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A Study of Variability, Correlation and Discriminant Function in *Brassica compestris* L. Var Brown Sarson

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ABSTRACT

Variability occuring in 40 cultivars of brown *sarson* was made with respect to yield and certain of its components. Both phenotypic and genotypic coefficients of variation were maximum in seed yield / plant while they were minimum in days to flowering. Broad sense heritability was highest in siliqua length. Genetic advance in per cent was the highest in seeds yield / plant. Both heritability and genetic advance were low in seeds / siliqua. Seed yield / plant: howed high phenotypic and genotypic correlations with primary branches / plant and 100-seeds weight. Relative efficiency of selection index based on seed yield / plant, plant height and 100 seed weight was the highest and was found better than the one calculated on all the four characters.

INTRODUCTION

The studies on heritability and genetic advance are helpful in selection on the basis of phenotypic performance. Discriminant function is used in constructing selection indices for simultaneous improvement of yield and its associated component characters. The results of the investigation conducted to study genetic parameters of yield, correlation and selection indices are presented in this paper.

MATERIALS AND METHODS

Open pollinated seeds of 40 cultivars of *Brasica compestris* L. var brown *sarson* were grown in 1967-68 *rabi* season in a randomised block layout with four replications in the Banaras Hindu University Research Farm, Varanasi. Each variety was grown in two rows of 15 m long with a spacing of 45 x 15 cm. Data on yield and its components were recorded from these sample plants. Genetic variance (Burton and Devanne; 1953), broad sence heritability (Johnson *et al.*, 1955), genetic advance (Lush 1949) and phenotypic and genotypic correlation between yield and three other characters (Panse and Sukhatme, 1957), plant height, primary branches / plant and 100-seed weight were determined. Selection indices involving these four characters were constructed using the discriminant function technique according to the method suggested by Robinson *et al.* (1951). Expected genetic advance at 5 per cent intensity of selection and relative efficiency were also computed.

RESULTS AND DISCUSSION

The analysis of the data revealed that differences in the quantitative characters studied were significant

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except in seeds / siliqua and secondary branches / plant. In each case the phenotypic coefficient of variability was higher than the genetic coefficient of variability (Table 1) but both showed parallelism. Highest variability was observed in seed yield / plant followed by spread and primary and secondary branches / plant. Variability was low in days to first flowering, siliqua length and plant height. These results are similar to those obtained by Bharadwaj and Singh (1962) in brown *sarson* and Rajan (1966) in *toria* where seed yield / plant showed high genetic coefficient of variation.

Estimates of broad sense heritability, genetic advance and genetic gain as per cent of mean through selection at a constant intensity of selection showed (Table 1) that heritability ranged from 18.86 per cent to 94.20 for seeds / siliqua and siliqua length, respectively. Genetic advance as per cent of mean was, however, maximum in seed yield / plant followed by primary branches/plant while it was least in seeds / siliqua and days to flowering. High heritability and high genetic gain are conducive to effective selection due to the action of additive gene action (Panse, 1957) as could be observed in the case of primary branches / plant. Days to first flowering showed moderately high heritability but low genetic advance. Such a situation may be caused by non-additive gene action i. e., dominance and epistasis.

TABLE 1. Estimates of variability and certain other parameters in brown *Sarson*

Character	Mean	S. E. *	Phenotypic coefficient of variability	Genotypic coefficient of variability	Heritability %	Genetic advance	Genetic advance (% of mean)
Plant height (cm)	114.98 ±	5.976	9.05	8.69	84.84	18.97	16.49
Spread of plant (cm)	64.56 ±	12.761	22.65	17.84	61.97	18.68	28.93
Primary branches/plant	5.73 ±	1.952	25.48	22.96	81.52	2.45	42.75
Secondary branches/plant	9.23 ±	2.288	25.64	17.77	53.44	2.61	28.26
Days to first flowering	40.76 ±	1.925	5.72	4.64	65.95	3.17	7.77
Siliqua/main axis	36.13 ±	4.688	14.83	11.65	61.72	6.82	18.85
Siliqua length (cm)	4.31 ±	0.122	8.33	8.08	94.20	0.69	16.17
Seeds/siliqua	17.69 ±	2.512	11.14	4.83	18.86	0.77	4.33
100-seed weight (gm)	0.33 ±	0.034	17.51	15.87	75.49	0.006	29.61
Seed yield/plant (gm)	5.07 ±	1.842	39.87	30.50	58.49	2.43	48.03

*Standared error of mean

Correlation between seed yield / plant and the three other characters, plant height, primary branches/plant 100-seed weight (Table 2) revealed that seed yield was directly correlated with primary branches/plant and 100-seed weight but showed negative genetic correlation with plant height, although phenotypic correlation was positive but low. Negative correlation between primary branches / plant and plant height was also observed (Table 2). Ramanujam and Rai (1963) obtained genetic association among yield / plant, pods / plant and seeds/pod in yellow *sarson*.

TABLE 2. Estimates of phenotypic and genotypic correlations in brown *sarson*

Character	Primary branches plant	100-seed weight	Seed yield/ plant
Plant height	0.1867	0.3058	0.3404
	—0.3576	0.3125	—0.5742
Primary branches/plant	—	0.6693	0.7076
		0.7417	0.9483
100-seed weight	—	—	0.5766
			0.8337

Upper figure indicates phenotypic correlation coefficient and lower figure indicates genotypic correlation coefficient.

TABLE 3. Selection indices and their relative efficiency in brown *sarson*

Selection indices	Expected genetic advance in seed yield	Relative efficiency
$0.5849 X_1$	5.3706	100.00
$-0.0775 X_2$	2.3990	42.80
$0.9065 X_3$	1.6830	31.33
$18.3892 X_4$	4.6144	85.91
$-0.5149 X_1 - 0.1080 X_2$	2.1533	40.09
$0.2434 X_1 + 0.6680 X_3$	5.6406	105.02
$0.1700 X_1 + 1.2142 X_4$	2.8835	53.69
$0.0257 X_2 + 0.5556 X_3$	1.4954	26.72
$0.0001 X_2 + 0.7782 X_4$	0.1938	3.60
$0.0045 X_3 + 0.7096 X_4$	0.5866	10.92
$0.5173 X_1 - 0.1224 X_2 + 0.5691 X_3$	7.6222	141.92
$0.2529 X_1 - 0.3070 X_2 + 21.1278 X_4$	9.0269	168.07
$-0.0705 X_1 + 0.6350 X_3 + 8.2515 X_4$	5.3509	99.63
$0.0002 X_2 + 0.0047 X_3 + 0.9951 X_4$	0.2286	4.25
$0.4578 X_1 - 0.1341 X_2 + 0.2278 X_3 + 13.2183 X_4$	7.8512	146.18

X_1 = Seed yield/plant X_2 = Plant height

X_3 = No. of primary branches/plant X_4 = 100-seed weight

Discriminant function showed that the maximum gain of 68.7 per cent ralative to that obtained on the basis of selection on seed yield/plant alone was obtained when three characters, seed yield/plant, plant/height and 100-seed weight were jointly considered. The relative efficiency was 46.19 per cent when all the four characters including primary branches plant were taken into account. Relative efficiency was 41.92 per cent when 100-seed weight was excluded. The results indicated that when a combination of characters which included seed yield/plant was taken into account, the relative efficiency was higher than selection based on seed yield alone. Similar increased efficiency with some multiple selection criteria was reported by Pundir and Rai (1971) in *toria*, Rajan (1966) in *Brassica* and Srivastava and Das (1973) in *sarson*. Thus, to ensure proper use of the associated characters, their relative importance as well as the economy of labour involved in the work are to be considered.

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