SHORT COMMUNICATION

HERITABILITY AND GENETIC ADVANCE STUDIES FOR GRAIN YIELD AND RELATED ATTRIBUTES IN HUSKED BARLEY *(HORDEUM VULGARE* L.)

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Abstract : Twelve husked barley strains were intermated in diallel fashion, excluding reciprocals. Parents alongwith F_1s and F_2s were evaluated for plant height, days to reproductive phase, productive tillers per plant, length of spike, grains per spike, spikelets per spike, biological yield per plant, harvest index, grain yield per plant, grain weight per spike and 1000-kernel weight. The heritability and genetic advance were estimated for all the attributes in narrow sense using genetic components. High heritability (more than 30%) was observed for plant height, days to reproductive phase, grains per spike, spikelets per spike and harvest index in both the generations and for grain yield per plant in F_1 and biological yield per plant in F_2 generation. Moderate heritability (10 to 30 %) was noticed in productive tiller per plant, length of spike and 1000-kernel weight in both the generations and grain weight per spike in F_2 generation. Low heritability (less than 10%) was exhibited in grain weight per spike in F_1 generation. An advancement of 6.98 g based on F_1 and 5.92 g based on F_2 were expected per cycle of selection for grain yield per plant. For 1000-kernel weight it was approximately 3 g. The expectation for advancement in grain weight per spike and length of spike was quite meager. Considering comparative genetic advancement in percentage over mean, maximum advancement to the tune of, approximately, 42% was estimated for grains per spike, where as an approximation of 22-25% of mean were estimated for plant height, days to reproductive phase, harvest index and grain yield per plant. Genetic advance is conforming to the heritability estimates. In order to achieve expected genetic advance, the attributes which are highly heritable (above 30%) may be improved through progeny selection whereas, the attributes like grain weight per spike for which heritability estimates were moderate, hence bulk selection followed by progeny selection would be appropriate. Considering heritability estimates, the economic attribute like grain yield it was moderate to high quantified the involvement of non additive gene action in considerable proportion. Hence for improvement in grain yield the progeny selection followed by biparental mating would be appropriate.

Keywords: Barley, *Hordeum vulgare* L., Heritability, Genetic advance, Grain yield

INTRODUCTION

Barley (*Hordeum vulgare* L.) is the oldest crop of the World's Agriculture. It was the first cereal to be domesticated in the Middle East around 9000 years ago. Its sanskrit name is depicted in *Veda as Yav* and mentioned its uses in different religious ceremonies revealing its cultivation in India since ancient time.

Hordeum vulgare L., a diploid with 2n = 14 chromosomes is the only cultivated species which has three distinct phenotypic forms, viz, two, four and six-rowed based on ear morphology. Initially these two forms were classified as two separate species but now these have been grouped in to one single species, i.e., *Hordeum vulgare* L.

It is easily digestible, having cool and diuretic effect on the body. It is beneficial for the diabetic patients and those suffering from stomach problems on account of intestine ulcer. Feeding trials conducted in Australia on birds, animals and human volunteers indicated that barley base diet *reduces the risk of coronary heart disease* by lowering down cholesterol; β-glucon and water soluble fiber fraction present in barley also lowers down the blood plasma cholesterol.

Barley is an important crop of arid and semi arid region and can thrive well under moisture stress conditions. Moreover it can tolerate salinity and alkalinity up to a greater extent. Therefore, this crop has become a boon to the poor farmers surviving on marginal and sub-marginal holdings. Keeping in view, its utility and sustainable productivity under stress environmental conditions, adoption of appropriate breeding methodology, so as to achieve anticipated advancement in productivity is of vital significance.

MATERIALS AND METHODS

In the present study twelve genetically diverse genotypes of husked barley were inter mated in all possible combinations excluding reciprocals. The parents along with F_1s and F_2s progenies were evaluated in a Randomized Block Design with three replications. Single row of parents and F_1s and two rows of F_2s were sown during (2017-18). Inter plant spacing was maintained at 3cm in a row of 5m length. All the required agronomical practices were adopted to grow a good crop. The observations on grain yield and related parameters viz., plant height, days to reproductive phase, productive tillers per plant, length of spike, grains per spike, spikelets per spike, biological yield per plant, harvest index, grain yield per plant, grain weight per spike and 1000-kernel weight on five plant basis in parents and F_1s where as In F_2s on 20 plants basis were recorded. The mean were subjected to various statistical and biometrical analyses as per Hayman, B. I. (1954) The heritability based on genetic components was

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worked out according to the method suggested by Crumpacker, D.W. and R.W. Allard (1962) and genetic advance according to Robinson *et al.* (1955).

Table 1. Heritability and genetic advance estimates for yield related attributes in F_1 and F_2 generation of barley.

Characters	Mean (X)¯		Heritability (narrow senses) %		Genetic advance		Genetic advance in % over mean	
	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
Plant height (cm)	90.63	89.77	66.13	58.04	18.85	17.62	20.79	19.62
Days to reproductive phase	47.23	45.71	47.99	53.43	10.77	11.02	22.80	24.10
Number of tillers per plant	18.28	17.489	20.84	14.14	1.96	1.78	10.72	10.18
Length of the main spike (cm)	9.79	9.08	15.58	14.55	1.72	0.38	17.56	4.18
Number of grains per main spike	54.29	55.40	31.62	38.55	22.78	24.26	41.95	43.79
number of spikelets per main spike	22.37	20.71	43.38	30.22	4.46	3.67	19.93	17.72
Biological yield per plant (g)	83.00	76.95	24.23	31.36	11.05	12.51	13.31	16.25
Harvest index (%)	37.60	34.42	41.93	41.44	8.86	8.94	23.56	25.97
Grain yield per plant (g)	31.02	26.55	37.90	28.09	6.98	5.92	22.50	22.29
Grain weight per main spike (g)	2.90	2.56	7.10	12.64	0.13	0.53	4.48	20.70
1000-kernel weight (g)	50.60	46.72	23.50	12.73	3.76	2.59	7.43	5.54

RESULTS AND DISCUSSION

High heritability estimate i.e. more than 30% were observed for plant height, days to reproductive phase, grains per spike, spikelets per spike and harvest index in both the generations and for grain yield per plant in F_1 and biological yield per plant in F_2 generation due to more contribution of additive genetic components (Table-l). The results are in accordance with Vimal, S.C. and Vishwakarma, S.R. (1998), Sinha, B.C. and Saha, B.C. (1999) and Yadav *et al*. (2002) Moderate heritability (10-30%) was observed for tillers per plant, length of main spike and 1000-kernel weight in both the generations and grain weight per spike in F_2 generation which were in accordance with the reports of Bouzerzour, H. and Djakoure (1998) A. The contribution of non-additive components was significant for controlling the traits like grain weight per spike in F_1 generation as evident from low heritability in F_1 generations (7.10%). This finding follows the results reported by Sinha, B.C. and Saha, B.C. (1999), Yadav *et al* (2015), Raikwar *et al* (2014), Manoj Kumar *et al* (2013) and Ajeet Pratap Singh (2011).

The genetic advance for 5% selection intensity showed that an advancement of 6.98 g based on F_1 and 5.92 g based on F_2 were expected per cycle of selection for economic attribute like grain yield per plant. Accordingly for 1000-kernel weight an advancement of approximately 3 g was also estimated. The expectation for advancement in grain weight per spike and length of spike was quite meager. Considering genetic advancement in percentage over mean, maximum advancement to the tune of, approximately, 42% was estimated for grains per spike where as an approximation of 22 to 25% gain was estimated for plant height, days to reproductive phase, harvest index and grain yield per plant. However, meager gain (below 10%) was recorded for grain weight per spike in F_1, length of spike in F_2 and for 1000- kernel weight in both the generations. Genetic advance is conforming to the heritability, though in certain cases it differs due to phenotypic standard deviation. Number of grains per main spike was observed as most important character while going for selection for high grain yield. The attributes which are highly heritable may be improved through progeny selection where as the attributes like grain weight per spike are required to be subjected for bulk selection followed by progeny selection.

Considering heritability estimates, the economic attribute like grain yield, was moderate to high quantify the involvement of non additive gene action in considerable proportion. Hence for improvement in grain yield, the progeny selection followed by biparental mating would be appropriate.

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