



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(10): 1034-1036
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www.thepharmajournal.com
Received: 01-08-2023
Accepted: 07-09-2023

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Effect of nitrogen levels and varieties different on growth, yield and economics of barley (*Hordeum vulgare* L.)

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Abstract

A field experiment was conducted during rabi season of 2022-2023 at the instructional farm, AKS, University, Sherganj, Satna (M.P.) site is situated at the latitude of 23° 58' N and longitude of 80° 0' 81', East in kymore plateau of M.P. The experiment consisted of 12 treatments in randomized block design with 3 replications viz; T₁ N0 V1 0 kg N/ha + JB-1, T₂ N0 V2 0 kg N/ha + JB-2, T₃ N0 V3 0 kg N/ha + JB-58, T₄ N1 V1 60 kg N/ha + JB-1, T₅ N1 V2 60 kg N/ha + JB-2, T₆ N1 V3 60 kg N/ha + JB-58, T₇ N2 V1 80 kg N/ha + JB-1, T₈ N2 V2 80 kg N/ha + JB-2, T₉ N2 V3 80 kg N/ha + JB-58, T₁₀ N3 V1 100 kg N/ha + JB-1, T₁₁ N3 V2 100 kg N/ha + JB-2, T₁₂ N3 V3 100 kg N/ha + JB-58. Maximum growth formation up to 90 days stage, the maximum plant height was 82.82 cm, leaves 8.64/plant and formation of tillers 8.69 per plant with the application of 100 kg N/ha. the barley varieties, JB-58 resulted in significantly higher length of spike (8.45 cm), number of healthy seeds (54.49/spike), test weight (41.98 g) and seed yield (18.65/plant). The second and third best varieties were JB-2 and JB-1, respectively. The JB-1 variety recorded lowest spike length (7.21 cm), healthy seeds count (47.76/spike), test weight (40.02 g) and seed yield (15.57 g/plant). Amongst the varieties, JB-58 gave the maximum net income up to Rs. 74725/ha with 3.54 B:C ratio. The variety JB-2 stood the second best (Rs. 69952/ha with 3.38 B:C ratio). The lowest net income (Rs. 65854/ha with 3.24 B:C ratio) was secured from JB-1 variety of barley.

Keywords: Varieties, nitrogen levels and productivity of barley

Introduction

Barley (*Hordeum vulgare* L.) is an important rabi cereal crop in India. It has low cost of production and input requirement, so it is preferred by resource poor farmers in the country. Barley is a nutritious and easily digestible cereal with 8-10% protein, 69.6% carbohydrate, 1.3% fat, 3.9% crude fiber, 1.5% ash, 26 mg calcium, 215mg phosphorus, 1.2% minerals and 336 calorific values. In India, during 2019-20, Barley occupied nearly 7.72 lakh hectare area producing nearly 17.26 lakh tons grain, with a productivity of 2522 kg/ha Anonymous, (2021) [1].

The crop needs less water and is more tolerant to salinity and alkalinity condition than other winter cereals. The crop possessed very high tolerance to drought and salt. The application of FYM in the soil helps in increasing the fertility of the soils as well as physical condition including water holding capacity (Singh *et al.* 2013) [4]. Plant nutrition plays an important role in growth and productivity of a crop. As barley crop is highly responsive to applied nutrient through various sources, a proper fertility management is an important parameter for optimizing the productivity of this crop.

Materials and Methods

Field studies were conducted during rabi season of 2022-2023 at the instructional farm, AKS, University, Sherganj, Satna (M.P.) site is situated at the latitude of 23° 58' N and longitude of 80° 0' 81' East in kymore plateau of M.P. state of India The soil of the experimental unit was sandy loam in texture, neutral in reaction (7.4) having medium in organic carbon (0.43) and available N (176.60 kg/ha) and medium in phosphorus (12.50 Kg/ha) whereas it was high in available k (200 Kg/ha). The experimental farm lies in humid subtropical zone with an average rainfall from 1077 mm. The mean temperature ranges from 21 °C to 31 °C during summer and rarely goes below 5 °C in winter due to high atmospheric humidity. The experiment consisted of 12 treatments in randomized block design with 3 replications. Wheat was sown in row 22.5 cm apart, using 100 kg/ha seeds.

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Result and Discussion

Growth characters

The applied nitrogen levels up to 100 kg N/ha brought about maximum plant height levels and tillers formation per plant up to 90 DAS stage, the stage of observations. At the maximum growth formation up to 90 days stage, the maximum plant height was 82.82 cm, leaves 8.64/plant and formation of tillers 8.69 per plant with the application of 100 kg N/ha. The second best applied treatment was 80 kg N/ha (76.27 cm height, 7.65 leaves and 8.07 tillers/plant) and the third position was attained by the application of 60 kg N/ha (73.62 cm height, 6.60 leaves and 7.16 tillers/plant (Bagri *et al.* 2022) [3].

Yield-attributing

The perusal of data in Summary reveal that amongst the barley varieties, JB-58 resulted in significantly higher length of spike (8.45 cm), number of healthy seeds (54.49/spike), test weight (41.98 g) and seed yield (18.65/plant). The second and third best varieties were JB-2 and JB-1, respectively. The JB-1 variety recorded lowest spike length (7.21 cm), healthy seeds count (47.76/spike), test weight (40.02 g) and seed yield (15.57 g/plant). The varietal differences in yield-attributes may be due to similar variations in the growth parameters, responsible for increased photosynthates, DM production and their translocation. The results are in accordance with those of Negi *et al.* (2003) [4]; Jat and Singh (2014) [5] and Pandey *et al.* (2008) [6].

Out of the applied nitrogen levels, the maximum 100 kg N/ha brought about significantly higher length of spike (9.45 cm), healthy seeds (56.15/spike), test weight (42.83 g) and seed yield (21.53 g/plant).

Economical

The economical aspect of crop production is the major consideration for the farmers while making a decision for adoption of new technology. Amongst the varieties, JB-58 gave the maximum net income up to Rs. 74725/ha with 3.54 B:C ratio. The variety JB-2 stood the second best (Rs. 69952/ha with 3.38 B:C ratio). The lowest net income (Rs. 65854/ha with 3.24 B:C ratio) was secured from JB-1 variety of barley.

Table 1: Plant height (cm) of barley at 90 DAS as influenced by N-levels and varieties

Varieties	N-levels (kg/ha)				Mean
	0	60	80	100	
JB-1	65.37	72.15	74.67	78.27	72.62
JB-2	71.80	73.76	76.23	83.80	76.40
JB-58	73.15	74.95	77.90	86.38	78.10
Mean	70.11	73.62	76.27	82.82	

	N-levels	Varieties	Interactions
S.Em±	0.34	0.29	0.58
C.D. (P=0.05)	0.95	0.82	1.69

Table 2: Number of tillers/plant of barley at 90 DAS as influenced by N-levels and varieties

Varieties	N-levels (kg/ha)				Mean
	0	60	80	100	
JB-1	4.18	6.50	7.65	8.32	6.66
JB-2	5.25	7.17	8.08	8.83	7.36
JB-58	6.43	7.82	8.47	9.29	8.09
Mean	5.29	7.16	8.07	8.69	

	N-levels	Varieties	Interactions
S.Em±	0.26	0.22	0.45
C.D. (P=0.05)	0.73	0.63	NS

Table 3: Seed yield (q/ha) of barley as influenced by N-levels and varieties

Varieties	N-levels (kg/ha)				Mean
	0	60	80	100	
JB-1	23.65	27.95	29.10	31.22	27.98
JB-2	24.30	29.76	30.95	32.15	29.29
JB-58	25.55	30.84	32.46	33.96	30.70
Mean	24.50	29.52	30.84	32.44	

Table 5: Net income (Rs./ha) of barley as influenced by N-levels and varieties

Varieties	N-levels (kg/ha)				Mean
	0	60	80	100	
JB-1	52768	65606	69284	75756	65854
JB-2	54940	41254	74878	78736	69952
JB-58	59034	75326	79926	84614	74725
Mean	55581	70729	74696	79702	

Table 4: Straw yield (q/ha) of barley as influenced by N-levels and varieties

Varieties	N-levels (kg/ha)				Mean
	0	60	80	100	
JB-1	50.84	55.63	58.47	60.73	56.42
JB-2	51.95	56.72	58.69	61.68	57.26
JB-58	53.67	60.88	61.28	63.92	59.94
Mean	52.15	57.74	59.48	62.11	

	N-levels	Varieties	Interactions
S.Em±	0.51	0.44	0.88
C.D. (P=0.05)	1.44	1.25	NS

	N-levels	Varieties	Interactions
S.Em±	0.53	0.46	0.91
C.D. (P=0.05)	1.49	1.29	NS

Conclusion

Based on one year experiment on barley it is concluded that amongst the varieties JB-58, performance the best with respect to growth parameters, yield-attributes, seed yield, seed protein and economical gain/ha. Thus the seed and straw yield was 30.70 and 59.94 q/ha, respectively. Seed protein was 12.76% along with net income Rs 74725/ha with 3.54 B:C ratio.

In case of applied nitrogen levels, 100 kg N/ha registered maximum growth and yield-attributing parameters seed and straw, yield, seed protein and economical gain. The seed and straw yield was 32.44 and 62.11 q/ha, respectively. Seed protein was 13.00% and net income Rs. 79702/ha with 3.65 B:C ratio.

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