

blast fungus *Magnaporthe oryzae* (*M. oryzae*) causes destructive disease and huge yield loss worldwide. Exploiting and breeding rice with broad-spectrum resistance to rice blast is therefore of great value for ensuring global food production.

In a study published in *Nature*, a research group led by He Zuhua from CAS Center for Excellence in Molecular Plant Sciences (CEMPS) of the Chinese Academy of Sciences reported a novel immune-metabolic regulatory network, and made a breakthrough regarding the genetic and [molecular mechanism](#) that confers [rice](#) broad-spectrum resistance against the [blast](#) fungus.

In 2017, He's group identified the broad-spectrum blast resistance gene *Pigm*. In this study, they discovered for the first time that the immune protein *PigmR* governs an [arms race](#) with the fungal virulent effector proteins with a competitive mode that hinges on a critical metabolic pathway of defense molecule production, which synchronize basal defense (PTI) and race-specific defense (ETI).

The researchers first identified a novel plant deubiquitinase, *PICI1*, as an immune hub for PTI and ETI in rice. *PICI1* deubiquitinates and stabilizes methionine synthetases to activate methionine-mediated immunity principally via biosynthesis of the defense phytohormone, ethylene. However, *PICI1* is targeted for degradation by blast fungal virulent effectors, to dampen immunity. In turn, NLR immune receptors, such as *PigmR*, protect *PICI1* from effector-mediated degradation to reboot the methionine-ethylene cascade that operates plant immunity.

Therefore, they uncovered a previously unknown plant host immune proteins-mediated arms race with pathogens, which safeguards primary metabolite biosynthesis and immune operation in plants.

Additionally, the researchers found that the natural variation of *PICI1*

contributes to divergence in field blast resistance between rice subspecies indica and japonica, providing a potential breeding target for broad-spectrum blast resistance in crops.

More information: Keran Zhai et al, NLRs guard metabolism to coordinate pattern- and effector-triggered immunity, *Nature* (2021).
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