

Food security: discovery of a gene for immunity against a disease that ravages rice and wheat crops

The fungus *Magnaporthe oryzae* ravages rice and wheat crops and poses a formidable threat to human food on a global scale. Researchers from INRAE, CIRAD and the Université de Montpellier, together with the Hunan Hybrid Rice Research Centre (HHRRC) and the International Rice Research Institute (IRRI) have discovered a gene in rice for resistance to this pathogen, challenging the findings of a study that remained the reference for 25 years. Published in *Nature Plants* on 4 June, these results pave the way to new solutions to improve disease resistance in crops that are compatible with the development of sustainable agriculture.

Blast disease, caused by the fungus *Magnaporthe oryzae*, is a veritable plague in agriculture. In addition to devastating rice crops – the staple food of 60% of the world's population – it began attacking wheat in the 1980s, across a growing area of distribution and with a serious risk of emergence in Europe.

In this context, researchers from INRAE, CIRAD and the Université de Montpellier, together with scientists from China and the Philippines, analysed the molecular mechanisms behind a natural resistance to blast found in rice. They identified *Ptr*, a new type of disease resistance gene in plants. The presence of this *Ptr* gene makes rice immune to strains of *M. oryzae* that secrete AVR-Pita virulence factor, a protein that, in the absence of this gene, helps the pathogenic fungus invade the plant.

The majority of resistance genes in plants code for antenna-like receptors (proteins) that recognise chemical signals emitted by pathogens.

Ptr, however, codes for a new type of protein, not previously known to be active in plant immune systems. Scientists do not yet understand how this protein works. Unexpectedly, this research invalidates previous reference studies, published in 2000, that reported that another gene named *Pi-ta* and coding for a conventional type of immune receptor was responsible for AVR-Pita detection.

This work paves the way to the study of new resistance mechanisms in plants based on *Ptr* protein and other new components, with the aim of better understanding natural resistance to disease and using it more effectively for crop protection.

Reference

Xiao G., Laksanavilatn N., Cesari S. et al. (2024). The unconventional resistance protein PTR recognizes the *Magnaporthe oryzae* effector AVR-Pita in an allele-specific manner. *Nature Plants*. DOI : <https://doi.org/10.1038/s41477-024-01694-z>

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