Rice Protein Identified that Moderates Resistance to Infectious Disease

September 23 2008

(PhysOrg.com) -- Researchers at the University of California, Davis, have identified a plant protein that is a key player in moderating resistance to infectious disease. The discovery has significant implications for medical and agricultural researchers, particularly those working to improve global rice production.

The protein, called XB15, keeps the plant's immune response from overreacting and damaging the plant.

Findings from the study, led by UC Davis rice geneticist Pamela Ronald, were published today in the journal *The Public Library of Science Biology*.

For more than 20 years, Ronald and her colleagues have been working to better understand the genetics behind how rice plants respond to the environment. They have developed rice plants that can better withstand environmental stresses, such as flooding and infectious diseases.

In 1995, the Ronald lab identified a protein in rice that serves as a "pathogen recognition receptor." Such receptors are proteins found in virtually all higher organisms and are key to controlling the plant and animal response to infection. The researchers found that this particular receptor in rice -- known as XA21 -- was very similar to proteins in humans and other animals that control the innate immune response.

While such immune responses are critical to the survival of the plant or

animal, they do come at a cost. In fact, in humans, the failure to regulate these responses can lead to various diseases, including some cancers.

Scientists have found that most plants or animals have built-in biochemical moderators, known as negative regulators, which keep an organism's immune response in check. These negative regulators make sure that a defense against a perceived pathogen is only mounted when truly needed.

In this recent study, Ronald and her colleagues identified a negative regulator for the XA21 pathogen recognition receptor -- a protein they named XB15.

"This finding gives us a better understanding of how the innate immune response is controlled," said Ronald, who chairs UC Davis' Plant Genomics Program.

Ronald and colleagues have shown that rice plants carrying an altered XB15 protein have enhanced resistance to bacterial leaf blight, which causes a serious bacterial disease of rice. They also discovered that if this protein is excessively produced in rice plants carrying the XA21 resistance gene, it could actually compromise the plant's ability to defend against the disease.

"This information should help us to develop hardier, more productive rice plants that can better meet the worldwide demand for rice," Ronald said. She noted that in parts of Asia, bacterial leaf blight has been known to reduce annual rice yields by as much as 60 percent.

"Rice is the staple food for more than half the world's population," Ronald said. "In developing countries, such significant crop losses translate directly into human suffering."

Collaborating on this study with Ronald were Chang-Jin Park, Ying Peng, Xuewei Chen, DeLing Ruan, Patrick E. Canlas and Rebecca Bart, all of UC Davis, and Christopher Dardick, formerly of the Ronald lab and now at the U.S. Department of Agriculture's Appalachian Fruit Research Station in Kearneysville, W.Va.

Provided by UC Davis