

## Studies on the relationship among *per se* performance, combining ability effects and heterosis in rice (*Oryza sativa* L.)

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### SUMMARY

A nine parent full diallel revealed the importance of both additive and non-additive gene actions in the expression of all the sixteen traits of interest. The parents *viz.*, ADT 44 and CR 1009 were found to be a good general combiners for grain yield per plant. The heterosis values when considered alone were misleading, as there was no correspondence with *per se* performance. Best specific crosses involved parents with low *gca* effects, implying the need for heterosis breeding and recurrent selection for specific combining ability programme in the segregating generations for substantial improvement of grain yield per plant.

Key words : Combining ability effects, Heterosis, *Oryza sativa* L.

**R**ice (*Oryza sativa* L.) is grown extensively in India and Asia. There is a wider scope for exploitation of heterosis. Proper choice of parents for hybridization is very crucial in generating heterotic hybrids. Further, relevant information about the inheritance of different quantitative characters play an important role in deciding proper selection strategies besides creation of variability. In this study, nine elite strains of rice were utilized in a full diallel crossing programme (including reciprocals) to obtain information on the combining ability, inheritance of grain yield and its component traits and heterotic potential.

### MATERIALS AND METHODS

Nine parents of rice *viz.*, ADT 37 ( $G_1$ ), Tulasi ( $G_2$ ), IR 50 ( $G_3$ ), ADT 38 ( $G_4$ ), Sasayasree ( $G_5$ ), IR 64 ( $G_6$ ), ADT 44 ( $G_7$ ), CR 1009 ( $G_8$ ) and IR 20 ( $G_9$ ), were selected based on their differences in their maturity period. Seventy two crosses were obtained by crossing them in full diallel, including reciprocals. The experiment was laid out in randomized block design with three replications, during December, 2001. Each entry was grown in three metre long row with a spacing of 20 × 15 cm. Observations were recorded on five randomly selected plants in each plot on sixteen quantitative traits. The statistical analysis of combining ability based on mean values was done as per method I and model I of Griffing (1956). The  $F_1$  hybrid performance was calculated as the estimates of heterosis over mid-parent

(Matzinger *et al.*, 1952). The scores of +1 and -1 were given to *gca* values being significant in desirable and undesirable directions, respectively, while zero score was given to non-significant *gca* values. Parents were classified as high (H), average (A) and low (L) combiners on the basis of their over all *gca* effects. Parents with over all *gca* effects of more than one were considered as high combiners while parents with zero over all *gca* effects were classified as average combiners. Low combiners had negative overall *gca* effects.

### RESULTS AND DISCUSSION

Analysis of variance revealed significant genotypic differences among all the sixteen characters, thus justifying the use of material in the present study (Table 1). Analysis of variance for combining ability (Table 2) revealed significant GCA and SCA variances for all the sixteen characters studied. The reciprocal effects were also significant for all the sixteen characters of interest. It suggested the importance of both additive and non-additive gene actions in the expression of the traits and also indicating the presence of reciprocal effects. In such a situation, reciprocal recurrent selection may be resorted to, for population improvement. The result is in confirmity with the findings of Jain Ying Peng and Virmani (1990) and Singh *et al.* (1995).

It is evident that the parents *viz.*,  $G_7$  (ADT 44) showed significant *gca* effects for total number of tillers per plant, number of productive tillers per plant, boot

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