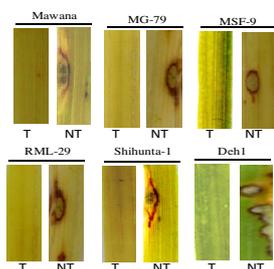


Gene construct of rice blast resistance gene *Pi54rh* and rice transgenic lines



Reaction of rice transgenic lines containing blast resistance gene *Pi54rh* to six strains of *Magnaportheoryzae*. T- transgenic; NT- non transgenic.

Technology description: Rice blast caused by *Magnaportheoryzae* (Herbert) Barr is one of the most widespread and devastating diseases of rice. The rice crop is vulnerable to this pathogen from seedlings to adult plant stages affecting leaves, nodes, collar, panicles and roots. It is estimated that each year, amount of the cereal grain destroyed by this disease could feed 60 million people. Because of severe damage caused by this disease, rice blast has been listed as a significant "potential biological weapon" by the Centre for Disease Control and Prevention, Atlanta, USA and is equally important in Indian context. Management of rice blast through host resistance is considered as one of the best available options. Wild species of rice are treasure trove harboring a number of useful resistance genes in their genome. The resistance gene against grassy stunt virus from *O. nivara* and the blast resistance gene *Pi9* (t) from *O. minuta* are two such examples. A dominant gene *Pi-k^h* (*Pi54*) present in *indica* rice line Tetep, associated with resistance to rice blast disease prevalent in North-western Himalayan region has recently been mapped and cloned. PCR based allele mining of the *Pi-k^h* (*Pi54*) gene from blast resistant wild species *Oryzarhizomatis* might be a prudent alternative to combat the dreaded disease.

Name of the Institute: National Research Centre on Plant Biotechnology, New Delhi

Stage of Development: The gene construct is ready for use in developing rice lines resistant to blast & transgenic lines are available to be used as donor

Patent/IPR status: The patent application has already been filed on this novel gene

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Background: We isolated the orthologue of *Pi54*, *Pi-rh* from the blast resistant wild species of rice, *Oryzarhizomatis* using allele mining approach. The intronless 1447 bp *Pi-rh* transcript contains 101 bp 5'-UTR, 1083 bp coding region and 263 bp 3'-UTR. The transmembrane localized PIRH protein has two LRR domains, a unique Zinc finger (C₃H type) domain, and rudimentary CC and NB domains. This is in sharp contrast to all rice blast resistance genes characterised so far which are said to belong to intra-cellular NB-LRR type R proteins. *Pi-rh* was found to express constitutively at basal level in the leaves of *O. rhizomatis*, but is upregulated 3.8 fold at 96 h post-pathogen challenge. The predicted presence of glycosylation, myristoylation and phosphorylation sites implicates its role in signal transduction process. The promoter elements contain CAAT box, G box, BH box and WRKY box related to defense response in plants. Functional validation of cloned *Pi-rh* gene using complementation test showed high degree of resistance to several *M. oryzae* strains in transgenic plants.

Benefits and Utility: Present study provides another blast resistance gene in the hands of rice breeders which can be effectively used for the development of resistant varieties. This gene *Pi54rh* has been cloned and characterized from the wild rice species, *O. rhizomatis* having cross-compatibility barriers with cultivated rice, *O. sativa*. However, using transgenic approach, it can be transferred to the cultivated varieties of *O. sativa*. Even transgenic lines developed at NRCPB can be used as donor for the introgression of this gene using MAS. Isolation of such genes using molecular biology approaches and their transfer to the elite cultivated rice lines can be used for blast disease management. It can be used to develop commercial rice varieties or hybrids resistant to the devastating blast disease in a

Country context: The gene construct is ready for developing blast resistant varieties/hybrids in any country

Scalability: The gene construct is available in plasmid transformation vector and ready for use

Business and Commercial Potential: Considering the rice export both in aromatic and non-aromatic categories and also an important part of National Food Security mission has great commercial value

Potential Investors to this technical innovation: Seed companies already working in the areas of rice varieties and hybrid development.

