Annals of Arid Zone 29 (1) 47-49, (1990)

HETEROBELTIOSIS FOR SEED YIELD AND QUALITY TRAITS IN INDIAN MUSTARD

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In Indian mustard (*Brassica juncea* (L.) Czern & Coss) the scope for exploitation of hybrid vigour will depend on the direction and magnitude of heterobeltiosis, biological feasibility and the type of gene action involved. There is however, limited published report on crossing of mutants with different varieties and/ or the intercrossing of mutants and heterobeltiosis in this crop. Present investigation was thus, undertaken to know the extent of heterobeltiosis in this crop.

Fourteen lines viz., RL 18, RLM 29, RLM 42, T59, RLM 188, RLM 196, RLM 222, RLM 240, RLM 269, RLM 299, RLM 391, RLM 528, RLM 564 and T 6342, selected on the basis of diversity for agronomic and quality characters were crossed in a diallel fashion (including reciprocals). All crosses alongwith the parental lines were planted in single row plots 2.25 m long at a spacing of 30 cm x 15 cm, in a randomized complete block design, with three replications. Data were recorded on 5 random plants in each entry for seed yield. Bulk seed sample of the 5 plants from each replication were used for quality analysis. The oil content was determined following Kartha and Sethi (1957). The mineral and protein contents of seed were determined by the AOAC and Kjeldahl methods (McKenzie and Wallace, 1954). Per cent heterobeltiosis was calculated as per cent increase or decrease in the mean value of F_1 hybrid over its better parent value. There were significant differences among different parents and hybrids for seed yield, oil, protein and mineral content. Some of the crosses showing positive heterobeltiosis are given in Table 1.

Seed yield/plant in parents, F_1s and reciprocals ranged from 2.0 to 5.1, 2.0 to 6.8 and 1.8 to 6.7 g, respectively. Heterobeltiosis for this trait ranged from -60.1 to 165.0 per cent. Ten F_1s and the seven reciprocal crosses showed significant heterobeltiosis. The highest heterobeltiosis was shown by the cross RLM 564 x RLM 196, followed by RLM 29 x RLM 222 and RL 18 x RLM 222.

Oil content in parents, F_1s and reciprocals ranged from 34.5 to 40.6, 35.3 to 42.1 and 34.3 to 42.2 per cent, respectively. Heterobeltiosis ranged from -11.8 to 8.0 and -12.6 to 7.8 per cent in F_1s and reciprocals, respectively. It was significant in 21 F_1s and 24 reciprocals, of which only three F_1s viz., RL 18 x RLM 222, RLM 196 x

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Table 1. Some of the crosses showing significant positive heterobeltiosis in Indian mustard.

Crosses	Seed yield/plant		Oil content		Protein content		Mineral content	
	Mean (g)	Per cent hetero-beltiosis	Mean (%)	Per cent hetero-beltiosis	Mean (%)	Per cent hetero-beltiosis	Mean (%)	Per cent hetero-beltiosis
RL 18 x RLM 188	5.36	113.5*	38.3	-1.46	28.4	11.05	4.16	-15.6
RL 18 x RLM 196	4.29	68.9	37.4	-3.45	24.9	-2.73	4.63	28.6*
RL 18 x RLM 222	5.65	129.7**	41.6	7.22*	25.1	-1.95	4.36	-3.1
RL 18 x RLM 528	4.82	121.1*	39.0	0.67	24.9	-2.62	4.36	-14.5
RLM 29 x RLM 42	5.19	109.3*	37.3	-4.45	23.0	-17.74*	3.60	-28.8**
RLM 29 x RLM 222	5.85	137.8**	38.3	1.89	26.2	-6.44$	4.50	-11.1
T 59 x RLM 222	6.83	55.2*	35.3	-7.35*	27.4	-6.30	4.26	- 5.3
RLM 196 x RLM 222	5.65	122.4**	35.8	-3.24	26.9	5.90	4.20	- 6.7
RLM 196 x RLM 391	2.59	-12.5	38.3	8.01*	26.5	-3.74	4.70	- 1.3
RLM 196 x RLM 528	5.27	107.5*	37.4	-1.13	33.4	31.34**	4.36	-14.5
RLM 222 x RLM 528	3.75	52.4	37.7	-0.26	31.0	22.05**	4.00	-21.6
RLM 564 x RLM 196	6.73	165.0**	37.7	-2.98	25.6	13.19	4.50	-6.8
RLM 240 x RLM 391	3.98	-21.8	38.4	-1.96	34.1	22.97**	4.43	-6.9
RLM 269 x RLM 299	5.08	48.1	42.1	7.04*	29.6	4.22	4.33	0.7
RLM 299 x RL 18	6.25	92.3*	37.2	-3.97	27.7	-2.12	4.50	8.2
T 6342 x RL 18	6.20	68.9*	38.8	4.28	25.0	-3.48	4.23	-6.6
RLM 269 x RLM 29	5.08	48 1	38.1	-3.05	30.3	6.58	4.00	-20.9*
RLM 196 x RLM 188	5 24	106.3*	34.3	-11.90**	27.1	18.83*	4.13	-16.2
RLM 299 x RLM 196	5.63	73.2*	38.0	0.15	28.0	-1 06	4.26	2.4
RLM 391 x RLM 196	6.30	112.8**	37.8	6.60*	32.0	15.96*	4.03	-15.3
6342 x RLM 196	2.32	-36.8	35.5	-12.57**	30.4	17.40*	4.30	- 5.1

* $p < 0.05$ ** $p < 0.01$

RLM 391, RLM 269 x RLM 299 and two reciprocals viz., RLM 391 x RLM 196 and RLM 391 x RLM 240 showed positive heterobeltiosis.

Protein content of seed in parents, F_1s and reciprocals was 21.0 to 29.2, 16.3 to 34.1 and 18.9 to 32.0 per cent, respectively. The heterobeltiosis value ranged from -40.7 to 31.3 per cent. The 4 F_1 crosses and 6 reciprocals. which were superior to better parent were RLM 188 x RLM 196, RLM 196 x RLM 528, RLM 222 x RLM 528, RLM 240 x RLM 391, RLM 188 x RL 18, RLM 196 x RLM 188, RLM 564 x RLM 188, RLM 391 x RLM 196, RLM 528 x RLM 196 and T 6342 x RLM 196 while 6 F_1s and 4 reciprocals showed negative and significant heterobeltiosis. Ranges for mineral content were 3.16-5.10 in parents, 3.30-5.26 in F_1s and 3.70-5.36 in reciprocal crosses. Heterobeltiosis varied from -35.3 to 28.6 and -24.9 to 15.6 per cent in F_1s and reciprocals, respectively. Among F_1s and reciprocals only one cross namely RL 18 x RLM 196 exhibited superior performance over better parent.

Most of the heterobeltiotic crosses involved low yielding parents. Thus, it appeared that mere phenotypic superiority of parents does not indicate the performance of hybrids and measurement of heterobeltiosis would provide useful information in selection of lines for hybridization. Crosses RLM 564 x RLM 196, T 59 x RLM 222 and RLM 391 x RLM 196 can be exploited for transgressive segregants or hybrid seed production for high seed yield.

REFERENCES

Kartha, A.R.S. and Sethi, A.S. 1957. A cold percolation method for rapid gravimetric estimation of oil in small quantities of oil seeds. Indian Journal of Agricultural Sciences. 27 : 211-217.

McKenzie, H.A. and Wallace, H.S. 1954. The Kjeldahl determination of nitrogen. A critical study of digestion condition, temperature-Catalyst and oxidation agents. Australian Journal of Chemistry. 7 : 55-70.