



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



NOVEMBER & DECEMBER 2024

MONTHLY RESEARCH HIGHLIGHTS

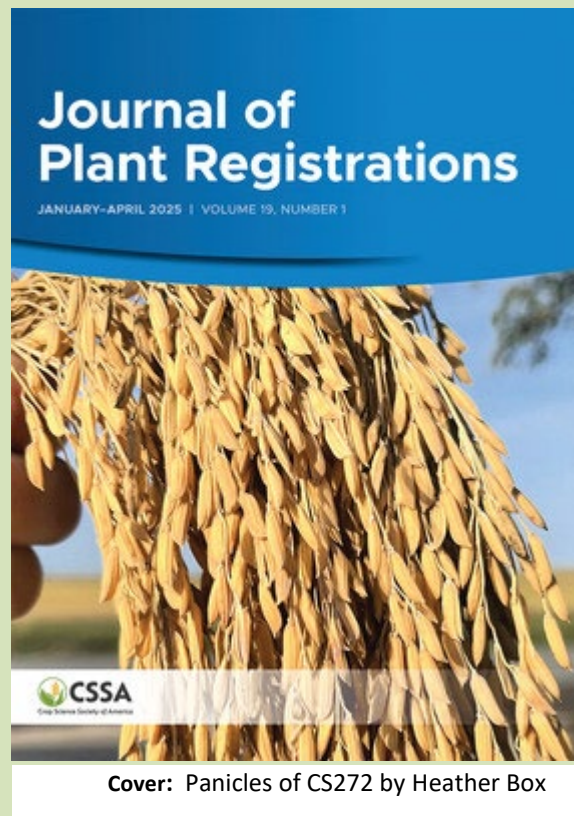
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- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: New crops, new varieties, and enhanced germplasm with superior traits.

Yulin Jia, James Gibbons, **Aaron K. Jackson**, **Heather Box**, **Haijun Zhao**, Xueyan Wang, **Melissa H. Jia**, Adam Famoso, Don Growth. Registration of three long grain rice germplasm lines containing improved blast resistance with the *Ptr* gene, low chalk, excellent milling quality, and good yield. **Journal of Plant Registrations** (cover). First published: 31 December 2024 <https://doi.org/10.1002/plr2.20407>.

Blast disease of rice is one of the most destructive diseases and is managed by using major blast resistance (*R*) genes. The *Ptr* gene in rice is an atypical blast *R* gene that confers resistance to a wide range of blast races. Here we release three blast resistant germplasm lines, designated as CS272, CS324, and CS353, with the *Ptr* gene selected from a cross of the US-adapted cultivars ‘Cybonnet’ and ‘Saber’. These lines were resistant to most blast races under greenhouse conditions, resistant to leaf blast in an upland blast nursery in Crowley, LA, and to panicle blast under flood conditions in Puerto Rico and Crowley. These lines are superior in panicle size and have many agronomic and grain-quality characteristics comparable to or better than those of both parents. These lines can be used in rice-breeding programs for improving blast resistance, quality, and yield and can be grown for premium long grain markets.

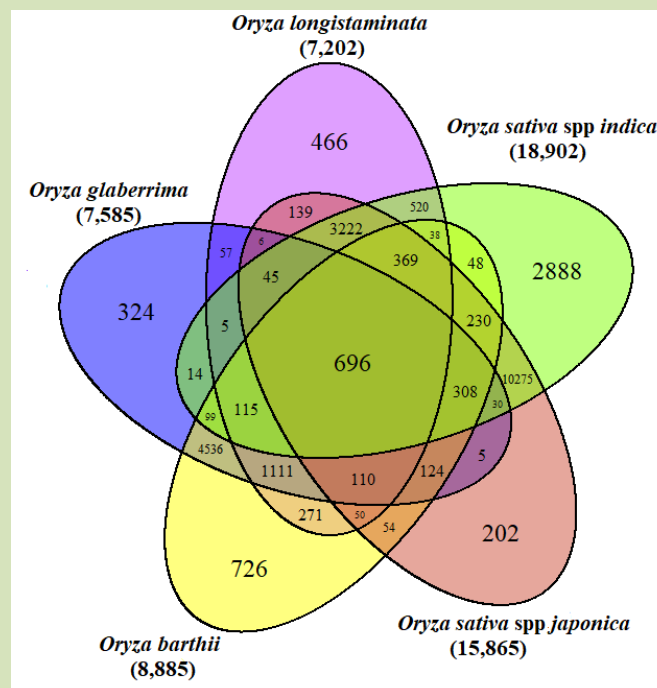


Cover: Panicles of CS272 by Heather Box

This addresses USDA-ARS Research Goal: Characterization of other *Oryza* species and understanding genetic variation.

Gouda, A. C., Sangare, J. R., Gninkoua, K., Wambugu, P., **Huggins, T. D.**, & Ndjiondjop, M. N. (2024). Genetic variation and population structure of the rice accessions maintained in the AfricaRice genebank using DArTseq. **Crop Science**, 1–20.
<https://doi.org/10.1002/csc2.21395>

Genebanks play a key role in conserving world-wide crop genetic diversity maintained in ex situ collections. To fully utilize rice collections, it is essential to understand their genetic diversity. The AfricaRice genebank holds the largest collection of rice germplasm originating from the African continent. The collection contains about 22,797 accessions of which 18,900 (83%) were collected from Africa, sixty-four percent of which is African *Oryza sativa* (14,480) and 14% (3,130) is the cultivated African rice, *Oryza glaberrima*. A subset of 9,013 accessions from *Oryza barthii*, *Oryza glaberrima*, *Oryza longistaminata*, *Oryza sativa ssp. indica* and *Oryza sativa ssp. japonica* was characterized using DArTseq genotyping-by-sequencing. A total of 27,718 high-quality single nucleotide polymorphism (SNP) markers were identified, revealing significant genetic diversity with an average genetic distance of 0.267, and 45.1% of pairs being highly distant. The analyses identified six clusters corresponding to species and biological classifications. These findings enhance the understanding of genetic diversity in the AfricaRice collection and provide valuable tools for breeding and genetic studies. The figure shows the number of unique SNPs associated with each *Oryza* species group, as well as the number of SNPs shared among the five species groups.



- **Technology Transfer**

- ✓ **Interactions with the Research Community**

On November 10-13, 2024, Dr. Georgia Eizenga attended the Crop Science of America annual meeting in San Antonio, Texas. She gave the Frank N. Meyer presentation titled “Mining the Diversity in Rice and it’s Ancestral Species for Rice Improvement” and was the 2024 recipient of the Frank N. Meyer Metal for Plant Genetic Resources for her research focused on evaluating rice wild species and unadapted, diverse germplasm for rice improvement, and developing genetic resources for fundamental research. Dr. Eizenga also introduced the Calvin Sperling lecturer, and as Past Chair of Div. C08: Plant Genetic Resources, assisted with several other C08 sponsored activities.



On December 3-4, 2024, Dr. Yulin Jia was invited to give a talk titled ‘Feeding the world through innovative plant breeding strategies’ at an international congress entitled “Towards decarbonization in the agri-food industry” in Seville, Spain (<https://www.renowagro.com/>). The meeting attendees include several senior officials of European Union, agricultural industries and universities, several hundred farmers, researchers and agricultural businessmen.

On December 10, 2024, three rice breeders, Drs. Teresa B. De Leon, Nirmal Sharma, Frank Maulana from Rice Experiment Station, Biggs, CA visited and shared their updates on rice variety development in California with scientists and staff members of DB NRRC.



Rice Germplasm Distributed

During the month of November, 8 rice genetic stocks were shipped to researchers in Germany and the United States.

During the month of December, 225 rice genetic stocks were shipped to researchers in Spain and the United States.

- **Stakeholder Interactions**

On December 8, 2024, Drs. Yulin Jia, Jeremy Edwards, and Shannon Pinson of DB NRRC with National Program Leader Dr. Jack Okamuro attended a stakeholder meeting organized by President/CEO of USA rice federation Peter Bachmann and USA rice federation chairman, Keith Glover (CEO/President of Producers Mill, Inc) to discuss challenges of low milling quality of US rice in recent years. A comprehensive plan involved in research and extension is being developed.

- **Education and Outreach**

Jai Lewis is a new biological science technician working in the Dale Bumpers National Rice Research Center in the Plant Pathology lab under the supervision of Dr. Yulin Jia. Jai earned her bachelor's degree in Agricultural Science from Tennessee State University, where she developed a strong foundation in understanding the science behind crop production and plant health.

During her undergraduate studies, she had the opportunity to intern with the USDA as a lab technician, focusing on researching plant diseases in soybeans. This experience was pivotal in solidifying her interest in plant pathology and honing her skills in laboratory research. Jai also explored the intersection of agriculture and wellness through an internship at Datus Henry CBD Wellness & Health, where she learned innovative methods for producing CBD products. These experiences not only expanded her technical expertise but also deepened Jai's understanding of how agricultural science can impact various industries.



Jai's primary focus is researching plant pathology, specifically studying rice diseases. This role allows her to contribute to critical advancements in protecting crops and supporting sustainable agricultural practices. Each day, Jai is excited to uncover new findings that help address the challenges faced by farmers and the agricultural community.

Looking ahead, Jai is eager to continue her work at this facility and further her contributions to the field of plant pathology. Jai looks forward to making a lasting impact in this field as she grows both personally and professionally.

Rachel Norris is a new biological science technician working in the Dale Bumpers National Rice Research Center in the Genomics lab under supervision of Melissa Jia and Dr. Jeremy Edwards! Rachel grew up in New Hampshire and decided rather early on her career. In first grade, she announced her chosen career of entomologist the day after she learned of the field. While her fascination with insects initiated the choice, the importance and impact of insects on society and the environment maintained her dedication to the field. Rachel achieved her goal earning two degrees in entomology, a M.S. from University of California, Riverside and a B.S. from Cornell University (with a second major biological science - concentration in ecology and evolutionary biology). In the nine years Rachel spent conducting entomological research, she has been a contributing author of seven scientific journal articles. As an undergraduate



researcher in Professor Thaler's lab, she investigated how the risk of predation alters the reproductive investment in the Colorado potato beetle. As a graduate student, co-advised by Professors Mauck and Rankin, Rachel investigated how the in-leaf feeding and dispersal behavior of the aphid, *Myzus persicae*, changed in response to the lady beetle chemical "footprints". As a Laboratory Technician for Professor Scott, at Cornell, Rachel studied pesticide resistance development in fruit flies and house flies.

Through her experiences in and out of the lab, Rachel has come to understand that connections to others and service are vital parts to her enjoyment and satisfaction in being a scientific researcher. Rachel is ecstatic to serve as a biological science technician to aid in DBNRRC mission and its connection to the community. Rachel is joined in Arkansas by her husband, Eric Sibbald, who does remote GIS work, and hopefully by a newly adopted dog soon. Her main hobbies are cooking and baking.

On December 3, 2024, Dr. **Georgia Eizenga** presented a guest lecture in the Molecular Biology class taught by Dr. Sathish Ponniah at the University of Arkansas-Pine Bluff. Dr. Eizenga discussed the early plant explorers who collected plants globally and these collections were the basis of the USDA-ARS National Plant Germplasm System. Subsequently, she explained the population structure of cultivated rice (*Oryza sativa*) and how it relates to the genotypic and phenotypic variation in across *O. sativa*; how genes controlling this variation were mapped using genome-wide association studies (GWAS) and quantitative trait locus (QTL) mapping with recombinant inbred line populations; and lastly the release of two germplasm lines for rice breeders to use in rice improvement. Dr. Eizenga also discussed the relationship between the genotypic and phenotypic variation found in the wild ancestral species of cultivated rice, *O. rufipogon* and *O. nivara*, and the relationship to *O. sativa*. After the lecture, Dr. Ponniah provided a tour of his lab and a couple of students discussed their research projects.



On December 12, 2024, DBNRRC staff had their annual holiday team building event, everyone enjoyed food, games and a chance to fellowship. The retirement of Dr. Shannon Pinson was celebrated by DB NRRC researchers, and her collaborators at university and a local rice farmer.



As part of annual holiday gathering, DBNRRC employees also came together to collect items to create children's goody bags to donate to the ICCM (Inter-Church Community Ministry) Foodbank in Stuttgart. Fifty-five goody bags for boys and girls were distributed - each included a winter hat, pair of gloves and a pair of socks, as well as holiday candies, fruit cups and other snacks. In addition to the goody bags, 65 lbs. of food items were delivered to ICCM collected by staff at DBNRRC.



- **International Research Collaborations**

On December 4-6, 2024, Dr. Yulin Jia visited rice paddy and a rice farmer in the Valencia region of Spain, Spain. Valencia region is known for its rice cultivation, which has been taking place for over 1, 200 years. The region is home to several varieties of rice, including ‘Bomba’, a medium-grain rice that retains its firm texture; ‘Senia’: produces a creamy texture, and ‘Albufera’, a progeny of Bomba and Senia. Rice cultivation in the Valencia region takes place in flooded fields which is a part of a culture heritage in Spain. A potential US-Spain collaboration to develop smart rice with resistance to rice blast disease was discussed with a professor from Polytechnic University of Valencia.



Rice paddy after harvesting in December



Tractor for rice field preparation

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/>