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7. Title

Marker-Assisted Breeding to Enhance Disease Resistance in Corn, Rice, And Sugarcane

12. Investigator Name(s) (Last Name and Initials)

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20. Termination Date 02/28/2013	40. Period Covered (mo/da/year): 03/01/2011 TO 02/28/2012

Outputs:

A progress report was presented in a USDA-DOE Project Directors meeting. Presentations on rice disease resistance were delivered at the Louisiana Rice Research Board Meeting and 34th Rice Technical Working Group Meeting. A two-week long Plant Breeding Summer Training was organized for high school students and teachers during July.

Outcomes/Impacts:

The corn inbred lines, B73 (susceptible) and MP715 (resistant), were used to develop mapping populations for QTLs controlling resistance to aflatoxin accumulation. Two hundred seventy-five individuals each in F2 and BC1F1 generations, respectively, were selfed in 2011. For the development of introgression lines, 120 BC1F1 plants were backcrossed to B73. A parental polymorphism survey using 412 microsatellite markers revealed a polymorphism rate of 59%. Both B73 and MP715 plants were inoculated with Aspergillus flavus strain 3357 using a side needle technique. Ears from both inoculated and uninoculated plants were collected for identification of differentials expressed genes using cDNA suppression subtractive hybridization. A recombinant inbred line (RIL) population is under development from a cross between a partially resistant variety (Jupiter) and the susceptible variety (Trenasse) and is being used to map genes for resistance to bacterial panicle blight (BPB). Three hundred F4 plants were derived from this cross which produced F5 seeds. A parental polymorphism survey with 900 SSR markers revealed 207 markers confirming a high genetic similarity between parents. Additional SSR markers are being screened to obtain more polymorphic markers and to ensure coverage of the whole rice genome. Thirty-three proteins associated with leaf scald resistance were identified from spots differentially expressed in response to infection by Xanthomonas albilineans. SYBR green and zPCR assays quantified bacterium (X. albilineans (Xa) populations) in three resistant and three susceptible cultivars. The populations detected by qPCR followed trends similar to disease severity ratings and vascular infection results. Low bacterial populations were found in newly emerged, systemically-infected leaves of resistant cultivars. In a greenhouse experiment, 15 cultivars with a range of leaf scald susceptibility were inoculated with Xa. The susceptible cultivars had higher populations of Xa. However, no bacteria were detected in five cultivars, four of which exhibited variable levels of susceptibility in field inoculations. Plants of all cultivars showed leaf scald symptoms in the inoculated leaves, but none developed systemic infection.

Publications:

Subudhi, P.K., J. Ham, C.A. Kimbeng, J.W. Hoy, and N. Baisakh. 2012. Marker-assisted breeding to enhance disease resistance in corn, rice, and sugarcane. USDA-DOE Project Directors Meeting, Town and Country Resort Center, San Diego, CA, Jan 13, 2012. Annual Report, Pp. 126-129.

Shrestha, B.K., H.S. Karki, D.E.Groth, X. Sha, P. Subudhi, H. Utomo, and J.H. Ham. 2012. Development of quantitative trait loci (QTL) mapping and breeding programs to improve rice resistance to bacterial panicle blight and sheath blight. The 34th RTWG meeting. (Abstract) Hot Springs, AR 71901, February 27-March 1, 2012.

Participants:

P.K. Subudhi (PI), C.A. Kimbeng, N. Baisakh, R. Dhakal, J.W. Hoy, J.H. Ham, B. Shrestha, Andreas Fel Guierrez Viveros, D. Groth, and X. Sha, LSU AgCenter; W. P. Williams, G. Windham, USDA Corn Host Plant

Resistance Research Unit, Mississippi State; W. Veal, A.P. Russel, S. Jordan, Belaire High School, Baton Rouge, LA; P. Kelly, K. Thompkins, Tara High School, Baton Rouge, LA.

Target Audiences:

Rice producers, corn growers, sugarcane farmers, plant breeders, geneticists, pathologists, researchers working with rice, sugarcane and corn diseases; students and teachers from various high schools.

Project Modifications:

Nothing significant to report during this reporting period.

Approved (Signature)	Title	Date