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Paper presented at the International Rice Congress 2023 from October 16-19 in Manila, Philippines.

Genetic Variation of Blast (Pyricularia oryzae Cavara) Resistance in Rice Lines Carrying Chromosome Segments of Oryza longistaminata in the Genetic Background of Kernel Basmati

Rena Tomita1 , Vincent Reyes2 , Yoshimichi Fukuta3,4 , Emily Gichuhi5 , Mayumi Kikuta6 , Daniel Menge5,7 , Kazuyuki Doi2 , Daigo Makihara1

1 International Center for Research Education in Agriculture, Nagoya University, Nagoya, Japan. 2 Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya, Japan. 3 Japan International Research Center for Agricultural Sciences, Tsukuba, Japan. 4 Graduate School of Agriculture, University of the Ryukyus, Nishihara, Japan. 5 Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya. 6 Graduate School of Integrated Sciences for Life, Hiroshima University, Higashi-Hiroshima, Japan. 7 International Rice Research Institute, Kenya

In the Mwea irrigation scheme, the largest rice growing area in Kenya, Basmati varieties have been produced in monoculture since the late 1980s. This has resulted in the breakdown of the resistance (R) gene-mediated response of local Basmati varieties to blast disease caused by Pyricularia oryzae Cavara. To enhance the blast resistance in Kenyan Basmati varieties, suitable bleeding materials for Basmati with effective R genes against local blast isolate are necessary. Longistaminata chromosome segment introgression lines (LCSILs) with the Kernel Basmati genetic background developed using a rice line called potential low-input adaptable-1 (pLIA-1) derived from a cross between Taichung 65 (T65), a japonica rice variety, and O. longistaminata. LCSILs are expected to harbor the useful R genes derived from T65 or O. longistaminata. The aim of this study was to identify the genomic regions associated with blast resistance in LCSILs. In this study, we investigated the genetic variation of LCSILs and their parents by using new differential system based on gene-for-gene theory and molecular characterization using single nucleotide polymorphism (SNP) makers. In addition, blast resistance of LCSILs in the field at Mwea was evaluated. LCSILs and their parents were classified into three groups—A, B1, and B2—based on reaction patterns to the standard differential blast isolates (SDBIs). Group A, including pLIA1, showed the highest resistance in all groups, followed by groups B1 and B2. Kernel Basmati in group B1 was considered to possess Pik-p or Pi7(t), Pi19(t), and other unknown R genes. Besides these R genes, LCSIL 6, 12, 27, 28, and 40, in group A, were determined to possess one of Pish, Piz-t or both genes that confer resistance to the Kenyan blast isolate. In the field test for two years, pLIA-1 and LCSIL 28 carrying Pish and Piz-t showed high level of resistance while Kernel Basmati was susceptible. Moreover, LCSIL 39 in Group B1 showed moderate resistance so that it was expected to possess the new R gene. These elite lines can be used for efficiently pyramiding blast R genes in the local Basmati varieties.

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