



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



FEBRUARY 2024

MONTHLY RESEARCH HIGHLIGHTS

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- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: Crop plants with enhanced nutritional and/or product quality for consumers and producers

Guimaraes, B.P., Schrickel, F., Rettberg, N., **Pinson, S.R.M., McClung, A.M.**, Luthra, K., Atungulu, G.G., Sha, X., de Guzman, C., Lafontaine, S. 2024. Investigating the malting suitability and brewing quality of different rice varieties. *Beverages* 2024, 10: 16.

<https://doi.org/10.3390/beverages10010016>

Beer is traditionally brewed using four ingredients: hops, malted barley, water, and yeast. Adding rice as an adjunct starch result in a lighter bodied beer with a light, crisp flavor. When rice is used as adjunct starch, it is not malted but is milled, cooked, and mixed into the malted barley mash. In this study, we evaluated the possibility of producing beer using malted rice, as needed for rice to replace all or a portion of the barley. Brewing beer from rice alone would yield a gluten-free beer, for which consumer demand is rapidly growing, and would benefit the US rice industry with expanded sales and consumption. We collected grains of 19 genetically and chemically diverse rice varieties all grown in the USA and malted them using a small-sample pilot malting process, mashed them, and collected their worts. These worts were analyzed chemically to compare their malting qualities with barley. All 19 rice varieties provided enough amylase enzymes for their starches to be well converted to sugars using standard malting conditions. Rice is known for containing less protein than wheat or barley grains, causing the widespread belief in the brewing community that rice beer cannot be produced without adding exogenous proteins. Our data broke this paradigm by identifying some rice varieties that produced wort with sufficiently high protein contents. We also discovered that rice varieties with purple-pigmented brans imparted a unique and desirable color to the wort. While further study would be required to determine the flavor and color of the resultant rice beers, this study of malted-rice worts provides direction and motivation for further study on the use of malted rice for beer production, and for the development of rice varieties containing the trait combinations needed to produce gluten-free malted-rice beers.



Collaborator Dr. Scott Lafontaine in the grain-malting laboratory at the University of Arkansas, Fayetteville. Glasses contain malted-rice worts, with the glass on the right showing the unique color resulting from malting rice having purple bran color.

- **Technology Transfer**

- ✓ **Interactions with the Research Community**

The 43rd **Rice Crop Germplasm Committee** meeting was held virtually on February 16, 2024. Fifteen of the 17 committee members attended and two guests including **Jai Rohila** (DBNRRRC). **Georgia Eizenga** chaired the meeting with presentations by Gayle Volk about the National Plant Germplasm System, Gary Kinard regarding the National Germplasm Resources Lab and Bishwo Adhikari from the USDA-APHIS Plant Germplasm Quarantine reported 58 rice accessions were grown in quarantine, a population of 150 accessions is pending for 2024 and provided an update on the rice endornavirus. Harold Bockelman reported eight accessions received PI assignments, about 2,587 rice accessions from the National Small Grains Collection (NSGC) were distributed to 78 requestors in 2023 and showed the longest and shortest rice seeds in the collection. **Trevis Huggins** reported there are currently 32,371 accessions in the Genetic Stocks-*Oryza* (GSOR) collection, and five new populations should be available by the end of 2024. There is broad interest in the new *Tropical Japonica* Core which will be publicly available after publication. Lastly the group reviewed the Rice Crop Vulnerability Slide and suggested updates to the slide.



Tropical Japonica Core Development

- Compiled 740 accessions believed to be TRJ from USDA rice germplasm collections.
- Accessions sourced from **RDP 1 & 2, the USDA-Core, the 3K panel, the Brazilian Core; US pedigree; Globally diverse checks from other sub-pops.**
- Genotyped with 13 genetic markers to verify TRJ subpopulation.
- 487 accessions are in the final TRJ Core.
- Micro-core, 25% of TRJ core to a representative set (134 accessions).

Invited by Dr. Pankaj Jaiswal, Professor of Department of Botany and Plant Pathology, Oregon State University (Program Director of Division of Integrative Organismal Systems, Plant Genome Research Program of National Science Foundation) **Dr. Yulin Jia** attended a workshop of the Planteome Project (<http://planteome.org/>) at Oregon State

University, Corvallis, OR from February 19th to 23rd to develop and enrich the Biotic Stress branch of the Plant Stress Ontology and the associated knowledge base. Dr. Jia presented a talk titled 'Host-pathogen interactions' highlighting challenges of host shifts of pathogens resulting in more severe rice diseases under unpredictable environments. About 15 scientists from the USA and France attended and developed a platform for the controlled narrative of plant responses to biotic stress. Future application and utilization of the ontology and potential collaborative research on natural variation of selected rice varieties of ARS was discussed during workshop.



Dr. Pankaj Jaiswal in a greenhouse showing rice straws after harvesting.

✓ Rice Germplasm Distributed

During the month of February, 6 rice genetic stocks were shipped to researchers in the United States.

• Stakeholder Interactions

Drs. Yulin Jia and Jai Rohila attended the 2024 Arkansas Rice Annual Meeting in Jonesboro, AR on February 1st, to get firsthand knowledge on the latest on rice production, agricultural policy, and the next farm bill, and to interact with rice growers and members of various organizations working in the US rice industry. This year the meeting was witnessed by over 400 attendees. The meeting was kicked off at 8:30 am by Dow Brantley (Chairman, Arkansas Rice Federation) and Peter Bachmann (President & CEO, USA Rice) followed by the Federal Legislative Panel discussions led by Peter Bachmann, and State Legislative Panel led by Kevin McGilton (President & CEO, Riceland Foods). After coffee break, Jim Whitaker (Chairman, Arkansas Rice Research & Promotion Board, ARR&PB) presented a chronological history of ARR&PB and interesting facts of Arkansas Rice production system and how the ARR&PB is involved at various levels at federal and state levels and how the checkoff dollars are being used in various promotional activities. The presentation was very well-received by audiences, which was followed by a panel discussion on importance of the Arkansas check-off under his leadership. Last, but certainly not the least, activity of the day was an interesting "Variety Panel" discussion led by Dr. Jarod Hardke (Professor and Rice Extension Agronomist at the University of Arkansas, Division of Agriculture) highlighting the past accomplishments and future needs of rice breeding programs in the state of Arkansas.



Peter Bachmann



Dr. Jai Rohila and Dr. Yulin Jia

The Arkansas Rice Research and Promotion Board (ARRPB) Funding Meeting was held on Thursday, February 8, 2024, at Little Rock, AR. The ARRPB was established in 1985 to improve the profitability of growing rice in Arkansas by conducting a program of research, extension, and market development using funds collected by self-tax of harvested rice. **Drs. Jeremy Edwards and Jai Rohila** presented their collaborative research ideas with their peer researchers from the University of Arkansas Division of Agriculture. This year a total of 43 proposals from various research institutions from all over the state of Arkansas were competing for the Rice Board funding. The meeting was held in a hybrid format - in-person attendance joined by live online speakers and audiences. From DB NRRC **Drs. Shannon Pinson, Georgia Eizenga and Ms Melissa Jia** attended the meeting.

- **Education and Outreach**

Science Day at Stuttgart Public Library: Coordinated by Raeann Braithwaite, Heather Farmer, Dr. Yulin Jia, Dr. Nisha Patwa, Paxton Harper, Cindy Ledbetter, Rebecca Roberts, Candis Ray, Paul Braithwaite, Heather Box, Tiffany Sookaserm, John Mitchell (University of Arkansas at Pine Bluff, UAPB), and Jonte'sha Burnett (UAPB) the 2nd Annual Science Day at the Stuttgart Public Library was held on February 29, 2024, from 9am - 3pm. This is a collaborative event, partnering the library with ARS, to expose local students to science. Over 100 3rd to 6th grade students from Stuttgart schools attended to gain hands-on experience in rice research including examination of chlorophyll content of rice leaves for improving rice yield, tasting of ARS rice products, learning about SNARC fish production systems, nutrition, and disease management research and the rice- fish experiment recently conducted by both units. This effort is predicted to impact local rural education and improve the relationship of ARS and stakeholders.



Left to right: Front - Dr. Yulin Jia, Jonte'sha Burnett, Dr. Nisha Patwa, Tiffany Sookaserm, Heather Box
Back - Paul Braithwaite, John Mitchell

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/>