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# COMBINING ABILITY AND HETEROSIS FOR SEED YIELD TRAITS INVOLVING NATURAL AND SYNTHETIC INDIAN MUSTARD (*BRASSICA JUNCEA* L. CZERN. & COSS.)

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Eleven diverse lines of *B. juncea* viz., Kranti, PR 8905, DIRA 337, TM 4, RML 198, RIL 8901, RJ 8901, CSR 83-268, RCC 15, NDR 8602 and RCC 4 used as females were crossed with three testers (RLM 619, P17 and Vardan as males) in a line × tester mating design to identify potential parents and cross combinations on the basis of heterosis and specific combining ability effects. Out of these testers, P17 is a newly reconstructed stable line developed by crossing *B. campestris* var. Candle with a land race of *B. nigra*. The resulting 33 hybrids along with the parents were grown at the Oilseeds Research Station, Kangra, Himachal Pradesh Krishi Vishvavidyalaya, in a randomized block design with two replications. Observations on five competitive plants from each plot were recorded for six quantitative traits (Table 1). Heterosis was estimated as percent increase or decrease over the better parent. The estimates of combining ability effects were estimated according to the method outlined by Kempthorne [1].

Natural *B. juncea* parents, RLM 619, CSR 83-268, RCC 15 and NDR 8602 were either good or average general combiners for the traits studied. Synthetic *B. juncea* parent P17 was good general combiner for siliquae/plant but poor combiner for seed yied/plant (Table 1).

None of the hybrids was consistently good showing high heterosis and sca effects for all the attributes (Table 1). Best heterotic cross-combination for seed yield was NDR 860 × RLM 619 (141 %) followed by CSR 83-268 × RLM 619 (114 %), PR 8905 × RLM 619 (107 %) and RLM 198 × RLM 619 (79%). Most of the heterotic crosses identified as superior for different attributes were not good specific combinations. Natural × natural cross combinations recorded higher number of heterotic crosses as compared to natural × synthetic cross combinations.

**Table 1. Good general combiners, good specific combinations, gca effects of the parents involved and heterotic combinations for yield and yield components in Indian mustard**

| Character | Good general combiners | Good specific combinations | gca effects | Heterotic combinations |
|---|---|---|---|---|
| Plant height | TM4 | RLM 198 × Vardan | (L × A) | TM 4 × RLM 619 |
| | DIRA 337 | PR 8905 × Vardan | (L × A) | DIRA 337 × RLM 619 |
| | RCC 15 | RCC 15 × RLM 619 | (G × A) | DIRA 337 × P 17 |
| | | | | NDR 8602 × RLM 619 |
| Primary branches/plant | - | - | - | DIRA 337 × RLM 619 |
| | | | | Kranti × RLM 619 |
| Secondary branches/plant | DIRA 337 | DIRA 337 × P17 | (G × A) | CSR 83-268 × P 17 |
| | RCC 15 | | | RCC 15 × P17 |
| | CSR 83-268 | | | CSR 83-268 × RLM 619 |
| | | | | RJ 8901 × RLM 619 |
| | | | | PR 8905 × RLM 619 |
| Siliquae/plant | RCC 4 | RJ 8901 × RLM 619 | (L × A) | RCC 4 × Vardan |
| | TM 4 | RCC 4 × RLM 619 | (G × A) | Kranti × Vardan |
| | CSR 83-268 | Kranti × Vardan | (L × L) | CSR 83- 268 × RLM 619 |
| | NDR 8602 | RLM 198 × P 17 | (A × G) | |
| | RCC 15 | RCC 15 × P 17 | (G × G) | |
| | P 17 | | | |
| Seeds/siliqua | - | - | - | RIL 8901 × P17 |
| | | | | NDR 8602 × P17 |
| Seed yield/plant | | CSR 83-268 × P17 | (A × L) | NDR 8602 × RLM 619 |
| | | RCC 4 × RLM 619 | (A × G) | CSR 83-268 × RLM 619 |
| | | NDR 8602 × RLM 619 | (A × G) | PR 8905 × RLM 619 |
| | | RCC 15 × Vardan | (A × A) | RL 198 × RLM 619 |

– = Not calculated, G = good combiner, A = average combiner, L = low combiner

Maximum number of good specific combinations were observed involving natural *B. juncea* as parents. Crosses RCC 4 × RLM 619, NDR 8602 × RLM 619 and RCC 15 × Vardan were superior showing higher sca effects for seed yield/plant, whereas RCC 4 × RLM 619, RLM 198 × P17 and RCC 15 × P 17 were good specific combinations for siliquae/plant. The cross DIRA 337 × P17 for secondary branches/plant and RCC 15 × RLM 619 for plant height was potential one exhibiting high sca effects. These crosses involved one of the parents as good general combiner and the other as an average combiner, could throw agronomically superior segregants. For effective utilization of these cross combinations, it is suggested to make inter se crosses among these combinations so as to have a multiple parents input in a central gene pool which will supplement genetic recombinations and will break undesirable linkages.

Higher combining ability of natural *B. juncea* may be due to their well adapted gene complexes in which the two genomes (A genome from *B. campestris* and B. genome from *B. nigra*) have coadapted. Poor combining ability of synthetic *B. juncea* may be due to cytoplasmic-nuclear interaction between A and B genomes. Though the adaptation may increase with the passage of time, but one has to be cautious while using synthetic *B. juncea* in a breeding programme.

## REFERENCES

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