Forage Res., **44** (1) : pp. 63-65 (2018) **http://foragereserach.in**
SHORT COMMUNICATION

RESPONSE OF BARLEY GENOTYPES TO DIFFERENT NITROGEN LEVELS UNDER IRRIGATED TIMELY SOWN CONDITIONS

NEELAM*[1], BHAGAT SINGH[2] AND SATPAL[2]

[1]Department of Agronomy,
CCS Haryana Agricultural University,
Hisar, Haryana-125 004 (Haryana), India
**(e-mail : berkesia.neelam@gmail.com)*

(Received : 5 June 2018; Accepted : 28 June 2018)

SUMMARY

A two factor field experiment was conducted during *rabi* 2014-15 at CCS HAU, Hisar, Haryana to study the response of new malt barley (*Hordeum vulgare* L.) genotypes to different nitrogen levels under irrigated and timely sown conditions. The highest grain yield was recorded at 120 kg N/ha (46.8q/ha), which was significantly higher than 60 kg N/ha (42.3 q/ha). The highest number of effective tillers/m^2 (446) was recorded at 120 kg N/ha, which was significantly higher than 60 kg N/ha (422) but statistically at par with 90 kg N/ha (443). Among N levels, maximum straw yield (74.7 q/ha) was recorded with 120 kg N/ha followed by 90 kg N/ha. Among genotypes, PL-874 produced highest grain yield (48.8 q/ha), which was significantly higher than other genotypes except BH-976 (47.3 q/ha). The maximum number of effective tillers/m^2 (476) was observed in DWRB-92, whereas maximum grains/earhead were recorded in BH-902, which was significantly higher than other genotypes. Among genotypes, maximum harvest index was recorded in RD-2849 (39.3) followed by DWRB-101.

Key words : Barley, nitrogen levels, genotypes, grain yield and harvest index

Barley (*Hordeum vulgare* L.) is the world's fourth most important cereal crop in the world after wheat, rice and maize. It is more productive under adverse environments than other cereals. In India it is primarily grown for human consumption, while most of it is used as cattle feed in USA and Europe. Barley has considerable potential to provide fodder during lean period and at low temperature due to its fast growth. It is a source of early nutritious fodder to overcome the winter feed problem. Barley can replace wheat as the dominant crop due to its tolerance to drought and salinity. Besides these conventional uses, it is an important industrial crop because it is used as raw material for beer, whisky and brewing industries. World's area, production and productivity of barley is 0.58 m ha, 1.43 mt and 2439 kg/ha, respectively (Anon., 2017). In India, area under barley is about 0.71 m ha with production of 1.61 mt. The national average productivity of this crop is 2280 kg/ha (Anonymous, 2017) and it is largely confined to North-West region. In Haryana, Barley is grown mainly in the South-Western zone over an area of 0.33 lakh ha with production and productivity of 0.99 lakh tons and 3010 kg/ha (Anonymous, 2015).

Grain used for livestock or human feed tend to have higher protein content. These barleys can also be hulled or hulless. Some new hulless cultivars now give more digestible and higher protein feed. The second most important use of barley is for malt. Malt is 60-65% un-degraded starch and is used to produce beer, distilled alcohol, malt syrup, malted milk and breakfast foods. The varieties suited for malt purpose are usually lower yielding as compared to feed purpose varieties.

Nitrogen is the most important element that plays role in the structure of various protein molecules, enzymes, coenzymes, nucleic acids and cytochrome and is a necessary component of chlorophyll (Shafe *et al.*, 2011). This element influences the vegetative and reproductive growth and impacts leaf area, number of spikes, number of grains and grain yield (Nahvi *et al.*, 2012). The amount of nitrogen that a barley crop needs to maximize yield and quality will depend on the seasonal conditions, soil type, and rotational history of the soil as well as the potential yield of the variety. Nitrogen is needed for early tiller development of barley to set up the crop for a high yield potential. Singh and Uttam (2000) recorded increased grain yield with increase in nitrogen level. However, increasing N level beyond a certain limit induced lodging and ultimately decreased grain yield and its components.

[2]Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar, Haryana-125 004 (Haryana), India.

Therefore, the present study was planned with an objective to work out the effect of nitrogen levels on grain yield and other important agronomic traits of different barley genotypes.

A field experiment was carried out during the *rabi* season of 2014-15 at Research Farm, Wheat and Barley Section, CCS HAU, Hisar. The soil of the experimental site was sandy loam in texture, having pH 7.8 and organic carbon 0.48%. The soil of the experimental site was low in O.C. (0.48 %), medium in available P (14 kg/ha) and available K (220 kg/ha). The experiment comprising of three levels of Nitrogen (60, 90 & 120 kg/ha) in main plots and 7 genotypes of barley *viz*. BH-976, PL-874, DWRB-101, RD-2849, DWRUB-52, DWRB-92 and BH-902 in sub-plot and was laid out in split-plot design with three replications. A common basal dose of 30 kg P_2O_5/ha and 20 kg K_2O/ha and N as per the treatments was applied. The sowing of barley varieties as per the treatments was done on 12 November 2014 at a spacing of 18 cm. Growth attributing parameters were recorded at the time of harvest. Five plants were selected randomly from each plot to record the observations on growth parameters. The crop was harvested on 10 April 2015. The data were analyzed using appropriate analysis of variance (ANOVA). OPSTAT software was used to carry out statistical analysis.

Effect of Nitrogen levels

Nitrogen application significantly influenced grain yield, biological yield and effective tillers/m^2, but number of grains per spike and test weight were not affected significantly with the increase in N doses (Table 1). The maximum number of effective tillers/m^2 (446) was also recorded at 120 kg N/ha, which was significantly higher as compared to 60 kg N/ha (422), but statistically at par with 90 kg N/ha (443). The highest grain yield (4681 kg/ha) was recorded at 120 kg N/ha, which was significantly higher than 60 kg N/ha (4228 kg/ha), but statistically at par with 90 kg N/ha (4578 kg/ha). The supply of nitrogen to soil might accelerated various physiological processes due to greater translocation of photosynthates from source to sink (grain) in crop plants thereby increasing grain yield in malt barley. However, starch concentration and husk content was significantly higher under 60 kg N/ha. Barley grown for malt purpose must have low starch concentration and husk content Narolia *et al*. 2013. The biological yield of 12152 kg/ha was recorded under 120 kg N/ha treatment, which was significantly superior to 60 kg N/ha (11406 kg/ha) and 90 kg N/ha (11854 kg/ha). Maximum straw yield (7471 kg/ha) was also recorded with 120 kg N/ha followed by 90 kg N/ha. Harvest index of 38.6% was recorded under 90 kg N/ha, which was found superior over other treatments. These results are in close conformity with the findings of Meena *et al*. (2012) and Singh *et al*. (2013). The increase in grain and straw yield might be due to increase in leaf area, tiller number, leaf area index and leaf area duration with increase in nitrogen level (Alazmani, 2015).

TABLE 1
Effect of nitrogen levels on yield attributes and yield of barley genotypes

Treatments	Effective tillers/m^2	No. of grains/ earhead	Test weight (g)	Grain yield (kg/ha)	Biological yield (kg/ha)	Straw yield (q/ha)	Harvest index (%)
Nitrogen Levels (kg N/ha)							
N1 (60)	422	28.9	48.7	4228	11406	7177	37.1
N2 (90)	443	29.4	48.8	4578	11855	7277	38.6
N3 (120)	446	29.2	48.5	4681	12152	7471	38.5
S. Em±	1	0.2	0.38	30	52	-	-
C. D. (P=0.05)	4	NS	NS	120	209	-	-
Genotypes							
DWRUB-52	424	26.8	43.6	4285	11412	7127	37.6
DWRB-101	444	26.1	45.4	4370	11126	6756	39.3
BH-902	390	47.6	44.0	4552	11867	7315	38.4
BH-976	429	26.1	54.8	4727	12883	8156	36.7
PL-874	447	26.8	51.0	4877	12779	7902	38.2
DWRB-92	476	23.7	54.5	4222	11275	7053	37.5
RD-2849	449	27.0	47.2	4438	11289	6851	39.3
S. Em±	2	0.4	0.3	61	92	-	-
C. D. (P=0.05)	5	1.1	0.9	175	265	-	-

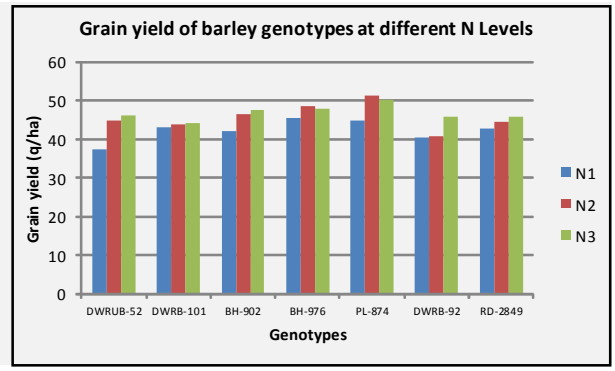

Fig. 1. Grain yield of barley genotypes at different nitrogen levels.

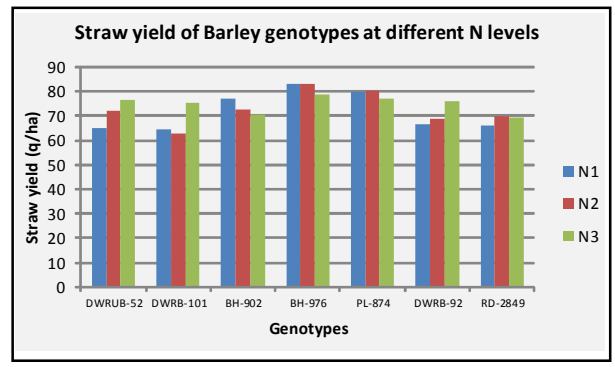

Fig. 2. Straw yield of barley genotypes at different nitrogen levels.

Effect of Genotypes

Among genotypes, yield and yield attributes were influenced significantly (Table 1). The barley genotype, PL-874 produced highest grain yield (4877 kg/ha), which was significantly higher than other genotypes, except BH-976 (4727 kg/ha). Maximum straw yield (81.6 q/ha) was recorded in BH-976 followed by PL-874. Maximum harvest index of 39.3% was observed in the genotypes RD-2849 and DWRB-101. The DWRB-92 genotype produced significantly higher effective tillers/m^2 (476) as compared to other genotypes. Maximum grains/earhead was recorded in BH-902, which was significantly higher than other genotypes. BH-976 genotype recorded highest test-weight (54.8 g) followed by DWRB-92 (54.5 g).

Performance of Genotypes at different N levels

The relative performance of different barley genotypes at different nitrogen levels with respect to grain and straw yield is shown in Fig. 1 and 2, respectively. The interaction of Genotypes × N levels was found non-significant for all the characters.

REFERENCES

Alazmani A., 2015 : The effect of cutting time under different amounts of nitrogen on yield and yield components of barley. *Global J. Sci. Frontier Res.* **15** : 33-36.

Anonymous, 2015 : *Progress Report of All India Coordinated Wheat & Barley Improvement Project* 2014-15, Barley Network.

Anonymous, 2017 : World Agriculture production. *Foreign Agric. Services*, USDA.

Narolia G. P., R. S. Yadav, M. L. Reager and R. S. Narolia. 2013 : Optimization of sowing and nitrogen levels and its scheduling on grain quality of malt barley (*Hordeum vulgare* L.) under irrigated condition. *Int. J. Plant Sci.* **8** (2): 305-308.

Meena, L. R., J. S. Mann and S. L. Meena. 2012 : Effect of levels and mode of nitrogen application on dual purpose barley (*Hordeum vulgare* L.) under semi-arid condition. *Indian J. Agron.* **57** (2): 168-170.

Nahvi, M. Davatgar, N., Derighgoftar, F., Sheikhhosseinian, A. & Abbasian, M. 2012 : Determination of N fertilization demand in wheat by leaf color diagram. *J. Grain & Plant Impr.* **28** (2): 53-68.

Shafe, L., Saffari, M., Imam, Y. & Mohammadinejad, G. 2011 : Effect of N and Zn fertilization on chlorophyll and leaf N content, yield and nutrients combination in grains of two corn (*Zea mays* L.) hybrids. *J. Grain & Plant Impr.* **27**(2): 235-246.

Singh, J., S.S. Mahal and Avtar Singh. 2013 : Productivity and quality of malt barley (*Hordeum vulgare*) as affected by sowing date, rate and stage of nitrogen application. *Indian J. Agron.* **58** (1): 72-80.

Singh, V.P. and S.K. Uttam. 2000 : Effect of farmyard manure and nitrogen levels on crop yield and economics of rice-wheat cropping system. *Crop Res.*, **5**: 82-86.