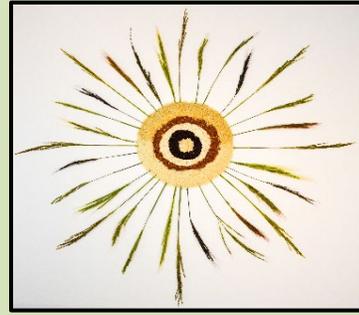




**Dale Bumpers National Rice Research Center
USDA-ARS
Stuttgart, Arkansas**



MARCH 2022

MONTHLY RESEARCH HIGHLIGHTS

For More Information: Dr. Yulin Jia, Acting Research Leader/Center Director
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• **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: Germplasm with enhanced nutritional quality for the consumers, the rice producers and food industry.

Pinson, S.R.M., Heuschele, D.J., Edwards, J.D., Jackson, A.K., Sharma, S., Barnaby, J.Y. Relationships among arsenic-related traits, including grain arsenic concentration and rice straighthead resistance, as revealed by genome-wide association. *Front. Genet.* 12:787767. <https://doi.org/10.3389/fgene.2021.787767>

There is concern that rice grains and foods can contain harmful amounts of arsenic (As), motivating rice breeders around the world to produce cultivars that restrict As accumulation in grains to protect human health. Arsenic enters roots through phosphorus (P) and silica (Si) transporters, As-detoxification involves S, and cell signaling to tolerate abiotic stress is impacted by Si, Ca, and Cu. Arsenic is also toxic to plants, with straighthead disorder (StHD) reducing yields by causing panicle sterility, resulting in upright or straight grain heads. Genetic variation in StHD resistance suggests that plants have evolved mechanisms that reduce As toxicity, possibly via regulation of As uptake, transport, or detoxification/sequestration. Because these mechanisms could also be causing the wide differences in grain As concentrations (grain-As) observed among diverse rice genotypes, it was hypothesized that some genes reduce both grain-As and StHD susceptibility. Detection of QTLs for both traits at the same chromosomal location would be indicative of a single gene affecting both traits. To test this hypothesis, we mapped genes for both grain-As, StHD and Si, P, S, Ca, and Cu in the USDA Rice Minicore Collection (RMC) using genome wide association study (GWAS). Response to arsenic-induced StHD was rated over two years in the Stuttgart, AR straighthead nursery. Grain element data were determined using ICP-MS of grains grown over two years in Beaumont, TX, and hull silica data were from two years of grains harvested in both AR and TX. Multiple QTLs (from 9 to 33) were identified for each of the investigated As-associated traits. The StHD and Si QTLs identified by this study were the first to be identified using high-density mapping, resulting in their being more precisely mapped to genomic regions of shorter Mb lengths than previously reported QTLs.

- **Technology Transfer**

- ✓ **Interactions with the Research Community**

On March 17th, Dr. Shannon Pinson provided information to Dr. Debasis Golui at North Dakota State University, Fargo, ND, regarding selection of rice germplasm for use in studies on arsenic uptake by rice plants.

On March 17th, Dr. Santosh Sharma, a Computational Biologist at DB NRRC gave a virtual seminar ‘Genomic predictions, selection and breeding for complex traits’; Dr. Thomas Tai, Research Geneticist, Crop Pathology and Genetics Research, Davis, California gave a virtual seminar ‘Update and challenges/pending gaps in rice research in California’ to DB NRRC scientists and National Program Leader, Dr. Jack Okamura.

On March 24th, Dr. Seve Linscombe, Director of The Rice Foundation, gave an update to DB NRRC scientists and National Program Leader, Dr. Jack Okamura, through online discussion on the challenges facing the US rice industry and his perspective on pending research gaps.

On March 24th, Dr. Brian Scheffler, Acting Associate Director of SEA/Director of the SEA's Genomics and Bioinformatics Research Unit, Stoneville, and his bioinformatic support scientists, Drs. Adam Rivers and Justin Vaughn discussed their bioinformatic capacity and equipment that can benefit rice research at DB NRRC.

On March 31st, Dr. Alton Johnson, Director of University of Arkansas Rice Research and Extension Center and his team members gave an update, pending rice research gaps and intent of research collaboration to DB NRRC scientists and National Program Leader Dr. Jack Okamura through online discussion.

- ✓ **Rice Germplasm Distributed**

During the month of March, 53 rice genetic stocks were shipped to researchers in the United States, Switzerland, Canada, Turkey, Belgium, and Italy.

- **Education and Outreach**

On March 23rd, Dr. Trevis Huggins was invited to speak at the Center for Computational Systems Biology Biweekly virtual seminar at Prairie View A&M University in Texas. The title of Dr. Huggins's seminar was “Curating the USDA-ARS National Small Grains Rice World Collection and the Genetic Stocks Oryza Collection”. The seminar was organized by Dr. Tesfamichael Kebrom, a research associate at Prairie View A&M, and a former colleague at Dr. Dirk Hays Lab at Texas A&M University. The seminar participants included undergraduate students and professors.

Staff with the Dale Bumpers National Rice Research Center recently participated in a mentorship with the Arkansas Children's Nutrition Center in Little Rock, AR. Jacqueline Hughes, Office Automation and Glen Beedle, Program Support Assistant mentored Tobi Smith a recently hired Program Support Assistant. Jackie and Glen assisted Tobi for 3 days explaining how WebTA, ARIS entries, travel, purchasing, annual reports and other ARS procedures are processed. Thanks to their efforts, Tobi will be familiar with the daily operations of her center.

Dr. Anna McClung

Although raised in huge metropolis area with no connection to agriculture, Anna McClung made her way to a career in plant breeding and genetics because of her ever-present interest in the beauty and diversity found in nature. She was intrigued as a young person by what cannot be seen whether it be buried dinosaur bones, the insides of geodes, under the depths of the ocean, or what was beyond the visible stars. Planning on a career in marine biology, she attended Texas A&M University, which had just started a huge oceanography program. By virtue of being an Aggie, she became interested in agronomy and in her junior year switched majors, requiring 20+ hrs. of course credits per semester to still graduate on time. After getting her BS degree, she worked on a farm for several months in Bavaria, Germany, falling in love with rural life and the amazing work ethic of farm families. She returned to Texas A&M to earn a MS degree in plant breeding, working on resistance to a new disease in corn. Wanting a completely new experience, she went to North Dakota State University, to earn her PhD and conducted research on incorporating the semidwarf gene and improved cooking quality in durum wheat. Her first job was with an Italian company based in New York to lead a corn breeding program in nitrogen use efficiency which required extensive travel to conduct yield trials in Ohio, Nebraska, Iowa, Missouri, and Italy as well as a winter nursery in Molokai. The late 1980s was a time of hostile corporate takeovers, which resulted in the closure of the lab where she worked so then, married and with two babies, in 1991 she accepted a USDA-ARS position in rice breeding at Beaumont, TX, working in the same rice fields that had once been walked by Hank Beachell (World Food Prize recipient) and Charlie Bollich (ARS Hall of Fame recipient). Dr. McClung began building partnerships with other ARS labs to develop imaging and phenotyping methods for rice sensory traits and with Texas A&M to establish marker assisted breeding for US rice. In 4 yrs., she was asked to be the Research Leader (RL) of the Beaumont program and then, in 2005, to also become the RL at DBNRRC with the goal to build a coordinated rice research program for ARS. As the agency looked to decrease administrative and facility costs, the Beaumont ARS program was closed in 2012 and all resources consolidated in



Stuttgart. Dr. McClung served as RL until 2021, guiding the development of a strong national research program that has evolved to meet the changing needs of stakeholders and the public. She has always maintained an active research program and has released 24 rice cultivars that have been grown on over 800,000 acres, with 12 currently in commercial production, in addition to other germplasm resources. Many of these cultivars have served as the basis for delving into the genetic basis for traits ranging from antioxidants in pigmented bran, to methane emissions, to drought tolerance in rice; all continuing her fascination with understanding the amazing world around us.

Laduska Sells was raised in Dewitt, AR, just a short distance from the Dale Bumpers National Rice Research Center and early on demonstrated her interest in agriculture, becoming a leader in the Future Farmers of America in her high school. During this time, she worked summers at the Stuttgart University of Arkansas Rice Research and Extension Center with the rice breeding program. She started her college education in 2002 and continued to work during summers at different university experiment stations gaining experience in rice genetics, cultural management, and weed control research. She received several scholarships during her college education and, in 2006, earned her bachelor's degree from the University of Arkansas at Monticello in Ag-Business. In 2007, Laduska joined ARS as a Biological Science Technician with the Breeding and Genetics program under the supervision of Dr.

Anna McClung. Over the years, Laduska has learned many new skills enabling her to implement research studies conducted in the field, greenhouse, and laboratory. Emboldened by new challenges, she has become the go-to person for all things related to field experimentation, operation of agricultural and seed processing equipment, irrigation management, application of ag-chemicals, and greenhouse operations that support research not only for Dr. McClung but for all ARS scientists at DBNRRC. In addition, she works



closely with the Location Administrative Officer to facilitate excessing obsolete property and with the Safety Officer as part of the SHEM committee, thus enhancing the DBNRRC workplace environment for all. She is highly motivated, has a strong work ethic, and always strives to exceed expectations. She is consistently an exemplary ARS employee and keystone to accomplishment of the DBNRRC research mission.

Luis Coral, Biological Science Technician with the Breeding and Genetics program, originally came from another rice growing country, Colombia. He was raised in a family of farmers where he spent his childhood among plantations of tomatoes, cucumbers, and beans, and where, as a youth, he helped to select seeds, perform cultural management, and operate an old Farmall tractor. After high school, he enrolled at the National University of Colombia, in Palmira, Valle del Cauca, married and soon had a family with two beautiful children, and then graduated as an agricultural engineer in 1994. He started a career with a bank serving as an appraiser for agricultural loans and stayed involved in agronomy as a consultant for organic cropping, a new market opportunity at that time. Eight years later, he and his family decided to immigrate to the USA and explore new opportunities. Initially, they worked where they could - in restaurants, construction, and cleaning properties- but always with the goal of finding their way back to careers in agriculture. In 2004, Luis started a position at Virginia State University in Petersburg, VA in the small ruminant program. Within a few months, he joined the soybean and edamame breeding program where he worked for over 8 years and earned a master's degree in Plant Science researching strawberry high tunnel production. His wife worked in various crops in the Horticulture department. Through this, their son joined the Navy and received training in Economics and Finance at George Mason University and his daughter began studying International Relations but is now finishing a MS degree in Occupational Therapy. She will return to Colombia to perform an internship there this summer. In 2014, Luis joined the Dale Bumpers National Rice Research Center under the direction of Dr. Anna McClung, and he is involved in all aspects of planting, cultural management, data collection and harvesting of the ARS field programs which cover some 20 acres. He has had specific responsibility for overseeing head row production fields of ARS released varieties. This includes careful observation and roguing of any variants to produce pure seed that is provided to growers and foundation seed programs located in numerous states.



Glen Beedle started at the Dale Bumpers National Rice Research Center in May 2016 as the Program Support Assistant. Before starting his Federal service, Glen was the Finance Director for the City of Arkadelphia, AR and was the Southeast Area Coordinator for the Arkansas Department of Emergency Management. A native of Arkansas County, Glen grew up helping his dad farm before going to college earning his Bachelor of Arts Degree in Communications at Henderson State University in Arkadelphia and a Master of Education Degree from the University of Arkansas in Fayetteville.

While at DBNRRC, Glen has helped with several facility tours, serves on the Environmental Management System audit review and currently is a member of the Southeast Area Council of Office Professionals as the Junior Chair and Outreach coordinator. Participates in Teams training sessions for Southeast Area Office Professionals and serves as a mentor to newly hired PSA in the Southeast Area.

In his free time Glen enjoys serving in the Stuttgart Lions Club and serves as the 1st Vice District Governor for District 7-L, outdoors activities and Razorback Sports.



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/>