ASSESSING HYBRID RICE VARIETIES USING DIALLEL ANALYSIS

WITH SPECIAL REFERENCE TO GRAIN QUALITY

By

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Thesis

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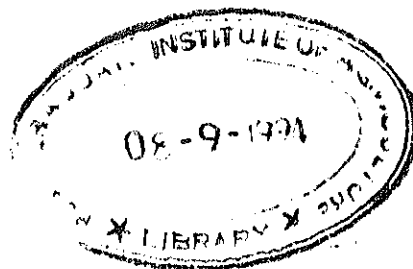

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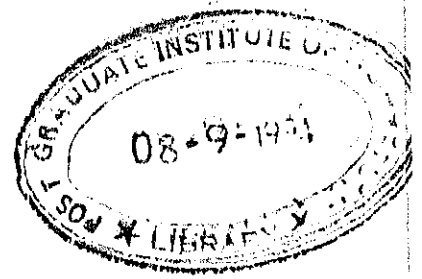UNIVERSITY OF PERADENIYA

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ABSTRACT

The genetics of some grain quality characters as well as some morphological and yield characters were studied in the F_1 generation of a 5 x 5 half-diallel set of crosses among a fixed set of inbred lines of rice (Oryza sativa Linn.). The data were analyzed using the combining ability analysis and W_r/V_r graphical analysis.

Both general combining ability (gca) and specific combining ability (sca) were significant in almost all the characters. The predictability factor given by $2\sigma^2_{gca}$ / $(2\sigma^2_{gca} + \sigma^2_{sca})$ was high for plant height, days to heading, kernel length, kernel breadth, kernel shape, amylose % and cooking time indicating the importance of additive gene action in predicting progeny performance for these characters. For number of tillers per plant, number of panicles per plant and protein content non-additive gene effects appeared to be more important than additive gene effects. In the remaining characters - number of grains per panicle, 100-grain weight, total milling yield % and kernel elongation ratio - the predictability factors were about 0.50 indicating that both additive and non-additive types of gene actions were of equal importance, in the inheritance of these characters. For the characters which indicated high non-additive genetic variation, non-allelic interactions were detected.

Partial dominance was recorded for plant height, days to heading, kernel length and kernel shape while the rest of the

characters showed complete dominance by the W_r/V_r graphical analysis. Over dominance was not recorded.

Significant heterosis was observed in number of tillers per plant, number of panicles per plant and protein content.

Very little heterosis and high additive genetic variance in this material suggested the possibility of achieving considerable genetic advance in these traits by isolation of superior recombinant inbred lines from the F_1's through an effective selection procedure.

None of the parents nor specific cross combinations excelled in all the characters. Among the parents studied, the best combiners regarding yield component characters were Bg 350 and Bg 380 for number of panicles per plant, Bg 400-1 and H_4 for number of filled grains per panicle, and Bg 380 and H_4 for 100-grain weight. Bg 380 and Bg 350 were good combiners for long kernels as well as high kernel length/breadth ratio. Bg 34-6 was a good combiner for intermediate kernels and low kernel length/breadth ratio. Bg 350 had the highest protein content and exhibited the highest gca effects. Bg 380, H_4 and Bg 34-6 were good combiners for total milling yield. Bg 34-6 was the best general combiner for kernel elongation. The lowest cooking time and the lowest gca effects were exhibited by Bg 350. The best specific combinations were Bg380 x Bg34-6 for number of panicles per plant and Bg 400-1 x H_4 for 100-grain weight.