Dale Bumpers National Rice Research Center
USDA-ARS
Stuttgart, Arkansas

April 2018

MONTHLY RESEARCH HIGHLIGHTS

For More Information: Dr. Anna McClung, Research Leader/Center Director
anna.mcclung@ars.usda.gov

- **Recent Scientific Publications**

ARS Anticipated Product: Crop plants with superior product quality

Pinson, S.R.M., Y. Jia, M.H. Jia, and J. Gibbons**.** 2018. Novel QTLs affecting rice kernel fissure resistance discovered in the cultivar 'Saber' augment those from 'Cybonnet'. Crop Sci. doi:10.2135/cropsci2017.10.0593; posted online April 26, 2018 at https://dl.sciencesocieties.org/publications/cs/pdfs/0/0/cropsci2017.10.0593

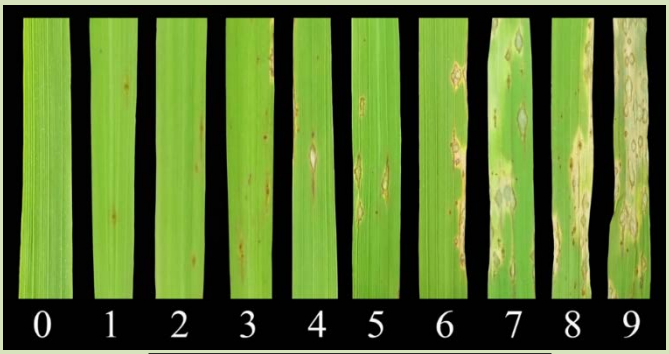
Rice is unique among the cereals for being directly consumed in the form of whole, milled kernels, as opposed to being processed with other ingredients before being consumed by humans. Fissures in kernels of rice caused by pre- or post-harvest stresses are the leading cause of breakage in the milling process. The economic value of broken rice is about half that of whole milled rice, so one goal of rice breeders is to reduce grain breakage during the milling process and development of fissure resistant (FR) rice varieties is one way to accomplish that. A previous rice FR study identified three FR QTLs (genomic regions) derived from the cultivar 'Cypress'. The current study discovered two new QTLs from the variety Saber and determined that stronger FR was observed in progeny in which FR QTLs from both Cypress and Saber were combined. With very few QTLs and genetic sources for FR known, the discovery and molecular-tagging of two additional FR QTLs from a novel source is of importance to the U.S. and international rice breeding community.

Rice kernels with internal fissures (right side of photo) are more likely to break during the milling process than intact kernels (left). Fissure resistance reduces breakage during milling which

ARS Anticipated Product: Crop plants with resistance to diseases

Chen, X., **Jia, Y., Jia, M.H., Pinson**, S., Wang, X., and Wu, B.-W. 2018. Functional Interactions between Major Rice Blast Resistance Genes, Pi-ta and Pi-b, and Minor Blast Resistance QTL. Phytopathology, https://doi.org/10.1094/PHYTO-02-18-0032-R)

Rice blast disease caused by the fungus *Magnaporthe oryzae* is the one most damaging rice disease worldwide. Major blast resistance (R) genes play important roles in preventing rice blast disease. However, the genetic mechanism of interactions of two R genes has not been clearly documented. In the present study, we used *M. oryzae* strains that differentiate the effects of blast R genes *Pi-ta* and *Pi-b*, with rice varieties Cybonnet, carrying *Pi-ta* and *Pi-km*, and Saber, carrying *Pi-b*, and evaluated their 243 progeny for disease reactions. The resistance effect of *Pi-km* was excluded by using virulent isolates toward *Pi-km*, and noticeable significant increase of resistance responses were observed in progenies with both *Pi-ta* and *Pi-b*. These findings suggest that *Pi-ta* interacts with *Pi-b* by triggering more effective defense responses. This knowledge is important for stacking both *Pi-ta* and *Pi-b* to develop blast resistant rice varieties worldwide.



Rice blast disease rating scale: 0 = no symptoms, 9= severe symptoms.

- **Technology Transfer**

  - ✓ **Interactions with the Research Community**

  - ✓ **Informal Contacts**

    On April 3, 2018, Dr. Shannon Pinson was contacted by Dr. Manisha Barthwal, a scientist with the private rice breeding company Bayer BioScience Pvt. Ltd in India. Dr Pinson provided Dr. Barthwal with details on using a laboratory fissure-induction system developed by Dr. Pinson for screening rice germplasm for rice kernel fissure resistance.

    On April 19, 2018, Dr. Jai Rohila, Research Agronomist with the DBNRRC, presented a talk to the USDA ARS staff at the Stuttgart location, as part of an Earth Day celebration event. Dr. Rohila presented research he is conducting to reduce the amount of water used in rice production. Growing rice using the "alternate wetting and drying" production method saves about 20% in irrigation resources as compared to the conventional season-long flood. Rohila's research also includes identifying and developing rice genetic resources that have sustained high yield potential when subjected to water stress.

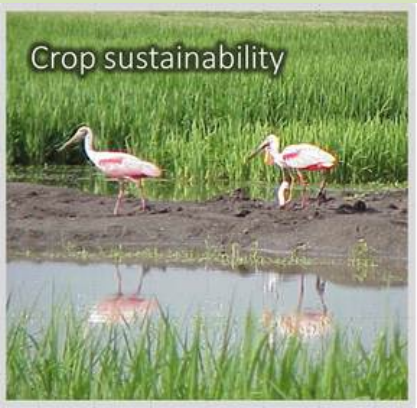
  - ✓ **Rice Germplasm Distributed**

    During April, **6,667** rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the US, Belgium, Canada, and Italy.

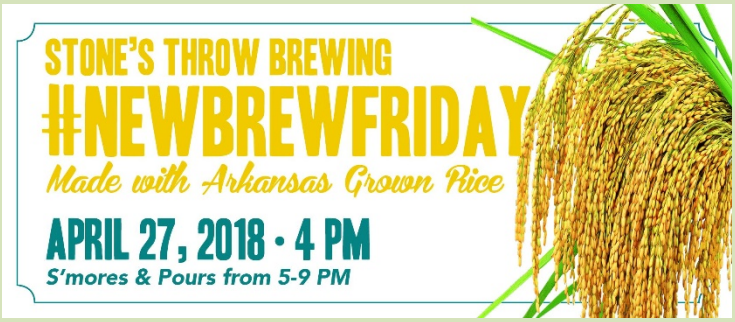
- **Stakeholder Interactions**

  On April 20, 2018, Dr. Anna McClung provided agronomic information on aromatic rice varieties originating from Iran that had potential for production in the southern USA.

  Rice photo used to promote 'Crop Sustainability.' A picture taken by Dr. Shannon Pinson of two roseate spoonbills walking on a levee between rice research plots is being used on the Crop Science Society of America (CSSA) website. Clicking on the photo-button viewable at https://www.crops.org/about-crop-science takes viewers to additional information on sustainable agriculture. Connecting 'Crop sustainability' so visibly with rice on a website viewed by scientists, educators, students, journalists, and others from around the world enhances public perception of the U.S. rice industry.



  April 27, 2018, Stone's Throw Brewing in Little Rock, AR launched a new craft beer made from the newly released ARS rice variety "Scarlett". They named the brew "The O'Hara" Scarlett Rice English Ale. The launch was promoted by the USA Rice Federation and Arkansas Rice. Scarlett rice was developed through a collaboration between ARS researchers, Anna McClung and Ming-Hsuan Chen, and Susan McCouch, Cornell University. It was derived from a cross with a wild relative of rice and has a red bran that is rich in anti-oxidants.



  On April 30, 2018, Dr. Anna McClung shared agronomic information on Scarlett rice to a grower interested in producing it in South Carolina.

- **Education and Outreach**

  On April 3, 2018, Dr. Anna McClung met with Kelley Bass, CEO, and Shannon Jones, STEM Coordinator, with the Museum of Discovery in Little Rock about participating in a week-long opportunity for girls in the 7-9th grades to explore STEM careers. The event will take place in Stuttgart, AR and will include a half day at the Dale Bumpers National Rice Research Center. The Museum of Discovery has made this program a priority as there continues to be a major gender gap in STEM careers with men far outnumbering women. The goal is to help promote and empower young women by providing them with STEM related experiences that are right in their hometown. This in turn helps to promote community support for the girls to be able to pursue STEM careers, hopefully in the same community that they live in.

On April 13, 2018, The Federal Asian Pacific American Council (FAPAC) (https://www.fapac.org/) Career Development Program (CDP) for high performers held the orientation meeting at the USDA Jamie Whitten Building, Washington DC. Dr. Yulin Jia, Molecular Plant Pathologist with DBNRRC, participated in the conference via telephone and was assigned his third mentee. The purpose of the FAPAC CDP is to serve as a resource for Asian American and Pacific Islander federal employees to empower them through career development initiatives and to expand career opportunities through preparation and networking.

On April 19, 2018, Mrs. Melissa Jia and Dr. Yulin Jia were invited to present seminars for undergraduate students majoring in Biology at Arkansas Tech University, Russellville, AR. Mrs. Jia presented a talk titled 'Translational Genomics at DB NRRC' and Dr. Jia presented a talk titled 'Understanding the Molecular Basis of Plant Immunity for Crop Protection'. Approximately 30 students and two professors attended the talks.