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

APRIL 2019

MONTHLY RESEARCH HIGHLIGHTS

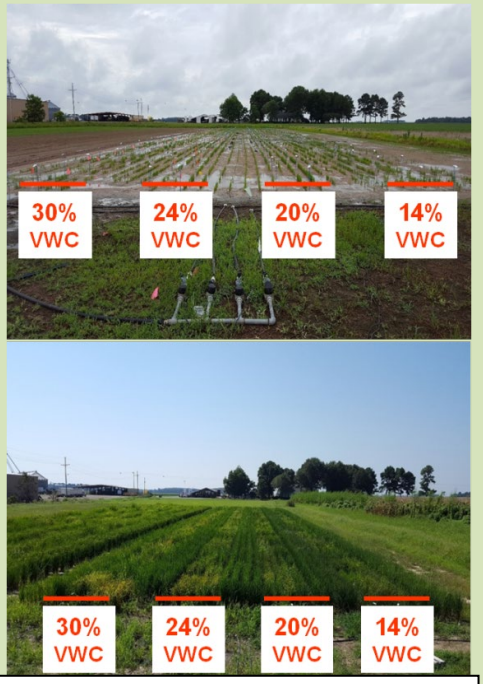
For More Information: Dr. Anna McClung, Research Leader/Center Director
anna.mcclung@ars.usda.gov

- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: Crop plants with enhanced water-use efficiencies.

Barnaby, J.Y., **R.S. Rohila**, C.G. Henry, R.C. Sicher, V.R. Reddy, and **A.M. McClung.** 2019. Physiological and metabolic responses of rice to reduced soil moisture: relationship of water stress tolerance and grain production. *International Journal of Molecular Sciences* 20(8), 1846. https://doi.org/10.3390/ijms20081846.

Adopting water saving management practices in rice production will significantly conserve water resources as well as reduce input (e.g. pumping underground water) costs. However, farmers will not adopt such practices if there is a significant risk of economic loss (i.e. reduced yield and/or grain quality). Having water stress tolerance during the transition from vegetative to the reproductive stage is critical to sustain floret fertility and during the reproductive stage to sustain grain filling (i.e. yield and quality). This study, using seven rice cultivars, demonstrated a wide range of responses in physiological and metabolic traits that were related to yield under reduced irrigation. The results demonstrated that there exists cultivar variation in response to different stress levels indicating a genetic balancing between survival (stress tolerance) and grain production. This implies that different breeding strategies may be needed to develop new cultivars tailored for different deficit irrigation production systems. For example, under mild stress, high yielding cultivars with a high transpiration rate would likely sustain higher yield than lower yielding cultivars with lower stomatal conductance. However, when aggressive water savings is attempted, severe stress conditions can occur and cultivars that have lower transpiration rates and accumulate soluble sugars would be a better option.



Underground irrigation system was used to establish four irrigation regimes throughout the season ranging from 30% soil volumetric water content (VWC, field capacity) to 14% VWC (severe stress).

- **Technology Transfer**

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

Dr. Michael Schläppi, Dept. of Biological Sciences, Marquette University, Milwaukee, WI, visited the DBNRRC April 9-11, to discuss progress on the USDA-NIFA grant entitled "Mechanisms of Cold Stress Tolerance Responses in Rice". On April 10, Dr. Schläppi presented a seminar updating the audience on the grant-funded research and a video of the rice crop grown in collaboration with a group of Hmong immigrant farmers near Milwaukee. Discussions amongst M. Schläppi, Georgia Eizenga, Jeremy Edwards, Aaron Jackson and Melissa Jia focused on grant Objective 3: Validate and fine-map preliminarily mapped cold tolerance quantitative trait loci (QTL).

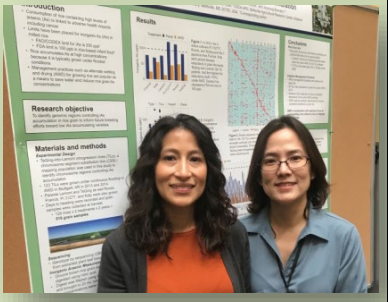
Dr. Schläppi harvesting rice in Wisconsin

On April 12, Dr. Yulin Jia (DBNRRC) participated via webinar in the Career Development Program (CDP) orientation of Federal Asian Pacific American Council (FAPAC) that took place in Fairfax, VA. FAPAC is a nonprofit organization representing the civilian and military Asian Pacific American (APA) employees in the federal and District of Columbia governments. As one of the 18 mentors, Dr. Jia will guide a mentee 5 to 10 hours per month based on their professional goals for a 6-month time frame to accomplish the career development training.

On April 19, Dr. Jinyoung Barnaby gave an invited seminar entitled "Exploring naturally existing genetic variation in physiological and metabolic traits affecting grain yield and methane emissions in rice" at the Department of Plant and Soil Sciences, University of Delaware, Newark.

On April 23, Dr. Yulin Jia contributed a blast picture for an e-monograph website of *Magnaporthales* (https://magnaporthales.sebs.rutgers.edu). This is an ongoing National Science Foundation supported project to provide open access to taxonomic, biogeography and molecular data to facilitate researchers and the broader user community worldwide.

On April 24, Drs. Jinyoung Barnaby and Cristina Fernandez-Baca (DBNRRC) attended the 29th Annual Beltsville area poster day. Dr. Fernandez-Baca presented a poster entitled "Cultivar variation in brown rice inorganic arsenic accumulation" at the meeting. (L-R): Drs. Fernandez-Baca and Barnaby



✓ **Rice Germplasm Distributed**

During April, 973 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the United States, Belgium, Canada, Italy and Pakistan.

- **Stakeholder Interactions**

On April 25, Dr. Shannon Pinson provided information about rice varieties with a typical or specialty cooking qualities, and their niche markets to David Ramsey, journalist with the Arkansas Times writing an article on agricultural entrepreneurial endeavors.

Dr. Anna McClung was interviewed as part of an article published in the New York Times on April 30, 2019 regarding the impact of changing climate on production of rice and other crops in the USA.
https://www.nytimes.com/2019/04/30/dining/farming-climate-change.html

- **Education and Outreach**

On April 3, Dr. Jinyoung Barnaby served as a judge at the STEM fair at the Benjamin D. Foulois Creative and Performing Arts K-8 School, Morningside, Maryland.

The annual conference of the Arkansas Historical Association was held in Stuttgart, AR, April 11 to 13 and hosted by the local Grand Prairie Historical Society. Approximately 25 attendees elected to participate in the DBNRRC tour on April 12. "Rice Comes to the Grand Prairie and a Look to the Future", a brief history of U.S. rice cultivation with a focus on Arkansas and DBNRRC research, was presented by Dr. Georgia Eizenga. Afterwards, Dr. Ming Chen and Lorie Bernhardt invited the group to taste three very different rice varieties, Carolina Gold, a U.S. heirloom long grain variety; Neches, a waxy rice like that used in Asian desserts; and Scarlett, newly released cultivar from the DBNRRC with red bran.

On April 24, two high school students, Ms. Tristan Johnson and Mr. Joshua Lewis, under the mentorship of Dr. Jinyoung Barnaby (DBNRRC), presented a poster entitled “Exploring naturally existing genetic variation in grain chalk formation in response to changing climate" at the 29th Annual Beltsville area poster day. (L-R): Ms. Tristan Johnson, Dr. Jinyoung Barnaby, and Mr. Joshua Lewis

- **New Research Grants**

Dr. Jai Rohila, Research Agronomist, DBNRRC, is serving as a Co-PI on a National Science Foundation project entitled, “Elucidating the role of epitranscriptome on adaptation to abiotic stresses in cereals.” The lead institution on the project is University of Pennsylvania with Oklahoma State University also serving in a Co-PI role. This project will study post-transcriptional regulation of heat and drought stressed induced transcriptomes and whether these can be used as novel molecular markers to select for drought and heat stress tolerant germplasm and breeding lines in a marker-assisted variety development program.