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Identification of Superior Indigenous Barley (*Hordeum vulgare* L.) Germplasm for Crop Improvement

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Abstract

Among 230 barley germplasm, only 24 significantly superior lines as compared to standards were identified for most of the characters studied. Superiority of these lines were based on adjusted mean value of yield and its components. On the basis of yield superiority and phenotypic acceptability only 12 elite lines were identified which may be used as donor for providing their potential value during barley improvement programme. These elite lines were K 273, P 486, P 478, K 501, RD 2496, K 511, P 515, BHS 249, P 485, K 375, P 513 and K 500. Thus presence of high variability in the present material indicates potential for crop improvement.

Key Words: *Hordeum vulgare L., Germplasm, Evaluation, Crop Improvement*

Introduction

Barley a crop of an ancient origin is grown worldwide for food, feed and forage. Being versatile and hardy in nature it can be cultivated under varying agro-climatic situations. Among the cereal crops in India, barley ranks fourth in acreage after rice, wheat and sorghum and occupied sixth position in production. Superior nutritional quality and multifarious uses, barley promises much in many least favorable and neglected agricultural areas, particularly in problematic soils like rain fed, dry land, saline-alkaline, and flood prone marginal/coastal areas of rivers. A systematic hybridization programme is essential to improve malt and feed barley to meet the growing demand of farmers. Climate change increases the negative impact of abiotic and biotic stresses on wheat and barley production. Increasing CO_2 concentrations reduce the ability of barley to assimilate nitrates[2], high temperatures increase stress and change the geographic distribution of pathogens, and altered precipitation patterns increase the likelihood of short-term crop failures and long term production declines. These constraints, compounded by increasing demand for food, and increasing costs for fertilizer, water and other inputs, require a national plan for innovative plant breeding and education.

Keeping these views in mind, this study was carried out to improve grain yield and quality through the genetic variability as fundamental to selection and to a great extent to the breeding methodology as such, since germplasm serves as valuable natural reservoir in providing needed attributes, for developing successful varieties.

Material and Methods

A total of 530 barley germplasm collected from different barley coordinating units of India with two standards (Hulled and hull - less) were planted in single row of 1.5 m length at JNKVV, College of Agriculture Rewa MP during *rabi* 2016-17. The experiment was organized in Augmented Block Design, with two checks repeated after every 13 lines of test entries. Spacing between rows was 25 cm. distance of plants within rows was maintained at about 10 cm by thinning, fertilizer was applied at the rate of 60:30:20 NPK per hectare as per soil test based . Agronomic practices were adopted for raising good crop. Statistical analysis was carried out on computer PC-XL of JNKVV, Regional Agriculture Station Sagar (MP) , India using Augmented Block Design.

Results and Discussion

Careful perusal of data in Table 1 shows that K 396 was superior for 12 traits followed by K 375 showing better performance for 11 characters only. Entry BHS 249, P 516 and K 370 were promising for 10 characters which may donate desirable trait potential during crop improvement. DL 544, DL468, K413, K426, K478,P227,DL448 and RD 2496 exhibited average superiority for 8-9 traits. Germplase bearing name K 273, P 486, P 516 were higher yield. Among average yielding genotype P 516, P227, K375 and DL468 were found early maturing accession.

Considering preferred combination of characters for estimating an integrity of grain yield/plant, it can be suggested that straight selection of whole plant may be based on effective tillers ,spike length, number of grains/ ear, economic yield and seed density. These may be selection criteria during choice of parent. Thus presence of high variability in material indicates potential for improvement through selection[3,5]. To continue improvements in breeding new cultivars, the diversity locked away in large germplasm collections must be utilised. The accessibility of genebank information has been greatly improved by the Internet web browsing system, although the exchange of seed has become more strictly regulated. We must solve these political problems and prepare for the further use of current barley diversity. Techniques based on genome sequences and resulting tools will accelerate the precise use of current diversity preserved in genebank collections. Evaluating genetic diversity in cultivated plants for plant breeding programs and heritable resources protection has a vital usage[1,4].

Table 1 Adjusted means for yield contributing characters of 24 best significantly superior for grains yield/plant in 530 germ plasm of barley

Germplasm	Grain yield/plant	Germination % in field condition	Days to 50% flowering	Plant height (cm)	No. of Spikelet's	Spike length(cm)	No. of spikelet's/ spike	No. of grains / spike	100-grain weight (g)	Length of seed (mm)	Breadth of seed (rom)	Length / Breadth ratio	Seed density g. ml^3	Seed germination % in lab condition
RD 2496	15.83	-	-	-	7.37	10.01	-	60.0	4.91	10.32	-	3.08	-	-
BHS 249	15.01	-	-	80.23	6.72	8.53	21.65	57.5	-	10.66	3.57	2.98	-	98.10
BHS 262	10.73	-	-	-	-	-	20.15	-	4.65	10.33	3.47	2.97	-	98.10
DL 443	9.79	-	80.75	-	-	8.73	23.35	54.3	4.66	-	3.42	-	-	98.10
DL 454	9.15	-	-	87.99	-	9.23	19.75	56.50	5.67	10.47	3.63	-	1.26	-
K 273	19.63	-	-	-	9.67	9.03	19.00	50.50	-	9.50	-	-	1.46	-
K 370	10.25	-	79.25	81.78	7.27	8.53	-	66.70	4.86	9.44	-	-	1.59	-
K 375	13.53	74.40	76.25	-	7.47	9.13	22.35	54.10	5.69	9.88	3.43	-	1.29	-
K 396	10.25	-	78.75	83.28	8.12	8.23	22.40	55.00	5.63	10.24	3.61	-	1.27	98.60
K 413	10.97	-	74.75	-	6.12	8.10	19.40	57.00	4.85	10.31	-	3.18	-	-

K 426	9.25	-	74.75	83.48	-	9.13	19.20	52.80	4.81	9.64	-	3.20	-	-
K 478	17.61	-	74.75	-	8.72	9.83	18.04	50.20	5.24	9.84	-	2.90	-	-
K 494	10.27	-	72.75	-	-	-	17.20	56.60	4.67	-	-	-	1.33	-
K501	15.90	-	73.25	83.53	7.72	8.53	-	56.90	-	9.15	-	-	-	-
K 511	15.42	-	73.25	-	6.92	8.33	19.90	56.30	4.78	-	-	-	-	-
KARAN 163	10.44	-	73.25	-	-	10.12	19.90	56.70	-	-	-	-	-	-
BH 35	9.47	-	78.25	88.98	-	-	19.70	-	5.72	-	3.54	-	-	-
BH 485	10.11	-	56.75	-	-	-	-	50.55	-	10.52	3.40	-	-	-
P 227	10.62	71.40	76.75	89.48	-	-	18.70	50.75	4.78	9.89	-	2.95	-	98.10
P 267	12.22	-	76.75	90.88	6.62	8.78	-	-	4.99	9.16	-	-	-	-
P 465	14.08	-	76.75	84.25	9.62	-	-	-	4.61	9.84	3.52	-	-	-
P 486	19.47	-	79.75	-	9.82	-	18.70	61.80	4.44	9.02	-	-	-	-
P 513	11.93	-	-	76.75	7.62	-	22.45	-	4.89	9.47	3.65	-	-	97.60
P 515	15.36	-	79.75	-	10.22	-	18.25	-	-	-	3.41	-	-	96.60
Checks	7.68	66.90	80.75	75.58	5.67	7.78	17.20	47.90	4.18	8.77	3.29	2.66	1.17	94.60
Lsd -2	1.00	0.51	1.00	4.43	0.42	0.50	0.66	1.11	0.22	0.16	0.10	0.09	0.05	0.30
Lsd- 3	1.35	0.97	1.35	5.97	0.57	0.67	0.90	1.50	0.30	0.22	0.14	0.13	0.08	1.84

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