Rice can 'borrow' stronger immunity from other plant species, study shows

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Like most other plants, rice is well equipped with an effective immune system that enables it to detect and fend off disease-causing microbes. But that built-in immunity can be further boosted when the rice plant receives a receptor protein from a completely different plant species, suggests a new study led by UC Davis plant-disease experts.

The study findings, which may help increase health and productivity of rice, the staple food for half of the world's population, are reported online in the journal *PLOS Pathogens*.

"Our results demonstrate that disease resistance in rice—and possibly related crop species—could very likely be enhanced by transferring genes responsible for specific immune receptors from dicotyledonous plants into rice, which is a monocotyledonous crop," said lead author Benjamin Schwessinger, a postdoctoral scholar in the UC Davis Department of Plant Pathology.

Immune receptors vary between plant groups:

Receptors are specialized proteins that can recognize molecular patterns associated with disease-causing microbes, including bacteria and fungi, at the beginning of an infection. These receptors are found on the surface of plant cells, where they play a key role in the plant's early warning system.

Some of the receptors, however, occur only in certain groups of plant species.

For example, the monocotyledon plant group, including rice and other grasses that sprout with a single seed leaf, contains different receptor proteins than does the dicotyledon group, including plants like beans, which germinate with two seed leaves.

Borrowed receptors launch stronger immune response:

In this study, Schwessinger and colleagues successfully transferred the gene for an immune receptor from the model plant Arabidopsis, a

member of the mustard family, into rice.

The rice plants that subsequently expressed this gene and produced the related immune receptor proteins were able to sense Xanthomonas oryzae pv. oryzae, an important bacterial disease of rice.

This demonstrated that receptors introduced to rice from the Arabidopsis plants via genetic engineering were able to make use of the rice plants' built-in immune signaling mechanisms and cause the rice plants to launch a stronger defensive immune response against the invading bacteria.

More information: Schwessinger B, Bahar O, Thomas N, Holton N, Nekrasov V, et al. (2015) Transgenic Expression of the Dicotyledonous Pattern Recognition Receptor EFR in Rice Leads to Ligand-Dependent Activation of Defense Responses. *PLoS Pathog* 11(3): e1004809. DOI: 10.1371/journal.ppat.1004809

Similar studies involving the transfer of immune receptors between species are reported in the journals New Phytologist, PLOS Pathogens, and the Journal of Integrative Plant Biology.

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