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Studies on Heritability and genetic advance over mean for 11 characters in F_1 and F_2 generations derived from 10 x 10 diallel cross in Indian mustard

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ABSTRACT: The systematic breeding programme depends upon three main important stages (i) creating genetic variability (ii) practicing selection and (iii) utilization of selected genotypes for developing promising hybrids/varieties in economic crop plants. In case of direct selection parameters, heritability and genetic advance are most important tools for improvement of any character of economic importance. In present study these two parameters were worked out in first and second filial generations separately involving 45 crosses in each.

In F_1 generation, heritability was observed maximum for plant height (88.76%) followed bynumber of oil content (88.69%) and minimumwas found for number of Siliquae/ main raceme (6.32%) followed by seed yield (10.80%) while in F_2, maximum for oil content (91.38%) followed bynumber of days to flowering (86.79%) and minimumwas found for number of Siliquae/ main raceme (5.25%) followed by seed yield (5.43%). High estimates for genetic advance were recorded for plant height (64.25 and 49.47% in F_1 and F_2), respectively.

KEYWORDS: Heritability, Genetic advance, F_1 and F_2 Generation, Indian Mustered

I.INTRODUCTION

Rape seed and mustered are the major Rabi oil seed crops of India. They occupy on prominent place being next in important to ground nut both in area and production. Oil crops have been the backbone of agriculture economy of Indian from time immemorial. India's contribution in the world's rape seed and mustered production is the highest of any country after China (Singh, 2004)**.**

Heritability is the ratio of Genotypic variance to phenotypic variance.It provides an idea about the progress determining the progress for the degree to which the character is transmitted from parents to the offspring. It provides the comparative value of heredity and environment on character variation. The effective improvement in particular character/characters for which the selection is made will be based on the quantum of genetic advance.

II.REVIEW AND LITERATURE

Asthana *et al.* (1979) reported high heritability for oil content and the expected genetic advance was 3.14% in *B. campestris* L var. yellow *sarson* and 1.94% in *Brassica juncea*. Eight mustard and four *sarson* varieties showed significant improvement I oil content after three years of selection compared to unselected stock as revealed by analysis based on single plant or plot bulk sampling or both.

Chaudhary and Sharma (1982) reported high heritability for number of primary branches per plant in Indian mustard.

Banga *et al.* (1984) elucidated in study of nine characters and varieties of *Brassica* species that broad sense heritability, estimates were high for flowering time, seed yield and plant height. For raceme length and total number of branches, it was moderately high.

Chaudhary and Goswami (1991) recorded high heritability (broad-sense) and genetic advance for number of siliquae per plant together with plant height.

Badwal and Labana (1988) found heritability value of 20% in the narrow sense, for seed yield in Indian mustard.

III.METHODS AND MATERIAL

This investigation comprised of ten parents diverse genotype of Indian mustard *vi..*, CSR 1020, CSR 1088, CSR 1027, CSR 1014, CSR 1082, CSR 1025, CSR 1066, CSR 1118, CSR 1104 and CSR 1102 were crossed in diallel fashion to produce 45 F_1's during *rabi* season *1997*-1998. The resultant F_1seed of each cross were raised at research

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farm of Brahmanand Mahavidyalya Rath, (Hamirpur) UP, Indiato obtain F_2's inoff seasonnursery insummer1998. Theparents and their45 F_1's and 45 F_2's weregrown in randomized block design with three replications.

The experimental material comprising of 100 treatment *viz.*, (10 parents + 45 F1's and 45 F2's) was evaluated in Randomized Block Design with three replications. Each parent and F_1's planted in one row, and F_2's in two rows of 5m long 45 cm apart, Plant to plant distance was maintained 15 cm by thinning. All the recommended agronomic practices were adopted for raising a good crop.

Ten plants in parents and F_1's and 20 plants in F_2's were taken randomly for each treatment in each replication and tagged for recording observations for days to 50% flowering, plant height (c),no. of primary branches per plant,number of secondary branches per plant,number of siliqua per main raceme,no. of seed per siliqua,siliqua length (cm), days to maturity, 1000-seed weight (%), oil content (%) and seed yield per plants(g).

Heritability is calculated as:

$$Heritability\left(h^2\right)=\frac{\sigma_g^{\,2}}{\sigma_p^{\,2}}$$

Genetic advance is calculated as:

$$G.A.=\frac{\sigma_g^{\,2}\times k}{\sqrt{\sigma_p^{\,2}}}$$

Where:

K is selection coefficient at 5% (2.05).

IV.RESULT

Heritability estimates (Table-1) were observed higher for oil content, days to flowering, plant height, number of seeds per siliqua, siliqua length and test weight in both the generations. This might be due to greater contribution of additive genetic component in the inheritance of these characters. It obviously indicates that if these characters are subjected to mass selection and any other selection scheme aimed at exploiting fixable (additive) genetic variance, widely adopted genotypes/strains could be developed which may possess good quality and productivity. High heritability estimates were also observed by Chauhan and Singh (1973), Number of siliquae per main shoot in both the generations; seed yield in F_2generation exhibited low estimates of heritability indicating that the selection pressure could be applied in advance generations for the improvement of these characters. Low heritability estimates were reported by Badwal and Labana (1988).

Most f the characters in F_2 had given higher heritability values than F_1 progenies. These higher estimates could be due to presence of additive x additive gene effects in segregating generation. Under such situation, intensive selection pressure during selection breeding programme could be given in early segregating generations and may be carried out in the advancement of generation.

Genetic advance in per cent of mean (Table-1) was found to be high for plant height, siliqua length in F_1generation coupled with high estimates of heritability. It clearly shows that the greater role of additive gene action then non-additive genetic components

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Low genetic advance for oil content was also reported by Asthana *et al.* (1979). The low genetic advance showed inconsistency in estimates of genetic gain which means selection pressure for such characters will not be more helpful for improvement in seed yield and it might be due to non-additive nature of gene action and more improvement could not be possible through direct selective.

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Table-1 Heritability, genetic advance and genetic advance in per cent over mean for 11 characters in F_1 and F_2 generations derived from 10 x 10 diallel cross in Indian mustard.

Characters	X		Heritability (n.s.) %		Genetic advance		Genetic advance in % of mean	
	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
1. Days to flowering	69.47	70.40	56.78	86.79	5.74	6.87	8.26	9.76
2. Plant height (cm)	197.87	190.32	88.76	74.52	64.25	49.47	32.47	39.16
3. No. of primary branches/ plant	5.94	5.99	33.29	14.62	0.58	0.37	9.98	9.18
4. No. of secondary branches/ plant	13.77	13.77	17.59	11.79	1.21	1.02	8.79	7.41
5. No. of siliquae/ main receme	52.85	44.25	6.32	5.25	23.43	20.18	4.43	4.56
6. No. of seeds / siliqua	11.98	12.28	46.57	51.93	2.03	2.13	16.94	17.35
7. Siliqua length (cm)	4.20	4.25	4.67	46.43	2.63	0.62	62.62	14.59
8. Days to maturity	113.42	111.09	20.22	13.08	16.52	12.68	14.57	11.27
9. Test weight (g)	40.47	39.58	40.58	33.71	0.73	0.63	1.80	1.59
10. Oil content (%)	40.47	39.58	88.69	91.38	4.59	4.6	11.4	11.70
11. Seed yield/ plant (g)	20.31	18.01	10.80	5.43	1.36	0.95	6.70	5.27

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