

Studies on Variability of Some Important Quantitative Characters in Barley

by

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Introduction: The building up of a wide and comprehensive collection of crop varieties is well recognised as an essential prerequisite to modern plant breeding work. The next step is to study the diversity in respect of quantitative characters, which are of economic importance, with a view to break up the observed variation in these characters into heritable and non-heritable components. The present investigation was carried out to assess the variability among certain barley types with respect to a few quantitative characters which appear to be related with yield. It was also considered worth while to determine the relative importance of these quantitative characters with the help of certain genetic parameters like co-efficient of variability, heritability, genetic advance, etc.

Material and Methods: The investigation were carried out at Baraut Agricultural College, Meerut, during *rabi* 1964-65. The material consisted of 30 barley varieties originating from Punjab, U.P., Rajasthan and I.A.R.I. The basis of selection was relative diversity with regard to parentage or origin. The varieties were sown in randomized block design with four replications. Each plot consisted of two rows with a row length of 15 feet and interplant distance of 6 inches, thereby, giving 60 plant per plot. Five plants per plot in each replication were selected at random for recording data. The characters on which data were collected were, heading date, days to maturity, plant height, number of nodes per tiller and number of productive tillers per plant, length of awn, and terminal internode, length of ear, weight, number of florets per ear, number of grain per ear, 1000-grain weight and grain yield per plant.

The genetic co-efficient of variation was estimated according to Burton (1952) and heritability (broad sense) by formulae suggested by Hanson *et al* (1956) while genetic advance was calculated by the formulae suggested by Johnson *et al* (1955).

Results and Discussion: The varietal differences were significant for all the characters studied (Table 1). However the plant height, yield and ears per plant were significant at 5% level of probability while others were significant at 1% level. The variability with respect to these characters in terms of range, mean, genetic co-efficient of variability and C.D. at 5% has been also given in

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Table 1. The range of variation was high for most of the plant characters, especially days to flower, tiller number, floret number, 1000-grain weight and grain yield, which are indeed the most important among characters of economic value. The genetic co-efficient of variation were also high for these characters except for days to flower. It appears that days to flower is subject to a high degree of non-heritable variation and as such, offers less scope for selection in comparison with the other four. The characters days to maturity, nodes per plant and plant height did not depict a useful amount of variability in the present material.

TABLE 1. Phenotypic variability and values of 'F' (for treatments) in various plant characters of some barley types

Characters	Range	Mean	F-value Treatments	Genetic coefficient of variability	C.D. at 5% level
Days to flower	88.74-112.00	98.53	85.8**	5.86	1.76
Days to maturity	138.00-153.00	142.20	89.6**	2.45	1.04
Height of the plant (cm)	76.00-104.25	88.31	6.4*	8.84	9.39
Nodes per tiller	3.45- 5.85	4.21	3.0**	7.63	0.64
Tiller per plant	7.75- 14.00	10.42	13.0**	19.55	1.67
Length of awn (cm)	9.45- 14.50	11.53	5.7	12.11	1.64
Length of terminal internode (cm)	24.80- 40.30	30.32	6.3**	11.03	4.04
Length of ear (cm)	6.35- 9.80	8.06	2.3**	8.43	1.65
Ear wt. (g)	1.34- 3.35	2.35	7.5**	20.42	0.14
Florets per ear	24.00- 71.25	47.38	44.4**	24.30	4.91
Grain per ear	20.06- 60.44	45.09	21.3**	20.59	5.73
1000-seed wt. (g)	31.25- 65.37	47.84	31.0**	15.98	3.59
Grain yield per plant (g)	8.42- 40.25	22.88	3.3**	30.28	7.74

*Significant at 5% level **Significant at 1% level

The estimates of phenotypic, genotypic and error variances, heritability (h^2) in broad sense, genetic advance (G.A.) and genetic advance as percentage of mean have been incorporated in Table 2.

Estimates of heritability were high for ear weight, days to flower, days to maturity, spikelets per ear, 1000-grain weight, grains per ear, length of terminal internode, grain yield and plant height (more than 50%) and low for other characters (less than 50%). On the other hand, G.A. was high for spikelet number, grain yield, ear weight, grains per ear, tiller number and 1000-grain weight (more than 20%) and low for others (less than 20%). It is now well understood that high h^2 values do not necessarily lead to a high genetic gain. However, if the estimates of genetic advance (G.A.) and h^2 are both high, it is a good indication of variation being due to a high degree of additive effects

(Johnson *et al.*, 1955). It may therefore be concluded that grain yield, 1000-grain weight, grains per ear, spikelets per ear, ear weight and number of tillers per plant, were mainly of additive gene types (Panse, 1957) and as such selection for these characters would prove more effective. Sharma, *et al.* (1966) have indicated similar situation for barely under rainfed conditions, Swarup and Chagale (1962) for certain characters in sorghum and Gandhi *et al.* (1964) for ear per plant, ear length and 1000-grain weight in wheat. Among the various barley characters which were found to have low values of h^2 as well as G.A. are nodes per tiller and ear length. These two characters are, therefore, not likely to respond favourably to selection.

TABLE 2. *Estimates of genotypic, phenotypic, variances, heritability and genetic advance for different characters of barley*

Characters	Phenotypic variance	Genotypic variance	Heritability %	Genetic advance	Genetic advance as % of mean
Days to flower	34.86	33.29	95.50	13.16	13.36
Days to maturity	12.73	12.18	95.68	7.05	4.96
Height of the plant (cm)	105.98	61.09	57.65	12.23	13.85
Nodes per tiller	0.32	0.11	33.33	0.38	9.02
Tillers/plant	5.63	4.16	73.90	3.74	35.90
Length of awn (cm)	3.36	1.96	58.31	2.09	18.13
Length of terminal internode (cm)	12.54	11.19	75.08	5.23	17.24
Length of ear (g)	1.86	0.46	24.62	0.69	8.56
Ear wt. (g)	0.24	0.23	96.73	0.96	40.85
Florets per ear	146.35	134.0	91.56	22.83	48.19
Grains per ear	101.98	85.21	83.57	17.40	38.63
1000-seed wt. (g)	59.39	52.40	88.23	14.00	29.26
Grain yield/plant (g)	74.17	47.99	64.70	10.33	45.19

Summary. A collection of 30 barley varieties were studied for a number of quantitative characters. A high phenotype range of variation was exhibited by characters of highest economic importance, *viz.*, days to flower, tiller number, 1000-grain weight and grain yield. However, the days to flower was found to possess poor genetic variability which was attributed to its high susceptibility to environmental variation. The characters days to maturity, nodes per plant and plant height do not depict useful amount of variability. The estimates of both, heritability (broad sense) and genetic advance, were

high for grain yield, 1000-grain weight, grains per ear, spikelets per ear, ear weight and tiller number, showing thereby that additive genetic may be predominant for these characters.

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