GENETICS OF OIL YIELD IN INDIAN MUSTARD (*B. juncea* (L.) Coss)

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Introduction

Oil is the most valuable component of seed and it ranges from 38% - 42% in the cultivars of Indian Mustard. Attempts are being made to increase the quantity of oil content in the seed. A large number of workers have described the type of gene action involved in the inheritance of oil yield and seed yield but results varied with the type of material used and the experimental conditions. Earlier studies (Gupta, 1976; Banga and Labana, 1984; Gupta and Labana, 1988 and Dhillon *et al* 1990) showed substantial hybrid vigour in Indian mustard, while certain combinations do well to produce good results. In the present study an attempt has been made to know the nature and magnitude of gene action and combining ability for oil content, seed yield and its component characters so as to formulate an appropriate breeding programme.

Materials and Methods

The material comprised of seven genetically diverse genotypes of *B. juncea* and their F_1's crossed in diallel fashion, excluding reciprocals. The parents and hybrids were grown in randomized block design with three replications at Regioinal Research Station, Bathinda, during 1988-89. Data were recorded for seed yield (g.), 1000 grain weight (g.), number of primary and secondary branches per plant, plant height (cm.), main raceme length (cm.), pods on main raceme and oil content (%). Mean values of five randomly selected plants were subjected to statistical analysis. Combining ability analysis was carried out using method II, Model I Griffing (1956).

Results and Discussion

The significant mean squares due to general (gca) and specific (sca) combining ability for plant height, seed yield, oil yield, thousand seed weight and secondary branches indicated that both additive and non-additive gene effects contributed towards genetic variability. Pooled analysis of variance for combining ability is given in Table 1. The preponderance of non-additive gene effects for plant height, seed yield, oil yield, thousand seed weight, pods on main raceme and secondary branches confirms the previous findings (Singh and Singh 1972; Anand and Rawat 1978; Paul, 1978; Gupta and Labana, 1988 and Dhillon *et al* 1990). However, for these characters both additive and non-additive gene effects were present suggesting the use of recurrent selection procedures for varietal improvement.

None of the parent was found to be a good general combiner for all the charact-ers,however estimates of gca effects (Table 2)revealed that Varuna was good general combiner for seed yield and oil yield followed by Pusa bold which was good combiner for seed yield, oil yield,and thousand grain weight. Thus Varuna and Pusa bold can be used to produce high promising material . Varuna was also one parent in crosses showing high sca effects for seed yield, oil yield, pods on main raceme, plant height and number of secondary bra-nches indicating its effective use also in conventional breeding techniques, involving hybridization followed byisolation of pure lines in the segregating generations. Varuna x RW-33-2 was found to be good combination for seed and oilyield whereas Varuna x RW-29-6 and Varuna x RLM-619 were good combinations for more pods on main raceme and shorter plant height.

Conclusion

In view of the involvement of both additive and non-additive gene effects for seed yield, oil yield, thousand seed weight and pods on main raceme, recurrent selection procedures seem to be effective for the improvement of these traits. Varuna and Pusa bold were identified to be the good general combiners and Varuna x RW-33-2 a good hybrid combination for seed and oil yield.

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Table 1. Analysis of variance for combining ability.

Source	df	Seed yield gms/ plant	Oil yield	Sec. dary bra- nches	Plant height (cms)	Pods on main shoot	Thousand seed weight (gms)
σ^2gca	6	4.64*	6053.1*	6.67*	174.4*	10.55	1.49*
σ^2Sca	21	10.03*	16111.5*	12.15	154.49*	35.29*	0.43*
Error	54	0.13	2.82	0.09	39.67	6.31	0.02
$\frac{1}{6}\Sigma g_i^2$	-	0.50	738.8	0.73	14.97	-	0.16
$\frac{1}{21}\Sigma Sij^2$	-	9.90	16108.7	12.05	114.80	28.97	0.41

Table 2. General and specific combining ability effects of the parents and crosses in diallel.

Source	Seed yield	Oil yield	Thousand seed weight	Secondary branches	Plant height	Pods on main raceme
1. RLM-619	-0.73	-28.56	0.22	0.6	-2.45	-
2. Varuna	1.14	37.1	-0.09	-0.32	6.37	-
3. RW-33-2	-0.17	-6.5	-0.7	1.5	-7.9	-
4. RW-29-6	-0.4	-7.7	0.3	0.09	1.4	-
5. RLC-1359	-0.06	-4.2	0.51	-0.65	1.7	-
6. RK-1404	-0.57	-24.1	-0.3	-1.2	0.06	-
7. Pusa Bold	0.84	33.9	0.32	-0.04	1.0	-
8. 1x 2	-1.2	-38.7	-1.3	-1.5	5.8	1.7
9. 1 x 3	1.3	41.2	0.02	6.2	-16.1	-1.1
10. 1 x 4	1.4	74.8	1.0	4.3	1.9	3.1
11. 1 x 5	1.5	75.1	0.5	-1.4	- 4.7	2.9
12. 1 x 6	3.1	124.9	-0.1	0.5	6.3	-1.4
13. 1 x 7	0.8	- 5.9	0.13	3.6	11.9	6.2
14. 2 x 3	6.2	247.4	0.46	3.5	11.3	9.7
15. 2 x 4	3.9	167.6	-0.98	1.63	5.3	9.9
16, 2 x 5	-0.35	-7.9	-0.5	5.58	15.2	8.4
17. 2 x 6	1.54	47.5	0.26	-1.3	8.1	-0.9
18. 2 x 7	-4.9	-182.5	0.2	-1.4	5.7	3.5
19. 3 x 4	-4.7	-206.8	0.21	-0.8	8.5	-0.4
20. 3 x 5	-2.7	-99.1	0.2	-3.5	12.9	-1.9
21. 3 x 6	1.9	99.6	0.12	0.19	3.6	4.15
22. 3 x 7	0.16	53.3	-0.22	1.16	15.3	-1.98
23. 4 x 5	-2.5	-87.4	-0.9	2.4	1.5	0.5
24. 4 x 6	-3.1	-126.1	0.6	0.9	2.8	4.8
25. 4 x 7	3.3	155.4	-0.1	0.4	1.7	4.04

Table 2. (Continued)

Source	Seed yield	Oil yield	Thousand seed weight	Secondary branches	Plant height	Pods on main raceme
26. 5 x 6	1.12	37.6	-0.21	4.4	7.8	-2.4
27. 5 x 7	4.8	128.8	-0.52	-1.1	-0.85	-0.12
28. 6 x 7	-0.02	7.7	0.08	0.02	-1.5	-0.72