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Standardization of Row Spacings for Feed Barley (*Hordeum vulgare L.*) Varities under Agro-Climatic Condition of Agra region

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Abstract

A field experiment was conducted to study "Standardization of Row Spacings in Feed Barley Varieties under Agro-Climatic Conditions of Agra region" was carried out during Rabi season of 2015-16 at Agricultural Research Farm, Raja Balwant Singh, College, Bichpuri, Agra. The variables involved in this study were three row spacing (20.0 cm, 22.50 cm and 25.0 cm) and three varities viz. BH-902, BH-946 and RD-2552. Thus, in all 9 treatment combination were compared in a split plot design having row spacing in main plot and varieties in sub plot with 4 replications. Data showed that the 22.50 cm row spacing gave highest grain yield (38.56 $Qh^{-1}a$) of barley varities followed by 20.00 cm and 25.00 cm row spacing. The highest yield attributes (no. of effective shoots $meter^{-1}$ row length, length of spike (cm), no. of grains $spike^{-1}$ and 1000 grain weight were also obtained by 22.50 cm row spacing. Variety BH-946 gave highest grain yield with all the row spacings followed by BH-902 and RD-2552. Variety BH-946 also gave highest earhead/m^2 and number of grains per spike. The highest net return Rs. 42978 ha^{-1} and B : C. ratio (2.71) were also obtained with 22.5 cm row spacing followed by 20.0 cm and 25.0 cm row spacing. Variety BH-946 gave highest net return and B:C ratio with all the row spacings followed by BH-902 and RD-2552.

Key words : Barley, Row Spacing, Standardization, Net return

Introduction

Barley (Hordeum Vulgare L.) is an ancient cereal grain, which upon domestication has evolved from largely a food grain to a feed and malting grain (Baik and Ullrich, 2008). It is considered to be the one of the most valuable food crop that survives almost every weather conditions. Although it is a crop that can survive any condition, it is a sensible crop and can get ruined in any stage of its growth. Among other cereal grain crops, barley is considered fourth largest cereal crop in the world with a share of 7% of the global cereal production (Pal et al., 2012). It is cultivated as a summer crop in temperate areas and as a winter crop in tropical areas. Barley has a short growing season and is also relatively drought tolerant. However, it is a tender grain and care has to be taken in all stages of its growth and harvest. Barley gives good yields with lesser agriculture inputs and it could also replenish the damaged soils (Naheed et al., 2015).

It is the stable food diet of many countries and is largely required for making breads and beer. Animal food and livestock feed is the primary use of barley crop. Malt is another important use of the crop. Globally, barley is mainly used to produce malt for beer-making of the 22 million tonnes of global malt production, 90% is produced from barley.

In India barley presently occupies nearly 0.68 million hectare with 1.84 million tonnes of production and 2718 $kgha^{-1}$ of average productivity. (www.indiastat.com, 2016)

Row spacing and direction had little effect on yield and yield components, water use, tillering, and light interception. Nevertheless, in some instances narrow row spacing resulted in more heads that were smaller and had lighter Kernels than wide row spacing. It was observed that greater soil water depletion for the narrow row spacings at the late planting date one year due to greater stem density. The narrow rows

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intercepted more light than wide rows and the wide rows intercepted more light at solar noon in east-west compared to north – south rows. Hence, there is no confirm theory that soil water is conserved in wide rows for use at more critical stages later in the season. Genotype plays a vital role in crop production, the choice of right genotype of barley helps to augment crop productivity by about 20-25 per cent. Any genotype of barley before being recommended for general cultivation for particular region must be judged for its potential, tolerance against disease in general and in particular responsiveness to added water and fertilizer and adaptability to different agro-climatic conditions. Thus, the value of stable and high yielding genotype has been universally recognized as an important factor for boosting crop production.

Keeping the above facts in view the present study has been conducted with the following specific objectives.

(i) To find out the best row spacing of feed barley for increasing productivity.

(ii) To evaluate the relative performance of barley varities for higher productivity.

Materials and Methods

A field experiment was conducted to study the standarization of row spacings for feed barley varities under agro climatic conditions of Agra region at Agricultural Research Farm, Raja Balwant Singh College, Bichpuri, Agra during *Rabi season* of 2015-16. The crop was sown in plot of 4.08´1.0m with three row spacings namely 20.0 cm (S_1), 22.5 cm (S_2) and 25.0 cm (S_3) with three barley varieties viz. BH-902, BH-946 and RD-2552. The recommended fertility level (60 kg N, 30 kg P_2O_5 and 20 kg K_2O) for barley crop was adopted in the experiment. The experiment was laid out in split plot design taking row spacing in main plot and varities in sub plot with four replications and nine treatment cominations. The total observations on growth and yield attributes and yield were recorded viz. No. of Shoots per m row length, Plant height (cm), Dry matter accumulation (g), of 25cm row length, effective shoots m^{-1} row length, spike length (cm), no. of grains $spike^{-1}$, 1000-grain weight, biological yield, grain yield and straw yield (qha^{-1}), harvest index (%), gross return ($Rs.ha^{-1}$), net return ($Rs.ha^{-1}$) and B:C ratio.

Results and Discussion

Data pertaining to different growth, yield attributing traits and yield are presented in Table 1 & 2. All the growth and development characters such as

Table 1: Influence of different treatments on Plant height (cm), total no. of shoots per m length and dry matter accumulation (g) in feed barley

Treatment	Plant Height (cm)				No. of shoots per m row length			Dry matter accumulation (g) in plant 25 cm row length			
	30DAS	60DAS	90DAS	120DAS	At harvest	30DAS	60DAS	90DAS	120DAS	At harvest	30DAS	60DAS	90DAS	120DAS	At harvest
Row spacing															
20.0 cm (S_1)	3.57	13.19	68.84	69.57	70.03	130.25	173.17	151.88	143.26	135.46	3.38	16.35	43.11	71.33	88.38
22.5 cm (S_2)	3.80	13.58	69.58	70.25	70.58	135.42	179.74	158.17	150.18	138.83	3.49	17.59	43.71	72.47	89.76
25.0 cm (S_3)	3.72	13.31	69.26	70.03	70.21	132.42	176.33	156.12	148.24	135.58	3.45	16.52	43.63	72.89	89.00
SEm ±	1.13	0.27	1.36	1.43	1.55	2.1	3.96	3.56	3.18	2.56	0.13	0.27	1.36	1.43	1.55
CD (p = 0.05)	NS	NS	3.80	3.50	NS	NS	6.50	5.21	4.10	NS	NS	1.01	3.50	4.17	4.50
Varieties															
BH -902 (V_1)	3.68	12.66	69.18	69.42	70.33	132.92	176.24	154.37	147.28	136.69	3.41	16.68	43.46	71.91	88.96
BH -946 (V_2)	3.82	17.34	77.18	77.90	78.28	138.28	189.78	167.62	154.85	142.75	3.53	18.02	45.7	77.28	93.65
RD -2552 (V_3)	3.60	10.08	61.27	65.53	62.20	126.91	163.2	144.18	139.56	130.41	3.58	15.76	41.28	67.5	84.54
SEm ±	0.1	0.21	1.02	1.07	1.13	1.69	3.05	2.5	2.24	1.92	0.10	0.21	1.02	1.07	1.13
CD (p = 0.05)	NS	0.62	3.03	3.18	3.36	5.02	9.06	7.43	6.66	5.70	NS	0.62	3.03	3.18	3.36

Table 2: Influence by different treatments on yield attributing characters and yield in barley

Treatments	No. of effective shoots m^{-1} row length	Length of spike (cm)	No. of grains per spike	1000-grain weight (g)	Biological yield (qha^{-1})	Grain yield (qha^{-1})	Straw yield (qha^{-1})	B : C ratio
Row spacing								
20.0 cm (S_1)	99.34	7.82	42.72	38.20	82.63	35.69	46.94	2.55
22.5 cm (S_2)	106.42	8.87	45.28	41.22	88.92	38.59	50.36	2.65
25.0 cm (S_3)	100.02	8.70	41.50	39.50	77.28	33.21	44.07	2.47
SEm ±	1.78	0.27	1.07	0.26	1.88	0.62	0.78	-
CD (p = 0.05)	6.16	0.93	3.10	0.73	6.51	2.15	2.7	-
Varieties								
BH -902 (V_1)	100.80	8.45	43.37	40.36	82.45	35.55	46.90	2.55
BH -946 (V_2)	106.45	9.15	44.88	42.07	86.44	37.40	49.04	2.71
RD -2552 (V_3)	98.54	7.79	41.24	40.32	79.95	34.51	45.44	2.42
SEm ±	1.72	0.21	1.03	0.21	1.82	0.9	0.69	-
CD (p = 0.05)	5.11	0.62	3.06	0.62	5.41	2.67	2.05	-

plant height, no of shoots per meter row length and dry matter accumulation in plants did not differ much among themselves due to different row spacing at various stages of crop growth (Table 1). However, these growth and development characters marginally improved with every increase in the spacing thus, the maximum values were recorded with 22.50 cm row spacing. Similarly, in case of dry matter accumulation in plants, in early stages of crop growth up to harvesting 22.50 cm row spacing (S_3) had maximum dry matter accumulation in plants as compared to 20.0 cm and 25.0 cm row spacing. These results are in confermity with the findings of Kaur et al, (2009), Hari Ram et al., (2012). On reviewing the result, it can be seen that different varieties of barley crop were significantly different from each other in terms of no. of shoots per m row length, plant height and dry matter accumulation. The maximum values of these growth characters were recorded with BH-946 (V_2) registering superiority over BH-902 (V_1) and RD – 2552 (V_3) at all the stages of crop growth. These results are in the close proximity to the findings of Singh and Singh (2002) and Kushwaha et al. (2009). An examination of data shown in Table 2 reveals that different row spacing had significant effect on no. of effective shoots per m row length, length of spike, no. of grains per spike and 1000-grain weight were significantly higher with 22.5cm row spacing than 20.0 cm and 25.0 cm row spacing. However, these yield attributing chacters were appreciably higher with BH-946 (V_2) followed by BH-902 (V_1) and RD-2552 (V_3). Table 2 clearly reveals that the variation in biological, grain and straw yield due to row spacing was significant. However barley crop planted in rows of 22.50 cm apart recorded higher biological, grain and straw yield over the crop planed in row spacing of 20.0 and 25.0 cm. These results are in close conformity with the findings of Kaur et al. (2009) and Dahiya, et al. (2016). Similarly to biological, grain and straw yield also signifivantly increased with the variety BH-946(V_2) over BH-902 (V_1) and RD–2552 (V_3). Better plant growth height be held responsible for higher straw yield with BH-946 (V_2) variety. The highest net income of Rs. 42978 ha^{-1} and B/C ratio of 2.71 was obtained with variety BH-946 shown in row spacing of 22.50 cm apart followed by BH-902 with 22.50 cm row spacing i.e. net income of Rs. 41362 ha^{-1} and B : C ratio of 2.65. The findings confirm the results of Tomar and Namdeo, (2002) and Mohammadi (2010).

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