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RESEARCH PAPER

Exploitation of heterosis breeding through diallel matting in Indian mustard [*Brassica juncea* (L.) Czern and Coss]

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Abstract **:** Six parents *viz.,* BPR 380-1, RSK 28, RH(OE)0103, SKM 532, GM 3 and GM 1 were crossed in diallel fashion (excluding reciprocals) in Indian mustard. Fifteen F_1 crosses of Indian mustard [*Brassica juncea* (L.) Czern and Coss] were studied to investigate mid parent, better parent and standard heterosis over check variety GM 2 for seed yield and its component traits. The analysis of variance for various characters revealed that the considerable genetic variation existed among the parents and hybrids for all the traits under study. The standard heterosis for seed yield and its components traits revealed that the highest standard heterosis for seed yield was observed in RSK 28 x RH(OE)0103 (32.3%) followed by GM 3 x GM 1 (25.53%). Amongst these hybrids, the SKM 532 x GM 1 was heterotic over GM 2 for various yield components, whereas, the hybrids RSK 28 x GM 1 and BPR 380-1 were also heterotic for main branch length and siliquae per plant.

Key Words **:** Heterosis, Heterobeltiosis, Indian mustard

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INTRODUCTION

The diallel analysis helps breeder to predict the utility of F_1 hybrids and its behavior in subsequent generation. Heterosis breeding could be potential alternative for achieving quantum jumps in production and productivity. The magnitude of heterosis particularly for seed yield is of paramount importance and if the heterosis feasible it can help to reach high yield levels.

MATERIALS AND METHODS

The resulting 15 hybrids and six parents were grown in Randomized Block Design with three replications at Main Castor-Mustard Research Station, S.D. Agricultural University, Sardarkrushinagar in *Rabi* 2009-10. The experiments involved 4 m long single row plots. The rows were 45 cm apart with distance between plants within rows being 15 cm. Observations were recorded on five random plants within a row for the characters *viz.,* days to 50 per cent flowering, days to maturity, plant height, main branch length, number of branches per plant, siliquae per plant, number of siliquae on main branch, seed yield per plant and 1000 seed weight.

RESULTS AND DISCUSSION

The analysis of variance for parents, hybrids and parents vs. hybrids computed for different characters under study is presented in Table 1. The results revealed highly significant differences due to genotype for all the characters indicating sufficient genetic variability present in the materials for all the characters under study. The variance due to genotype was further partitioned into parents, hybrids and parent vs. hybrids for all the traits significant difference due to parents and hybrids were found for all the characters. Whereas, parents vs. hybrids was significant for all most characters except plant height, siliquae on main branch, siliquae per plant and seed yield per plant. This indicated existence of considerable amount of genetic variability among parents and hybrids for

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all the characters.

Significant negative heterosis was recorded for days to 50 per cent flowering, which is desirable for the development of early type. It was observed that crosses showing negative heterosis for 50 per cent flowering did not always exhibit negative heterosis for days to maturity revealing complex nature of gene action. Two hybrids expressed consistently significant and negative standard heterosis for plant height. The crosses RSK 28 x RH(OE)0103 (-19.81%) and BPR 380-1 x RH (OE)0103 (-14.76%)were the best two hybrids for plant height. From this it was observed that cross involving RH(OE)0103 and RSK 28 as one of the parents showing dwarfness suggesting their use as a potential donor parents for the development of dwarf varieties.

For seed yield, five crosses depicted significant positive relative heterosis, two crosses exhibited significant positive heterobeltiosis, while, significant positive standard heterosis was exhibited by two crosses. A study of standard heterosis for seed yield and its component traits revealed that the hybrid RSK 28 x RH(OE)0103 (32.3%) expressing highest standard heterosis followed by GM 3 x GM 1 (25.53%). Whereas, the hybrids RSK 28 x GM 1 and BPR 380-1 were also heterotic for main branch length and siliquae per plant. High association among these attributes as well as seed yield have been reported as in the case of combinational heterosis (Joshi and Patil, 2003 and Patel *et al.,* 2010).

The standard heterosis for main branch length, number of siliquae on main branch, siliquae per plant and number of

Table 1: Analysis of variance for parents and hybrids for seed yield and its components characters in Indian mustard

Source of variation	df	Days to 50% flowering	Days to maturity	Plant height	Main branch length	No. of siliquae on main branch	Total siliquae per plant	No. of branches per plant	Seed yield per plant	1000 seed weight
Replications	2	3.92	13.86*	190.25	1.02	18.30	1232.6	11.49	7.75	0.01
Genotypes	20	34.29**	44.04**	891.22**	180.9**	151.92**	13922.7**	276.58**	79.67**	1.06**
Parents	5	44.59**	120.63**	1798.59**	204.2**	69.26**	17273.9**	129.45**	153.45**	1.91**
Hybrids	14	31.27**	10.62**	606.26**	170.3**	191.43**	13687.7**	317.21**	58.82**	079**
P vs. H	1	25.60**	128.93**	343.80	212.6**	12.18	511.74	443.35**	2.56	0.70**
Error	40	1.50	3.82	124.53	3.69	13.76	897.79	6.031	5.23	0.06

*and ** indicate significance of values at P = 0.05 and P = 0.01 levels, respectively

Table 2 : Summary of highest heterotic cross combinations in desired direction and range of heterosis (%) with respect to each character in Indian mustard

Characters	Best heterotic crosses and range of heterosis		
	Over mid parent	Over better parent	Over check (GM 2)
Days to 50% flowering	RSK 28 x GM 3	RSK 28 x GM 3	RSK 28 x GM 3
	(-7.91 to 13.14)	(-17.42 to 7.59)	(-11.71 to 8.98)
Days to maturity	GM 3 x GM 1	GM 3 x GM 1	GM 3 x GM 1
	(-2.77 to 11.92)	(-4.58 to 5.07)	(-4.58 to 0.86)
Plant height	GM 3 x GM 1	RH(OE)0103 x GM 3	RSK 28 x RH(OE)0103
	(-9.58 to 20.05)	(-19.62 to 14.09)	(-19.81 to 12.41)
Main branch length	RSK 28 x GM 1	SKM 532 x GM 3	RH(OE)0103 x GM 1
	(-32.62 to 15.36)	(-36.61 to 10.72)	-36.61 to 2.68
No. of siliquae on main branch	SKM 532 x GM 1	SKM 532 x GM 1	BPR 380-1 x RH(OE)0103
	(-30.49 to 35.37)	(-39.86 to 28.25)	(-29.82 to 44.74)
Siliquae per plant	BPR 380-1 x RH(OE)0103	SKM 532 x GM 3	RSK 28 x RH(OE)0103
	(-38.01 to 49.39)	(-44.02 to 42.61)	(-61.09 to 1.41)
No. of branches per plant	SKM 532 x GM 1	SKM 532 x GM 1	SKM 532 x GM 1
	(-45.11 to 130.85)	(-55.49 to 83.29)	(-43.89 to 83.13)
1000 seed weight	RH(OE)0103 x GM 3	RSK 28 x GM 1	SKM 532 x GM 3
	(-39.8 to 19.02)	(-46.46 to 8.55)	(-46.30 x 32.34)
Seed yield per plant	RSK 28 x RH(OE)0103	RSK 28 x RH(OE)0103	RSK 28 x RH(OE)0103
	(-45.85 to 90.02)	(-63.33 to 44.76)	(-52.92 to 32.3)

branches per plant (2.68%, 44.74%, 1.41% and 83.13 %) were very high. Standard heterosis for 1000 seed weight is very low (-2.34%). The use of crosses exhibiting high heterosis of yield and its component characters in breeding programmes aimed at development of high yielding varities is advocated. The superior F_1 hybrids are expected to produce transgressive segregants if additive genetic systems of the superior parent and complimentary epistatic effects of the F_1 act in the same direction to maximize intensity of the desirable yield attributes.

REFERENCES

Joshi, S. and Patil, S. (2003). Exploitation of heterosis breeding in Indian mustard [*Brassica juncea* (L.) Czern and Coss]. *J. Oilseeds Res.*, **20** (1) : 31-34.

Patel, C.G., Parmar, M.B., Patel, K.R. and Patel, K.M. (2010). Exploitation of heterosis breeding in Indian mustard [*Brassica juncea* (L.) Czern and Coss]. *J. Oilseeds Res.*, **27**(1) : 47-48.

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