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EFFECT OF CULTIVARS AND PLANT GEOMETRY ON DRY FODDER PRODUCTION OF BARLEY UNDER VARIOUS MOISTURE REGIMES ON RAISED BED PLANTING

NAVEEN KUMAR[1], SURESH KUMAR[2] AND R. K. ARYA[2]

[1]Department of Agronomy, CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India
[2]RDS Seed Farm, CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India
*(e-mail : sureshsella@gmail.com)
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SUMMARY

A field experiment was conducted during **rabi** 2011-12 at research farm, CCS Haryana Agricultural University, Hisar, Haryana (India) in a semi-arid climate to study the effect of cultivars, row spacing and moisture regimes on dry fodder production and its contributing traits in barley planted on raised beds. The treatments consisting of combination of three cultivars *viz.*, BH 393, BH 902 and BH 885 and two rows spacing viz., 2 rows per bed and 3 rows per bed in main plots and three moisture regimes (irrigation at IW/CPE 0.3, 0.4 and 0.5) in sub plots. The experiment was laid out in split plot design with three replications. The results revealed that the plant height, number of tillers per meter square, leaf area index and dry fodder yield was recorded maximum with BH 902 cultivar. Plant height of barley was not affected significantly by row spacing, but number of tillers per meter square, and leaf area index was recorded significantly higher in 3 rows per bed. Dry fodder yield was also recorded higher in 3 rows per bed. Among three moisture regimes, plant height, number of tillers per meter square, leaf area index and dry fodder yield were recorded maximum with irrigation at IW/CPE 0.5. Among interaction between cultivars and row spacing, BH 902 cultivars when planted in 3 rows per bed produced maximum dry fodder yield than other combinations.

Key words : dry fodder production, bed planting, row spacing, moisture regime, barley cultivars

India supports nearly 20% of the world's livestock being the leader in cattle (16%) and buffalo (5.5%) population. The livestock sector contributes 32% of the agricultural output, which is 22% of the total GDP in India. Deficiency in feed and fodder has been identified as one of the major components in achieving the desired level of livestock production. The shortage in dry fodder is 21.8% compared with requirement of 560 million tons for the current livestock population (Kumar *et al*., 2012). Most of the fodder-deficit states are in arid and semi-arid agro-ecological zones and Haryana is also fodder a deficit state. Barley is used as animal feed at the vegetative stage or cut before maturity and either feed directly or used for silage (Bisht *et al.* 2009). Among the main grains barley straw is second to Oats in nutritional value and palatability and it is better than wheat straw (Redden, 2012). Its cultivation is mainly confined to marginal area with poor soil conditions coupled with erratic rainfall and limited irrigation water. Sowing of barley on beds is a relatively new technology, in which the crop is sown in 2 or 3 rows on the top of raised beds and the furrows or corrugation between two beds are meant for irrigation. This planting system facilitates mechanical weed control, increased water use efficiency, reduced crop lodging and lower seed requirement (Yadav *et al*., 2002). In India, planting of barley on beds is recent introduction and information on the response of bed planted barley cultivars to irrigation is lacking. Keeping this in view, an experiment was conducted to evaluate the dry fodder production in bed planted barley as influenced by cultivars and row spacing under varying moisture regime.

MATERIALS AND METHODS

The experiment was conducted during *rabi* 2011-12 at research farm of CCS Haryana Agricultural University, Hisar, Haryana (India) situated at 29°10' N latitude and 75° 46' E longitude at an elevation of 215.2 m above mean sea level in a semi-arid climate. The experimental treatments consisted of combination of three cultivars *viz.*, BH 393, BH 902 and BH 885 and two rows spacing *viz,* 2 rows per bed and 3 rows per bed

(70 cm wide with 40 cm top and 30 cm furrow) in main plots and three moisture regimes (irrigation at IW/CPE 0.3, 0.4 and 0.5) in sub plots. Experiment was laid out in split plot design with three replications. The experiment was sown on 11 December 2011 with the help of bed planter using recommended seed rate. The size of the bed was 70 cm with 40 cm top and 30 cm furrow. Two rows of barley were sown on top of beds by maintaining 20 cm spacing between the two rows and 10 cm on both sides of the top, while three rows of barley were sown on top of beds by maintaining a row to row spacing of 10 cm and 10 cm on both sides of the top. Irrigations were applied as per treatments based on IW/CPE in individual plots and the depth was measured with the help of current meter. The IW/CPE ratios were calculated based on depth of irrigation water and the cumulative pan evaporation during the particular period. Only one pot-sown irrigation (64 mm) was applied in the treatments IW/CPE 0.3 but two irrigations were applied in each treatment IW/CPE 0.4 (116 mm) and IW/CPE 0.5 (117 mm). The data were statistically analyzed by the standard procedure as described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Dry Fodder Attributes

Plant height and number of tillers per meter square varied significantly due to cultivars and their values were maximum in cultivar BH 902, which was significantly higher than BH 393 and BH 885. Leaf area index was also highest in BH 902, being significantly higher than BH 885, but statistically at par with BH 393 (Table 1). This difference in these attributes may be due to their individual varietal characters. The plant height was not affected significantly by row spacing, however, number of tillers and leaf area index were significantly higher in 3 rows per bed than 2 rows per bed. The increase in number of tillers was primarily due to the fact that competition between the plants for space within the row was less in 3 rows than 2 rows per bed and increased number of tillers contributed to higher leaf area index. Similar results have been reported in wheat by Kumar *et al.* (2010).

Moisture regimes significantly influenced the plant height, number of tillers and leaf area index. Their values were significantly higher with irrigation at IW/CPE at 0.4 or 0.5 than irrigation at IW/CPE 0.3. This increase was due to increased uptake of nutrients with increased availability of moisture for plant uptake. These results are supported by Mollah and Paul (2008) and Singh *et al.* (2012).

Dry Fodder Yield (kg/ha)

Dry fodder yield of barley were significantly

TABLE 1
Dry fodder yield and its attributes in bed planted barley as affected by cultivars, row spacing and moisture regimes

Treatments	Plant height (cm)	No. of tillers (per/m^2)	Leaf Area index	Dry fodder Yield (kg/ha)
Cultivars				
BH 393	96.0	310.4	3.73	5802
BH 902	102.6	381.8	3.92	7415
BH 885	85.3	343.2	3.61	5165
S. Em±	1.0	4.9	0.07	150
C. D. (P=0.05)	3.2	15.3	0.22	473
Row spacing				
2 rows per bed	94.1	337.8	3.64	5857
3 rows per bed	95.1	352.5	3.87	6397
S. Em±	0.8	4.0	0.06	123
C. D. (P=0.05)	NS	12.5	0.18	386
Moisture regimes: Irrigation at				
IW/CPE=0.3	92.2	323.6	3.52	5192
IW/CPE=0.4	95.1	353.2	3.79	6405
IW/CPE=0.5	96.6	358.5	3.95	6785
S. Em±	0.8	3.9	0.06	202
C. D. (P=0.05)	2.2	11.4	0.17	589

influenced by cultivars (Table 1). It was maximum in cv. BH 902, being statistically superior to BH 393 and BH 885. This increase can be ascribed to more plant height, number of tillers and LAI in BH 902. The cv. BH 393 also proved superior to BH 885 in straw yield due to more dry matter accumulation and plant height. The dry fodder yield was also higher under 3 rows per bed as compared to 2 rows per bed, which may be to increased number of tillers and LAI. Similar results have been reported by Yadav *et al.* (2002), Kumar *et al.* (2010) and Kumar *et al.* (2005).

TABLE 2
Dry fodder yield (kg/ha) of bed planted barley cultivars as influenced by row spacing

Cultivars	Row spacing	
	2 rows per bed	3 rows per bed
BH 393	6050	5554
BH 902	6863	7967
BH 885	4658	5672
S. Em±	212	
C. D. (P=0.05)	668	

Among the moisture regimes, the increase in moisture regime from irrigation at IW/CPE 0.3 to IW/CPE 0.4 or 0.5 resulted in significant increase in dry fodder yield. This can ascribed to increased number of tillers and LAI due to better micro environmental conditions for growth and development of barley crop under irrigation at IW/CPE 0.4 and 0.5 (two irrigations). Singh *et al.* (2012) also reported significant increase in straw yield with increased IW/CPE.

Interaction Among Cultivars and Row Spacing

Among the interaction of barley cultivars and row spacing on beds, the cultivar BH 902, when planted with three rows per bed gave significantly higher dry fodder yield (7967 kg/ha) as compared to other combinations (Table 2). The second treatment combination was BH 902 cultivar planted with 2 rows per bed, which was followed by BH 393 in 2 rows per bed and BH 885 cultivar planted with 3 rows per bed. Minimum dry fodder yield was produced by BH 885 cultivar planted with 2 rows per bed (4658 kg/ha).

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