



**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: Enhanced knowledge of how growth and development of crop plants are controlled at the genetic and molecular levels

Eizenga, G.C., Chen, M.H., Jia, M.H., Jackson, A.K., and Edwards, J.D. 2019. Registration of the Estrela × NSFTV199 Rice Recombinant Inbred Line. *Journal of Plant Registrations* DOI:10.3198/jpr2019.04.0019crmp.

Rice yield is determined by several factors including number of plants per acre, number of panicles per plant, number of grains per panicle and grain size which is affected by days to maturity and flag leaf dimensions. Most rice produced in the southern USA is classified as *tropical japonica* whereas most rice grown in Asia is classified as *indica*. *Tropical japonica* rice is substantially different from *indica* rice both in appearance and genetically, thus there is a need to dissect the processes controlling rice yield and quality in *tropical japonica*. The *tropical japonica* Estrela/NSFTV199 mapping population is diverse for these yield related traits and grain quality. In addition to the previously reported traits, this study reports the evaluation of the population for flag leaf dimensions, which affects grain yield; leaf hairiness, an undesirable trait in rice; and grain chalkiness, which negatively affects the appearance and cooking quality of rice kernels. This Estrela/NSFTV199 population is being made publicly available for research groups to identify the mechanisms controlling these yield-related and quality traits, evaluate the population for additional traits of interest, and for breeders to make crosses with their elite breeding materials for varietal development.



This addresses USDA-ARS Research Goal: Development of new phenotyping approaches for important traits

Armstrong, P.R., McClung, A.M., Maghirang, E.B., Chen, M.H., Brabec, D.L., Yaptenco, K.F., Famoso, A.N. and Addison, C.. 2019. Detection of Chalk in Single Kernels of Long Grain Milled Rice Using Imaging and Visible/Near Infrared Instruments. Cereal Chemistry DOI:10.1002/cche.10220.

Milled rice in the marketplace is expected to have uniform grain shape and white translucent grains. However, grain chalkiness, can vary according to cultivar, cultural management practices, climate during the growing season, and post-harvest handling. Poorly packed starch granules in the grain result in opaque areas in either the entire or a portion of the grain. Rice chalk is a



characteristic that consumers and grain processors associate with low quality and results in a substantial price reduction to the producer. The rice industry has observed increased grain chalk in some widely grown long grain cultivars which is affecting access to some markets and crop value. Having a high throughput, objective method to quantify grain chalkiness would help breeders to accurately select and develop low chalk rice cultivars. Four imaging systems were compared for accuracy in grain chalk quantification. These included a single kernel near-infrared (SKNIR) tube instrument and a silicon-based light-emitting diode (SiLED) high speed sorter that were developed by USDA-ARS (Manhattan, KS) and compared with two commercially-available imaging instruments, WinSEEDLE and SeedCount that are used for chalk quantification. All of the instruments can be used to classify chalk, but their level of accuracy depends on how chalk is defined. Both the SKNIR and SiLED instrument chalk classifications appear to be partially based on differences in starch, protein, and water content, whereas the other imaging instruments rely on color differences of pixels and pixel areas.

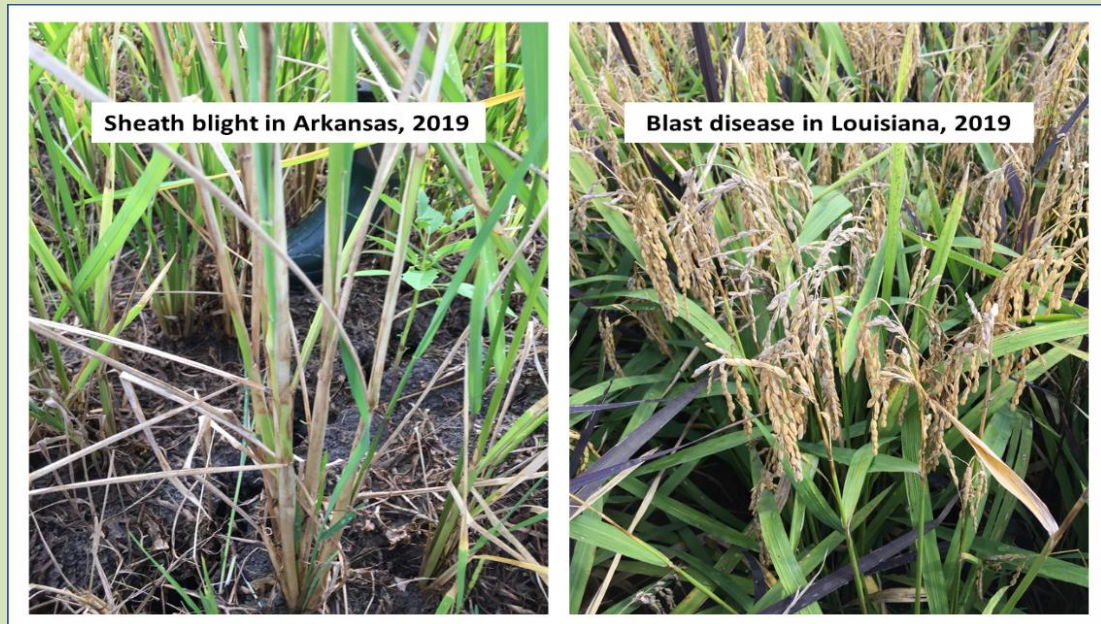
- **Technology Transfer**

- ✓ **Interactions with the Research Community**

On September 4th, Dr. Yulin Jia provided information of disease reactions of US rice germplasm to rice blast and sheath blight fungi to a scientist in Institute for Advanced Learning and Research in US (<https://www.ialr.org/>) to select rice varieties for testing the effectiveness of two bacterial endophytes against both fungal diseases.

On September 10th, Dr. Yulin Jia assisted a rice breeder in California to evaluate blast disease in advanced breeding lines. Blast disease is a threat for stable rice production in California. Rice breeders are developing blast resistant rice varieties in California.

On September 25th, Dr Yulin Jia provided information on the resistant spectrum of blast resistance genes *Pi-ta* and *Ptr* to a rice breeder of University of Arkansas for guiding the deployment of blast resistance genes.



Dr. Yulin Jia established a research collaboration with a rice breeder Dr. Adam Famoso at Rice Research Station of Louisiana State University (LSU) with MTA. The objectives of this collaboration are to fine map and clone the major sheath blight resistance gene *qShB9-2* and develop rice varieties with improved resistance to sheath blight disease. On September 25, Dr. Jia provided 5 backcrossed breeding lines carrying *qShB9-2* for Dr. Famoso to identify molecular recombinants using high throughput genotyping facility at LSU AgCenter, Crowley, LA. Dr. Famoso will genotype thousands of plants and select rice lines to be advanced using high throughput single seed advancement system in his lab.



Greenhouse at LSU with Adam Famoso (L) and Yulin Jia (R) where rice seedlings are being grown for DNA marker analysis. Seedlings with the desired genes will be advanced to produce seed and the others discarded.

✓ **Rice Germplasm Distributed**

During the month of September, 5 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the United States.

- **Stakeholder Interactions**

On Sept. 25th, Dr. Anna McClung, hosted a visit from Mr. Glenn Roberts, Anson Mills, Columbia, SC to observe field plots of specialty rice varieties under development. Pictured below headrow purification field of Dragon Eyeball 100.



On September 30, forty 40 acres of 'Eclipse' was harvested by a rice farmer for exporting as food to an international market. 'Eclipse' is the name being used for one of premium medium grain rice germplasm lines released by Dr. Yulin Jia's research team that has enhanced blast resistance. Picture below was taken from Eclipse in a yield trial in Stuttgart, Arkansas, 2019.



In the month of September Dr. Ming-Hsuan Chen, Cereal Chemist, provided advice to a food processing company located at Seattle, WA on testing different cooking methods to improve the sensory traits of their new rice product. Journal articles relevant to the topic were provided.