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

MAY & JUNE 2020

MONTHLY RESEARCH HIGHLIGHTS

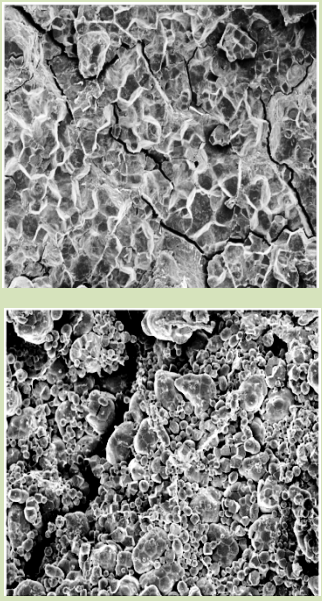
For More Information: Dr. Anna McClung, Research Leader/Center Director
anna.mcclung@ars.usda.gov

- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: New phenotyping approaches for important traits

Barnaby, Jinyoung Y., Trevis D. Huggins, Hoonsoo Lee, Anna M. McClung, Shannon RM Pinson, Mirae Oh, Gary R. Bauchan et al. "Vis/NIR hyperspectral imaging distinguishes sub-population, production environment, and physicochemical grain properties in rice." *Scientific Reports* 10, no. 1 (2020): 1-13.

Rice grain quality impacts crop value and is determined by genetic and environmental factors. Various chemical, physical, and visual analyses are used to determine grain quality which are laborious, expensive, and, sometimes, subjective. We evaluated the potential of high-throughput hyperspectral imaging as means of quantifying rice grain quality traits as well as classifying grain-samples according to genetic sub-population and production environment. Over 220 diverse rice cultivars that had been genotyped with over 3 million SNP markers were grown in three environments. Brown rice was evaluated using visible and near infra-red (Vis/NIR) spectroscopy and compared with standard laboratory measures of grain quality. Results demonstrated that Vis/NIR spectroscopy can classify rice according to sub-population (indica, temperate japonica, and tropical japonica) and production environment based on differences in physicochemical grain properties. The genomic analysis using the Vis/NIR data revealed chromosomal regions containing several plausible candidate genes for grain chalkiness. This study demonstrated for the first time that Vis/NIR is a non-destructive high-throughput phenotyping method that can predict rice grain quality traits and can be used to identify candidate genes controlling these traits.



Scanning electron microscope images of rice grain with 6% chalk (top) and 51% chalk (bottom).

- **Technology Transfer**

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

May 6th, Dr. Trevis Huggins, Geneticist and Curator of the Genetic Stocks Oryza (GSOR) collection, provided information to a researcher at the University of Nebraska-Lincoln regarding pre-treatment of rice seeds to minimize fungal growth during germination.

May 26th, Dr. Ming-Hsuan Chen assisted in connecting a researcher, who is interested in using rice or rice product (i.e. rice milk) as an additive to lime mortars and coatings for repairing old architecture, with an ARS scientist working on rice milk research.

On June 13th, Dr. Yulin Jia sent two sheath blight isolates to a researcher at Noble Research Institute, Ardmore, Oklahoma for conducting research on uncovering signaling of plant innate immunity.

✓ **Rice Germplasm Distributed**

During the month of May, 34 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the United States.

During the month of June, 34 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the United States, Belgium, Hong Kong and Switzerland.

- **Stakeholder Interactions**

May 21st, Dr. Ming-Hsuan Chen, research chemist, provided information to a bread making company in California on commercial rice milling practices in Arkansas as well as contact information to obtain current Arkansas rice production acreages.

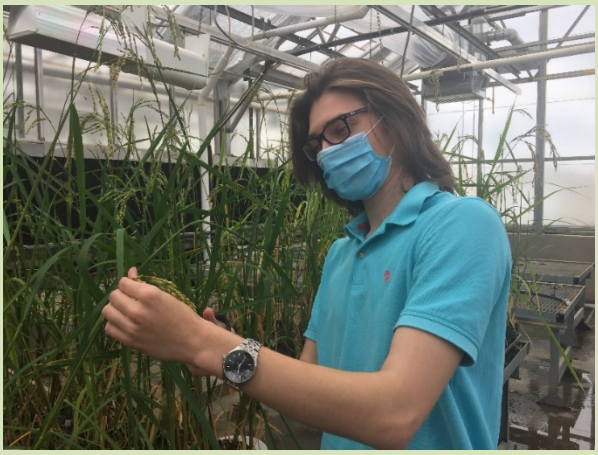
On June 16th and 29th, Dr. Anna McClung provided information regarding production of specialty varieties to interested parties in North and South Carolina.

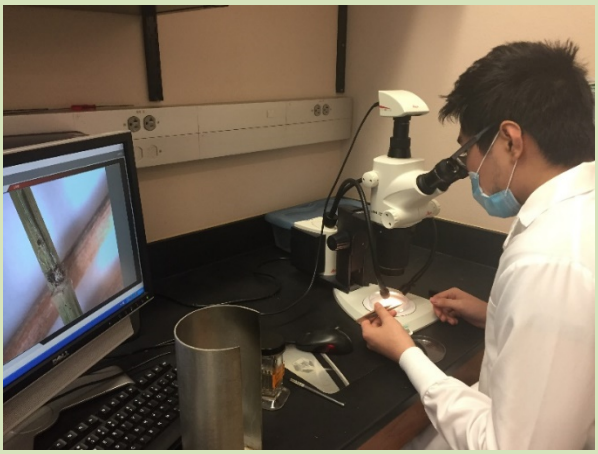
June 18th, Dr. Ming-Hsuan Chen assisted Stuttgart, AR rice mills by providing rice standards for rice grain quality analysis.

- **Education and Outreach**

On May 7th, a story 'Preparing U.S. Rice for a Parched Future' was posted on ARS' News and Events page regarding research conducted by Drs. Jai Rohila and Anna McClung with DBNRRC, along with Chris Henry of the University of Arkansas and Argelia Lorence with Arkansas State University. The research demonstrated the importance of exploring diverse rice germplasm for unique traits that can be used to develop new U.S. rice varieties thrive with reduced irrigation inputs. https://www.ars.usda.gov/news-events/news/research-news/2020/preparing-us-rice-for-a-parched-future/

Since June 2, Dr. Yulin Jia has been training two undergraduate students Nick Herring (L) and Devin Sha (R) to learn how to culture rice blast fungus pathotypes for research on understanding genetic resistance to this important disease.





On June 26th Dr. Yulin Jia gave an invited virtual presentation for new scientists and postdocs in the Southeast Area of USDA-ARS. His topic was "Conducting individual and collaborative research for success". A total of 73 participated in the conference.

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/