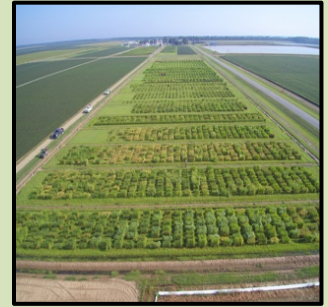




**Dale Bumpers National Rice Research Center  
USDA-ARS  
Stuttgart, Arkansas**



**MARCH 2018**

**MONTHLY RESEARCH HIGHLIGHTS**

**For More Information: Dr. Anna McClung, Research Leader/Center Director  
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● **Recent Scientific Publications**

Temesgen Mulaw, Yeshi Wamishe, and **Yulin Jia**. 2018. Characterization and in-plant detection of bacteria that cause bacterial panicle blight of rice. *American Journal of Plant Sciences* 9: 667-684.

Anticipated Product in USDA-ARS 2018-2022 Action Plan that this Applies to: New phenotyping approaches for important traits

*Burkholderia glumae* (BPB) is a bacterium that threatens rice grain production in most southern rice producing states of USA. In 2015, 178 panicles with symptoms of BPB were collected from nine counties of Arkansas. These samples were analyzed genetically and through culturing techniques. Some 73 samples were determined to be of bacterial origin, however, only 45 of the 73 were due to *B. glumae* while the other species were undetermined. Differences were observed in pathogenicity among the 45 *B. glumae* isolates when tested with tobacco leaves. Using naturally infected plants from the field and DNA extraction methods, *B. glumae* was detected in the seeds, stems and sheaths, but not in the leaves or roots. Together these results show the usefulness of artificial culture media, tobacco disease reactions, and DNA tests for characterization of BPB, and its distribution in different plant parts. These findings are useful for understanding bacterial movement within plants and for developing methods to manage BPB disease.



Zhao, D., Hamilton, J.P., Vaillancourt, B., Zhang, W., **Eizenga, G.C.**, Cui, Y., Jiang, J., Buell, C.R., and Jiang, N. 2018. The unique epigenetic features of Pack-MULEs and their impact on chromosomal base composition and expression spectrum. *Nucleic Acids Research* 46:2380-2397. doi: 10.1093/nar/gky025

Anticipated Product in USDA-ARS 2018-2022 Action Plan that this Applies to: New tools for applying fundamental knowledge to crop improvement

“Jumping genes”, or transposable elements, are one mechanism that increases genetic diversity in plants. Jumping genes were first proposed by maize (corn) geneticist Dr. Barbara McClintock in the 1940s but it was not until scientific advances in understanding DNA structure during the 1970s confirmed the prevalence of transposable elements in living organisms, including rice, that the importance of jumping genes was realized. The current study was undertaken to better understand the function of the jumping genes classified as Pack-MULEs (Pack Mutator-like transposable elements) in rice. The DNA sequences in the approximately 3,000 different Pack-MULEs found in rice were examined and it was discovered that about 40% of the Pack-MULEs produced mRNA and proteins mainly during the reproductive stage, when the rice panicle develops and seeds are produced. This suggests many of these jumping genes can ultimately control functions which are important for developing the rice seeds. For example, these jumping genes may have played a role in the evolution of the rice progenitor species, *Oryza rufipogon*, which usually has an open panicle with smaller and lighter seeds, and can easily cross pollinate with other *Oryza* species, to the current day cultivated rice, *Oryza sativa*, that has a more closed panicle shape with larger and heavier seeds, and is self-pollinated. A better understanding of how these Pack-MULEs increase genetic diversity ultimately is important for breeding for improved rice yield and grain quality.



- **Technology Transfer**

- ✓ **Rice Germplasm Distributed**

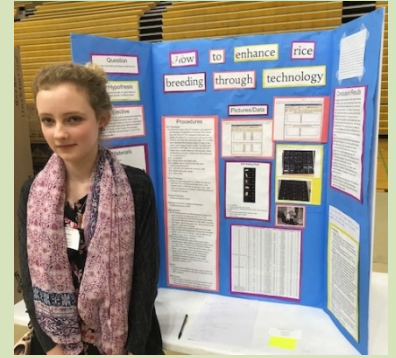
During March 6,996 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the US. Purified headrow/breeder seed was provided to growers in TX, AR, MS, MD, and SC, including 1150 lbs of new varietal release, Scarlett, 350 lbs Sierra, 400 lbs Presidio, 950 lbs Jasmine 85, 200 lbs Charleston Gold, 300 lbs IAC 600, and 325 lbs Carolina Gold Select, all ARS varieties, along with 380 lbs of other specialty germplasm lines.

- **Stakeholder Interactions**

On March 28, 2018 Dr. Shannon Pinson provided information to Mr. Steve Baragona, science correspondent for Voice of America, about how various plant traits contribute to grain yield; how these traits shift, interact, and trade-off; and the process of gathering data necessary for making a newly discovered QTL truly interesting and useful to breeders. Mr. Baragona will use this information as he writes an article about the “ideal plant architecture” gene, that reportedly increases rice grain yield by 10 to 85% when backcrossed into multiple rice varieties.

- **Education and Outreach**

Evie Jackson mentored by Aaron Jackson, Ming Chen and Georgia Eizenga placed 2<sup>nd</sup> in the regional science fair junior division at University of Arkansas at Pine Bluff and 3<sup>rd</sup> in the regional science fair junior division at University of Arkansas at Monticello. The title of her project was “How to Improve Rice Breeding through Technology”.



- **New Research Grants**

Submitted to USDA-NIFA Organic Agriculture Research and Extension Initiative: “Best Management Practices for Sustainable Organic Rice Production in the South: Development and On-Farm Validation” PI Zhou, XG; Co-PIs **McClung, AM, Gealy, D**, Dou, F, Way, MO, Huang, B, Bagavathiannan, M., Samonte, O, Moore, P, Wilson, LT, Shade, J, Watkins, KB