

Rice Landraces of Bangladesh: Mutation in the *waxy* and *Rc* genes.

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ABSTRACT

Most Bangladeshi rice varieties are Indica and nonglutinous. However, glutinous rice also exists, for example, Beruin varieties. Glutinous rice produces cohesive grains and are therefore of importance in festivals where the main food item is rice cake. Some of these glutinous rice varieties are red in color. The red pericarp color of rice is of much significance due to its nutritional, evolutionary and domestication history

Glutinous rice contains much higher level of amylopectin compared to nonglutinous rice and high amylopectin is easy for digestion, therefore it has a high glycemic index. This is due to lack of the synthesis of the starch amylose, because of a defect in the gene (*waxy*) for granule-bound starch synthase. This defect is due to G to T mutation, which causes defective splicing of the gene transcript. The amylose content in nonglutinous rice however varies considerably, apparently because of the suppression of the *waxy* gene mutation due to sequences elsewhere. The *waxy* gene from both glutinous and nonglutinous varieties was sequenced in an attempt to find the G to T mutation or suppression in Bangladeshi landrace. There were two SNPs found to be unique for Bangladeshi glutinous and nonglutinous landraces compared to database sequences in the promoter for the *waxy* gene. SNPs found in this study may therefore be indicative of the origin of Bangladeshi rice.

Some glutinous varieties included in the study were also red in color. Knowledge on genetics of red rice is important to avoid the transfer of herbicide resistance property of weedy red rice as well as to implement good features like disease resistance trait. Among them some red and white accessions were found with the same name and could not be distinguished visually unless dehulled. It was found in a study that either a 14 bp deletion or a C to A mutation in the red pericarp regulating gene *Rc* which encodes a bHLH transcription factor can turn a rice from red to white. For this purpose a portion of the *Rc* gene was sequenced and the 14 bp deletion was found in white Bangladeshi varieties under study. In addition, rice microsatellite fingerprinting of Non Glutinous and Glutinous rice varieties with both red and white pericarp were performed for characterization and dissimilarity analysis. The dendrogram from the study could differentiate the glutinous varieties from others and the heterozygosity analysis could differentiate the red and white varieties with the same name as different accessions.

In future more varieties can be collected from different parts of Bangladesh for analyzing sequence variation. The evolutionary linkage of these varieties with respect to global rice accessions can be made by comparison with database sequences.