

EFFECT OF SOWING DATES AND FERTILITY LEVELS ON NUTRIENT UPTAKE AND QUALITY OF DUAL PURPOSE BARLEY VARIETIES

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SUMMARY

In order to select best suited dual purpose barley variety to work out optimum sowing date and fertilizer level, a field experiment was conducted during **rabi** 2011-12. The treatment consisted of combinations of three dual purpose barley varieties (RD 2552, RD 2715 and RD 2035), three sowing dates (15, 25 November and 5 December) and two fertility levels (75 kg N+25 kg P₂O₅/ha and 60 kg N+20 kg P₂O₅/ha). Among dual purpose barley varieties, RD 2715 and RD 2552 were equally efficient as both registered highest concentration of protein and N and P uptake by green fodder, grain and straw compared to variety RD 2035. Variety RD 2552 had significantly higher concentration of TDN in green fodder than RD 2715 and 2035. Early sown i. e. 15 November crop resulted significantly in higher protein content and accumulation of N and P in green fodder, grain and straw over late i. e. 25 November and 5 December sowings. TDN content in green fodder increased with delay in sowing. Application of 75 kg N+25 kg P₂O₅/ha significantly improved protein and TDN content, N and P uptake by fodder, grain and straw over 60 kg N+20 kg P₂O₅/ha.

Key words : Dual purpose varieties, barley, sowing time, fertility levels, uptake, quality

Barley (*Hordeum vulgare* L.) is an important cereal crop of India next to the maize, wheat and rice both in acreage and in production of grain. It has such morpho-physiological traits that make it suitable for dual purpose condition than other cereals. It is highly efficient in the utilization of water and nutrients in limiting condition, has high capacity for tillering and re-growth after cutting and additional capacity for large accumulation of biomass. It provides fodder during lean period and overcomes the winter feed problem. It sets seed rapidly after re-growth, thus escaping terminal stress due to high temperature and warm winds. Thus, as a dual purpose (green forage and feed/grain) crop, it provides welcome boost to the confidence of forage growers and fits well for crop diversification in the integrated crop livestock production system of the state. The identification of such high yielding adaptable dual purpose barley varieties as per crop growing situation is considered to be the first and foremost step for development of production technology. Among agronomical manipulations, optimum sowing time and mineral fertilization are considered to be one of the most important pre-requisites for realizing higher green fodder

as well as grain yield (Kaur *et al.*, 2013). Keeping the above points in view, an experiment was conducted to study effect of sowing dates and fertility levels on nutrient uptake and quality of dual purpose barley varieties.

MATERIALS AND METHODS

A field experiment was conducted during **rabi** season of 2011-12 at Instructional Farm, Rajasthan College of Agriculture, Udaipur (Rajasthan) situated at 24°35' N latitude, 73°42' longitude and altitude of 579.5 m above mean sea level. The soil of the experimental field was clay loam in texture having 295.3 kg/ha available nitrogen, 16.6 kg/ha available phosphorus and 275.7 kg/ha available potassium with pH 7.8 and EC 0.88 dS/m at 25°C. The experiment consisted of 18 treatments comprising combinations of three dual purpose barley varieties (RD 2715, RD 2035 and RD 2552), three sowing dates (15, 25 November and 5 December) and two fertility levels (60 kg N+20 kg P₂O₅/ha and 75 kg N+25 kg P₂O₅/ha). These treatments were evaluated in split plot design with three replications keeping varieties and sowing dates in main plot and fertility levels as sub-plot. As per

treatment, dual purpose barley varieties were sown on dates mentioned above in lines 23 cm apart using seed rate of 120 kg/ha. The total quantity of phosphorus and half dose nitrogen as per treatment were drilled in furrows before crop sowing. The remaining half nitrogen was applied in two equal splits i. e. at 30-35 DAS and just after fodder cutting. Adequate plant protection measures and irrigation were given as per requirement. The crop was harvested for green fodder at 55 days after sowing and thereafter the crop was left for grain and straw.

RESULTS AND DISCUSSION

Effect of Varieties

An examination of data (Table 1) revealed that dual purpose barley variety RD 2715 accumulated significantly higher N and P by green fodder to the tune of 4.9 and 5.2 per cent over RD 2552, and 28.0 and 28.3 per cent over RD 2035, respectively. Variety RD 2552 was found next in order and recorded significantly higher N and P uptake compared to RD 2035. Both varieties RD 2552 and RD 2715 were at par with each other as both these varieties registered highest concentration of protein in green fodder over variety RD 2035. However, TDN content in green fodder of variety RD 2552 was

significantly higher than varieties RD 2715 and RD 2035. After harvest of green fodder, the crop was raised for grain and it was observed that grain produced due to variety RD 2552 accumulated significantly higher N by 7.1 and 23.3 per cent and P by 6.8 and 27.3 per cent as compared to RD 2715 and RD 2035, respectively. Further variety RD 2715 also registered significantly higher N and P uptake by grain over RD 2035. Whereas varieties RD 2552 and RD 2715 were at par both accumulated significantly higher quantum of N and P by straw over RD 2035. The greater availability of nutrients with varieties RD 2552 and RD 2715 seemed to have critical concentration of these nutrients at cellular level and fulfilled their requirement for proper plant growth and efficient translocation towards sink components. These results are in accordance with the findings of Rashid and Khan (2008) and Singh *et al.* (2012). As the uptake is a product of yield and nutrient content, considerable increase in either of components may increase N and P uptake. The variety RD 2552 at par with RD 2715 both registered highest protein content in grain and straw as compared to RD 2035.

Effect of Sowing Dates

The highest N and P uptakes by green fodder

TABLE 1
Effect of sowing dates and fertility levels on nutrient uptake and quality of dual purpose barley varieties

Treatment	N uptake (kg/ha)			P uptake (kg/ha)			Protein content (%)			TDN (%) in green fodder
	Green fodder	Grain	Straw	Green fodder	Grain	Straw	Green fodder	Grain	Straw	
Varieties										
RD 2715	78.03	62.28	16.88	28.70	15.46	3.96	6.01	10.13	1.63	63.09
RD 2035	60.96	54.13	15.62	22.37	12.97	3.56	5.87	9.90	1.58	63.09
RD 2552	74.38	66.74	17.53	27.28	16.51	4.07	5.98	10.23	1.66	63.39
S. Em±	1.21	1.31	0.29	0.43	0.34	0.08	0.03	0.07	0.01	0.05
C. D. (P=0.05)	3.63	3.94	0.88	1.28	1.02	0.24	0.09	0.22	0.04	0.15
Sowing dates										
15 November	76.09	73.65	19.32	27.53	17.70	4.49	6.07	10.82	1.68	63.09
25 November	71.16	61.16	17.08	26.12	15.14	3.98	5.96	9.94	1.62	63.16
05 December	66.11	48.33	13.63	24.70	12.09	3.12	5.84	9.41	1.57	63.32
S. Em±	1.21	1.31	0.29	0.43	0.34	0.08	0.03	0.07	0.01	0.05
C. D. (P=0.05)	3.63	3.94	0.88	1.28	1.02	0.24	0.09	0.22	0.04	0.15
Fertility levels										
60 kg N+20 kg P ₂ O ₅ /ha	69.04	56.55	15.40	25.51	14.03	3.61	5.86	9.73	1.58	63.12
75 kg N+25 kg P ₂ O ₅ /ha	73.20	65.55	17.94	26.72	15.93	4.12	6.04	10.44	1.67	63.26
S. Em±	0.53	0.73	0.18	0.17	0.18	0.06	0.01	0.05	0.008	0.04
C. D. (P=0.05)	1.59	2.17	0.54	0.53	0.55	0.17	0.04	0.16	0.022	0.11

were recorded when crop was sown on 15 November which were reduced significantly with the delay in sowing time by 10 days. The corresponding reduction in N and P uptake by green fodder was 6.9, 15.1 and 5.4, 11.5 per cent over 25 November and 5 December sowings, respectively. The crop sown early i. e. 15 November recorded highest protein content in green fodder, while TDN content was highest when crop was sown late i. e. 5 December. At harvest of grain crop, the crop sown on 15 November accumulated significantly higher quantum of N and P by grain and straw as compared to 25 November and 5 December sowings. The highest protein content in grain and straw was also noted when crop was sown early i. e. 15 November.

Effect of Fertility Levels

Application of fertility level i. e. 75 kg N+25 kg P_2O_5 /ha significantly improved N and P uptake, protein and TDN content of green fodder over application of 60 kg N+20 kg P_2O_5 /ha. At harvest of grain crop, N and P uptakes by grain and straw recorded under 75 kg N+25 kg P_2O_5 /ha were significantly higher by 15.9, 13.5 and 16.5, 14.1 per cent, respectively, over application of 60 kg N+20 kg P_2O_5 /ha. The significantly higher protein content in grain and straw was estimated under application of 75 kg N+25 kg P_2O_5 /ha as compared to 60

kg N+20 kg P_2O_5 /ha. This improvement in protein content under the influence of higher fertility level seemed to be on account of increased N content of green fodder, grain and straw. The results are in collaboration with the findings of Meena *et al.* (2011) and Duhan (2014).

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