Transgenic Pearl Millet Male Fertility Restorer Line (ICMP451) and Hybrid (ICMH451) Expressing Brassica juncea Nonexpressor of Pathogenesis Related Genes 1 (BjNPR1) Exhibit Resistance to Downy Mildew Disease

Ramadevi Ramineni., Vijayakumar Sadumpati., Venkateswara Rao Khareedu, Dashavantha Reddy Vudem*

Centre for Plant Molecular Biology, Osmania University, Hyderabad, Andhra Pradesh, India

Abstract

Brassica juncea Nonexpressor of pathogenesis-related genes 1 (BjNPR1) has been introduced into pearl millet male fertility restorer line ICMP451 by Agrobacterium tumefaciens-mediated genetic transformation. Transgenic pearl millet plants were regenerated from the phosphinothricin-resistant calli obtained after co-cultivation with A. tumefaciens strain LBA4404 harbouring Ti plasmid pSB111-bar-BjNPR1. Molecular analyses confirmed the stable integration and expression of BjNPR1 in transgenic pearl millet lines. Transgenes BjNPR1 and bar were stably inherited and disclosed co-segregation in subsequent generations in a Mendelian fashion. Transgenic pearl millet hybrid ICMH451-BjNPR1 was developed by crossing male-sterile line 81A X homozygous transgenic line ICMP451-BjNPR1. T3 and T4 homozygous lines of ICMP451-BjNPR1 and hybrid ICMH451-BjNPR1 exhibited resistance to three strains of downy mildew pathogen, while the untransformed ICMP451 and the isogenic hybrid ICMH451 plants were found susceptible. Following infection with S. graminicola, differential expression of systemic acquired resistance pathway genes, UDP-glucose salicylic acid glucosyl transferase and pathogenesis related gene 1 was observed in transgenic ICMP451-BjNPR1 and untransformed plants indicating the activation of systemic acquired resistance pathway contributing to the transgene-mediated resistance against downy mildew. The transgenic pearl millet expressing BjNPR1 showed resistance to multiple strains of S. graminicola and, as such, seems promising for the development of durable downy mildew resistant hybrids.

References


