Researchers examine bacterial rice diseases, search for genetic solutions

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As a major food source for much of the world, rice is one of the most important plants on earth.

Keeping it safe from disease has become, in part, the task of a group of three researchers from Iowa State University and one from Kansas State University.

The researchers are looking at two bacterial diseases of rice. The most costly is bacterial blight of rice, which is caused by a bacterium called *Xanthomonas oryzae pathovar oryzae*, and can diminish yield by up to 50 percent.

"This is the most important bacterial disease in rice, and in some areas, it is the most important rice disease of any kind," said Adam Bogdanove, an associate professor of plant pathology who is part of the ISU research team.

The team is also studying bacterial leaf streak of rice caused by the closely related bacterium *Xanthomonas oryzae pathovar oryzicola*. Bacterial leaf streak is usually not as damaging as bacterial blight, but it is increasing in importance in many areas of the world, particularly Southeast Asia.

These bacteria damage rice by entering the plant and taking control of certain rice cell processes, eventually killing the rice cells. Pathovar oryzae does this in the vascular system of the plant, which typically

allows the bacterium to spread faster and cause more damage than is its cousin, oryzicola, which is limited to growth in the tissue between the veins.

Some types of rice are naturally resistant to the *Xanthomonas* bacteria. Bogdanove and other researchers -- Bing Yang, Iowa State assistant professor of genetics development and cell biology; Dan Nettleton, Iowa State professor of statistics; and Frank White, principal investigator and professor of plant pathology at Kansas State University, Manhattan -- are researching why some types of rice are naturally resistant to the bacteria.

In rice varieties that are resistant to the diseases, the team is exposing the plants to the two bacteria. They then check to see which plant genes are activated, and to what extent.

By identifying which genes are turned on, Bogdanove believes the team can identify the genes that are making the plants resistant.

"We are looking at genes of successful plants," he said. "What genes are active and when and how much they are being turned on."

Bogdanove hopes that this effort will aid in breeding the resistance into cultivated varieties that are currently susceptible to the diseases.

Another aspect of the research is aimed at discovering how the bacteria change gene expression in susceptible rice plants.

"If we understand which genes are being manipulated by the pathogens in disease, we can look into different varieties and wild relatives of rice for variants of these genes that are immune to manipulation and bring these genes into cultivated varieties," said Bogdanove. "The idea is to reduce or eliminate susceptibility altogether."

Rice is the major food staple for more than half the world's population. In the United States, rice is planted on almost 3 million acres with yields of around 7,000 pounds per acre in 2007, according the U.S. Department of Agriculture.

American producers grow 95 percent of the rice eaten in this country and the United States is a major exporter as well, according to Bogdanove.

In addition to the benefits to rice, the research should be helpful in understanding and controlling diseases in other cereal crops.

"Rice is a model plant for cereal biology," said Bogdanove.

Source: Iowa State University