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Research Note

Genetic variability for yield and its components in indian mustard (*Brassica juncea* L. Czern & Coss)

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Abstract
Study of 60 genotypes of Indian mustard (*Brassica juncea* L. Czern & Coss) for 13 different characters revealed considerable variability for all the characters under study. The eight characters *viz.*, days to 50% flowering, days to maturity, number of secondary branches per plant, length of main branch, number of siliqua per plant, number of seeds per siliqua, test weight and seed yield per plant showed high estimates of GCV as well as high heritability. The characters like number of secondary branches per plant, seed yield per plant and number of siliqua per plant, in that order, exhibited high heritability and high expected genetic advance. Hence selection will be effective for these traits.

Key words: Indian mustard, Genetic variability, heritability, genetic advance.

Indian mustard [*Brassica juncea* (L.) Czern & Coss.] is the second most important oilseed crop of the world as well as India after groundnut. Genetic variability plays an important role in plant breeding, because hybrids between lines of diverse origin generally display a greater heterosis/ variability than those between closely related parents (Syed, *et al.* 1994). The knowledge of genetic parameters of variation, provides an idea about extent of genetic improvement possible for different characters. Heritability and genetic advance of seed yield and its component help to assess the genetic gain that can be obtained by selection. Hence, the study was undertaken to gather information on variability, heritability and genetic advance in Indian mustard.

An experiment was conducted at Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) during *rabi* season of the year 2011-12. The material for present study comprised 60 genotypes of Indian mustard. Experiment was laid out in a randomized block design with two replications. Each plot consisted of a single row of 18 plants. Inter and intra row spacing was kept 40 and 15 cm, respectively. The recommended package of practices was adopted to raise a good crop. The observations on 13 quantiative traits were recorded in each plot on five randomly selected plants from each replication. Genotypic and phenotypic variances were computed according to method suggested by Johnson *et al.* (1955). Genotypic and phenotypic coefficient of variation (GCV and PCV) were estimated based on formulae given by Burton (1952) and heritability and genetic advance as per cent mean were calculated according to Allard (1960).

The analysis of variance for the experimental design revealed significant differences among the genotypes for 13 characters under study which indicated the presence of considerable amount of variability in the material (Table 1).

Phenotypic coefficient of variation (PCV) was higher than the corresponding genotypic coefficient of variation (GCV) for all the observed characters. Genotypic coefficient of variation helps to measure the range of genetic variability present in the particular character. The high estimates of GCV were observed for number of primary branches per plant, number of secondary branches per plant, length of main branch, number of siliquae per plant, seed yield per plant and number of seeds per siliqua; while rest of characters were having low to moderate GCV per cent (Table 2). Wide differences in the estimates of GCV and PCV indicated that variability was largely impaired by environmental factors.

The high heritability (>60%) was observed for days to 50% flowering, days to maturity, number of primary branches per plant, number of secondary branches per plant, length of main branch, number of siliqua per plant, number of seeds per siliqua, test weight, seed yield per plant and protein content (Table 2). Similar results were also observed by Ghosh and Gulati (2001) and Yadava *et al.*, (2011). The high estimates of heritability coupled with higher genetic advance expressed as per cent of mean for seed yield per plant, number of siliqua per plant and number of secondary branches per plant indicated that heritability of these traits is mainly due to additive gene effects and phenotypic selection on the basis of these characters may be effective for yield

improvement. Characters *viz.,* days to 50% flowering, days to maturity, number of primary branches per plant, number of secondary branches per plant, length of main branch, number of seeds per siliqua, length of siliqua and test weight showed high to moderate heritability along with moderate genetic advance as per cent of mean. These findings are in accordance with the earlier reports by Kumar *et al.,* (2007) and Mishra *et al.,* (2009) for test weight and number of seeds per siliqua.

From the above results, it can be concluded that selection of characters *viz.,* seed yield per plant, number of siliqua per plant, and number of secondary branches per plant would be most effective in improving seed yield. High genotypic coefficient of variation, high heritability and high genetic advances are helpful in making selection of superior genotypes.

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Table 1. Analysis of variance (mean squares) for various characters in Indian mustard

Characters	Mean Squares		
	Replications	Genotypes	Error
d.f.	1	59	59
Days to 50 per cent flowering	2.16	39.42**	4.27
Days to maturity	32.00	73.64**	9.58
Plant height (cm)	333.50	369.43**	172.52
No. of primary branches per plant	0.61	1.95**	0.33
No. of secondary branches per plant	1.84	46.31**	3.78
Length of main branch (cm)	21.87	425.75**	17.33
Number of siliquae per plant	722.00	9861.28**	722.57
Length of siliqua (cm)	0.198	0.336**	0.085
Number of seeds per siliqua	0.045	5.53**	0.37
Test weight (g)	0.11	0.55**	0.05
Seed yield per plant (g)	0.05	68.29**	4.19
Oil content (%)	1.01	3.61**	1.17
Protein content (%)	2.39	5.63**	1.05

*and ** significant at 5% and 1% levels, respectively.

Table 2. The estimates of genotypic and phenotypic variance and other genetic parameters for different characters in Indian mustard

Characters	h^2 (%)	GCV (%)	PCV (%)	GA% mean
Days to 50 per cent flowering	80.50	7.67	8.55	14.19
Days to maturity	77.00	4.69	5.35	8.48
Plant height (cm)	36.30	4.61	7.65	5.72
No. of primary branches per plant	70.70	13.00	15.47	22.58
No. of secondary branches per plant	84.90	21.97	23.84	41.69
Length of main branch (cm)	92.20	13.93	14.51	27.55
Number of siliquae per plant	86.30	16.37	17.62	31.34
Length of siliqua (cm)	59.40	7.09	9.20	11.24
Number of seeds per siliqua	87.60	11.05	11.80	21.32
Test weight (g)	82.00	10.57	11.68	19.66
Seed yield per plant (g)	88.40	20.20	21.48	39.15
Oil content (%)	51.10	4.79	6.70	7.06
Protein content (%)	68.40	4.91	5.94	8.38