PROJECT RB-4

ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
January 1, 1995- December 31, 1995

PROJECT TITLE: Marker Assisted Breeding of California rice varieties

STATUS OF PROPOSAL: Continuing

PROJECT LEADER: P. C. Ronald, Dept. Plant Pathology

PRINCIPLE UC INVESTIGATORS: D. Mackill, Dept. Agronomy

COOPERATORS: C. Williams, Purdue University

LEVEL OF 1995 FUNDING: 18,000.00

Objectives and Experiments:

Our objectives were to develop a rapid screening procedure using PCR for California rice varieties. We also tested the usefulness of our cosmid library for identifying markers linked to a wide compatibility locus and test these markers for their use in screening for this trait in California rice varieties.

Summary of 1995 research:

We tested the usefulness of our markers in screening for a wide compatibility locus in California rice varieties. We first used the marker to select two classes of plants- those that had the japonica allele (j) and those that had the wide compatibility locus (W). Plants were crossed with an Indica tester (IR50), so those with a japonica allele should show higher sterility. Our data indicated that 75% of the plants with the japonica allele had higher sterility as predicted. 83% of the plants with the W allele showed high fertility. In order to confirm these results, we will retest the genotype of these plants as well as score additional plants.

Dave Mackill has generated 4 markers that can be used for fingerprinting California rice varieties. In a first step in making these markers easier to use, we have cloned them and will generate STS markers that can be used in breeding programs.

Concise general summary of current years results:

We have produced a DNA marker for diagnosis of the wide compatibility gene in javanica rice. The presence of this gene makes it possible to intercross rice varieties (Indica, japonica and javanica) and species in order to transfer useful traits without barriers caused by sterility of the F_1 hybrid. We used this marker to identify javanica X japonica F1 progeny containing the wide-compatibility marker. These F1 plants were crossed to an Indica tester line. We have tested the fertility of these plants find that the marker may be a good tool to diagnose plants containing the gene based solely on their DNA marker profile. In the future, we hope to apply these methods to develop diagnostic DNA markers for other important rice genes such as stem rot resistance and submergence tolerance.

We have also cloned "RAPD" markers developed by D. Mackill that can be used in fingerprinting California germplasm. Once these clones are characterized further, the germplasm screening method could be carried out at virtually any location with minimal equipment or molecular biology skills. Such techniques are already being implemented at other rice research institutes such as the International Rice Research Institute in the Philippines.

Finally, in another project in the laboratory, we have cloned the disease resistance gene *Xa21* and engineered rice for resistance to bacterial blight. These results have yielded important clues on the mechanism of disease resistance in rice and provide opportunities for future engineering of resistance to currently intractable disease problems.