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GENETIC VARIABILITY IN INDIAN MUSTARD

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ABSTRACT

The analysis of variance revealed significant genotypic difference for all the nine characters studied. Seed yield/plant had highest co-efficient of genotypic and phenotypic variability. The characters studied showed high heritability with highest value estimated for seed yield/plant. Estimate of genetic advance in per cent of mean was also observed highest for seed yield/plant. The estimates of genetic advance in per cent of mean were comparatively low for oil content and days to flower. The low values of GCV, h^2 also observed for the characters such as oil content and days to flower suggest that these characters cannot be improved effectively merely by selection.

Genetic variability has been considered to be basic of plant breeding (Simmond, 1983). The Indian mustard has been found of high variability at both phenotypic and genotypic levels for various quantitative characters. A wide of variation has been reported for seed yield, oil content and several other important components of yield (Gupta, 1972; Singh *et al.*, 1975, Asthana *et al.*, 1979, and Chaudhary *et al.*, 1991). High expected genetic advance has been reported for seed yield (Kumar *et al.*, 1988). In general, the characters which possess greater variability to show more genetic advance (Paul *et al.*, 1976).

Twenty five genotypes of Indian mustard were grown during *rabi* 1995-96, under irrigated conditions. In RBD, with each plot consisted of 3 m long paired rows-sown 50 cm apart. The distance between plant to plant was maintained at 15 cm by way of thinning. All recommended cultural practices and plant protection measures were adopted for raising the crop. Competitive plants were selected at random for recording observations for all characters under study.

Analysis of variance and estimates of genotypic and phenotypic co-efficient of variance, broad sense heritability and expected genetic gain were worked out following the methods of Singh and Chaudhary (1985).

The analysis of variance revealed highly significant genotypic differences for almost all the characters except days to flower, number of primary branches and oil content (Table 1). This indicated the presence of high variability among the genotypes used in present study. The range of variation was maximum for plant height (156.20-206.47) followed by seed yield/plant (17.00-49.00) and number of siliquae on main raceme (37.93-63.07), while it was lowest in case of siliquae length (4.18-6.13) and 1000-seed weight (4.00-6.30). The phenotypic and genotypic variances were estimated and presented in the Table 2, that the chcaracters which showed greater range exhibited higher magnitude of variations (Phenotypic and genotypic) for significant comparison among characters for variability, standardization with respective mean values was done to get PCV and GCV.

On the other hand, careful examinations of the variances and coefficient of variation indicated that there was no difference between phenotypic and genotypic variances and PCV and GCV for some characters. Plant height and siliqua length showed little difference which indicated that these characters were comparatively less influenced by environment.

The high variances alone are not the only determinants of the expected progress that would be made in respect of quantitative traits (Falconer, 1981). It was suggested that the GCV together with high heritability (h^2) estimates would give a better picture of the

Table-1. Analysis of variance (ANOVA) for 9 quantitative characters in Indian mustard

Sources	df	Mean Squares								
		Days of flower	Plant height (cm)	No. of Primary branches	No. of Secondary branches	No. of Siliquae on main Raceme	Silliqua length (cm)	1000-seed weight (gm)	Oil contents (%)	Seed yield/ plant (gm)
Treatments	24	25.161*	546.967**	1.317*	22.931**	127.559**	0.559**	1.830**	4.542*	149.119**
Error	48	3.469	20.677	0.204	2.581	9.786	0.031	0.219	1.022	4.398

* - Significant at 5% level.
** - Significant at 1% level.

Table-2 . Components of variability for 9 quantitative characters in Indian mustard.

Sr.No.	Characters	Range		Mean	Variance		Coefficient Variation		Hertiability (%)	Genetic Advance (% mean)
		Minimum	Maximum		Genotypic	Phenotypic	Genotypic	Phenotypic		
1.	Days to Flower	44.93	57.27	50.08	7.230	11.629	5.37	6.53	67.6	9.084
2.	Plant height	156.20	206.47	184.41	181.420	202.097	7.30	7.71	89.8	14.256
3.	No. of Primary Branches	4.32	7.53	4.19	0.371	0.575	11.72	14.60	64.5	19.256
4.	No.of Secondary Branches	14.53	24.98	18.78	6.783	9.634	13.87	16.29	72.4	24.331
5.	No. of Sillquae on main raceme	37.93	63.07	48.53	39.257	49.043	12.91	14.43	80.0	23.797
6.	Sillqua length	4.18	6.13	4.95	0.176	0.207	8.47	9.19	84.9	16.148
7.	1000 - seed weight	4.00	6.36	5.54	0.537	0.756	13.22	15.69	71.0	22.903
8.	Oil content	35.30	39.88	37.52	1.173	2.195	2.89	3.95	53.4	5.344
9.	Seed yield/plant	17.00	49.00	31.35	48.243	52.638	22.15	23.14	91.6	43.689

extent of genetic gain to be expected under selection. In the present study, high h^2 estimated were obtained for seed yield/plant (91.6%), plant height (89.8%), siliqua length (84.9%), number of siliquae on main raceme (80.0%) indicating that improvement can be possible through direct selection in respect of these traits. Similar results, were found by Gupta (1972), Bang *et al.*, (1986) and Kumar *et al.*, (1988).

However, in general, the characters with high h^2 did possess greater variability (high GCV). These characters also showed high genetic advance (GA). Johnson *et al.*, (1995) suggested that h^2 considered together with GA is more reliable in predicting the effect of selection than h^2 alone. Therefore, selection for seed yield par plant, number of secondary branches, 1000-seed weight, number of siliquae on main raceme, which possess high GCV, high h^2, and moderate to high GA in the material under study expected to result in considerable genetic gain, while selection for plant height, siliqua length, high h^2 is not expected to result in maximum genetic gain. Lowest value of GCV, h^2 and GA observed for oil content suggesting that this character cannot be imporved effectively by selection.

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