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Research Article

Fodder-cum-feed Potential of Barley (*Hordeum vulgare* L) as Influenced by Varieties, Nitrogen and Cutting Managements

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Abstract A field experiment was conducted during the winter (Rabi) season at Agricultural Research Farm of S.D.J.P.G. College Chandeshwar, Azamgarh U.P. for two years to study the Fodder-cum-feed potential of Barley(Hordeum Vulgare L) as influenced by varieties,nitrogen and cutting managements. The treatments comprising the six barley varieties (Karan-265, Karan-521, Karan-19, Karan-741, Karan-4 and K-226), three levels of nitrogen(40,80 and 120 kg ha ^{1}) and three cutting managements(Uncut,45 D.A.S. and 45 & 65 D.A.S.) were evaluevated. Barley varieties Karan-741 produced significantly higher green fooder yield (399.00, 187.00, 395.00 and 185.00 q ha-1 45 D.A.S., 45 D.A.S. and 65 D.A.S. respective years respectively) than the other rest varieties. Nitrogen levels 120 kg ha ^{1} produced higher fodder(487.00,230.00,482.00 and 227.00 q ha ^{1}) during both experimental years at cutting were applied, 45,45 and 65 days after sowing respectively. The forage cut at 45 days after sowing produced higher green fodder than second plant cutting at 45 and 65 days after sowing. The uncut treatments produce 61.72% higher grain yield than cut crop at 45 D.A.S. and produced significantly higher grain yield than cut crop at second cutting. Linear responce of nitrogen(Y=a+bx) was obtained each nitrogen levels. In conclusion, the variety Karan-741 of hull-less barley is best suited for fodder -cum-feed. Barley should be grown recommended row spacing to get higher production along with @120 kg N and 45 days after sowing.

Keywords: Forage yield, Grain yield,Fodder,Cuttings,Days After Sowing.

Introduction

The nutritional breakdown of the barley sprouts shows that the sprouts are very high in energy and protein and contain sufficient of these to meet the needs of most stock. Barley grass is considered the most nutritional of the green grasses containing and abundance of nutrients unsurpassed by any other type of grass. During pre-green revolution barley is the major staple cereal. By virtue of hardey and versatile nature superior nutritional value(soluble digestible fibres, low gluten paletable and succulent leaves) satisfactory better grain yield and medicinal importance(due to presence of beta glucon,acetycholine,desirable chlorophyll and anti oxidant) Barley is suppose to be crop of present era.(Gill et.al. 2017). To day nearly 8.3 m.ha of the country's cropped area under forage crops and their is little scope for its further expansion due to already existing pressure on agriculture land for food and commercial crop. Therefore the situation need to be tackled by maximising forage production in space and time identifying new avenues of forage resources. Improvement of forage production in existing farming situation and utilizing marginal, sub marginal and problematic soils for growing forage. There are large number of leguminous and non leguminous crop grown for fodder purpose in different cropping season. Among the fodder crop barley is considered for dual purpose because its also regenerate after cutting. Other view of ideal plant type of fodder barley has been suggested by Ram (1982). Such plant types should be composed to quick growth, profuse tillering, broad leaves and delyed heading. Keeping above facts in view the present investigation was planned to sort out better dual purpose barley varities for filling the wider gap between demand and supply of green forage in the country and for taking grain yield from the regenerated crop.

Materials and Methods

A field experiment was carried out during Rabi seasons 2014-15 and 2015-16 at Agricultural Research Farm in department of Agronomy,Shri Durgaji Post Graduate College Chandeshwar, Azamgarh(26°47? N and 82°12? and 84 meter above the mean sea level) U.P. Fifty four treatment combinations comprising six varities (Karan-265, Karan-521, Karan-19, Karan-741, Karan-4 and K-226 in which five varieties were hull-less and one was hulled respectively), three nitrogen levels (40,80 and 120 kg ha ^{1}) and three green forage cut treatments (uncut, first cutting 45 days after sowing and second cutting 45 and 65 days after sowing) were evaluated in split plot design (S.P.D.) with three replications, assigning varieties in main plots, nitrogen levels in sub plot and cutting managements in sub-sub plots. The soil was sandy loam in texture, normal in reaction (pH 7.8), low in available nitrogen (165 ha ^{1}), average available P_2O_5 (15.66 kg ha ^{1}) and available K_2O (237 kg ha ^{1}). The crop was sown with a uniform seed rate 90 kg ha ^{1} during first week of November and basal dose of half nitrogen and full amount of phosphorus and potash was supplied through urea, D.A.P. and M.O.P. respectively. The crop for green fodder was cut with the help of sikle at a height of 5 cm from the ground level after 45,45 and 65 days after sowing as per treatment and green fodder yield was recorded. After green foliage cut crop was irrigated and remaining half nitrogen in two splits were applied.

Results and Discussion

Performance of Varieties

The variety K-226 recorded significant differences in plant height (58.06 and 58.37 cm) in both years respectively. Karan-521 produced (12.65%) lower plant height than K-226 barley variety. All the cultivars were obsereved statistically at par to produced number of tillers plant ^{1} Karan-741 produced significantly higher in no of ear bearing tillers plant ^{1} than other varieties and at par to the Karan-19. Karan-265 produced lowest number of ear bearing tillers plant ^{1}. The other yield attributing characters like length of spike, no of spike lets ear ^{1} and no of grain ear ^{1} slightly differed to each other. Karan-741 produced slightly more no of grains ear ^{1}. Considerable differences were observed among the six varieties in grain and straw yield. Karan-741 and Karan-4 were similar and produced significantly higher grain yield than others cultivars. It seems to be the consequence of its greater ability to maintain higher level of physiological properties.

Effect of Nitrogen

Application of 120 kg N ha increassed significantly higher plant height, no of tillers plant ^{1}, no of ear bearing tillers plant ^{1}, length of spike, no of grains ear ^{1}, grain yield plant ^{1} accept length spike and test weight over 80 kg N and 40 kg N ha ^{1}. These characters in turn resulted in the significantly highest grain and straw yields over other levels of nitrogen (Table-1, and 2). Improved growth and yield attributes increased with increased dose of N may be due to the fact of that N being and important constituent of nucleotides protein, chlorophyll and enzyms involves in various metabolic process which has a direct impact on the vegetative and reproductive phase of plants at low level of N plant might has not been able to meet N requirement, ultimately resulting in stunted growth. At higher level of N crop absorbed sufficient amount of N, resulting in better growth parameter which in turn gave higher grain and straw yield. The finding is in accordance with that of Awasthi and Surajbhan (1993).

Linear responce of nitrogen(Y=a+bx) was obtained with each incremental level of N up to 120 kg ha-1 maximun freen forage , seed and straw yield ha-1 ware obtained with N@120 kg ha-1 .

Effect of Cutting Managements

The growth yield components and yield were significantly influenced by cutting management(Table-1,2). The seed yield was maximum in both year (22.38 and 21.90 q ha-1) from the uncut treatment followed by 1st cut at 45 days for forage yield(364.58 and 360.75 q ha-1) and seed from the(14.49 and 13.90 q ha-1) during respective years respectively, and most significant drastically poor grain and straw yield(9.41,8.82 grain yield and 21.65,20.34 straw yield) production in 2nd cutting management. Similar trained was observed during next year also. The results are in conformity with those by Desi and Deore (1980) and Taneja(1982), and who reported that forage harvesting at 45 days after sowing,and leaving the crop to regenerate for seed gave better forage and seed yields than other cutting, although the seed and straw yield of non-cut treatment out yielded other treatments. The maximum forage yield production produced by Karan-741(Table-3) in both years. Similar trend was observed by Sannagoudar et al. (2017) and Joon et al. (1993).

Table-1: Effect of varities level of N and plant cutting on growth and yield components of Barley during 2014-15 and 2015-16.

Treatments	Plant height(cm)		No of tillers plant ^{1}		No of ear bearing tillers plant ^{1}		Length of spike(cm)		No of spike lets ear ^{1}	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Varieties										
Karan-265	52.68	53.33	4.83	4.99	3.50	3.54	6.10	6.15	51.60	51.68
Karan-521	51.54	49.60	4.34	4.40	3.52	3.50	6.28	6.31	53.34	52.03
Karan-19	51.29	51.18	4.67	4.86	3.93	3.96	6.18	6.24	51.77	49.64
10826159Karan-741	51.84	52.65	4.62	4.65	4.10	4.30	5.90	5.99	49.60	49.60
Karan-4	51.47	50.97	4.60	4.52	3.87	3.75	6.09	5.80	48.34	49.13
Karan-226	58.06	58.05	4.50	4.37	3.79	3.71	5.93	5.45	44.47	45.86
C.D.(P=0.05)	**2.36**	**2.10**	**2.27**	**2.57**	**0.23**	**0.15**	**0.18**	**0.60**	**2.05**	**1.42**
N levels (kg ha ^{1})										
40	49.74	49.38	3.70	3.87	3.02	3.02	5.82	5.82	48.43	47.44
80	53.22	53.20	4.56	4.63	3.80	3.77	6.28	5.96	50.60	49.05
120	55.79	55.47	5.52	5.40	4.62	4.43	6.39	6.36	50.07	51.22
C.D.(P=0.05)	**1.37**	**0.93**	**0.23**	**0.24**	**0.16**	**0.10**	**0.009**	**0.030**	**0.28**	**0.34**
Cutting management										
Uncut	69.87	68.48	5.63	5.60	4.93	4.87	7.74	7.60	66.74	64.06
45 D.A.S	54.03	54.56	4.60	4.73	3.85	3.75	5.73	5.64	52.62	53.09
45 & 65 D.A.S	34.84	35.01	3.54	3.56	2.66	2.69	5.03	4.90	30.38	30.55
C.D.(P=0.05)	**1.33**	**1.33**	**0.15**	**0.17**	**0.14**	**0.09**	**0.27**	**0.34**	**0.84**	**0.88**

Table-2: Effect of varities level of N and plant cutting on growth and yield component and yield of Barley during 2014-15 and 2015-16.

Treatments	No of grains ear ^{1}		Grain yield plant ^{1}(g)		Test weight(g)		Grain yield(q/ha)		Straw yield(q/ha)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Varieties										
Karan-265	43.20	43.23	2.30	2.30	32.52	32.30	15.33	14.99	35.25	34.48
Karan-521	42.48	42.73	2.32	2.32	32.02	32.01	13.63	13.25	31.31	30.47
Karan-19	42.65	43.03	2.31	2.30	33.32	33.21	15.20	14.88	34.96	34.23
Karan-741	43.39	44.04	2.45	2.44	34.07	34.12	16.96	16.35	39.00	37.71
Karan-4	42.02	42.04	2.31	2.30	33.15	33.04	16.95	16.22	38.98	37.35
Karan-226	38.52	39.19	2.55	2.54	38.32	38.20	14.19	13.54	33.31	31.14
C.D.(P=0.05)	**1.86**	**1.83**	**0.25**	**0.38**	**1.95**	**1.94**	**0.38**	**0.37**	**1.11**	**0.62**
N levels (kg ha-1)										
40	37.31	37.56	1.62	1.61	32.38	32.37	9.46	9.02	21.77	20.74
80	41.17	41.95	2.37	2.37	34.39	34.38	13.59	13.09	31.26	30.11
120	47.08	47.62	3.13	3.12	34.92	34.79	23.22	22.53	53.40	51.84
C.D.(P=0.05)	**0.85**	**0.79**	**0.12**	**0.16**	**0.93**	**0.80**	**0.25**	**0.04**	**0.56**	**0.29**
Cutting management										
Uncut	56.36	56.27	3.91	3.90	39.48	39.45	22.38	21.90	51.44	50.38
45 D.A.S	43.66	44.02	2.14	2.14	35.44	33.34	14.49	13.90	33.32	31.97
45 & 65 D.A.S	29.19	26.54	1.07	1.06	28.80	28.65	9.41	8.82	21.65	20.34
C.D.(P=0.05)	**1.05**	**0.81**	**0.16**	**0.09**	**0.66**	**0.70**	**0.26**	**0.20**	**0.45**	**0.38**

Table-3 Forage yield production (q/ha) during 2014-15 and 2015-16

Treatments	45 D.A.S	45&65 D.A.S	45 D.A.S	45&65 D.A.S
	2014-15	2015-16	2014-15	2015-16
Varieties				
Karan-265	347.75	150.00	345.00	147.50
Karan-521	361.50	162.50	357.50	162.50
Karan-19	364.00	175.00	362.50	172.50
Karan-741	399.00	387.50	395.00	185.50
Karan-4	357.50	180.00	353.00	177.50
Karan-226	357.50	177.50	354.50	175.00
N levels (kg ha-1)				
40	232.25	115.00	230.00	103.75
80	374.50	170.00	370.00	153.75
120	487.00	230.00	482.50	227.50
Mean	364.58	171.75	360.75	161.75

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