



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.23

TPI 2022; 11(3): 344-345

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www.thepharmajournal.com

Received: 06-12-2021

Accepted: 10-02-2022

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Effect of nitrogen levels and number of Irrigation on growth characters of barley (*Hordeum vulgare* L.) var. 'Ritambhara' (K-551) under the Bundelkhand conditions in U.P.

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Abstract

A field experiment was conducted with four levels of nitrogen viz. 25,50,75 and 100 kg ha⁻¹ and number of irrigations (one, two and three) Growth characters such as plant height, number of functional leaves per plant were found to increase with increasing levels of nitrogen and irrigation. The maximum plant growth was recorded under the 100 kg N ha⁻¹ and three irrigations.

Keywords: Nitrogen, Irrigation, characters, K-551, Bundelkhand

Introduction

Barley is a prominent crop grown basically in most of the parts of the country under the limited inputs supply. It is an exhaustive crop such as other cereals and requires more nutrients from the soil under assured irrigation. But under limited moisture, in dry land areas the response of nutrients especially nitrogen is low. Under limited irrigation areas particularly where wheat cultivation is not possible, barley crop can provide higher economic yield even under low input supply. Considering the above facts, the present study was carried out to work out the suitable amount of nitrogen and number of irrigations for obtaining maximum yield of barley under Bundelkhand conditions.

Materials and Methods

The experiment was carried out at the Research Farm of Brahmanand Post Graduate College, Rath Hamirpur (U.P.) during the Rabi season of 2018-19 with four nitrogen levels viz. 25,50,75 and 100 kg ha⁻¹ and three number of irrigation i.e., one, two and three irrigations. The above treatments were tried in all possible combinations and arranged in Randomized Block Design with four replications. The soil of the experimental site was silty loam in texture having 0.53% organic carbon, 0.062% available nitrogen, 26.4 kg ha⁻¹ available phosphorus, 205.00 kg ha⁻¹ available potassium and pH was 7.6 Line sowing of var. Ritambhara was done on 28th November 2018 at 25cm apart. The distance between plant to plant was kept 5cm. The half dose of nitrogen and full dose of phosphorus (40 kg ha⁻¹) and potash (30 kg ha⁻¹) were applied at the time of sowing in furrows. The rest half dose of nitrogen was applied as top dressing i.e. 30 days after sowing. Irrigations according to treatment were applied as Ist irrigation at 30 days after sowing i.e. on 28th December and IInd and IIIrd irrigations were applied at 60 and 85 days after sowing on 28th January and 23rd February respectively. All the cultural operations were done as and when necessary for good stand of the crop.

Results and Discussion

It was not worthy that the barley plant responded well to varying levels of nitrogen and number of irrigations. Growth in terms of plant height, number of functional leaves, fresh and dry weight were recorded at different growth stages. Growth parameters were found to increase with increase in levels of nitrogen and irrigation.

Effect of nitrogen levels

The plant height (cm) recorded at three different stages (i.e. at 60, 90 D.A.S. and at maturity) increased with advancement in age of the crop. The plant height decreased with decreasing

levels of nitrogen. The maximum plant height (108 cm.) has been obtained with N₄ (100 kg N ha⁻¹) followed by 75,50 and 25 kg N ha⁻¹ respectively.

Table 1: Effect of nitrogen levels and number of irrigations on growth characters (Plant height, number of functional leaves fresh and dry weight and no. of tillers plant⁻¹) at various stages.

Treatment	Plant height (cm)			No. of functional leaves		Fresh weight (g)			Dry weight (g)			No. of tillers per plant 90 DAS
	60 DAS	90 DAS	At maturity	60 DAS	90 DAS	60 DAS	90 DAS	At maturity	60 DAS	90 DAS	At maturity	
Nitrogen Levels (Kg/Ha)												
N ₁ (25)	52.41	97.41	103.75	8.05	6.0	25.05	30.58	7.75	3.97	5.88	6.91	2.67
N ₂ (50)	53.66	97.83	105.00	8.66	6.66	31.2	34.40	9.50	4.20	6.24	8.30	3.00
N ₃ (100)	54.50	101.66	107.75	9.00	7.00	31.9	36.8	12.4	4.4	8.44	11.21	3.33
N ₄ (100)	55.50	102.17	108.00	9.33	7.66	38.5	38.79	17.0	5.43	8.97	15.40	3.66
S.E.M +	0.928	1.298	1.36	0.182	0.132	3.406	0.674	0.219	0.254	0.128	0.43	0.20
C.D. at 5%	1.89	2.642	2.76	0.37	0.270	0.934	1.372	0.446	0.519	0.261	0.884	0.407
Number of Irrigations												
One (I ₁)	51.5	97.25	104.31	8.45	6.37	29.54	33.42	11.87	4.28	6.00	10.00	2.82
Two (I ₂)	52.87	100.62	107.00	8.77	6.83	31.24	35.5	12.28	4.48	7.50	10.51	3.16
Three (I ₃)	57.68	100.68	107.68	9.06	7.28	34.25	35.8	12.70	4.73	8.39	10.81	3.50
S.E. m +	0.804	1.124	1.182	0.158	0.115	2.95	0.584	0.190	0.22	0.111	0.37	0.173
C.D. at 5%	1.630	2.288	2.276	0.321	0.234	N.S.	1.189	0.386	N.S.	0.226	N.S.	0.352

Data presented in table-1 show that the growth characters viz- plant height, fresh and dry weight, number of functional leaves and number of tillers were found to increase with increasing levels of nitrogen up to 100 kg ha⁻¹. Linear increase in above parameters were recorded up to 90 days stage which comes under vegetative growth phase, after that slow increase were observed up to harvest stage and this is because of the fact that application of nitrogen during vegetative period enhanced the meristematic cell-division due to which plant show linear growth impression. After that plants enter into the reproductive growth phase where rate of growth is comparatively ceased and development takes place. Nitrogen being a constituent of protein, pyrimidines porphyrins and co-enzymes, purines and pyridines are found in nucleic acid essential for protein synthesis helps in the growth of the plants.

Work on growth substance and naturally occurring phytohormones indicate important inter-relationship of such substances with nitrogen, cytokinin and auxin activity diminishes under conditions of nitrogen deficiency or lack of nitrogen causes retardation of growth of stem elongation. The results are in conformity with those of Prakash and Agrawal (1989), Singh and Singh (1991)^[1], Sood *et al.* (1993)^[2], Johan and Paul (1992) and Kumar and Singh (1998)^[3].

Effect of number of irrigations

Growth characters viz. plant height, number of functional leaves, fresh and dry weight, number of tillers per plant and total number of shoots per running metre were found to increase with increasing number of irrigations (I₃), increase in above parameters may be due to irrigation which help in the growth of the plants by fulfilling the water need and transpiration demand of the plants. Wahab and Singh (1983)^[4], Mishra *et al.* (1995)^[5] and Kumar *et al.* (1998)^[3].

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