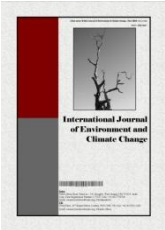

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Effect of Different Weather Relationship in Barley (*Hordeum vulgare L.*) in Different Sowing Dates and Varieties in Prayagraj Conditions

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment entited "Effect of different sowing dates and varieties on growth and yield of barley (*Hordeum vulgare* L.) Under Prayagraj conditions" was conducted during the Rabi season of 2021-2022. The experiment was set at forestry field of Sam Higginbottom University of Agriculture Technology and Science Prayagraj U.P. The experiment was laid out Factorial RBD with three replications having two factors. First factor comprised of three dates of sowing 15oct. 30 Oct. and 15 Nov. whereas second factor consist of three Barley varieties viz; Parth, SHB832, and RD 2052 Crop sown on 15th November recorded higher seed yield as compared to 30th October and 15th October sowing. In cases plant growth parameters of Barley maximum was recorded under 15th November as compared to 30th October and 15th October and in case of varieties maximum growth, plant height, no of tillers per plant, dry weight of per plant, length of spike, grain spike per plant, test weight, grain yield, straw yield, was recorded with 15th nov RD 2052 variety as compared to 15th Oct. Parth and 30th Oct. SHB 832. 15th November sowing with RD 2052 variety proved the most remunerative and economically feasible for cultivation of Barley under the agro climatic conditions of Prayagraj UP.

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Keywords: Plant height; no of tillers; dry weight; test weight; grain yield; straw yield; harvest index.

1. INTRODUCTION

Barley (*Hordeum vulgare* L.) is an annual, self-pollinating cereal crop that belongs to the same plant family (Poaceae or Gramineae) as maize, oats, rice and wheat; tribe Triticeae and genus Harem. It is world's fourth most important cereal crop after wheat, maize and rice and fifth after teff (*Eragrostis tef* L.) wheat, maize and sorghum in area coverage in Ethiopia [1]. Barley is among the major grain cereals dominantly cultivated in the central highlands of Ethiopia where the soils are often acidic in reaction.

Barley grows under a wide range of soil and climatic conditions. However, ti is best adapted to fertile and well drained silt to clay loam soils and warm dry climates (Anderson et al. 1993). Though barley grain has many uses, including livestock feed, human food and production of malt in Ethiopia, the grain is mainly produced for human consumption and sold for cash. About 90% of the grain is used for human food and it accounts for over 60% of the food for the inhabitants of the highlands [2].

The rest is used for local and industrial beverages. The straw is the second preferred animal feed next to teff straw. Stem stubs of barley are also used for roof thatching [3-5]. The yield depends on reaction of different cultivars to environmental conditions such as sowing date, cultivars, plant density, types of soil, fertilizer etc. (Soleymani et al. 2011).

Sowing date and cultivar are the agricultural factors which can be effective on enjoyment of the desirable factors and light energy absorbed by plant population and accumulation of dry matter [6-9]. Growth analyses have been studied to investigate reaction of crops cultivars to environmental condition and improvement of economic performance (Dehghanzadeh et al. 2007).

1.1 Justification

In India, shrinking land resources coupled with increased population exerts huge pressure on the farmers, researchers and agricultural policy makers to meet the food grain requirement of the nation. This enforces to search out for newer vistas. With optimum change in temperature and rainfall the optimum time of sowing will also change and ultimately the crop growth will also be affected [10,11]. The weather parameters which determined the optimum date of sowing are supposed to be altered to some extent with climate change occurring in that region. Keeping these aspects in view the present study on Effect of Different Weather Relationship in barley (*Hordeum Vulgare* L.) In Different Sowing Dates and Varieties in Prayagraj Conditions was carried out with the following objectives.

1. Effect of different date of sowing on growth and yield of Barley (*Hordeum Vulgare* L.) crop.
2. To evaluate Agrometeorological indices for Barley (*Hordeum vulgare* L.) Crop.

2. MATERIALS AND METHODS

The experiment was conducted at field of collage of forestry Sam Higginbottom University of Agriculture Techonology and Science Prayagraj-2110007 (UP) it is located at 25.45°N 81.84°E in the southern part of the Uttar Pradesh at an elevation of 98 meters (322 ft5) and stands at the confluence of two, the Ganges and Yamuna. The region was known in antiquity as the Vats country. To its south and southeast is the Bundellkhand region; to its east is middle Ganges valley of North India.

Prayagraj features the typical version of a humid sub-tropical climate that is common to cities in north-central India. Prayagraj experiences three seasons: hot dry summer, cool dry winter and warm humid monsoon. The summer season lasts from April to June with the maximum temperatures ranging from 40 °C (104 °F) to 45 °C (113 °F). Monsoon begins in early July and lasts till September. The winter season lasts from December to February.

Hordeum vulgare L. cultivars namely Parth, SHB832, RD 2052 were sown during rabi season at 15 days' intervals on three dates of sowing beginning 15st October 2021. The field experiment was conducted in a RBD in which three varieties and three sowing dates were replicated three times.

Date	Variety
15 Oct. 2022	Parth
30 Oct. 2022	SHB 832
15 Nov. 2022	RD 2052

T1 –D1V1 (15-Oct.Parth)
T2- D1V2 (15-Oct. SHB 832)
T3- D1V3 (15-Oct RD 2052)
T4-D2V1 (30-Oct Parth)
T5-D2V2 (30-Oct SHB 832)
T6-D2V3 (30-Oct RD 2052)
T7-D3V1 (15-Nov Parth)
T8- D3V2 (15-Nov SHB 832))
T9- D3V3 (15- Nov. RD 2052)

Fertilizers were applied as per recommended agronomic package of practices for the experiment i.e. nitrogen @ 120 kg/ha, P_2O_5 60 kg/ha and K_2O 40 kg/ha and 20 kg Sulphur. Seeds were sown at the rate of 100 kg seed per hectare in rows spaced 30 cm apart and 3-4 cm deep by a hand drawn drill. Weeding was carried out manually.

The crop was irrigated during the four most critical growth stages viz. CRI, tillering, flowering, milking as per recommended irrigation package of practices for the crop under prayagraj conditions.

2.1 Observe Growth, Yield, and Meteorological Parameters

Growth parameters was recorded like- plant height,(at 30,60,90,DAS and at harvest), no. of tillering, (at 30,60,90,DAS and at harvest), dry weight (at 30,60,90,DAS and at harvest) and Yield & economical parameters was recorded like- test weight, grain yield, straw yield, harvest index and also meteorological indices (GDD,HTU,PTU) was recorded at different phenological stages of plant and at final maturity.

2.2 Statistical Analysis

Analysis of treatment for all the treatments in randomized block design was carried out. Testing the hypothesis, the following ANOVA table was used analysis of variance (ANOVA) as outlined where the 'F' test was significant for comparison of the treatment means, CD values were worked out at 5% probability level. C.D = S.E (d) ×'t' error d. f. at 5% level of significance.

3. RESULTS AND DISCUSSION

3.1 Growth Attributes

May be observed that there is no significant relationship due to date of sowing on plant height was observed after 30 days of crop while after 30 days of sowing of barley the plant height had significant effect because of date of sowing it was also entered from the table that variety has significant effect on plant height from 30 DAS, 60 DAS, 60DAS. Among all applied treatments, maximum plant height was exhibited in T_9 var. RD 2052 (10.60, 51.40, 114) at 30, 60, 90, DAS respectively and found to be lowest in T_1 var. Parth (8.26, 45.20, 106) at 30, 60, 90 DAS respectively Table 1.

Table 1. Plant height as influenced by different date of sowing and varieties

Treatments	Plant height		
	30 DAS	60 DAS	90 DAS
Date of sowing			
15th Oct 2021	8.544	45.7	107.522
30th Oct 2021	9.244	48.389	110.156
15th Nov 2021	9.878	50.067	112.189
SEm±	0.071	0.22	0.202
CD (p=0.05)	0.215	0.667	0.61
Varieties			
Parth	8.978	47.178	108.778
SHB 832	8.867	47.356	108.744
RD 2052	9.822	49.622	112.344
SEm±	0.071	0.22	0.202
CD (p=0.05)	0.215	0.667	0.61

From Table 2 may be observed that there is no significant relationship due to date of sowing on tillers of per plant observed after 30 days of crop while after 30 days of sowing of barley the tillers of per plant had significant effect because of date of sowing it was also entered from the table that variety has significant effect on tiller of per plant from 30 DAS to 90 DAS. No. of tillers per plant was exhibited maximum in T9 var. RD 2052(6.0 9.33 and 10) at 30, 60and 90 DAS and found to be lowest in T1 var. PARTH (4, 6.33 and 7.33) at 30, 60and 90 DAS respectively.

From Table 3 may be observed that there is no significant relationship due to date of sowing on dry weight observed after 30 days of crop while after 30 days of sowing of barley the number of branches had significant effect because of date of sowing it was also entered from the table that variety has significant effect on dry weight from 30 DAS to 90 DAS. Dry Weight of Plants (g) was exhibited maximum in T9 var. RD 2052 (0.48, 8.50 and 21.9gm) at 30, 60, and 90 DAS respectively and found to be lowest in T2 var. PARTH (0.40, 6.6 and 18.30) at 30, 60, and 90 DAS respectively.

Table 2. No of tiller as influenced by different date of sowing and varieties

Treatments	No of tillers		
	30 DAS	60 DAS	90 DAS
Date of sowing			
15th Oct 2021	4.667	7.111	7.889
30th Oct 2021	5	7.667	8
15th Nov 2021	5	7.778	8.667
SEm±	0.286	0.221	0.263
CD (p=0.05)	N/A	N/A	N/A
Varieties			
Parth	4.111	6.556	7.778
SHB 832	4.556	7.222	7.667
RD 2052	6	8.778	9.111
SEm±	0.286	0.221	0.263
CD (p=0.05)	0.866	0.668	0.794

Table 3. Dry weight as influenced by different date of sowing and varieties

Treatments	Dry weight		
	30 DAS	60 DAS	90 DAS
Date of sowing			
15th Oct 2021	0.446	7.033	19.948
30th Oct 2021	0.477	7.578	20.4
15th Nov 2021	0.456	7.589	20.356
SEm±	0.012	0.19	0.314
CD (p=0.05)	N/A	N/A	N/A
Varieties			
Parth	0.444	6.867	19.067
SHB 832	0.437	7.144	19.651
RD 2052	0.497	8.189	21.986
SEm±	0.012	0.19	0.314
CD (p=0.05)	0.036	0.575	0.949

3.2 Growth Attributes

From Table 4, the no significant result were observed for interaction of date of sowing and variety on test weight also conducted. may be observed that there is significant relationship due to date of sowing on grain yield it was also entered from the table that variety has significant effect on grain yield The no significant result were observed for interaction of date of sowing and variety straw yield also conducted. May be observed that there is significant relationship due to date of sowing on harvest index it was also entered from the table that variety has significant effect on harvest index.

Test Weight (gm) was exhibited maximum in T9 var. RD 2052 (39.00gm) and found to be lowest in T1 PARTH (37 gm) respectively. Grain Yield (q ha-1) was exhibited maximum in T9 var. RD 2052 (29.92 q ha-1) and found to be lowest in T1 var. PARTH (27.13 q ha-1) respectively. Straw Yield (q ha-1) was exhibited maximum in T9 var. RD 2052 (19.43 q ha-1) and found to be lowest in T1 var. PARTH (15.20 q / ha-1) respectively. , Harvest index was exhibited maximum in T1 var. PARTH (64.93) and found to be lowest in T9 var. RD 2052 (60.28) respectively.

Table 5 the maximum heat units (GDD, HTU, PTU). Consumed by 15 oct. growing crop and minimum GDD,HTU, PTU. Consumed by15 nov. growing crop and in case of varieties maximum consumed by Parth and minimum consumed by RD 2052 variety.

May be observed that there is significant relationship due to date of sowing on heat unit consumption was also entered from the table that variety has significant effect on heat units consumption.

Table 4. Yield parameters as influenced by different date of sowing and varieties

Treatments	Test weight	Grain yield	Straw yield	Harvest index
Date of sowing				
15th Oct 2021	37.778	27.823	16.382	63.11
30th Oct 2021	37.889	28.463	17.904	61.406
15th Nov 2021	37.889	28.438	18.487	60.607
SEm±	0.342	0.209	0.317	0.43
CD (p=0.05)	N/A	N/A	0.959	1.299
Varieties				
Parth	37.222	27.838	16.979	62.266
SHB 832	37.222	27.756	16.949	62.136
RD 2052	39.111	29.131	18.846	60.721
SEm±	0.342	0.209	0.317	0.43
CD (p=0.05)	1.033	0.631	0.959	1.299

Table 5. Meteorological indiesis as influenced by different date of sowing and varieties

Treatments	GDD	HTU	PTU
Sowing dates			
15th Oct 2021	1,393.22	8,594.61	15,133.67
30th Oct 2021	1,356.89	8,153.71	14,694.18
15th Nov 2021	1,293.33	7,564.66	13,935.45
SEm±	1.294	2.361	2.387
CD (p=0.05)	3.912	7.138	7.219
Varieties			
Parth	1,361.56	8,123.48	14,600.51
SHB 832	1,347.00	8,100.25	14,586.10
RD 2052	1,334.89	8,089.25	14,576.70
SEm±	1.294	2.361	2.387
CD (p=0.05)	3.912	7.138	7.219

4. CONCLUSION

On the basis of findings, present research work it can be concluded that 3rd date of sowing (15th Nov. 2021) was found most suitable period for sowing Barley which resulted in maximum growth and yield AND consume optimum heat units and change timely phenological stages. Heat units (GDD,HTU, PTU) are play most important role in plant growth and production. It was conducted from the trial that in treatment T9(D3V3) var. RD2052 found to be appropriate for barley (*Hordeum vulgare* L.) on prayagraj. It was also found significant for getting maximum growth, yield of the crop. Here it's a need for further investigation to confirm the results at Prayagraj. Among variety of barley RD 2052 proved superior in growth and yield. Based on our study we can recommended farmers around prayagraj to prefer use of RD 2052 variety and sowing of Barley in the 2nd and 3rd week of November for better results and yield and variety in case of RD 2052 is most suitable variety for prayagraj region Based on this study we can recommended farmers around prayagraj to prefer use of RD 2052 variety and sowing of mustard in the 2nd and 3rd week of November for better results and yield.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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