DEVELOPMENT OF THREE LINE RICE HYBRIDS USING NEW PLANT TYPE INTER-SUB SPECIFIC *(indica/japonica)* DERIVATIVE LINES

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Extended Summary

Discovery of wide compatibility genes (Ikeshahi and Araki, 1984) in rice recently has shifted the thrust on enhancing heterosis from current level of *indica/indica* hybrids to *indica/japonica* hybrids (Yuan, 1990) as it has enabled to be real possibility. For the development of three-line rice hybrid using *indica/japonica* derived lines, it is necessary to have heterotic three lines from such derivatives. Their parental lines includes a cytoplasmic male sterile (CMS) line (A line), maintainer line (B line) that is similar to A line with respect to nuclear genome but is male fertile and a restorer (R) line for restoring fertility in the hybrid (F_1). Therefore, the first step in this direction involves development and identification of effective and stable restorer (R line) and maintainer lines (B line) in Bangladesh condition. Test crossing (CMS × Source line) is the first basic step in hybrid rice breeding program to identify restorer and maintainer on the basis of fertility/sterility of pollen and spikelet in the resulting hybrids.

A 2- years project was thus conducted during June 2005 to May 2007 with the financial support of SAURES (Sher-e-Bangla Agricultural University Research System), where first experiment entitled "Identification of potential maintainers and restorers from *indica/ japonica* derivatives" was conducted in Aman season, 2005 and second experiment entitled "Conversion of selected maintainers possessing desirable plant type into CMS line" was conducted in Rabi season 2005-2006. The other experiment entitled "Development and evaluation of new plant type based hybrids" and "conversion of selected maintainer lines into new CMS lines" was conducted in Aman season 2006 and evaluation of hybrids will be conducted in the next Boro season, 2006-2007.

The experimental materials consisted of one hundred test cross progenies derived from *indica/japonica* lines, one hundred pollen parents and one CMS line (IR25A). Out of 100 test crosses, 10 test cross hybrids either did not germinate or numbers of plants were insufficient therefore the data relating to present study were recorded on 90 crosses.

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Pollen sterility/fertility was used as the indices to classify pollen parents of test crosses into different categories following the method of Govinda Raj and Virmani (1988).

The study showed that out of 90 pollen parents, 50 were restores (55.56%), 14 were partial restorer (15.56%), 5 were partial maintainers (5.56%) and 21 were complete maintainers (23.33%).

A uniformity and homogeneity of restorer lines is important for their use in development of hybrids. In the present study, out of 50 restorer lines, 31 lines were selected on the basis of crop uniformity of the respective hybrids for agronomic traits for further evaluation. On the basis of mean performance of uniform testcross hybrids, the restorer lines were scored in different scale proposed by IRRI (1980) for proper identification. On the basis of overall score for the characters studied, all the 31 restorer lines were ranked.

The restorer genotypes having the lowest score of scale were placed in the top rank (I) and the restorer genotypes having the highest score of scale had been placed in the lowest rank (XII). Following the pooled approach, the restorers having the rank I to V (14 restore genotypes) were considered as potential restorer for producing experimental hybrids in the next crop season (Table 1).

Besides perfect pollen sterility, the maintainers should possess good agronomic characters with suitable desirable floral traits for enhancing out crossing rate. For achieving these objectives, the mean performance of morphological and agronomic characters of test cross hybrids (CMS line) were also measured and scored using different scales proposed by IRRI (1980) for identification of potential maintainers. Uniformity of the maintainer line is very important for conversion and use as CMS line in hybrid breeding. In the present study 4 test cross hybrids showing complete male sterility lacked in morphological uniformity. Therefore, 17 uniform lines out of 21 lines were selected for further data recording. All the 17 maintainer lines induced in the present study have been ranked based on overall score for the characters studied.

Table 1. List of selected top ranking (score I to V) restorer lines on the basis of desirability characterization

Sl. No.	Test cross No.	Total score	Rank
1.	TC-76	17	I
2.	TC-35	23	II
3.	TC-15	25	III
4.	TC-51	25	III
5.	TC-74	25	III
6.	TC-32	31	IV
7.	TC-47	31	IV
8.	TC-68	31	IV
9.	TC-70	31	IV
10.	TC-71	31	IV
11.	TC-10	33	V
12.	TC-41	33	V
13.	TC-42	33	V
14.	TC-96	33	V

This was done on the basis of sum of scores. The ranking was done from I to VI. The hybrids having the highest score received the lower ranking VI. Following this pooled approach, the maintainers' genotypes having the rank I and II had been considered for conversion into new CMS lines. On the basis of ranking 7 maintainer lines were qualified for conversion into new CMS lines in the next crop season (Table 2).

Table 2. The list of selected maintainer lines securing the rank I to III

Sl. No.	Test cross No.	Total score	Rank
1.	TC-44	15	I
2.	TC-53	15	I
3.	TC-87	15	I
4.	TC-63	17	II
5.	TC-23	19	III
6.	TC-58	19	III
7.	TC-91	19	III

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