



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



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MONTHLY RESEARCH HIGHLIGHTS

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- **Recent Scientific Publications**

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

Jia, Y., and Jia, M. H. 2022. Registration of a blast-resistant premium medium-grain rice germplasm Eclipse. *Journal of Plant Registrations*, 1–9. <https://doi.org/10.1002/plr2.20253> Published Nov 16 2022.

Rice blast disease is one of the most damaging rice diseases worldwide. In the present study, we developed a blast resistant and ‘Calrose’ type medium grain quality rice germplasm, Eclipse. It was selected from a backcross between a tropical blast resistant japonica rice variety Katy and a temperate medium grain rice variety ‘M-202’. Eclipse was evaluated in uniform regional rice nurseries in Southern USA during 2019-2020 and further characterized in Arkansas fields during 2020-2021. Blast resistance was determined under greenhouse and field conditions. Under greenhouse conditions, Eclipse was resistant to the blast race, IA45, IB1, IB49, IB54, IC17, IE1, IG1, IH1 similar to that of Katy. Under naturally infected field conditions in Louisiana and Puerto Rico, Eclipse was resistant to both leaf and panicle blast infections similar to that of Katy. Eclipse has major blast resistance genes *Pi-ta* and *Ptr* genes, lacks *Pi-b*, *Pi-ks* and *Pi-z*. Eclipse is a glabrous type of medium grain rice and has a low amylose content identical to M202 and a quality of Calrose rice. In Southern United States, Eclipse has an average height of 98 cm and yields 8686 kilograms of grains per hectare. It reaches 50% heading at 83 days after planting with a lodging rate of 22% and 59% head rice. Eclipse is useful for dissecting components involved in disease resistance, breeding for improving disease resistance, grain quality and can also be used directly by rice growers for premium grain production under organic conditions and for intercropping with other valuable livestock, such as fish.



Examples of blast reactions of rice variety and germplasm to blast races under greenhouse conditions

- **Technology Transfer**

- ✓ **Interactions with the Research Community**

On Nov. 3, Southeast Associate Area Director Dr. Prasanna Gowda met all staff members at DB NRRC and joined a discussion where each of the rice scientists shared highlights of their research. Subsequently, he discussed ideas to foster new collaborations with Dr. Alton Johnson (Director of UA Rice Research and Extension Center) and with interim Dean/Director Dr. Bruce McGowan and Assistant Dean of Research Dr. Christopher Mathis and Professor Dr. Sathish Ponniah of School of Agriculture, Fisheries and Human Sciences, UAPB. Subsequently, he toured UAPB and ARS research labs and greenhouses.



From left to right: Mr. Bishnu Prasad Joshi – Graduate Student, Mr. Reghan Mutethia – Graduate Student, Mr. Dipak Khanal – Graduate Student, Dr. Christopher Mathis – Assistant Dean/Associate Research Director, School of Agriculture, Fisheries and Human Sciences (SAFHS) – Sitting in the Chair, Dr. Yulin Jia, Dr. Jeremy Edwards, Dr. Bruce McGowan – Interim Dean (SAFHS), Ms. Shermaine Critchlow – Graduate Student, Dr. Prasanna Gowda and Dr. Sathish Ponniah – Associate Professor, SAFHS

On Nov. 8, Dr. Yulin Jia evaluated blast reaction of rice varieties with Dr. Sathish Ponniah at University of Arkansas Pine Bluff to create blast resistant plants using novel methods.



Nov. 10, Dr. Yulin Jia virtually met a Postdoctoral Research Associate Dr. Geoff Vrla at University of California at Berkeley to discuss ideas of gene stacking for creating durable blast resistant rice plants that would help US rice growers.

Dr. Jai Rohila, Research Agronomist at DB NRRC, participated in an international workshop led by USAID to discuss initiating a new research collaboration between the US and Brazil on reducing fertilizer dependence in agriculture under four major themes: 1) Precision management, big data, and AI. 2) Biological products, soil biology, and soil health. 3) New products, including fertilizers and bio-stimulants. 4) More efficient use of existing nutrient sources. As part of the discussion, Dr. Rohila shared his vision on increasing fertilizer use efficiency in rice production via germplasm improvement under the theme #4. The workshop was held at the University of Florida, Gainesville, Nov 16-17. Thirty-three USDA- ARS scientists participated in this workshop.



✓ **Rice Germplasm Distributed**

During the month of November, 4 rice genetic stocks were shipped to researchers in the United States.

● **Education and Outreach**

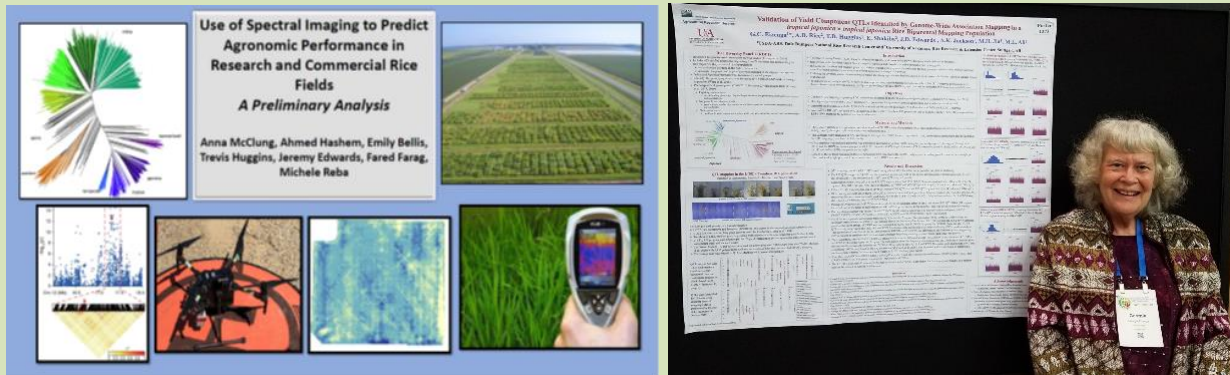
On Nov. 1, Dr. Trevis Huggins provided samples of 20 diverse rice varieties from the USDA- ARS world rice collection to Dr. Craig Wilson, Director of USDA Future Scientist Program. These will be used in educational outreach events that focuses on hands-on and inquiry-based science teaching that links teachers with agriculture. The program operates in 40 states, Puerto Rico, and Panama.

On Nov. 2, Dr. Anna McClung provided seed of a USDA-ARS developed rice variety for ARS researchers in New Orleans, LA and Beltsville, MD that are evaluating the effects of consumption of resistant starch on gut microbiota and control of obesity.

On Nov. 4, Dr. Anna McClung was interviewed by journalists regarding the release of two pigmented bran varieties, USDA-Tiara with purple bran and Scarlett with red bran. These varieties have elevated levels of natural antioxidants that have health beneficial properties. The research was published by USDA-ARS [ARS Researchers Develop New Rice Grains with Dazzling Color and Flavor \(govdelivery.com\)](#) and by Food Business News [US-grown purple and red rice offer unique nutrition and flavor profiles | Food Business News](#).

Drs. Anna McClung and Georgia Eizenga, from the DBNRRC, attended the annual Crop Science Society of America meeting held in Baltimore, MD, Nov. 6-9, 2022. Dr. McClung presented the talk "Use of Spectral Imaging to Predict Agronomic Performance in Research and Commercial Rice

Fields” summarizing results from collaborative research between ARS and Arkansas State University regarding the potential for using drone imaging to help with characterizing rice breeding materials for agronomic and stress responsive traits. Dr. Eizenga presented a short talk on her poster “Validation of Yield Component QTLs Identified by Genome-Wide Association Mapping in a *tropical japonica* × *tropical japonica* Rice Biparental Mapping Population”. Additionally, Dr. Eizenga participated in the graduate student networking session; judged student presentations/posters; as selection committee chair, introduced the Ron Phillips Plant Genetics Lecturer, Dr. Paul Gepts (Univ. California-Davis); and participated in the Division C08 (Plant Genetic Resources) business meeting.



On Nov. 9, Dr. Anna McClung, Research Geneticist, was presented with the Crop Science Society of America Fellow award at the annual Tri-Society meeting held in Baltimore, MD Nov. 6-10. The Fellow award is the highest recognition bestowed by the Society. Members of the Society nominate worthy colleagues based on their professional achievements and meritorious service with only up to 0.3 % of the Society’s active and emeritus members being elected.

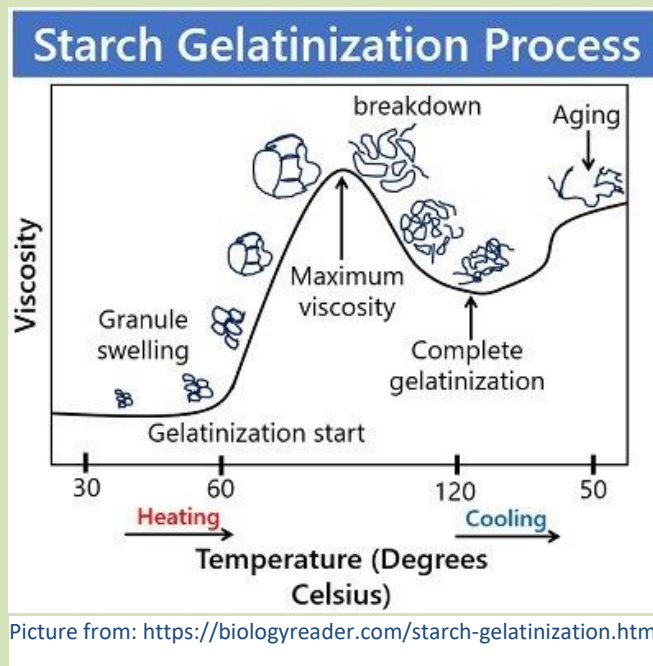


(L to R) are three ARS recipients of awards: Anna McClung, rice geneticist/breeder, CSSA Fellow, Marilyn Warburton, cold season crops geneticist/germplasm curation, 2022 President CSSA, and Jodi Scheffler, cotton geneticist/breeder, CSSA Fellow

On Nov. 15, Dr. Jeremy Edwards delivered an invited guest lecture for the University of Arkansas at Pine Bluff (UAPB) undergraduate and graduate level course: Molecular Biology (AGRI-4400/GAGRI-5400). Dr. Edwards' lecture title was "Genetic discovery and molecular markers to accelerate plant breeding." He presented plant breeding concepts, use of molecular markers in plant breeding, and molecular marker discovery techniques in controlled crosses and in diverse plant collections. He also shared examples of molecular marker discovery from his own research experience and led discussions on the latest advances in genomic research.

On Nov. 17, Drs. Yulin Jia, Jeremy Edwards, Anna McClung, Shannon Pinson, Georgia Eizenga, Aron Osakina, Yixiao Huang, and supporting scientist and technician Melissa Jia and Heather Box attended 2022 annual membership meeting of Riceland Food in Stuttgart, AR. Riceland food is a farmer-owned agricultural marketing cooperative, and a major miller and marketer of rice based in the United States. During the meeting Riceland Foods reported over \$1 billion in revenue. During lunch Dr. Jia introduced DB NRRC mission and programs to Chairman Roger Pholner and Riceland's new president and CEO, Jason Brancel who shared his vision for the cooperative during his CEO Report.

In the Nov/Dec 2022 issue of the journal "Cereal Chemistry", research by DBNRRC scientists Drs. Anna McClung and Ming-Hsuan Chen (ret) was highlighted under "Editor's Picks". The article, "Predicting single kernel and bulk milled rice alkali spreading value and gelatinization temperature (GT) class using NIR spectroscopy", was a result of a collaboration with USDA-ARS researchers at the Stored Product Insect and Engineering Research Unit, in Manhattan, Kansas. One key aspect of rice quality is the gelatinization temperature which occurs when the starch granules in the raw kernel completely soften during cooking. Having a rapid method to evaluate co-mingled grains at a processing facility or grains which are genetically segregating for this trait in a breeding program will help to assure uniform cooking quality. An instrument which can rapidly evaluate individual kernels with near infrared spectra was tested to see if it could differentiate GT class in raw, uncooked rice grains. The instrument correctly classified the grains over 85% of the time. The results demonstrate the potential for using spectral scans of raw rice as a means of predicting cooking quality and will benefit commercial rice processors and breeding programs.



Dr. Yixiao Huang was born and raised in Liaoning, China. In 2016, he received his Bachelor of Science degree in plant protection from China Agricultural University. He conducted his capstone project in Dr. Youliang Peng's lab, and he worked on the function of two effectors in *Magnaporthe oryzae* by gene knockout. That was the first time he knew about rice blast disease, and he developed a strong interest in plant science and molecular biology. From 2016 to 2022, he attended a PhD program in plant pathology under the guidance of Dr. Nian Wang at University of Florida. His project was to study the outer membrane proteome of *Candidatus* Liberibacter species especially *Candidatus* Liberibacter asiaticus which is a causal agent of citrus Huanglongbing disease. He also detected the interactions between bacterial outer membrane proteins and citrus proteins. Currently, he is an ORISE Postdoctoral Fellow under Dr. Yulin Jia at USDA-ARS Dale Bumpers national Rice Research Center. He is involved in multiple team projects which include identification of soil microbes that regulate the release of greenhouse gas in rice paddy, identification of interacting proteins from rice and *M. oryzae* which are important for plant immunity and studying potential roles of rice resistance genes in abiotic stress tolerance. He is passionate of his choice of career path so far and believe that he will make important contributions for rice industry and sciences.



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/>