

Rice blast resistant Recombinant inbred line to be used as donor for *Pi54* blast resistance gene



Leaf and Panicle blast resistant line (nrcpb-lpbd04) (left) and susceptible recurrent parent (right)

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

Stage of Development: The donor line is *indica* type, homozygous and ready for use in MAS

Patent/IPR status: The line is being registered with NBPGR and molecular markers are available to track the gene within the line

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Technology description: Biotic stresses like Rice blast, Bacterial leaf blight, Sheath blight and Stem borer limiting rice productivity where ever rice is grown. Of these stresses, rice blast caused by *Magnaportheoryzae* is a serious constraint in rice production at global level. None of the rice cultivars possesses durable blast resistance because of the highly variable nature of the pathogen. Although chemical control of rice blast disease is feasible yet it remains environmentally unsafe. Developing blast resistance cultivars is important for sustainable management of the disease. More than 100 blast resistance genes have been identified and mapped in different rice genotypes. Of these, more than 20 genes have been cloned by using positional cloning approach. We identified and cloned a durable blast resistant gene *Pi54* (*Pik^h*) from the *indica* rice line Tetep exhibiting resistance to several strains of *M. oryzae*. The *Pi54* gene located on chromosome 11 is a dominant and atypical NBS-LRR gene having unique zinc finger domain. Functional complementation indicated that this gene provides stable and high level of resistance to leaf and neck blast against geographically diverse strains of *M. oryzae* collected from different parts of India.

Background: Rice blast disease can be effectively managed by the resistant varieties of rice. Using conventional approaches, it is relatively difficult to developed resistant varieties because of large linkage drag oftenly associated with the gene of interest. Rice blast resistant gene *Pi54* (*Pikh*) was originally identified and cloned from rice line Tetep. This line is agronomically inferior and late in maturity which affects the segregating population. For the cloning of Blast resistance gene *Pi54* we developed a recombinant inbred line (RILs) population in the background of *Indica* type commercially grown varieties. These RILs are being maintained for the past many years and are now in F₁₃ stage. One of the recombinant inbred lines (nrcpb-lpbd04) has been found highly resistant to leaf and panicle (Neck) blast at the blast "hot spot" location. The gene is tightly linked with SSR and gene based markers, thus can be transferred in any rice varieties using marker assisted selection (MAS).

Benefits and Utility: Blast resistant rice line nrcpb-lpbd04 (where; lpbd stands of Leam and Panicl Blast Donor) is a unique source of blast resistance gene *Pi54* which provides resistance to both leaf and panicle blast. We have also developed DNA markers linked to this gene hence can be used for marker assisted selection. The source of gene and the markers provide an opportunity to the rice breeders in public and private sectors to develop commercial rice varieties or hybrids resistant to the devastating blast disease in a short time.

Country context: The genetic stocks are relevant for the development of blast resistant varieties/hybrids in any country

Scalability: The rice line is *indica* type, homozygous 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