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

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MONTHLY RESEARCH HIGHLIGHTS

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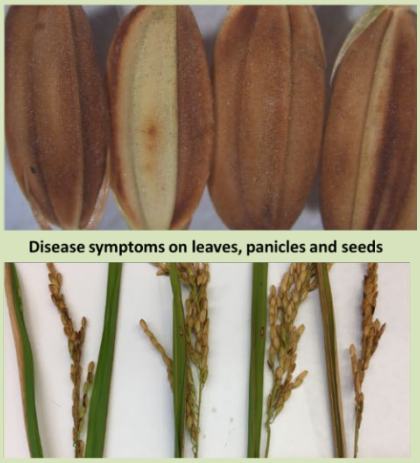
- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: New, more rapid, reliable, economical methods for detecting and identifying plant pathogen species, strains, or pathotypes, and often using limited amounts of plant or non-plant material

Emily Luna, Jillian Marie Lang, **Anna McClung**, Yeshi Wamishe, **Yulin Jia**, and Jan E Leach. 2023. First report of rice bacterial leaf blight disease caused by *Pantoea ananatis* in the United States. Plant Disease Jan 6 DOI: 10.1094/PDIS-08-22-2014-PDN

Detection of diseases that are uncommon to the USA rice production area is important for sustaining the rice industry and production of this globally important crop. Here we report the first identification of bacteria leaf blight disease caused by *Pantoea ananatis* in a small set of global rice cultivars grown under field conditions in Arkansas. This organism is commonly found in nature, in soil, water, plants, and insects, etc. It has been found to cause symptoms globally in a wide range of crops including onions, pineapple, peanuts, corn, bananas, and rice. However, it has not been previously reported in rice in the USA. In addition to the observed bacteria leaf blight symptoms, the disease was found to cause reduced grain production in rice plants that were very susceptible. Leaf tissue from infected plants was used to isolate the causal organism and DNA was extracted for analysis. A genetic marker specific for a gene found in the *P. ananatis* organism was used to verify that this was the cause of the disease. Although there were hundreds of rice varieties planted in the same field, less than 20 had any evidence of symptoms. Thus, we conclude that *P. ananatis* is the causal pathogen for leaf blight-like symptoms observed in the global rice cultivars grown in Arkansas. There is no known chemical control



Disease symptoms on leaves, panicles and seeds

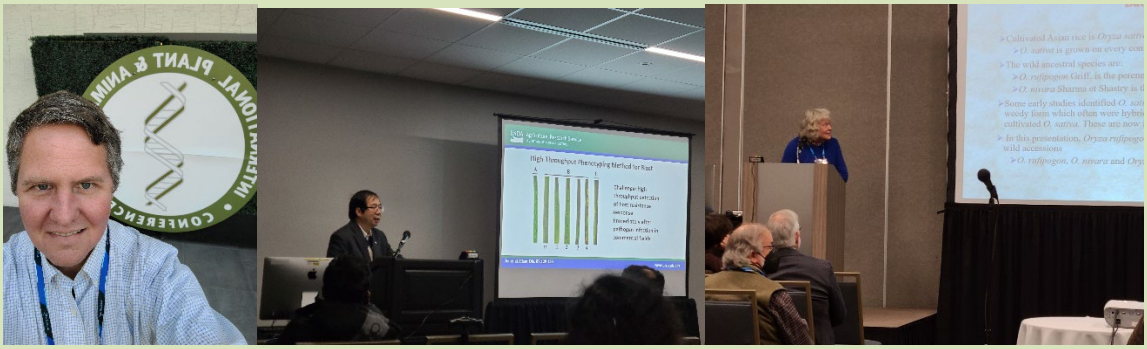
for most bacterial diseases in rice. Knowing that this organism is found in the southern US rice growing area and can cause symptoms, given the right variety and environmental conditions, is important for managing losses from diseases in the future.

- **Technology Transfer**

  - ✓ **<u>Interactions with the Research Community</u>**

    On January 4, 2023, Dr. Anna McClung participated with Dr. Chris Henry, University of Arkansas, in the development of a symposium on climate smart rice production practices. The event will be held as part of the 39th Rice Technical Working Group meeting to be held in Hot Springs, Arkansas, Feb. 20-23, 2023. The symposium will include a number of presentations from rice farmers across the country and the technology they are using for improving the sustainability of rice production.

    Drs. Yulin Jia, Jeremy Edwards and Georgia Eizenga from the Dale Bumpers National Rice Research Center attended the 30th International Plant and Animal Genome (PAG) Conference held January 13 to 18 in San Diego. The three scientists interacted with US and international scientists, and attended scientific workshops, industry workshops, digital tools and resources sessions, and poster sessions. Dr. Jia organized and presented in a workshop entitled "Rice as a Model for Genetics, Genomics and Breeding". Dr. Edwards organized the "Allele Mining" workshop. Dr. Eizenga gave an oral presentation titled "Discerning the Influence of Admixture on the Genotypic and Phenotypic Characterization of the Oryza rufipogon Species Complex (ORSC)" in the "Genomics of Genebanks" workshop and presented the poster "Maximizing the Potential of African *O. sativa* Rice Through the Creation of an Africa Rice *O. sativa* Core Collection (AROSCC)". The scientists also attended a meeting with National Program Leader Dr. Jack Okamuro to discuss new research opportunities.



    On January 25, 2023, Drs. Yulin Jia, Jeremy Edwards, Trevis Huggins, Shannon Pinson, and Anna McClung participated virtually in the Annual Rice Breeder's Meeting. This meeting was also attended by rice breeders and researchers from five US State breeding programs: Arkansas, California, Louisiana, Mississippi, and Texas. Dr. Jia presented results on resistance to blast disease collected for the 2022 entries, Drs. Edwards and

Huggins proposed use of a new molecular marker panel (LSU80) for characterizing the rice germplasm accessions in the National Small Grains Collection (NSGC), and Dr. Pinson presented plans to provide the US breeders in the future with evaluations of rice grain quality traits by wet chemistry. USDA will also be contributing two lines for multi-state evaluation in 2023.

✓ **Rice Germplasm Distributed**

During the month of January 1175 rice genetic stocks were shipped to researchers in the United States.

Dr. Anna McClung provided pure seed of three specialty varieties to a seed company for production and commercialization.

- **Stakeholder interaction**

On January 11, 2023, Keith Glover and Steven Caver, the General Manager and the Vice President of Operations at Producers Rice Mill Inc., Stuttgart, AR, visited the USDA Dale Bumpers National Rice Research Center and met with several ARS scientists - Drs. Yulin Jia, Jeremy Edwards, Shannon Pinson, Jai Rohila, Georgia Eizenga, and Trevis Huggins - to share information on aspects of rice grain quality that are needed to improve the marketability and profitability of US rice, and how these attributes might be provided through improved genetics of US rice varieties. Also in attendance were Dr. Nora Lapitan (USDA-ARS Deputy Administrator), Dr. Jack Okamuro (USDA-ARS National Program Leader), Dr. Alton Johnson (Univ. of AR), and several DBNRRC staff personnel, technicians, and postdoctoral scientists.

On January 10, 2023, a two-page publication was created by the Plant Breeding Coordinating Committee about the development by USDA of the red bran rice variety called Scarlett. The publication is part of their "Incredible Feats" project to inform the general public about plant breeding and the development of new crop varieties that provide food and feed. This will also be used to appeal to students to consider plant breeding and genetics as a career.

The January edition (Vol 47, No. 1) of the trade paper “Farm Show” which has 130,000 subscribers in the Midwest and Canada included a story about the development of the USDA specialty rice cultivars, Scarlett and USDA-Tiara, that are now being commercialized nationwide.

Purple Rice Good For Heart Health

The recently introduced USDA-Tiara purple rice will be better for the people who grow it and the people who eat it. The new, long-grain variety is resistant to major rice diseases, yields well and matures in 110 days. It also contains higher levels of antioxidants shown to benefit heart health.

"In addition to being higher in antioxidants than blueberries, Tiara is also an aromatic with a popcorn/buttery flavor when cooked," says Anna McClung, USDA ARS. "It has a premium price in the market because of its novel characteristics and currently limited supply."

McClung developed USDA-Tiara by crossing a medium-grain purple rice developed in Brazil with a long-grain rice from the U.S. The purple grain genetics had previously traveled to Brazil from China, where a famous black rice was called The Emperor's rice.

"I named this new variety Tiara for a crown a princess might wear," says McClung.

McClung previously developed and released Scarlett, a 120-day red rice in 2019. It also has good disease resistance.

Scarlett was the result of crossing a wild red rice, considered a weed by commercial rice growers, with a conventional, long-grain brown rice. If red rice shows up in commercial brown rice, the producer gets a lower price. The goal was to recover genes from the weedy rice to improve yield and productivity without the red bran.

"However, one of the selections from the cross had good yield potential and excellent long grain shape, but with the red bran," says McClung. "We decided to release it as a specialty rice."

USDA-Tiara purple rice (left) and Scarlet red rice (right).

It has proven popular with specialty rice producers in the South and as far north as the Pennsylvania border with New Jersey. "We are thrilled we have growers who have picked it up and are marketing it," says McClung. "They're often trying to get out of the commodity business. They have to do the hulling, packaging and marketing, but they're jumping on and making it work."

McClung has been looking for a foundation seed company to produce USDA-Tiara seed for sale to growers. "I'm now working with the Shoffner Foundation Seed program," she says. "They already work with the purple rice from Brazil, as well as Scarlett, and are a good source for specialty colored rice."

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On January 17, 2023, Dr. Anna McClung provided information on resistant starch and phytochemicals in rice varieties to a small rice company interested in marketing specialty varieties.

When brown rice is milled into flour, an enzyme in the rice bran becomes activated as it is exposed to oxygen. This enzymatic activity can result in a reduced shelf life because the flour can become rancid. On January 19th, Dr. Anna McClung provided information on the best storage practices for preventing this to a company interested in using brown rice flour in healthy snack foods.

On January 20, 2023, Dr. Anna McClung provided information regarding grain quality characteristics for using rice to make koji. For centuries, koji has been an important part of Asian cuisine. It provides flavor and health benefits to food and is typically produced using grains like rice or barley. When rice is inoculated with the fungus, Aspergillus oryzae, the grain is converted to sugars (koji pictured) that are then used in various fermented foods. When used to ferment rice, beverages like sake and amazake are produced.

On January 23, 2023, Drs. Yulin Jia, Shannon Pinson, Trevis Huggins, and Georgia Eizenga and Ms. Melissa Jia attended the Arkansas Rice Annual Meeting, held at the Grand Prairie Center, Stuttgart, AR. The meeting was opened by Betsy Ward, CEO of the USA Rice Federation, and Wes Ward, the Arkansas Secretary of Agriculture. Also, in attendance were more than 225 rice growers and industry representatives including several employees from the Arkansas Department of Agriculture, and staff members from the offices of Senator John Boozman and Congressmen Rick Crawford and Bruce Westerman. Information presented at this annual meeting included progress on the new 2023 Farm Bill, proposed updates to the Arkansas Rice Check-off Program, innovative new technologies available to rice growers (drone technology, on-farm renewable energy, etc.), and examples of how rice growers can participate in several recently funded "climate smart" programs including the USDA Climate-Smart commodity funding to USA Rice.

On January 23, 2023, Dr. Yulin Jia attended the Arkansas Rice Research and Promotion Board (ARRPB) meeting held in the afternoon at the Grand Prairie Center, Stuttgart, AR. Also in the attendance were University of Arkansas division of agriculture leaders, and USA Rice Federation staff members. The Arkansas Rice Research and Promotion Board heard activity reports and funding requests from USA Rice and the Rice Foundation. The meeting also highlighted current challenges for US rice in both domestic and international marketplaces. Specifically, a significant portion of the market in Mexico was lost due to quality and price concerns.

- **Education and Outreach**

Joel Ledbetter was raised in the Center-Point community, part of the greater metropolitan Gurdon, Arkansas, area. He grew up enjoying sports and the outdoors. Joel hunted, camped, fished, swam, water skied, rode motorcycles and ATVs, played baseball, football, golf and tennis as well as other outdoor activities like mowing grass, cutting firewood, milling lumber, bailing hay, vegetable gardening and caring for livestock.

He joined the National Guard as an Indirect Fire Infantryman one week after turning seventeen and graduated basic training the summer before his senior year of high school. Joel attended Henderson State University using the GI Bill to avoid student loans. He eventually graduated with a Bachelor of Science in Chemistry. With the support of his college professors, he landed his first professional job as an analytical/instrumental chemist under the direction of a fellow HSU Reddie at a new environmental laboratory. He worked long hours and gained valuable experience setting up new procedures and instruments before training new employees to do the work.

From there, he took a job as a QA/QC technician at an ammonium nitrate and nitric acid manufacturer. There, he learned about chemical manufacturing processes and served as the representative for the lab on the safety committee in a very challenging environment.

From there, he moved to an environmental laboratory in Little Rock where he worked in inorganic analysis and coordinated with industrial customers for wastewater sampling and discharge permit renewals. Joel got married and moved to Stuttgart for his wife new job at DBNRRC. He commuted from Stuttgart to Southwest Little Rock daily for five years before accepting the job as Safety and Occupational Health Specialist for the Stuttgart ARS Location, where he have worked on ever-evolving safety and environmental challenges since. Together, Joel and Cindy have raised three children in Stuttgart, Joel is fortunate to have the best carpool ride to work since 2006.

Heather Farmer is new to USDA ARS. Heather started in April of 2022 as an Administrative Assistant to Raeann Braithwaite. While the majority of her job is in Budget/Finance, she is also a timekeeper and handle Link Pass activation. Heather assist in travel authorizations, excess property, vehicle reporting, and maintaining the location websites for DBNRRC, SNARC and ACNC.

Heather and her husband have 4 beautiful children. They live on a 40-acre farm in Wabbaseka, AR. In 2008 she decided to stay home to raise their children. She continued to work from home part time over those years for a local business handling their property management books and she is also the owner of a Taxidermy business.

Heather is excited about her new adventure with the USDA ARS and look forward to working close with all of you for many years to come.

- **New Research Grants**

A collaborative research project between Dr. Jai Rohila (ARS) and Dr. Prasanta Subudhi (Louisiana State University, LSU) entitled "Climate Resilient Innovations for Sustainable Production of RICE (CRISP-RICE)" was awarded $10 million from the USDA National Institute of Food and Agriculture (NIFA)- AFRI Grants Program [Sustainable Agricultural Systems (SAS)] for research to be conducted over four years, April 2023 to March 2027. The funded grant is a research collaboration between the LSU, ARS, University of Arkansas, Mississippi State University, Clemson University, and Texas A & M University.

See the web version of all DBNRRC research highlights at: https://www.ars.usda.gov/southeast-area/stuttgart-ar/dale-bumpers-national-rice-research-center/docs/monthly-research-highlights/