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## Crossability in Some Wild and Cultivated Rice (*Oryza sativa* L.) Genotypes From Different Ecotypes of Bangladesh

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**Abstract:** An experiment was carried out to study the crossability and genetic relationship in  $F_1$ 's of two wild and three cultivated rice genotypes viz., Wild 4855, Jhora 4325, Dular, Hab. Aman 2 and Jagliboro. Seed set percentage in diallel progenies (without reciprocal) of five rice genotypes ranged from 4.91 to 65.77%. Crossability of Jhora 4325 was highest with Jagliboro followed by Hab. Aman 2, Dular and Wild 4855 that indicate the closeness of the genotypes with each other. Among the cultivated genotypes crossability of Dular with Jagliboro was highest followed by Hab. Aman 2, Jhora 4325, respectively. On the other hand Hab. Aman 2 showed highest crossability with Jagliboro followed by Jhora 4325. Jagliboro showed higher crossability in all the crosses, which could be count as a key genotype in the evolutionary process of the five rice genotypes.

**Key words:** Rice (*Oryza sativa* L.), cross ability, genetic relation

### INTRODUCTION

Rice is a self-pollinated crop. Rice species or genotypes from different ecotypes when crossed inter or intra specific crossing barrier occurs. Pre and post hybridization barriers discouraged researchers in phylogenetic study of rice germplasm. To determine whether or not a plant species is closely related to another, it is necessary to specify the criteria for evaluating inter-relationships between varieties belonging to different species. There are different criteria available to determine such relationships among the genotypes. According to Stebbins (1958) the relationship between morphological characteristics, as a fundamental of taxonomy and presence or absences of reproductive barriers before and after crossing are the two important ways. Crossability between two different species is the percent seed set after crossing, which is good measure of genetic affinity among and between the genotypes of the respective crops. The difficulty in the production of interspecific hybrids varies to greater extent. Bangladesh has high diversity of rice genotypes including land races, cultivars and wild, grown in different ecotypes and season. Cultivated rice genotypes are usually grown in three different seasons: Aus, Aman and Boro, so there may be some reproductive barriers in crosses with the wild genotypes. There is hardly any data on crossability, pre and post hybridization barriers of

using rice genotypes from different ecotypes. The objective of this study was to find out whether there is any post hybridization barriers present or not and crossability among and between some rice genotypes.

### MATERIALS AND METHODS

Two wild and three cultivated (traditional) rice genotypes viz., Wild 4855, Jhora 4325, Dular, Hab. Aman 2 and Jagliboro were crossed following half diallel mating design in all possible combinations without reciprocals. Designations and primary source of collection with accession of five rice genotypes included in the study are presented in Table 1. Crosses were made in two seasons. The experiment was carried out at the field laboratory of the Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh during the Aman and Boro season of 2001-2002. Seeds were harvested 21-25 days after pollination. Data were collected from 10 cross combinations on number of florets

Table 1: Designations and primary source of collection with accession of five rice genotypes included in the study

Designation	Accession	
	GRS-BRRI	Primary source/GRS-BRRI
Jhora (Wild)	4325	Wuzirpur, Barishal /GRS-BRRI
Wild	4855	Mollarhat, Khulna/GRS-BRRI
Jagliboro (Deshi Boro)	1806	Khaliajuri, Kishorgonj/ GRS BRRI
Hab. Aman 2	3916	GRS-BRRI
Jhora (Wild)	4326	Wuzirpur, Barishal/GRS-BRRI

pollinated and total number of seed set. Crossability (percent seed set) was expressed as the percentage of seed set in hand pollinated florets and was calculated as follows:

$$\text{Crossability} = \frac{\text{Total No. of seed set}}{\text{Total No. of florets pollinated}} \times 100$$

## RESULTS AND DISCUSSION

Crossability (percentage of seed set) in the two wild and three cultivated (traditional) rice genotypes obtained from the 10 cross combination are presented in Table 2. Seed set percentage of crosses with Wild 4855 (Female parent) and Dular, Hab. Aman 2, Jagliboro, Jhora 4325 ranged from 4.91% to 27.70, which indicates the wide variation in seed set (Table 3). Anyway the crosses with wild 4855, highest seed set was found between the cross-Wild 4855 and Dular (27.7%). In comparison with Wild 4855 and Dular cross, seed set percentage did not exceed even half of Wild 4855 × Dular, in crosses Wild 4855 × Hab. Aman 2 (10.86%) and Wild 4855 × Jagliboro (7.76). Seed set percent between Wild 4855 and Jhora 4325 was lowest (4.91%), these two genotypes are not cultivated. Dular a cultivated Aus genotype when crossed with Hab. Aman 2, Jagliboro and Jhora 4325 seed set ranged from 18.91% to 52.06. Highest seed set was found in the cross Dular × Jagliboro and lowest in Dular × Jhora 4325. Seed set between Dular and Hab. Aman 2 was 44.48%. Seed set percentage in these crosses did not vary so much and found good. In cross Hab. Aman 2 × Jagliboro was 65.77%, which was highest from all other crosses. Hab. Aman 2 when crossed with Jhora

4325, the setting percentage was 25.72% which is less than half in comparison with seed set recorded in cross Hab. Aman 2 × Jagliboro. On the other hand seed set percent was 50.27% in the cross Jagliboro × Jhora 4325.

Overall seed set percentage varied in the genotypes, which is remarkable. Seed set percentage ranged from 4.91 to 65.77%. While the cultivated genotypes used as female parent in the crosses the seed set percentage was higher. In the crosses with Wild 4855 the seed set percentage was comparatively low. Jhora 4325 showed an increasing level of seed set percentage with the cultivated genotypes than the Wild 4855. Sitch *et al.* (1989) used IRRI rice cultivars as female parent in crosses with wild rice and obtained seed set ranging from 9 to 73%. In his study it was also mentioned that 4.3 to 19.7% seed set percentage as good seed set in crosses using wild and cultivar as parent material. Chu *et al.* (1969) also found seed set rate 39 to 42% in interspecific hybridization. In the present study a similar range of seed set was obtained with the wild and cultivated rice genotypes crosses, suggesting the chance of difference in crossability among the genotypes is low. It's also indicates that the genotypes may be originated in the same process of evolution. No embryo rescue was needed and all the genotypes in their crosses produced well-developed seeds. Except in crosses viz., Wild 4855 × Hab. Aman2, Wild 4855 × Jagliboro and Wild 4855 × Jhora 4325 where the seed set percentage was comparatively low because the seeds were degenerated after two to three weeks in some pollinated spikelets. Such type of seed degeneration was also reported by Sitch *et al.* (1989) in his experiment with wild rice and IRRI rice cultivars. Infact, the cultivated genotypes in the present study are usually grown in three different seasons: Aus, Aman and Boro, so the variation in the crossability in the wild and cultivated genotypes was not unexpected. Tao *et al.* (1999) found great variation in different season for interspecific crossability in rice using wild and cultivated rice.

Crossability result indicated that among the studied rice genotypes Jhora 4325 and Jagliboro showed high cross ability with other genotypes. Comparatively Jagliboro showed remarkable crossability both with wild and cultivated rice. Five rice genotypes in the present study showed no strong post hybridization barrier. On the other hand good range of seed set percentage revealed genetic affinity among and between the rice genotypes.

Table 2: Crossability in F<sub>1</sub>'s derived from crosses of 2 wild and 3 cultivated rice genotypes

Cross combinations/cross	No. of florets pollinated	No. of seeds set	Crossability (%) (Seed set percentage)
Wild 4855/Dular	397	110	27.70
Wild 4855/Hab. Aman 2	828	90	10.86
Wild 4855/Jagliboro	1094	85	7.76
Wild 4855/Jhora 4325	1769	87	4.91
Dular/Hab. Aman 2	290	129	44.48
Dular/Jagliboro	194	101	52.06
Dular/Jhora 4325	497	94	18.91
Hab. Aman 2/Jagliboro	149	98	65.77
Hab. Aman 2/Jhora 4325	311	80	25.72
Jagliboro/Jhora 4325	183	92	50.27

Table 3: Mean, range, standard deviation and standard errors in 10 cross combinations of five rice genotypes for different characters

Characters	Mean	Range	SD	SE
No. of florets pollinated	571.2	149-1769	519.385	164.244
No. of seeds set	96	80-129	14.238	4.502
Crossability (%) (Seed set percentage)	30.844	4.91-65.77	21.126	6.681

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