New Genetic Tool Helps Improve Rice

EurekAlert

U.S. Department of Agriculture (USDA) scientists have developed a new tool for improving the expression of desirable genes in rice in parts of the plant where the results will do the most good.

Roger Thilmony, a geneticist with USDA's Agricultural Research Service (ARS), has shown that the LP2 gene promoter can be used to direct other introduced genes to express beneficial traits in specific plant tissues without the potential for causing unintended consequences. Thilmony works at the ARS Crop Improvement and Utilization Research Unit in Albany, Calif. ARS is USDA's principal intramural scientific research agency.

Rice is under constant threat from pathogens such as rice blast, a fungus found in fields worldwide, and sheath blight, a continuing threat to U.S. growers. Scientists who develop disease-resistant varieties often find that introducing a gene may prevent disease in one part of the plant, but also may reduce seed quality or produce other "side effects" because the gene is expressed throughout the plant. Tissue-specific promoters, such as LP2, are segments of genes that can direct the activity of introduced genes only to parts of the plant where the beneficial traits are needed.

Thilmony and his ARS colleagues Mara Guttman, James Thomson and Ann Blechl found that the gene they named LP2 is consistently expressed in green tissues. In experiments, they fused the LP2 promoter with a "reporter gene" known to produce a specific enzyme, and inserted that fused DNA package into seven lines of rice to see where the enzyme would be produced.

They found that the LP2 promoter steered expression of the reporter gene specifically to green tissues where photosynthesis occurs. The reporter gene enzyme activity was highest in the leaves, and nearly undetectable in the roots, seeds and flower parts.

The LP2 promoter could be used to improve varieties of rice, barley and wheat and could aid in the development of biofuel crops, in which scientists need to control leaf traits without affecting other tissues, according to Thilmony.

The researchers published their work in *Plant Biotechnology Journal* and have filed a provisional patent on use of the LP2 promoter.

This research supports the USDA priority of promoting international food security.

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