Indian J. Genet., 58(4): 513-516 (1998)

POSSIBLE UTILISATION OF COMMERCIAL HETEROSIS IN INDIAN MUSTARD *BRASSICA JUNCEA* (L.) COSS & CZERN.

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(Received: April 15, 1996; accepted: October 30, 1998)

ABSTRACT

Possibilities of exploitation of heterosis using functional-genetic male sterility in *B juncea* was explored by studying the extent of heterosis for yield and other characters in 19 F_1 hybrids against five commercial cultivars. Eighteen hybrids outyielded the best check RLM 514. Three of them viz. MS X Pant Rai 1002, MS X RH 848 and MS X RLC 1047 were significantly superior over the best check in seed yield by 81.19%, 5065% and 64.94 % respectively. The overall heterosis (taking all hybrids and checks into account) for seed yield was very high (59.69%). The agronomic superiority of the three hybrids was reflected by 1.5 to 2.0 times oil yield and one week earliness in flowering as compared to RLM 514.

Key words : Indian Mustard, heterosis, functional - genetic male sterility.

The phenomenon of heterosis for hybrid breeding has been commercially exploited in cross pollinated crops like corn, sunflower, pearl millet and sorghum. In these crops genetically controlled male sterility has been instrumental in harvesting high economic gains. Rice is one among very few self-pollinated crops where male sterility has been exploited commercially. In the present study, a functional-genetic male sterile line (fms) developed at Punjab Agricultural University, Ludhiana has been used for the synthesis of F_1 hybrids.

MATERIALS AND METHODS

The functional-genetic male sterile line (fms) and nineteen diverse parental lines of Indian mustard (*B. juncea L. C*) were selected for the development of F_1 hybrids by hand pollinating the fms with 19 male parents. These hybrids were grown alongwith five commercially grown varieties viz. Varuna, Kranti, RLM 514, RLM 619

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RESULT AND DISCUSSION

Mean and range of F1 hybrids and five commercial cultivars are given in Table 1.

Table 1. Mean values of F_1 hybrids and commercial cultivars for different characters

Genotypes	Seed yield (g)	Branches/Plant		Siliquae /Plant	1000 Seed wt. (g)	Harvest Index (%)	Days to 50% flowering	Oil content (%)	Oil yield (g)
		Primary	Secondory						
fms × YSR 1-P2	26.90	5.73	16.60	571.1	3.36	20.33	57.50	42.10	11.32
fms × RLC 1105	23.75	4.60	16.08	599.9	2.92	23.41	56.25	42.10	10.00
fms × Kranti	27.13	4.78	16.00	613.5	4.24	21.99	56.25	42.63	11.57
fms × RLM 629	20.88	4.73	14.45	579.6	2.81	29.08	54.00	41.95	08.76
fms × Pant Rai 1002	34.88	4.75	14.48	662.7	4.21	28.21	62.00	42.70	14.89
fms × Varuna	20.38	5.20	15.28	565.8	3.92	19.36	54.00	43.20	08.80
fms × RLC 1359	24.13	5.10	16.00	688.9	3.38	23.26	62.50	42.00	10.14
fms × RH 3811	19.75	5.20	16.45	601.2	3.51	20.95	54.25	42.00	08.30
fms × RW 11842/26	26.50	4.88	16.28	694.8	4.05	21.67	60.00	40.63	10.77
fms × RLC 1031	27.50	5.05	15.98	610.9	3.72	24.10	55.50	41.65	11.45
fms × Rh 848	29.00	5.55	16.10	802.5	3.47	21.96	63.00	42.88	12.44
fms × RLC 1047	31.75	5.88	17.08	735.4	2.96	23.28	61.50	42.40	13.46
fms × RLC 1209	22.50	5.05	15.25	596.6	3.40	20.08	59.75	41.35	09.30
fms × RLM 619	25.25	6.08	16.78	610.5	3.17	18.70	59.50	43.38	10.95
fms × RFD 4	16.75	4.90	14.93	654.3	3.81	17.61	57.75	41.40	06.94
fms × RLC 1355	22.25	5.55	14.40	476.6	3.11	20.61	59.50	42.70	09.50
fms × RLM 240	24.00	4.95	16.08	655.0	3.42	23.09	55.50	42.35	10.16
fms × RLM 1357	23.38	5.50	17.05	442.9	3.04	21.52	54.00	40.90	09.56
fms × CDA 39	26.13	6.80	20.48	729.9	3.91	16.46	64.00	39.73	10.38
RLM 514	19.25	5.85	15.20	472.0	2.74	17.35	69.75	40.65	07.83
RLM 619	19.13	5.28	13.80	432.5	3.87	19.73	58.50	42.60	08.15
RLC 1359	16.38	4.60	12.80	555.1	3.82	16.48	54.75	41.30	06.77
Kranti	14.75	4.55	12.95	474.5	3.60	21.25	55.50	40.68	06.00
Varuna	14.63	4.35	11.98	508.7	3.75	21.45	54.50	40.20	05.88
* CD ($P \leq 0.05$)	9.28	0.88	3.25	157.9	0.73	5.93	5.11	1.52	

and RLC 1359 in a randomised complete block design with four replications during winter, 1987-88. The seeds were space planted at distances of 15 cm and row to row distance was 30 cm. Each replication had two rows each three meter long.

The data were recorded on ten randomly selected plants in commercial varieties as well as in the F_1 hybrids. The mean of ten plants for each character was worked out for the purpose of statistical analysis in each replication. The characters studied were seed yield, primary branches, secondary branches, siliqua length, seeds per siliqua, seed size, plant height, harvest index, days to flower and oil content. The commercial heterosis was expressed as per cent deviation of F_1 hybrid from the commercial varieties.

Table 2. Best hybrids for different characters and their level of heterosis

Characters	Best F_1	Average level of heterosis (%) over mean of 5 checks	Level of heterosis (%) over best check
Seed yield	fms × Pant Rai,1002	110.37	81.19
Primary branches/Plant	fms × CDA-39	39.73	16.24
Secondary branches/Plant	fms × CDA -39	54.45	34.75
Siliquae/Plant	fms × RH- 848	65.41	44.67
Main shoot length	fms × RLC 1359	21.78	15.97
Siliquae on main shoot	fms × RLC 1047	31.56	16.97
Siliqua length	fms × RLC 1047	04.35	–
Seeds per Siliqua	fms × RLC 1105	12.22	09.77
1000-seed weight	fms × Kranti	21.20	09.61
Plant height (dwarf)	fms × RLM - 629	(6.90)	00.00
Harvest index	fms × RLM-629	52.77	35.57
Days to 50% flowering (earliness)	fms × RLM - 629 fms × Varuna fms × RLM - 1357	(7.05)	(0.90)
Oil content	fms × RLM 629	6.72	01.83

( ) indicates negative value

--- indicates check cultivar better than best F1's for this character

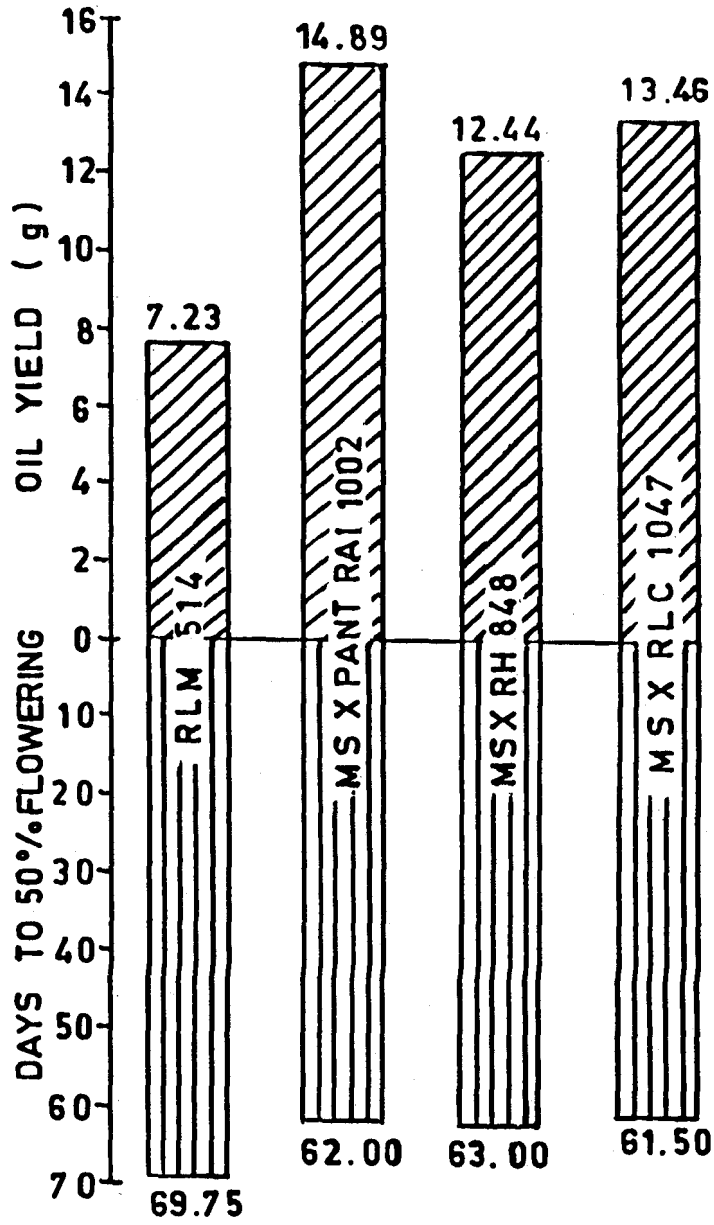

Fig. 1. Agronomic worth of three best hybrids

For seed yield the mean of the F_1 hybrids ranged from 16.75 to 34.88 g per plant against the range of 14.63 to 19.25 g for commercial cultivars. The mean of the hybrids was 24.83 g/plant whereas it was 16.83 g/plant for commercial cultivars.

For seed yield three of the hybrids MS × Pant Rai 1002, MS × RH -848, MS × RLC 1047 significantly out- yielded the best check RLM 514. The best F_1 hybrid (MS × Pant Rai 1002) showed an average level of heterosis of 110.37 per cent heterosis over the best check. Upto 250 per cent heterosis over mean of the parents and 47 per cent over the highest yielding cultivars has been reported for seed yield in brown sarson [1]. In *B. juncea* heterobeltiosis for seed yield was reported from 87 per cent [2] and upto 239 per cent [3]. Similarly Banga and Labana [4] reported 56 per cent heterosis for seed yield over the national check in field trials. An [5] in an experiment developed six F1 hybrids in *B. napus* and found that the F1's had a high heterosis rate for seed yield (20.6%). According to Grant and Beversdorf [6] 10 to 20 percent average heterosis justifies the efforts currently underway to develop cytoplasmic male steriles and restorers in *B. napus*. In this context, the fact that these three hybrids excess the best check by more than 50% for seed yield assumes importance from agronomic point of view.

Two other parameters besides seed yield which determine the desirability of a *B. juncea* hybrid are oil content and maturity. The comparison of the hybrids with the best check with regard to these characters is served well by a graph presented in Fig. 1. The hybrid MS × Pant Rai 1002 is seen to have oil yield about two times of RLM 514. The other two hybrids had one and a half time oil yield than the best check RLM 514. Moreover the three hybrids came to flower about a week earlier than the check RLM 514. The extent of commercial heterosis observed in this study, therefore, presents a very promising picture for exploitation of heterosis in *B. juncea*.

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