



Rice - Blast Resistance Genes

USDA and university collaborators across the United States

In response to the rice blast pandemics in the 1980s, scientists found two major genes contributing to blast resistance in rice varieties 'Katy' and 'Tetep', then developed several genetic markers to reliably identify these crucial genes. The discovery of these genes and markers for them has enabled rice breeders to use a marker assisted approach when selecting for blast resistance, thereby increasing the speed and accuracy of rice breeding. Thanks to these advances, dozens of other blast resistant rice varieties have been developed and released in the U.S.



Photo by Yulin Jia, USDA-ARS

PROJECT GOALS

- ✓ Uncover the molecular mechanism of rice blast disease resistance
- ✓ Develop genetic markers to identify blast resistance genes
- ✓ Integrate blast resistance into U.S. rice cultivars

Problems Addressed

Rice blast is one of the most damaging rice diseases in the world. Yield loss from this fungal infection depends on varietal susceptibility, the degree of infection, and the timing of fungicide application. Some yield losses associated with blast outbreaks have reached 50% or more. Although fungicides are available to mitigate blast outbreaks, these treatments can exceed \$70 per hectare—a major expense for U.S. growers, who grow 2% of world's rice production.

Solutions Developed

To better understand rice blast disease resistance, USDA scientists performed DNA analyses of two resistant varieties. In 2002, they identified a major blast resistance gene, *Pi-ta*, and developed three genetic markers from it. In 2018, USDA and university scientists discovered *Ptr*, an important gene required for *Pi-ta* to function. The discovery of this new class of resistance genes revealed the molecular mechanisms behind blast resistance. These genetic markers have been used in breeding and release of numerous U.S. cultivars with rice blast disease resistance.



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