



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



**FEBRUARY 2021**

**MONTHLY RESEARCH HIGHLIGHTS**

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● **Recent Scientific Publications**

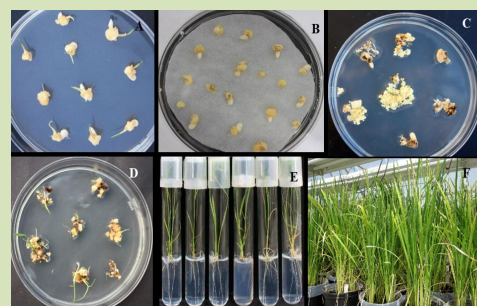
*This addresses USDA-ARS Research Goal: New biotechnological tools to transfer gene function for improved crop varieties*

Suresh Pokhrel, Sathish K. Ponniah<sup>1</sup>, **Yulin Jia**, Oliver Yu and Muthusamy Manoharan. 2021. Transgenic Rice Expressing Isoflavone Synthase Gene from Soybean Shows Resistance against Blast Fungus (*Magnaporthe oryzae*). Plant Disease (Posted online on February 22. <https://doi.org/10.1094/PDIS-08-20-1777-RE>)

Rice blast disease caused by the fungus *Magnaporthe oryzae* (*M. oryzae*) is one of the most lethal diseases of rice worldwide. The product of isoflavones, especially genistein, is a precursor for the production of phytoalexins - antimicrobial compounds that induce broad-spectrum disease resistance. Rice does not contain isoflavone and it is unknown if products of isoflavone, including genistein from soybean and maize, can provide effective resistance to rice blast fungus *M. oryzae*. In the present study, we expressed three isoflavone biosynthetic genes, soybean chalcone synthase (CHS) and soybean isoflavone synthase (IFS) genes and the maize transcriptional factor C1/R (CRC) in rice and evaluated transgenic lines for rice blast reactions at University of Arkansas at Pine Bluff. We found transgenic lines with enhanced levels of genistein also having enhanced blast resistance for each transgene. The greatest level of disease resistance was observed in transgenic lines expressing all three transgenes and was correlated with the amount of genistein. These findings indicate opportunities for the development of novel methods for controlling rice blast disease via a genetic engineering approach.



**Rice blast disease symptoms on panicle stems (neck blast), seeds, and leaf.**



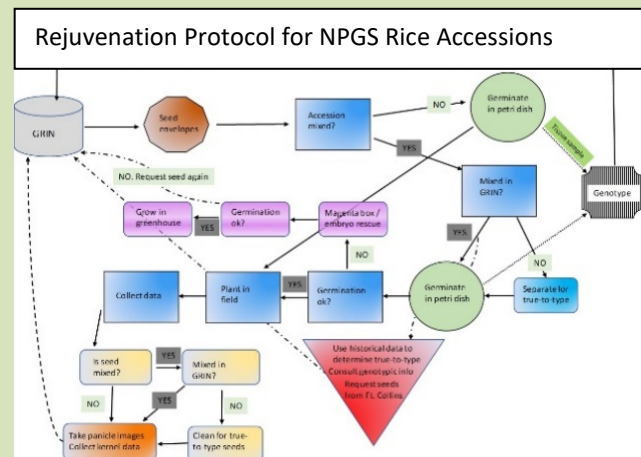
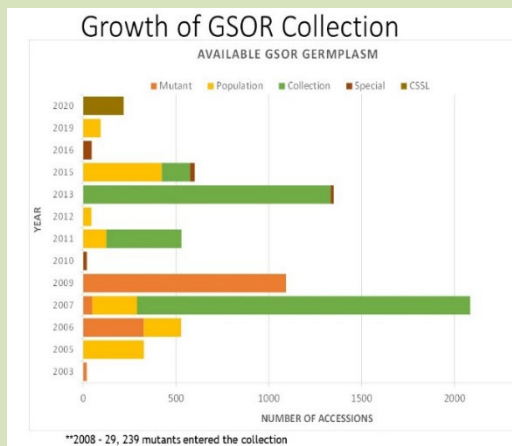
**Transgenic rice (cv Nipponbare) expressing soybean isoflavone synthase gene in a greenhouse at University of Arkansas at Pine Bluff.**

- **Technology Transfer**

- ✓ **Interactions with the Research Community**

February 19, Drs. Yulin Jia and Jeremy Edwards provided information on the choice of rice genotype for mutant population development under greenhouse conditions for scientists in a company in Denmark.

The annual meeting of the Rice Crop Germplasm Committee (CGC) was held virtually on Feb. 24, 2021 and attended by 24 members and guests. The Rice CGC is an advisory committee to the National Plant Germplasm System (NPGS) for rice and committee members include both public and private rice breeders from the rice growing states, a pathologist, entomologist and the USDA employees responsible for managing various the rice collection. From the DBNRRC, Dr. Trevis Huggins presented an update on the Genetic Stocks-*Oryza* (GSOR) collection and the rejuvenation protocol implemented for NPGS rice accessions, Dr. Georgia Eizenga chaired the meeting and Drs. Anna McClung and Shannon Pinson participated in the meeting.



- ✓ **Rice Germplasm Distributed**

During the month of February, 13 rice genetic stocks were shipped to researchers in the United States from the Genetic Stocks *Oryza* (GSOR) collection.

- **Stakeholder Interactions**

Dr. Ming-Hsuan Chen, Aaron Jackson and Melissa Jia provided information on molecular markers for the Waxy gene to predict rice functional and sensory qualities to a science research analyst, Rheumel Kheem Albano, at the Philippine Rice Research Institute.

Additional recommendations for marker design and experimental conditions were also provided.

- **Education and Outreach**

February 3, an article entitled “Gene banks are getting a long overdue update. They’re an important tool for crop diversity and the fight against climate change” written by Lela Nargi was posted by *The Counter*. The story highlights gene banks and efforts to genotype the accessions in the gene banks around the world to increase their usefulness for crop improvement. For the story, several researchers who utilize accessions in the USDA-ARS National Plant Germplasm System as part of their research programs were interviewed including Dr. Georgia Eizenga. Eizenga explained the importance of the recent genotyping efforts at the DBNRRC reported in *Crop Science* (<https://doi.org/10.1002/csc2.20256>)



Photo by: Lance Cheung/USDA; plant accessions stored in a USDA genebank

to increase the value of the rice collection to the broader rice breeding community. (*The Counter* is an independent, nonprofit, nonpartisan newsroom investigating the forces shaping how and what America eats.)

Story link:

<https://thecounter.org/gene-banks-overdue-update-crop-diversity-climate-change-food-security/>

February 3, Dr. Anna McClung, was interviewed by Dr. David Shields, College of Arts & Sciences, University of South Carolina, on the development of the new ARS rice variety, Santee Gold, which is derived from the heirloom variety Carolina Gold that is documented to have been grown on the Mid-Atlantic Coast in the 17<sup>th</sup> century. The interview will be part of Dr. Shields teaching regarding “Southern Foodways”.



Santee Gold Panicles on Left, Carolina Gold Panicles on Right

February 12, Dr. Yulin Jia gave a virtual seminar titled ‘Functional analysis of the rice blast resistance gene *Ptr* using fast neutrons and Crispr-CAS9’ to 59 graduate students and 3 faculty members of Cell and Molecular Biology program (CMB) of the University of Arkansas- Fayetteville. The UA CMB program is an interdisciplinary graduate program that examines various aspects of cell function, structure, metabolism, and chemical functions on, within and between cells.

February 25, Dr. Yulin Jia and Melissa Jia virtually served as judges in the West Central Regional Science Fair at Arkansas School for Mathematics, Sciences and Arts (ASMSA, [www.asmsa.org](http://www.asmsa.org)). ASMSA is one of 15 public, residential high schools in the country specializing in the education of talented and motivated students who have an interest in mathematics, science, creativity, humanities, and the arts.

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/>