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Estimates of heritability and genetic advance for different attributes in Indian mustard (*Brassica juncea* L.)

Richa Nigam, Alka Kushwaha and Archana Srivastava
Department of Botany
Dayanand Girls P G College, C.S.J.M. University, Kanpur, India

Abstract

High heritability and genetic advance for 12 characters (days to flowering, number of primary branches per plant, number of secondary branches per plant, length of main fruiting branch, relative water content in leaf, seed weight per plant, dry matter per plant, harvest index, test weight, oil content, erucic acid content in oil and protein content in seed) were studied in C.S.A.U. University of Agriculture & Technology, Kanpur (U.P.) in Rabi using 10 diverse genotypes of Indian mustard, 45F_1 hybrids and 45F_2 hybrids for generation mean analysis.The characters like high heritability coupled with high genetic gain for test weight and moderate heritability and moderate genetic gain for erucic acid content in oil and harvest index. This indicated that these characters are probably governed by additive genes, selection which is likely to be beneficial in improving these characters.

Key words- Indian mustard, heritability, genetic advance

Introduction

Improvement of genetic architecture of any crop depends upon the nature and extent of genetic variability required to effective selection in any breeding material. The heritable variation is marked by non-heritable variation, which creates difficulty in exercising selection. Hence, it becomes necessary to split over all variabilities into heritable and non-heritable components with the help of certain genetic parameters, which may enable the breeders to plan out proper breeding programme. Therefore, the progress of a population mainly depends upon the amount and magnitude to genotypic variability present in the population.

Materials and methods

The present investigation was carried out at Research Farm of C.S.A. University of Agriculture and Technology, Kanpur during Rabi season. Ten diverse genotypes viz., CSR -1017, RL-18, LAHA-101, T-6342, RK - 8901, RK-8601, RK-8608, RK-8701, A-11 and B-85 which were maintained by selfing and crossed in a diallel fashion excluding reciprocals were used. Ninety crosses (45 F_1's and 45 F_2's) along with ten parents were evaluated in a Randomized Complete Block Design (RCBD) with three replications. All the treatments were grown in 5m long three row plots. Row to row and plant to plant distance was maintained at 45 cm and 20cm respectively. Recommended agronomic practices were used to raise the crop. Data for 12 characters were recorded on 20 randomly selected plants from each plot. The heritability was judged according to the formula proposed by Crumpacker and Allard (1962) in F_1 generation and in F_2 generation by Varhalen and Murray (1969). Expected genetic advance was estimated by Robinson *et. al*. (1949).

Results and discussion

High heritability (>30%) estimates were obtained in F_1 generation for test weight, harvest index, length of main fruiting branch and erucic acid content in oil in order of the magnitude of estimates. Most likely, the high heritability was due to additive gene effects. These results were supported by Chaudhary etal. (2003). Low estimates of heritability (<10%) were recorded for relative water content in leaf. Seed yield per plant, number of primary branches per plant, number of secondary branches per plant and lowest in dry matter per plant. In F_2 generation, high heritability estimates were obtained for five characters namely, test weight, harvest index, length of main fruiting branch, protein content in seed and days to flowering in order of magnitude of the estimates. Low heritability estimates were recorded for relative water content in leaf, number of primary branches per plant, seed yield, number of secondary branches per plant and dry matter per plant. It was observed that corresponding estimates in F_2 were higher as compared to F_1 for all the characters except oil content and erucic acid content in oil (Table1) Estimates of genetic advance in percentage of mean ranged from 0.75 (relative water content in leaf) to 36.09 (test weight) in F_1 generation. High estimate was obtained for only test weight while moderate estimates were obtained for harvest index and erucic acid content in oil. Low estimates were found for length of main fruiting branch, days to flowering, protein content in seed and seed yield, oil content, number of primary branches per plant, number of secondary branches per plant, dry matter per plant and relative water content in leaf. In F_2 generation, the range varied from 1.24 per cent (relative water content in leaf) to 43.04 percent (test weight). High estimate was recorded for test weight while moderate estimates were obtained for harvest index, length of main fruiting branch and erucic acid content in oil. Low estimates were obtained for all those characters which were low in F_1 generation. The magnitude of estimates of genetic advance was found higher for all characters in F_2 generation in comparison to F_1 except for oil content and erucic acid content in oil (Table 1).

The moderate to high heritability estimates for most of the characters studied and thus can be improved through selection. Days to flowering, length of main fruiting branch, harvest index, test weight, oil content, erucic acid content in oil and protein content in seed indicated that they were largely influenced by environment and thus required high selection intensity for improving these traits. These finding are also supported by Wahhab and Bachyne (1977), Pal *et al.* (1983) and Wang and Qui (1990). Other characters viz., number of primary and secondary branches per plant, relative water content in leaf, dry matter per plant and seed yield per plant showed low values of heritability estimates. This indicated that much improvement is not possible through selection due to presence of non-additive gene action. The results are supported by Ghosh and Gulati (2001). Characters viz., days to flowering, length of main fruiting branch, harvest index, oil content, erucic acid content in oil and protein content in seed had low to moderate genetic gain and high to moderate heritability. This implies that high values of heritability are not always an indication of high genetic gain (Johnson *et. al*. 1955). Thus, it appears that these characters are influenced by non-additive gene effects and much improvement is not possible through selection. The character like test weight showed high genetic gain with high heritability and erucic acid content in oil and harvest index coupled with moderate genetic gain and moderate heritability. (Table1). This indicated that these characters are probably governed by additive genes. Selection is likely to beneficial in improving these characters. The present findings are also supported by Wan and Hu (1983).

Table.1 Estimates of heritability and genetic advance in percentage of mean for 12 characters in F_1 and F_2 generations of Indian mustard

Characters	Heritability				Genetic advance		Genetic advance in percentage of mean	
	Mean performance		Percentage (%)					
	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
Days to flowering	57.94	58.39	27.54	37.42	03.87	04.53	06.68	07.75
Number of primary branches / plant	07.85	06.75	02.16	04.71	00.07	0.13	00.85	01.90
Number of secondary branches / plant	28.89	24.29	01.64	04.23	00.25	0.63	00.88	02.58
Length of main fruiting branch (cm)	81.67	79.39	39.60	60.98	06.06	09.38	07.41	11.82
Relative water content in leaf (%)	80.11	81.97	05.29	09.98	00.60	01.02	00.75	01.24
Seed yield per plant (g)	36.24	26.37	03.24	04.46	00.91	01.14	02.51	04.30
Dry matter per plant (g)	72.53	123.91	01.09	01.87	01.41	02.17	00.82	01.75
Harvest index (%)	21.02	21.32	43.20	69.81	02.61	03.81	12.43	17.87
Test weight (g)	03.82	03.90	84.24	96.79	01.38	01.68	36.09	43.04
Oil content (%)	36.17	36.01	20.26	14.30	00.69	0.50	01.90	01.39
Erucic acid content in oil (%)	45.12	44.58	32.88	26.41	05.12	04.44	11.35	09.97
Protein content in seed (%)	19.90	20.12	22.96	40.05	00.74	01.06	03.70	05.28

References

1. Chaudhary, V.L., Rakesh Kumar and Sah, J.N. (2003) Variability studies in Indian mustard. *J. Applied Bio.,* 13 (1/2) : 9-12
2. Crumpacker, D.W. and Allard, R.W. (1962) A diallel cross analysis for heading date in wheat. *Hilgardia,* 32 : 375-378
3. Ghosh, S.K. and Gulati, S.C. (2001) Genetic variability and association of yield components in Indian mustard (*Brassica juncea* (L) Czern and Coss). *Crop Res.* Hisar, 21 (3) : 243-249
4. Johnson, H.W., Robinson, H.F. and Comstock, R.E. (1955) Genotypic and phenotypic correlation in soybean and their implication in selection. *Agron. J.*, 47 (1) : 477-482
5. Pal, R., Singh, H. and Jatsara, D.S. (1983) Inheritance of oil content in rape-seed (Brassica *compestris (*L*).* var. *toria*) *Indian J. Agric. Sci.,* 17 : 177-180
6. Robinson, H.F., Comstock, R.E. and Harvey, P.H. (1949) Estimates of heritability and degree of dominance in corn. *Agron. J.,* 41: 353-359
7. Varhalen, L.M. and Murray, J.C. (1969) A diallel analysis of several fibre property traits in upland cotton. *Crop. Science,* 9: 311-315
8. Wahhab, M.A. and Bachyne, M. (1977) Heritability estimates for some yield contributing characters in Indian mustard. *Indian J. Agric. Sci.*, 47 (11) : 556-562
9. Wan, Y.L. and Hu, G.C. (1983) Studies on heritability, genetic correlation and genetic advance of major characters in rape. *Zhonggno Yoriliao* (Chinese oil crop), 1 : 1-7
10. Wang, F. and Qui, J. (1990) Studies on the inheritance of seed protein content and its correlation with other characters in *Brassica napus. Scientia Agriculture Sinica*, 23 (6) : 42-47

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