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Marker-assisted Incorporation of Major Gene Resistance in Aromatic Landrace

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Abstract—*Short grained aromatic rices are popular across the country and are supposed to be a part of rich cultural heritage of unique quality rice types usually grown in specific ecological niches. Besides, cultivation of important high yielding varieties, considerable area is planted under aromatic landraces in J&K State of India and include Mushk Budji and Kamad which are highly priced and enjoy huge demand in domestic markets. Mushk Budji, however, is highly susceptible to rice blast and is losing its area because of frequent crop failures.*

Therefore, an initiative was taken to incorporate three major genes viz., Pi54, Pi1 and Pita in the genetic background of Mushk Budji using a three-gene donor line, DHMAS70Q 164-1b. The two were crossed and BC_1F_1, BC_2F_1 and BC_3F_1 progenies were generated through marker-assisted backcross breeding. Marker-assisted foreground selection was conducted using gene based molecular markers in order to select for genes Pi54, Pi1 and Pita, respectively. In BC_1F_1, foreground selection was carried on 17 plants for the genes Pi54, Pi1 and Pita of which a single plant (SKUA-485-27) was found to be heterozygous for all the three genes and was advanced to BC_2F_1. Of the 11 BC_2F_1 plants, three were found carrying all the three genes. In BC_2F_2 foreground selection helped to identify homozygous plants for all the three genes. The marker-assisted background selection was performed using 78 genome wide markers. Finally, 10 three-gene pyramids carrying genes Pi54+Pi1+Pita were developed which included the lines namely SKUA-485-27-4-38, SKUA-485-27-4-40, SKUA-485-27-7-3, SKUA-485-27-77, SKUA-485-27-47. They represent the BC_1F_3 and BC_2F_2 generations and recorded the background genome recovery ranging from 82.7 to 91.0%. The derived lines expressed resistance to diagnostic isolates under controlled conditions and also showed resistance under natural conditions at three locations. The pyramided lines possess cooking quality traits and aroma similar to recurrent parent Mushk Budji.

Keywords*: Rice, landrace, Mushk Budji, blast, gene, pyramiding, markers.*