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Heterosis and Genetic Architecture for Oil Content in Indian Mustard*

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Adopting line x tester (11 x 6) mating design (Kempthorne, 1957) heterosis for oil content in Indian Mustard (*Brassica juncea* (L.) Czern & Coss) was conducted. The 66 F_1s and 17 parents were grown in a R.B.D. with 3 replications at three locations in Gujarat (Sardar Krushinagar, Talod and Surat) and one location in Rajasthan (Udaipur) in *rabi* 1993-94. Each entry represented a single row of 3 m length. The inter and intra row spacing were 45 and 15 cm, respectively. The per cent oil content was estimated by using Nuclear Magnetic Resonance Technique (Tiwari *et al.*, 1974). Heterosis over better parent (Fonseca and Patterson, 1968) and over standard check (Varuna) was calculated.

Mean squares due to genotypes were significant at all the four locations as well as pooled over locations. Likewise, mean squares due to parents vs hybrids were significant at all the locations, indicating presence of heterosis for oil content in Indian mustard. However, this trait was highly influenced by the environmental differences as evidenced by significant mean squares due to locations.

There was no appreciable increase in oil content due to hybridization (mean oil content of parents 34.68% and hybrids 35.66%). These results confirm the findings of Prasad and Singh (1985). The heterobeltiosis on pooled basis varied from -8.75 (RSK 28 x Kranti) to 10.61 per cent (RSK 77 x Vardan). The hybrid which followed positive heterobeltiosis on pooled basis were RSK 77 x Vardan and RSK 76 x Vardan (Table 1). Both the hybrids also showed significant heterobeltiosis at all the locations. It was noticed that the cross Lalpur 17 x RIC 1359 which had highest oil content, involved two parents having comparatively low oil content than the best parent (RSK 28). This might be due to the presence of different genes or gene complexes, seperately in both the parents and when they were brought together they nicked well and gave higher oil content. This can also be due to the presence of nonallelic interactions. The standard heterosis on pooled basis ranged from -6.96 (RSK 76 x Varuna) to 7.93 per cent (Lalpur 17 x RLC 1359). Only two hybrids viz., Lalpur 17 x RLC 1359 and RSK 28 x RLC 1359 (Table 1) recorded significant positive and consistent performance at all the four locations, in both these hybrids RLC 1359 was a common male parent.

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TABLE 1

Estimate of heterosis crosses over better parent and standard check (Varuna), GCA and SCA effects on pooled basis for oil content of 31 selected crosses of Indian mustard.

Sr. No.	Cross	Mean oil content %	Heterosis % over		GCA effect of		SCA effects of crosses
			Better parent	Standard Check (Varuna)	Female Parent	Male Parent	
1.	RSK 16 % GM 1	36.40	2.03**	1.68**	0.18**	0.13**	0.43**
2.	RSK 16 % PM 67	35.40	4.04**	-1.12*	0.18**	-0.11**	-0.33**
3.	RSK 16 % Kranti	35.97	5.19**	0.47	0.18**	-0.83**	0.96**
4.	RSK 16 % Vardan	35.27	4.78**	-1.48**	0.18**	0.16**	-0.74**
5.	RSK 28 % PM 67	37.05	-4.45**	3.49**	0.92**	-0.11**	0.59**
6.	RSK 28 % RLC 1359	37.98	-2.04**	6.9**	0.92**	0.73**	0.68**
7.	RSK28 % Vardan	37.53	-3.20**	4.83**	0.92**	0.16**	0.80**
8.	RSK 69 % GM1	37.30	1.57**	4.19**	0.44**	0.13**	1.08**
9.	RSK 69 % PM 67	36.95	0.57	3.21**	0.44**	-0.11**	0.96**
10.	RSK 69 % Vardan	37.45	1.93**	4.61**	0.44**	0.16**	1.19**
11.	RSK 76 % GM 1	36.68	2.83**	2.46**	-0.28**	0.13**	1.18**
12.	RSK 76 % Kranti	36.25	6.02**	1.26*	-0.28**	-0.83**	1.71**
13.	RSK 76 % Vardan	36.47	10.53**	1.87**	-0.28**	0.16**	0.73**
14.	RSK 77 % PM 67	35.58	4.58**	-0.61	-0.32**	-0.11**	0.36**
15.	RSK 77 % Kranti	35.32	3.29**	-1.34*	-0.32**	-0.83**	0.82**
16.	RSK 77 % Vardan	35.54	10.61**	-0.73	-0.32**	0.16**	0.05
17.	RSK 78 % GM1	36.36	1.92**	1.56**	0.20**	0.13**	0.38**
18.	RSk 78 % PM 67	35.67	3.56**	-0.36	0.20**	-0.11**	-0.08
19.	RSK 78 % RLC 1359	36.79	-2.62**	2.77**	0.20**	0.73**	0.20*
20.	RSK 78 % Vardan	36.59	6.24**	2.21**	0.20**	0.16**	0.57**
21.	Lalpur 17 % GM1	36.68	2.83**	2.46**	0.58**	0.13**	0.32**
22.	Lalpur 17 % Varuna	38.22	6.75**	6.76**	0.58**	-0.08*	2.05**
23.	Lalpur 17 % RLC 1359	38.64	2.27**	7.93**	0.58**	0.73**	1.67**
24.	RJ 9 % Varuna	36.92	3.24**	3.13**	-0.13*	-0.08*	1.48**
25.	CSR 164 % PM 67	35.61	2.35**	-0.5	-0.35**	-0.11**	0.41**
26.	CSR 164 % Kranti	35.33	1.56**	-1.31*	-0.35**	-0.83**	0.86**
27.	BID 902 % PM 67	36.33	6.76**	1.48**	-0.39**	-0.11**	1.17**
28.	BID 902 % Vardan	35.73	5.13**	-0.20	-0.39**	0.16**	0.30**
29.	RH 7513 % PM 67	35.06	3.01**	-2.07**	-0.85**	-0.11**	0.36**
30.	RH 7513 % RLC 1359	36.66	-2.98**	2.40**	-0.85**	0.73**	1.12**
31.	RH 7513 % Vardan	34.83	7.12**	-2.71**	-0.85**	0.16**	-0.14
	S.E.		0.19	0.19	0.05	0.03	0.10
	Crosses significant	54	48				
	Positive significant	25	19				
	Negative significant	29	29				
	Range (Min.)	-8.75	-6.96				
	(Max.)	10.61	7.93				

* and **, Significant at P = 0.05 and P = 0.01 levels, respectively.

The rresults of pooled analysis of variance for combining ability revealed that variation due to locations was highly significant. The mean squares due to males were significant. The interaction mean squares due to line x location, line x tester x location were significant. This trend indicated that the estimates of GCA and SCA variances were influence by the environment. The variance components due to males (σ^2m) were higher than that of female (σ^2f), which indicated greater contribution of males for oil content. The ratio σ^2gca/σ^2sca being less than unity, suggested greater role of non-additive genetic system in the inheritance of oil content. These results are in accordance with the findings of Hari Singh and Yashpal (1991) and Prakash Kumar *et al.,* (1994).

Male parent RLC 1359 exhibited significant and positive GCA effect at all the four locations as well as over the locations and was a good general combiner for this quality character of economic importance. Five parental lines viz., RSK 28, Lalpur 17, RSK 69, RSK 78 and RSK16, expressed positive significant GCA effects for this trait in pooled analysis (Table 1). Therefore, it would be worthwhile to use these parental lines in exploitation of hybrid vigour.

The best crosses at all locations as well as across locations were RSK 77 x Vardan and RSK 76 x Vardan over better parents over the better parents and Lalpur 17 x RLC 1359 and RSK 28 x RLC 1359 over the standard check `Varuna' RLC 1359 was the best general combiner and proposed for exploitation in breeding researches of Indian Mustard.

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