Collection Helps Fight Destructive Rice Disease

New sources of rice resistant to blast, one of the most destructive rice pathogens worldwide, have resulted from a program at the Dale Bumpers National Rice Research Center in Stuttgart, Arkansas, where ARS scientists are identifying valuable genes and traits in rice germplasm.

The researchers analyzed the U.S. Department of Agriculture Rice Core Collection, part of the National Small Grains Collection (NSGC) and the ARS-coordinated National Plant Germplasm System, a cooperative effort by public and private organizations to protect crops' genetic diversity. Collections help preserve germplasm, such as plant seed, and these stocks have characteristics that breeders can use to create new lines with valuable traits.

FERNANDO CORREA (D542-2)

YULIN JIA (D542-1)

Testing for rice blast resistance in genetically engineered rice plants is done in various countries. Above, plant molecular pathologist Yulin Jia samples a field in Columbia for the disease.

Left: A typical eye-shaped lesion of rice blast disease on a U.S. rice cultivar, Katy, inoculated with *Magnaporthe grisea.*

The core collection consists of 1,791 entries, or about 10 percent of the U.S. rice collection's 18,408 entries in the NSGC. These accessions were selected to be representative of the entire rice collection, which would be too difficult to fully analyze. In 2002, Stuttgart researchers grew 1,696 entries in the field for evaluation and seedstock development.

Wengui Yan, a geneticist at Stuttgart, leads efforts to build the core collection with geneticist Georgia Eizenga, plant molecular pathologist Yulin Jia, chemist Rolfe Bryant, and J. Neil Rutger, the program's chief scientist. He was joined by ARS cooperators including Tom Tai, a rice geneticist in the Crops Pathology and Genetics Research Unit at Davis, California, and Harold Bockelman, curator of NSGC at Aberdeen, Idaho. Yan completed the agronomic analysis and is working with other ARS scientists on a comprehensive evaluation, including DNA analysis. In Beaumont, Texas, geneticists Anna McClung and Robert Fjellstrom, in the Rice Research Unit, analyzed molecular markers related to blast resistance and grain quality.

Blast resistance genes identified in germplasm in the core collection are different from any resistance genes currently available in the U.S. rice industry. Rice blast is caused by a fungus, *Magnaporthe grisea,* which can attack the rice plant's aerial parts at any growth stage. Four rice genes play a major role in blast resistance in U.S. germplasm. Unfortunately, *M. grisea* is able to evolve rapidly and overcome resistance imparted by these genes.

Now, new sources have shown strong resistance to blast in both field and laboratory studies over several years and at various test locations around the world. Molecular marker analysis of their DNA has yielded none of the four known genes responsible for blast resistance in the U.S. rice industry.

"Diversifying sources will make it harder for pathogens to overcome resistance and will make the resistance more durable," Yan says.—By **Jim Core,** formerly with ARS.

This research is part of Plant, Microbial, and Insect Genetic Resources, Genomics, and Genetic Improvement, an ARS National Program (#301) described on the World Wide Web at www.nps.ars.usda.gov.

Wengui Yan is at the USDA-ARS Dale Bumpers National Rice Research Center, P.O. Box 1090, 2890 Hwy. 130 East, Stuttgart, AR 72160; phone (870) 672-9300, fax (870) 673-7581, e-mail wyan@spa.ars.usda.gov. ✷