et al.,*[18], El-Sayed *et al.*[23,24].

Effect of Applied Nitrogen Fertilizer Levels: Results in Table 3 indicated that the effect of nitrogen at rate of 70 kg/fed gave the highest plant height, Flag leaf area, number of spikes/m^2, number of grains spike, 1000grain weight, grain yield ardab/fed. and protein percentage in grains as compared with other nitrogen rates, such results were expected since the application of nitrogen rates had increased number of spikes/m2 in turn in the excessive increase in barley grain yield

These results are in agreement with those obtained by Osman *et al.*[16] who indicated that increasing nitrogen level at 60 kg/fed increased plant height spike length, number of spikes/plant and 1000 grain weight also, Gewiefel[12] who stated that high nitrogen rates might increases plant tolerance to saline and alkaline conditions. Obtained results may be attributed to the increase in the rate of translocation of photosynthate products as a result of improved growth and flag leaf area. Ayyer[7,14] El-Zein[8] and Munir *et al.*[6] found the same result in wheat.

Effect of Nitrogen Sources: Data presented in Table (2) showed that ammonium nitrate as nitrogen source gave the highest significant plant height, flag leaf area, number of spikes /m2, number of grains

Table 1: Growth,yield parameters and protein percentage of four Barley cultivars.

Cultivars	Plant height (cm)	Flag leaf area	Number of Spikes/m^2	number of grains /spike	1000-grain Weight (g)	Grain yield ardab/ fed	Grain Protein content (%)
Giza 123	69.6	11.34	412.3	45	40.82	14.43	11.55
Giza 124	73.8	12.74	455.7	48.3	47.02	16.74	8.49
Giza 2000	77.3	13.34	462	49.9	47.23	17.37	11.59
Giza 12	68.1	9.91	381	43	39.82	12.93	10.27
LSD (5%)	0.6	0.3	1.5	1.5	0.19	0.32	0.23

ardab = 120Kg

Table 2: Effect of nitrogen levels on plant height, flag leaf area, number of spikes/m2, number of grains /spike,1000-grain weight, grain yield ardab /fed. and protein percentage of barley

N- levels Kg/fed	Plant Height (cm)	Flag leaf area	Number of spikes/ m^2	Number of grains/ spike	1000 grain weight (g)	Grain yield. ardab Fed	Protein (%)
30	73.8	10.69	405.9	46	42.64	14.38	9.67
50	78.6	11.84	431.8	49.2	44.56	15.46	10.39
70	83.1	12.96	446.2	52.5	45.58	16.27	11.21
L S D 5%	0.3	0.22	2.1	0.9	0.22	0.2	0.11

Table 3: Effect of nitrogen sources on plant height, flag leaf area, number of spikes/m^2, number of grains /spike,1000-grain weight, grain yield ardab /fed. and protein percentage of barley

N-sources	Plant Height (cm)	Flag leaf area	Number of Spikes (m^2)	Number of grains/ spike	1000- grain weight (gm)	Grain yield ardab/fed	Grain Protein (%)
Urea	47.9	11.38	411.9	47.1	43.11	14.91	9.88
A N	83.2	12.68	442.1	51.7	45.51	15.87	11.04
A. S	78.1	12.44	429.9	50.7	44.17	15.33	10.42
L S D	0.2	0.19	2.1	0.99	0.19	0.16	0.15

AN=Ammonium nitrate(33.5%N)
AS=Ammonium sulphate(21.6%N)
U =(Urea46%N)

Table 4: Effect of interaction between nitrogen rates sources and cultivars on plant height , flag leaf area, number of spikes/m2,1000-grain weight, of barley

cultivars	N source	Plant height	Flag leaf area	Spike / m^2	1000grain Weight (g)
Giza 123	A N	80.4	11.67	469.6	41.66
	AS	73.7	10.96	455	41.18
	U	70.2	10.55	441.9	40.07
	A N	82.8	13.83	469.6	48.88
	A S	76.8	11.89	413	47.92
Giza 124	U	72.8	11.16	390	44.25
	A N	84.6	14.23	470.3	51.11
	A S	80.9	13.01	464.3	49.31
	U	78.1	11.68	453.8	47.31
Giza 2000	A N	85.1	10.51	394.4	40.68
	A S	81.1	9.65	386.8	39.82
	U	78.3	8.99	362	38.96
Giza 12	A N	85.1	10.51	394.4	40.68
	A S	81.1	9.65	386.8	39.82
	U	78.3	8.99	362.0	38.96
L S D -5%		1.7	0.67	7	0.71

AN= ammonium nitrate(33.5%N)
AS= ammonium sulphate(21.6% N)
U = Urea (46 % N)

Table 5: Effect interaction between nitrogen levels and cultivars on plant height , flag leaf area, number of spikes/m2,1000-grain weight and grain yield /fed.of barley

Cultivars	N kg/fed	Plant height (cm)	Flag leaf area	Spikes (m2)	1000 grain weight	Grain yield ardab/fed
Giza 123	30	65.3	8.99	358.3	39.71	13.72
	50	67.5	9.65	366.2	40.43	14.63
	70	71.6	10.51	368.2	41.07	14.94
Giza 124	30	66.5	10.55	377.3	43.71	15.46
	50	69.5	10.96	395	47.07	16.91
	70	73.1	11.67	413.3	48.17	17.86
Giza 2000	30	67.7	11.16	409	46.47	15.81
	50	73.7	11.89	446.6	48.47	17.43
	70	80.1	14.23	471.6	50.45	18.89
Giza 12	30	71.5	11.68	426.6	38.71	12.32
	50	76.6	13.01	451.6	39.13	12.87
	70	83.7	13.83	463.3	39.97	13.39
L S D -5%		1.6	0.67	7	0.47	0.65

spike, 1000 – grain weight, grain yield /fed and grain protein percentage compared with both ammonium sulphates and urea, on the other hand urea as a source of nitrogen gave the lowest values in all studied characters. Such results may be due to the differences in soil management, soil texture or soil reaction as shown from soil analysis. Osman *et al.*,[16] stated that nitrate fertilizers especially slow – acting forms were better than ammonia and amide fertilizers in their effect on the biological processes and humification of plant matter. Hamid and Sarwar[3] found that ammonium nitrate gave greater yield and protein response than urea and Recous *et al.*[1] found greater N uptake efficiency for nitrate than urea also Cooper and Blakeney[2], El-Hindi *et al.,*[9] and El-Ghobashy,[5] found the same results.

Interaction Effects: Cultivars X N sourceData presented in Table 4 indicated that significant interaction between cultivars and N source on plant height, flag leaf area, number of spikes / m2, 1000 - grain weight. However growing barley Giza 2000 with ammonium nitrate gave the highest plant height, flag leaf area, number of spikes /m2 and 1000 -grain weight. Although Barley Giza 123 with urea application gave the lowest one. El-Hindi *et al.,*[9].

Cultivars X N Levels: Table 5 indicated that combination of Giza 12 with 70 kg N/fed gave the highest plant height, flag leaf area, number of spikes/m2, 1000 grain weight and yield ardab /fed. While, Giza 1123 with 30kg N/fed gave the lowest values of these characters.

Cultivars X N –levels X N – source: Barley Giza 126 with 70 kg N/fed and fertilized with ammonium nitrate 33.5% N as a source of N gave the maximum yield under such soil conditions.

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