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Combining ability analysis for yield and its component characters in rice (*Oryza sativa* L.)

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SUMMARY

Combining ability analysis performed on a 9 ´ 9 diallel showed that GCA, SCA variances and reciprocal effects were significant for all the six characters of interest. The parent variety ADT 44 portrayed significant positive *gca* effects for number of productive tillers per plant, number of filled grains per panicle, 100 grain weight, biomass per plant, grain yield per plant and harvest index. In general, in the expression of high *sca* effects, all the combinations of parents namely those with high ´ high, high´ low and low ´ low *gca* effects were involved. For improvement of crop, biparental mating approach, reciprocal recurrent selection and diallel mating design would be appropriate in utilizing both type of gene effects.

Keywords: Rice, Combining ability, *GCA* effects, *SCA* effects.

India has the largest area under rice (44.6 m.ha), which accounts for almost 30 per cent of the worlds rice area. The annual rice production of India has been worked out to be 87 million tonnes (Venkatramani, 2005). At the current rate of population growth, rice production has to be enhanced to about 125 million tonnes by 2020 (Mishra, 2005). Studies on combing ability in rice will be useful in evolving high yielding hybrids, which in turn would be useful in solving our future food problem. Hence, the present study was formulated to bring out the combining ability of nine parents of rice, differing in maturity periods.

MATERIALS AND METHODS

Nine diverse rice genotypes with variable maturity period Tulasi, ADT 37, IR 50 (short duration); IR 64, Sasayasree, IR 20 (medium duration) and ADT 38, ADT 44 and CR 1009 (long duration) were mated in a 9 ´ 9 diallel fashion resulting in 72 F_1's. These F_1 hybrids along with their parents were grown in a randomized block design with three replications, during December, 2001. Each experiment plot comprised of a single row of 3.0 m length, with a spacing of 20 cm between rows and 15 cm between plants within a row. The crop was maintained under irrigated transplanted conditions under normal fertility levels. The data were recorded on five random plants per entry per replication. The data were complied and subjected to combining ability analysis of Griffing (1956) model I (fixed) method 1.

RESULTS AND DISCUSSION

The analysis of variance for combining ability is presented in Table 1. It shows significant GCA and SCA variances for all the six characters under investigation. The reciprocal effects were also significant for all the characters studied. It suggested the importance of additive and non-additive gene actions in the expression of the traits and also indicating the presence of reciprocal effects. The present results are in accordance with the findings of Jain Ying Peng and Virmani (1990); Singh and Singh (1993); Singh *et al.* (1995). In our study, higher magnitude of GCA variances than the SCA variances were recorded, for all the six characters. It indicated a predominant role of additive genetic variance which was fixable. These findings are in agreement with those of Yadav *et al.* (1999); Meenakshi and Amirthadevarathinam (1990) and Singh and Sing (2004). Non-additive effects are also important in the preset materials. Such gene action was also reported by Narasimman (2006).

The estimates of *gca* effects (Tables 2 - 7) showed that the parent ADT 44 was a good general combiner for number of productive tillers per plant, number of filled grains per panicle, 100 grain weight, biomass per plant, grain yield per plant and harvest index. The parent IR 50 was a good general combiner for number of productive

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