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Heterosis, Combining Ability and Genetic Relationship of Selected Parent Lines for Hybrid Rice Development

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Abstract

Combining ability analysis is one of the powerful tools available to estimate combining ability effects and aids in selecting desirable parents and crosses for exploitation of heterosis. The performance of parents and crosses can be measured through combining ability effects. Therefore, gathering information on nature of gene effects and their appearance in terms of combining ability is essential.

In this study, the combining ability of 11 restorer lines and three widely used CMS lines was evaluated using the line \times tester mating design. It specifically aimed to (1) quantify the level of heterosis of the generated hybrids, (2) determine the yield performance of tested single cross hybrids and identify male parent with highest restoring ability, (3) determine the general and specific combining ability of 11 restorer lines and three female parents for different quantitative traits, and (4) estimate kinship among parent lines using markers. GCA and SCA effects across yield and its component were analysed. Neighbour-joining trees based on genetic similarity were constructed and were visualised in MEGA5.2

The top five hybrids namely; PR47775H, PR47774H, PR47794H, PR47800H and PR33875H were identified to have high heterotic effects and product of good line and tester combiners. Correlation analysis revealed that GCA effect and per se performance of lines had significant positive relationship. Also, lines that did not show its high per se performance to all the traits can also be a good combiner. Analysis of variance for yield and other agronomic characters showed significant difference among genotypes in days to maturity, plant height at maturity, productive tiller count, panicle length, filled grains per panicle, total spikelet count, spikelet fertility, 1000 grain weight, grain length and width, and grain yield.

Keywords: Combining ability, GCA effect, heterosis, line \times tester, SCA effect