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# Effect of Nitrogen and Phosphorus Scheduling on Performance of Barley Genotypes and Overall Economics

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**Abstract**

Barley genotype , BH393 registered significantly higher plant height, number of effective tillers/$m^2$, 1,000-grain weight, and grain yield than all other varieties viz. BH331, BH338 and BH646 during 2004-05 and 2005-06. Almost all the yield attributes and grain yield increased significantly with each successive increase in N and P levels up to 80 and 45 Kg/ha during both years, respectively.
**Key words : Hordeum vulgare, Nitrogen, Phosphorus, Grain yield, Economics.**

In India, barley is grown on 0.616 million hectares with production and productivity of 1.21 million tones and 19.58 quintals per hectare (1). In Haryana it is mainly grown in the south western region with average productivity of 2.8 tones per hectare. The average yield is quite low as compared to the potential yield level. Lack of information on suitable cultivars and judicious nutrient management is the basic reason for low yield. Hence, present investigation was carried out to study the effect of genotypes, nitrogen and phosphorus on the production of barley.

## Methods

The field experiment was carried out at farm of Department of Plant Breeding, CCS Haryana Agricultural University, Hisar during winter (rabi) seasons of 2004-05 and 2005-06. The experiment included five fertilizer levels ($N_0 + P_0$), $N_{40} + P_{15}$ kg ($^1/_2$ N at sowing + $^1/_2$ N at first irrigation), $N_{60} + P_{30}$ kg ($^1/_2$ N at sowing + $^1/_2$ N at first irrigation), $N_{80} + P_{45}$ kg ($^1/_2$ N at sowing + $^1/_2$ N at first irrigation), $N_{80} + P_{45}$ kg/ha ($^1/_3$ N at sowing + $^1/_3$ N at first irrigation + $^1/_3$ N at second irrigation) and four varieties (BH 393, BH 331, BH 338 and BH 646). The experiment was laid out in split-plot design with fertilizer levels in main plots and varieties in subplots with three replications. The soil of the experimental field was sandy loam in texture, having pH 8.1 with low to medium level of fertility (177.3 kg/ha available N, 14.26 kg/ha available P and 376.6 kg/ha K). The entire quantity of N, P and K based on treatments was applied through urea, single super phosphate and murate of potash respectively. The crop was seeded at 75 kg/ha with a row-to-row distance of 23 cm in the last week of november and was harvested in the first week of April in both the years. Two irrigations were applied at 45 and 85 days of sowing during both the years.

## Results and Discussion

Table 1 shows that genotype BH393 registered significantly higher plant height than all other varieties viz. BH331, BH338 and BH 646 during both years. Nitrogen application has already been reported to increase plant height and number of tillers per plant (2). The yield attributes, viz. effective tillers/$m^2$, 1,000-grain weight were also significantly higher in BH 393 than all other varieties . Verma et al. (3) reported differences among cultivars for yield attributing characters. The improvement in yield attributing characters with increase in nitrogen levels which resulted into higher grain yield might be due to the reason that N being an important constituent of nucleotides, proteins, chlorophyll and enzymes, involved in various metabolic process might have a direct impact on the vegetative and reproductive phases of plants. At higher level of N, crop absorbed sufficient amount of N and resulted in better growth parameters which in turn provided higher grain and straw yield. Because of highest values of all the yield attributes, BH 393 resulted in significantly highest grain yield during

**Table 1.** Effect of fertility levels and varieties on yield contributing characters, yield and economics of barley. $T_1$ : $N_0$ + $P_0$, $T_2$ : $N_{40}$ + $P_{15}$ kg ($^1/_2$ N at sowing + $^1/_2$ N at 1st irrigation), $T_3$ : $N_{60}$ + $P_{30}$ kg ($^1/_2$ N at sowing + $^1/_2$ N at 1st irrigation), $T_4$ : $N_{80}$ + $P_{45}$ kg ($^1/_2$ N at sowing + $^1/_2$ N at 1st irrigation), $T_5$ : $N_{80}$ + $P_{45}$ kg/ha ($^1/_2$ N at sowing + $^1/_3$ N at1st irrigation + $^1/_3$ N at 2nd irrigation); $V_1$ : BH393, $V_2$ : BH331, $V_3$ : BH 338, $V_4$ : BH646.

| Treatments | Yield contributing characters: Plant height (cm) | | Grains/ ear head | | Effective tillers No. / m² | | 1000-grain weight (g) | |
|---|---|---|---|---|---|---|---|---|
| | 2004-05 | 2005-06 | 2004-05 | 2005-06 | 2004-05 | 2005-06 | 2004-05 | 2005-06 |
| **Fertilizer** | | | | | | | | |
| $T_1$ | 60.3 | 54.1 | 49.0 | 47.4 | 155 | 151 | 43.5 | 43.1 |
| $T_2$ | 80.4 | 72.0 | 53.7 | 51.8 | 174 | 171 | 44.1 | 43.7 |
| $T_3$ | 83.1 | 80.0 | 56.8 | 54.7 | 181 | 176 | 45.3 | 45.0 |
| $T_4$ | 88.0 | 81.0 | 58.5 | 56.6 | 184 | 178 | 45.8 | 45.4 |
| $T_5$ | 89.5 | 82.2 | 59.1 | 57.8 | 185 | 180 | 46.0 | 45.5 |
| CD 5% | 1.9 | 6.0 | 2.8 | 2.0 | 4.4 | 2.5 | 0.9 | 1.7 |
| **Varieties** | | | | | | | | |
| $V_1$ | 86.0 | 79.0 | 61.4 | 58.3 | 179 | 176 | 46.9 | 46.4 |
| $V_2$ | 80.0 | 74.2 | 59.2 | 56.1 | 175 | 171 | 42.7 | 43.8 |
| $V_3$ | 82.1 | 75.0 | 57.0 | 54.6 | 173 | 170 | 41.6 | 42.7 |
| $V_4$ | 75.0 | 71.0 | 54.7 | 51.4 | 170 | 168 | 39.6 | 40.1 |
| CD 5% | 1.3 | 2.6 | 2.2 | 2.4 | 2.6 | 1.2 | 1.2 | 2.3 |

**Table 1.** Continued.

| Treatments | Grain yield (q/ha) | | Economics Net income (Rs/ha) | |
|---|---|---|---|---|
| | 2004-05 | 2005-06 | 2004-05 | 2005-06 |
| **Fertilizer** | | | | |
| $T_1$ | 30.6 | 29.3 | 1890 | 4700 |
| $T_2$ | 40.5 | 39.1 | 7460 | 10723 |
| $T_3$ | 44.6 | 43.2 | 9875 | 13946 |
| $T_4$ | 46.7 | 45.3 | 10723 | 14476 |
| $T_5$ | 48.9 | 47.1 | 11958 | 15618 |
| CD 5% | 4.4 | 2.3 | – | – |
| **Varieties** | | | | |
| $V_1$ | 48.6 | 47.5 | 12804 | 16455 |
| $V_2$ | 43.0 | 42.3 | 8853 | 12530 |
| $V_3$ | 41.2 | 40.2 | 7489 | 10779 |
| $V_4$ | 38.2 | 37.2 | 5193 | 7925 |
| CD 5% | 3.2 | 2.5 | – | – |

both years. Allam (4) already reported that N fertilizer increased grain yield of barley.

Plant height increased significantly with an increase in N level up to 80 kg/ha. The number of effective tillers/m² increased significantly up to 80kgN/ha. The yield attributers viz. grains/ear and 1,000-grain weight increased significantly with every increase up to 80kg N/ha (1/3 N as basal + 1/3 N at first irrigation + 1/3 N at second irrigation) + 45kg $P_2O_5$/ha fertility level over control. Mc Kenzie et al. (5) also reported a linear increase in grain yield with successive increase in phosphorus levels. The beneficial effect of split application of N was also reported by Mc Taggart and Smith (6). Grain and straw yields were significantly higher in BH 393 variety than other varieties (BH 331, BH 338 and BH 646), which might be due to more number of grains per spike, higher 1,000-grain weight) and effective tillers/m². Ondruch (7) also reported differences in grain yield among different barley varieties.

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