Vol. 13, No. 2, Page No. 14-18 (2024)
Received : August, 2024, Accepted : October, 2024

Effect of Yield Contributing Characters of Barley (*Hordium Valgare* L.) Through Nitrogen and Zinc Scheduling

Uma and Krapal Rana
Department of Agronomy
R.B.S. College, Bichpuri, Agra

Abstract

The present field experiment was conducted during Rabi season of 2022-23 at Agricultural Research Farm, R.B.S. College, Bichpuri, Agra. The investigation reported here was carried out during Rabi season of 2020-21. The experimental crop of barley was raised after Bajra in kharif season at the Agricultural Research Farm, Raja Balwant Singh College, Bichpuri, Agra which is located at latitude of 27.2º North and longitude of 77.9° East with an elevation of 163.4 m above the mean sea level. The research farm is located at the distance of about 11 km to the west of Agra city on Agra-Bharatpur Road. This region falls under south-western semi-arid zone of Uttar Pradesh.

The soil of experimental field was Gangetic alluvial with calcareous layer at the depth of about 1.5-2.0 meters and was well drained. To ascertain the fertility status and other physico-chemical properties of the soil of experimental area, a composite soil sample from the 0-30 cm. depth was taken just before sowing and was subjected to various mechanical and chemical analyses.

The field experiment was conducted during Rabi season of 2022-23. A "Randomized Block Design" nine treatment with three times replicated.

T_1 [1/2 at basal+ 1/2 at tillering (35-40 DAS)], T_2 (1/2 at basal +1/4 at tillering (35-40 DAS) +1/4 at anthesis stage (80-90 DAS)], T_3 [1/3 at basal+ 1/3 at tillering (30-40 DAS) + 1/3 at flag leaf stage (65-70 DAS)], T_4 [1/2 at basal+ 1/2 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (80-90 DAS)], T_5 [1/2 at basal+ 1/2 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS)], T_6 [1/2 at basal+ 1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS)], T_7 [1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at flag leaf (65-70 DAS) and 0.5% urea spray at anthesis stage (80-90 DAS)], T_8 [1/3 at basal+ 1/3 at tillering (30-40 DAS) + 5.0% at flag leaf stage (80-90 DAS)], T_9 [1/3 at basal+ 1/3 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS)]. The result was found T_6 [1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS) resulted in highest growth characters, yield attributing characters and yield net returns.

Key words : Nitrogen, Zinc, Barley, Yield contributing character.

Introduction

Barley (Hordium velgare) crop has wide adaptability. It can be grown not only in the tropical and sub-tropical zones, but also in the temperate zone and the cold tracts of the far north, beyond even the 60º north altitude[1]. Barley can tolerate severe cold and snow and resume growth with the setting in of warm weather in spring. It can be cultivated from sea level to as high as 3300 meters.

Rajasthan emerges as India's largest barley producing state in 2024, leveraging its vast open spaces and favourable climate. Its predominantly arid and semi-arid regions, notably in districts like Jodhpur, Nagaur, and Bikaner, foster optimal conditions for barley cultivation. The state prioritizes advanced farming techniques and breeding practices to enhance barley yields, underscoring its leadership in agricultural innovation within the barley sector. Rajasthan stands as the largest barley producing state in India, leveraging its vast open spaces and favourable climate, followed by Uttar Pradesh, Punjab and Madhya Pradesh.

Almost 60 per cent of the total barley produced in India is consumed as cattle feed. In addition, to direct human consumption about 0.25 million tonnes of barley is used by the malting industries in the country for the production of beer, whisky and other products, viz. industrial alcohol and vinegar. Malt syrup is utilized in the preparation of candies, breakfast beverages and medicines. By product of brewing and distilling industry, known as 'brewers' and 'distillers grain' is useful as cattle feed. Bold and plump seeded barley varieties are suitable for manufacture of pearl barley and powder products which form the diet of the sick and convalescent people. Pearl barley is used for barley water, which is diuretic and is given to persons suffering from kidney disorders (Hand Book of Agriculture, 2016).

Barley is quite nutritious cereal. Each 100 g of barley grain comprises 10.6 g protein; 2.1 g fat, 64.0 g carbohydrate, 50.0 mg calcium, 6.0 mg iron, 31 mg vitamin B1, 0.10 mg vitamin B2 and 50 µg foliate (Vaughan et al., 2006) and form a staple food for many people in India. The dishes like chapati, sattu etc. are prepared from barley flour are still highly popular. In addition, the energy rich drinks are also prepared from the malt extracts of barley. In India, about 90% of the barley produced is used for human consumption, while in USA and European countries most of it is used as cattle feed. The barley grains make palatable and nutritious livestock feed, the straw is used as forage and green forage either directly fed to the animals or used for making hay and silage.

Material and Methods

The present field experiment was conducted at Agricultural Research Farm of Raja Balwant Singh College, Bichpuri, Agra during Rabi season of 2022-23. The treatment of experiment was nine T_1 [1/2 at basal+ 1/2 at tillering (35-40 DAS)], T_2 (1/2 at basal +1/4 at tillering (35-40 DAS) +1/4 at anthesis stage (80-90 DAS)], T_3 [1/3 at basal+ 1/3 at tillering (30-40 DAS) + 1/3 at flag leaf stage (65-70 DAS)], T_4 [1/2 at basal+ 1/2 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (80-90 DAS)], T_5 [1/2 at basal+ 1/2 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS)], T_6 [1/2 at basal+ 1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS)], T_7 [1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at flag leaf (65-70 DAS) and 0.5% urea spray at anthesis stage (80-90 DAS)], T_8 [1/3 at basal+ 1/3 at tillering (30-40 DAS) + 5.0% at flag leaf stage (80-90 DAS)], T_9 [1/3 at basal+ 1/3 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS)] and one variety of Barley DWRB 160 (malt) and design R.B.D. with three replication. The research farm is situated at about 11 km to the west of Agra on Agra-Bharatpur road at latitude of 27°2 N and longitude of 77°9 E with an elevation of 163.4 m above the mean sea level. The field at Bichpuri farm having homogeneous fertility and uniform textural make up was selected for the field experimentation. This region falls under south – western semi arid zone of Uttar Pradesh. The soil of the experimental site is Gangatic alluvial in origin with calcareous layer at the depth of about 1.5 – 2.0 meter and well drained.

Result and Discussion

The data presented in Table-1 reveal that T_6 treatment significantly produced the higher number of shoots metre^{-1} row length by 4.73 to 16.40 per cent than T_1-1/2 at basal +1/2 at tillering (35-40 DAS) and treatments except spray of T_9-1/3 at basal +1/3 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS). So far comparison of treatment is concerned, T_6-1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage[4].

Table 1 Yield contributing characters of barley

Treatments	No. of spikes metre^{-1} row length	Length of spike (cm)	No. of grains spike^{-1}	Grain weight spike^{-1} (g)	1000 grain weight (g)
T_1	92.37	7.03	39.91	2.05	38.8
T_2	95.47	7.25	42.78	2.25	41.98
T_3	92.47	7.07	40.28	2.11	39.03
T_4	96.19	7.27	43.03	2.25	43.28
T_5	95.3	7.23	42.28	2.2	40.63
T_6	99.03	7.46	44.11	2.51	44.45
T_7	94.11	7.17	41.28	2.14	39.78
T_8	93.03	7.16	41.03	2.13	39.58
T_9	97.08	7.44	43.69	2.28	44.06
SEm±	1.41	0.11	0.53	0.17	0.72
CD (P=0.05)	4.24	0.32	1.51	0.52	2.15

(65-70 DAS) significantly increased the number of spikes metre^{1} row length over T_1-1/2 at basal + 1/2 at tillering (35-40 DAS), T_3-1/3 at basal+ 1/3 at tillering (30-40 DAS) + 1/3 at flag leaf stage (65-70 DAS), T_7-1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at flag leaf (65-70 DAS) and 0.5% urea spray at anthesis stage (80-90 DAS), T_8-1/3 at basal +1/3 at tillering (30-40 DAS) + 5.0% at flag leaf stage (80-90 DAS) which were nominal among themselves and could not reach the level of significance.

A critical study of the data indicate that all the practices produced appreciably higher length of spike by 19.05 to 26.92 per cent than that of T_1-1/2 at basal + 1/2 at tillering (35-40

DAS), T_9-1/3 at basal+ 1/3 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS) had significantly higher length of spike by 2.17 to 8.62 per cent than all the treatments except T_6-1/2 at basal + 1/4 at tillering (35-40 DAS) +5.0% urea spray at anthesis stage (65-70 DAS) which also appreciably increased length of spike by 6.62 and 5.96 per cent over T_1-1/2 at basal + 1/2 at tillering (35-40 DAS) and T_3-1/3 at basal + 1/3 at tillering (30-40 DAS) + 1/3 at flag leaf stage (65-70 DAS), respectively which were nominal and could not reach the level of significance. Rest of the treatments were statistically at par among themselves in this respect.

The number of grains spike significantly increased by 1.71 to 13.43 per cent due to different treatment over T_1-1/2 at basal + 1/2 at tillering (35-40 DAS). T_9-1/3 at basal + 1/3 at tillering (35-40 DAS) +5.0% urea +0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS)was at par with T_6-1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS) and produced appreciably higher number of grains spike by 4.43 to 11.52 per cent than all other treatments. T_6-1/2 at basal + 1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS) appreciably increased the number of grains spike by 6.99 to 10.72 per cent over T_3-1/3 at basal + 1/3 at tillering (30-40 DAS) + 1/3 at flag leaf stage (65-70 DAS), T_4-1/2 at basal + 1/2 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (80-90 DAS), T_5- 1/2 at basal +1/2 at tillering (35-40 DAS)+5.0% urea+0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS) and T_6-1/2 at basal -1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS) which differed marginally and could not reach the level of significance[2,3,5].

The data reveal that T_6-1/2 at basal +1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS) had significantly higher grain weight spike^{-1} by 7.80 to 45.39 per cent than T_1-1/2 at basal +1/2 at tillering (35-40 DAS). T_9-1/3 at basal + 1/3 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS) treatment had appreciably higher grains weight spike^{-1} by 17.14 to 34.87 per cent than T_4-1/2 at basal +1/2 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (80-90 DAS) which appreciably increased grains weight spike^{-1} by 13.14 to 30.26 per cent over rest of the treatments.

The treatments had appreciably higher 1000 grain weight by 6.01 to 22.16 per cent than T_9-1/3 at basal+1/3 at tillering (35-40 DAS)+5.0% urea + 0.5% $ZnSO_4.7H_2O$ spray at anthesis stage (80-90 DAS). T_9-1/3 at basal + 1/3 at tillering (35-40 DAS) + 5.0% urea + 0.5% $ZnSO_4.7H_2O$. spray at anthesis stage (80-90 DAS) was at par with T_6-1/2 at basal +1/4 at tillering (35-40 DAS) + 5.0% urea spray at anthesis stage (65-70 DAS) and significantly increased 1000 grain weight by 1.31 to 15.23 per cent over rest treatments. T_6-1/2 at basal + 1/4 at tillering (35-40 DAS)+5.0% urea spray at anthesis stage (65-70 DAS) had significantly higher 1000 grain weight than all other treatments of T_1-1/2 at basal +1/2 at tillering (35-40 DAS) which were not appreciable among themselves[6].

References

1. Ghulam, Hussain, A.L. and Jaloud, A.A. (1998). Effect of irrigation and nitrogen on yield, yield components and water use efficiency of barley in Saudi Arabia. *Agriculture water management*, 36(1):55-70.
2. Gupta J.P., Kumar, Rajesh and Kumar, Vimlesh (2019). Effect of nitrogen management and plant growth regulators on yield and yield placement and seeding rate on barley productivity and wild was oats fecundity in a zero-tillage system. *Crop Science*, 48:1569-74.
3. Kassie Meharie and Tesfaye Kindie (2019). Malting Barley Grain Quality and Yield Response to Nitrogen Fertilization in the Arsi Highlands of Ethiopia. *Journal Crop Science Biotechnology,* 22(3): 225-234.
4. Kenbaey, B. and Sade, B. (2002). Response of field grown barley cultivars grown on zinc deficient soil to zinc application. *Communications in Soil Science and Plant Analysis,* 33(3):533-544.
5. Kumawat, P.D., Jat, N.L. and Yadav, S.S. (2006). Effect of organic manure and nitrogen fertilization on growth, yield and economics of barley (Hordeum vulgare). *Indian Journal of Agricultural Sciences*, 76(4):226-229.
6. Meena, L.R., Mann, J.S. and Meena, S.L. (2012). Effect of levels and mode of nitrogen application on dual purpose barley (Hordeum vulgare) under semi-arid condition, *India Journal of Agronomy*, 57(2):168-170.