

RICE RESEARCH & PROMOTION BOARD 2004 PROGRESS REPORT

TITLE: Discovery, Definition and Utilization of Resistance Genes for Arkansas Rice Disease Control.

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OVERALL GOAL: Maintain and enhance disease control options through discovery, definition and utilization of host resistance genes.

PROGRESS REPORT BY OBJECTIVE:

Objective. Identify, evaluate and define disease resistance genes in experimental breeding lines.

Progress: Artificially inoculated blast and sheath blight nurseries were established at the RREC and the Pine Tree Experiment Station. Greenhouse tests to evaluate reaction of selected entries to specific races have been completed or are underway at the RREC.

The long described blast race IE-1K apparently has evolved to compromise the Pi-ta R gene in the Banks variety. We have isolated and identified this variant. Advanced breeding lines in the Uniform Regional Nursery plus other germplasm were identified as being resistant. Greenhouse tests are currently underway to further identify race IE-1K-Banks resistance in preliminary Arkansas breeding lines as well as useful rice germplasm prior to the 2005 planting and crossing season.

Objective. Increase resistance genes available for rice disease control efforts.

Progress: Approximately 500 core collection entries per year from the U.S. rice germplasm collection are being evaluated in inoculated greenhouse blast tests and in the inoculated field blast and sheath blight nurseries at the RREC and PTES. Cooperative research has identified germplasm with apparent novel resistance genes. Thirteen lines exhibit resistance to race the race IE-1K-Banks variant and to the even more virulent race IB-33. New red rice collection entries were evaluated for blast reaction in greenhouse and blast field tests at the RREC. Red rice entries resistant to Pi-ta virulent races are identified. Quarantine entries were processed through the UA-APC rice quarantine greenhouse in Fayetteville.

Objective. Enhance utilization of desirable cold tolerant rice genotypes.

Progress: Efforts are underway to develop specific seed coating procedures to enhance germination under adverse conditions and to facilitate the rice quarantine process. 2005 field tests are prepared.

Objective: Investigate methods to enhance disease control strategies. Progress: Cumulative induced blast field resistance appears to be a widely adapted if not universal response within the rice germplasm base. To date all susceptible rice plants tested have exhibited some degree of enhanced blast field resistance in greenhouse tests which contrast blast development in rice growing upland with that growing in a deep flood. The response was observed in test plants inoculated with the commonly occurring rice blast races found in rice production fields or with the naturally mutated rice blast races virulent to Katy (Pi-ta virulent races IE-1K, IB-33 and others). Additional tests are underway to further define blast field resistance, to identify and quantify this extremely valuable resistance mechanism in genetic breeding lines, and to define the economic value and methodology for utilization in Arkansas production areas.