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Short Communication

Heterosis study in Indian mustard [*Brassica juncea* (L.) Czern and Coss]

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The country accounts for 13% of world's oilseeds area and 7% of production [1]. Oil seeds form the second largest agricultural commodity after cereals sharing 14% of the country's gross cropped area and accounting for nearly 5% of the gross national product and 10% value of all agricultural products. Heterosis is the most exploited biological phenomenon of the 20th century, which enabled breeders to significantly improve the crop performance by exploiting hybrid vigour [2]. Significant heterosis exists for seed yield and oil content in all oilseed crops regardless of breeding behaviour [3]. Further, to keep pace with new challenge, broading of genetic base for development of superior hybrids and for exploitation of maximum heterosis assumes importance in mustard heterosis breeding [4]. For a successful hybrid breeding programme, it is essential that a significant heterosis is available in the F_1 population and that a method is available for commercial seed production economically [5].

The experiment material for the study consisted of sixty F_1s derived from the crosses by 15 lines and four tester. Materials were grown in Randomized Complete Block Design with three replications in rabi seasons of 1998-1999 and 1999-2000 at the Research Farm, of V B S, Purvanchal University, Jaunpur. Five competitive plants were randomly selected and tagged well in advance for recording the observations in parents and crosses for 12 morphological characters.

The manifestation of seed yield heterosis over BP and SV (Kranti) in the present investigation ranged from 16.39 to 69.6 per cent and 9.59 to 70.68 per cent, respectively. In the present investigation, magnitude of seed yield heterosis over BP ranged from 16.39 per cent in NDR-119 × Varuna to 69.6 per cent in KBJ-39 × Kranti and over SV from -9.59 to in JGM-93877 × Kranti 70.68 per cent in the same respective crosses with a mean heterosis of 19.89 (over BP) and 23.51 (over SV) per cent. Out of a pool of 60 F_1S studied 45 crosses displayed heterosis over BP and 49 over SV, of which 43 were common crosses. The most potential crosses in the order of merit for seed yield were KBJ-39 × Kranti, PSR-10 × Kranti, KBJ-39 × Rohini, KBJ-39 × Varuna and JGM-93877 × N. Rai. Based on magnitude of heterosis over BP as well as SV, five crosses *viz.*, NDR-119 × N. Rai, BIO-541 × Kranti, RSM-204 × Kranti, DIR-612 × N. Rai and R. K. 9301 × N. Rai could be identified as potential combinations for oil content.

As regards oil content, 51 crosses registered significant heterosis over standard variety, which was mainly due to low *per se* performance of standard variety for oil content (39.27%). Five cross combinations *viz.*, NDR-119 × N. Rai, BIO-541 × Kranti, RSM-204 × Kranti, DIR- 612 × N. Rai and RK-9301 × N. Rai with very high heterosis for oil content over BP as well as over SV may be considered outstanding for exploitation through heterosis breeding. For other characters, the per cent heterosis over BP ranged from -7.09 (PBR-107 × N. Rai) to 1.51 (BIO-541 × Rohini) for days to maturity, from –33.03 (SKM-92-96 × Varuna) to 13.14 (KBJ-39 × Varuna) for plant height, from –27.95 (PSR-10 × N. Rai) to 49.45 (JMM 72-74), for number of primary branches per plant, from –31.75 (RL-962 × Kranti) to 18.8 (SKM-92-96 × Kranti) for number of secondary branches per plant, from –15.19 (BIO-541 × Kranti) to 38.33 (JGM-93877 × Varuna) for number of siliquae on main raceme from –26.62 (BIO-541 × Rohini) to 13.30 (KBJ-39 × Varuna) for length of main raceme from –15.84 (RSM-204 × Varuna) to 13.37 (NDR-119 × Varuna) for siliquae length, from –35.68 (PCR-20 × Rohini) to 25.66 (PCR-20.2 × Kranti) for 1000 seed weight.

References

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Table 1. Heterosis (%) over standard variety (SV) and better parent (BP)

Crosses	Days to 50% flowering	Days to maturity	Plant height	No of primary branches	No. of secon-dary branches	Length of main raceme	No of siliquae on main racem	Siliquae length	No of seeds per siliquae	1000 seeds weight	Oil content	Seed yield per plant
Standard variety												
PCR-20 × Kranti	4.58**	−3.95	9.29	28.40**	−3.04	11.26**	6.38**	7.28	16.05	14.71	7.00**	38.96**
PCR-20 × N. Rai	4.38**	0.21	0.22	44.36**	2.28	0.84	5.83**	−3.08	24.89*	13.82	4.61**	39.71**
RK-9301 × N. Rai	5.41**	−4.55	9.88*	64.01**	18.96**	15.23**	16.62	10.64*	11.88	42.65*	10.59**	52.68**
RK-9301 × Rohini	5.49**	−4.11	3.42	36.58**	5.56	5.95**	11.11**	13.73**	−1.65	8.53	2.95**	47.98
DIR-612 × Varuna	1.61	−2.64	2.37	21.60*	1.52	3.32**	3.60	18.49**	6.76	60.88**	4.61**	19.64**
DIR-612 × Kranti	3.74*	−2.22	−1.20	7.98	−1.99	−7.66**	6.36**	10.08*	6.85	33.24*	5.35**	24.62**
DIR-612 × N. Rai	7.63**	−2.07	−1.71	23.25*	−15.10	−3.96**	−8.64	12.89**	7.11	68.82**	11.59**	38.77**
NDR-119 × Kranti	5.80**	−4.74	7.76	48.25	7.49*	12.22**	0.75	20.17**	7.46	36.18*	3.95**	47.56**
NDR-119 × N. Rai	3.36*	−3.40	10.82*	43.39**	12.05**	13.23**	3.20	5.32	27.58*	62.35**	8.81**	48.12**
RL-962 × Kranti	1.61	−1.81	−1.12	21.79*	−15.51	−2.06*	8.51**	4.48	7.72	35.29*	11.79**	56.25**
JGM-93877 × N. Rai	1.34	−2.88	2.50	30.93**	7.20	5.47**	3.58	4.76	15.78	24.12	6.09**	56.77**
KBJ-39 × Varuna	11.31**	−4.84	15.19*	42.61**	−8.89	15.48**	26.23**	5.04	8.59	13.53	5.22**	61.18**
KBJ-39 × Kranti	3.61*	−0.26**	7.97	48.05**	−5.62	7.76**	3.63	8.12	6.76	11.18	1.12	70.68**
KBJ-39 × Rohini	4.13**	−4.59	−2.39	24.12*	3.57	−1.77	2.93	16.81**	−2.52	4.71	2.90**	61.65**
PSR-10 × Kranti	3.36*	−5.07	1.42	27.24**	−4.45	5.18**	9.34**	16.81**	23.50*	28.24	0.43	61.14**
Better parent												
RSM-204 × Varuna	13.63**	−0.89*	8.33	26.62**	9.94*	−0.09	24.88**	−15.84**	0.35	23.88	4.33**	41.55**
RSM-204 × Rohini	13.20**	−3.66*	3.89	−18.35**	0.15	−7.59**	11.46*	−2.64	6.40	−17.61	3.69**	45.97**
JGM-93877 × N. Rai	3.77*	−3.16**	1.30	6.26	−0.47	−12.50**	6.27**	3.03	6.37	−23.27*	−0.49	52.65**
KBJ-39 × Varuna	7.11	−3.23**	13.14**	1.80	19.13	13.30**	33.55**	−4.17	6.25	−13.66	−3.16**	60.18**
KBJ-39 × Kranti	3.62*	−0.21	6.04	5.69	−16.23	7.77**	3.65	8.22*	5.85	−12.17	−6.94**	69.60*
KBJ-39 × Rohini	7.95**	−4.55**	−4.13	−11.43	−8.05	−11.01**	8.53**	3.05	−10.87	−17.13	−5.28**	60.65**
PSR-10 × Kranti	5.23**	−4.27**	1.42	21.11*	−4.47	5.19**	9.35**	7.20	14.99	−2.31	−0.65	61.13**
PBR-107 × Varuna	−2.04	−2.01**	5.72	15.84	−5.26	− 14.62**	9.90**	−12.62**	0.11	−16.64	−4.31**	44.72**

** and * Significant at P = 0.01 and 0.05 respectively

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