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Studies on Genetic Heritability and Genetic Advance for Seed Yield and Its Component in Barley (*Hordeum vulgare* L.)

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ABSTRACT

A trial was conducted to study selection parameters for grain yield and related characters in a diallel cross set of 10 parents, 45 F_{1s} and 45 F_{2s} barley were evaluated in randomized complete block design with three replications. The genetic parameters estimated for the traits based on mean performance, narrow sense heritability and genetic advance. The high heritability coupled with high genetic advance was observed for one character biological yield per plant in F_1 generations. Moderate heritability with moderate genetic advance was found for 1000-grain weight in both generation and leaf area index, grain yield per plant in F_2 generation, indicating that selection in later generations would be much rewarding. Low heritability with low genetic advance was found for days to 50% flowering and days to maturity in F_2 generation.

Key words: *Generation, Grand mean Heritability (narrow sense) and genetic advance in per cent of mean.*

INTRODUCTION

Barley (*Hordeum vulgare* L.) is the leading food/feed crop ranks next only to wheat, rice and maize among the cereals cultivated worldwide[5]. It is a major source of food for a number of people living in cooler semi arid areas of the world, where wheat and other cereals are adapted poorly. It is a staple food of the people in Nepal, Tibbat and Bhutan. Barley (*Hordeum vulgare* L. 2n = 14, sub family Poaceae) is an important *rabi* cereal rank fourth after wheat, rice and maize. Barley a high energy, nutritionally and environmentally safe crop, has potential to produce satisfactory qualitatively and quantitatively yield under problematic soils. It is a versatile and hardy crop able to produce reliable harvest in area with poor rainfall and poor soils. Since ages is used as major staple food for millions of people in developing countries. The heritability measures the value of selection for a particular trait in various types' progenies.

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It encompasses the phenotypic variance attributable to genetic causes which have a predictive function in plant breeding leading to permanent genetic improvement. The knowledge of heritability establishes appropriate selection method coupled with the prediction of any gains from selection, and also help to establish the magnitude of the genetic effects. Larger genotypic variance is most preferred given that high heritability value can be obtained with genotypes with either small or large genetic progress. High heritability is associated with additive gene effect whereas low heritability is due to dominance and epistasis. The coefficient of variance shows that extent of variability represented by the different characters but it excludes the heritable portion.

MATERIAL AND METHOD

Basic material of the trial was taken on the basis of morphological differences for various characters in genotype from the genetic stock of barley, maintained by breeder at AICRP plan of the university. Genetic stock of barely maintained through natural self pollination of section of rabi cereal, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. Each parent F_{1s} and F_{2s} treatment was sown in RBD (RANDOMIESD BLOCK DESIGN) in single and double rows of 3m length along with row to row and plant to plant spacing of 22.5 cm and 5 cm, respectively. recommended package of practice was applied to raise healthy crop. The data was recorded for days to 50% flowering, days to maturity, plant height (cm), number of productive tillers per plants, canopy temperature depression (^{0}C), length of spike (cm), leaf area index(cm), number of grains per spike, grain weight per spike (g), 1000 grain weight (g), biological yield per plant (g), harvest index (%), and grain yield per plant(g) mean data were used for statistical analysis.

RESULTS AND DISCUSSION

Analysis of variance revelled significant coefficient difference among the parents F_1 s , F_2 s , parents vs F_1 s and parents vs F_2 s indicating considerable variability among the genotypes for studied characters. The estimates of heritability (narrow sense) and genetic advance in per cent of means were estimated for 13 characters in both generations' results have been presented in table. In order to facilitate the description of heritability and genetic advance were classified into three categories.

(i)	Low Heritability	-	below 10% percent
(ii)	Medium Heritability	-	10 to 30 percent
(iii)	High heritability	-	above 30 percent

Heritability

Heritability was computed as per method suggested by Crumpacker and Allard (1962) in F_1 and Verhalen and Murray (1969) in F_2 generation. High heritability was observed in plant height, grains weight per spike and biological yield per plant in both generations, whereas medium heritability were observed in characters like number of productive tillers per plant, canopy temperature depression, Length of spike, Leaf area index, 1000-grain weight, grain yield per plant and days to maturity in F_1 generation. whereas low heritability were observed in character Days to 50% flowering , number of grains per spike and Harvest index in both generation and days to maturity in F_2 generation

Genetic advance

Genetic advance as percent of means for each character was calculated as suggested by Johnson *et al.* For convenience following classifications were used for describing various parameters of variability in the text: (table-1)

Genetic advance >20% High

10-20% moderate

<10% Low

In order to ascertain the relative merit of different attributes, genetic advance in percent of mean varied from 3.18 to 29.06 in F_1 generation. In F_1 generation characters like number of productive tillers per plant, canopy temperature depression, length of spike, leaf area index, number of grains per spike, biological yield per plant and grain yield per plant exhibited high value of genetic advance. whereas, plant height (cm), 1000-grain weight

and harvest index (%) exhibited moderate value of genetic advance. and days to 50% flowering, days to maturity and grain weight per spike exhibited low value of genetic advance.

Similar results observed in F_2 generation, in order to ascertain the relative merit of different attributes, genetic advance in percent of mean varied from 3.87 to 22.06 in F_2 generations. In F_2 generation characters like number of productive tillers per plant, canopy temperature depression, length of spike and number of grains per spike exhibited high value of genetic advance. whereas, plant height (cm), leaf area index, 1000-grain weight , biological yield per plant, harvest index % and grain yield per plant exhibited moderate value of genetic advance and days to 50% flowering, days to maturity, and grain weight per spike exhibited low value of genetic advance.

The high heritability coupled with high genetic advance was observed for one character biological yield per plant in F_1 generations. Moderate heritability with moderate genetic advance was found for 1000-grain weight in both generation and leaf area index, grain yield per plant in F_2 generation, indicating that selection in later generations would not be much rewarding. low heritability with low genetic advance was found for days to 50% flowering and days to maturity in F_2 generation.

Grand mean heritability (narrow sense) and genetic advance for 13 characters in Barley.

Source of variance	generation	Days to 50% flowering	Days to maturity	Plant Height(cm)	Number of productive tillers/plants	C.T.D.(^{0}C)	Length of spike(cm)	Leaf area index(cm)	Number of grains /spike	Grains Weight /spike (g)	1000-grain weight(g)	Biological yield per plant(g)	Harvest index (%)	Grain yield/ plant (g)
h² (narrow Sense)	F_1	3.76	11.18	37.57	13.98	23.09	10.90	19.13	6.70	51.85	24.23	37.74	9.44	22.58
	F_2	3.56	9.12	55.95	20.90	26.54	12.48	25.81	6.61	50.07	27.86	59.40	7.80	27.43
Genetic advancement 5%	F_1	2.74	5.04	10.21	2.55	1.63	1.37	0.48	9.85	0.12	6.16	6.07	6.90	3.29
	F_2	3.55	5.79	7.97	1.84	1.39	1.24	0.34	9.27	0.12	5.30	4.57	8.09	2.21
Genetic advance as % of mean 5%	F_1	3.18	3.92	14.22	27.96	24.80	24.24	20.86	21.45	8.39	17.32	23.28	15.95	29.06
	F_2	3.87	4.46	10.93	20.10	20.59	22.06	14.46	20.49	8.45	14.74	17.31	18.66	19.31
Grand Mean	F_1	86.10	128.54	71.77	9.12	6.57	5.65	2.30	45.92	1.43	35.56	26.07	43.24	11.32
	F_2	86.38	129.70	72.87	9.15	6.75	5.62	2.35	45.23	1.42	35.94	26.40	43.35	11.44

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