

July 2017

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

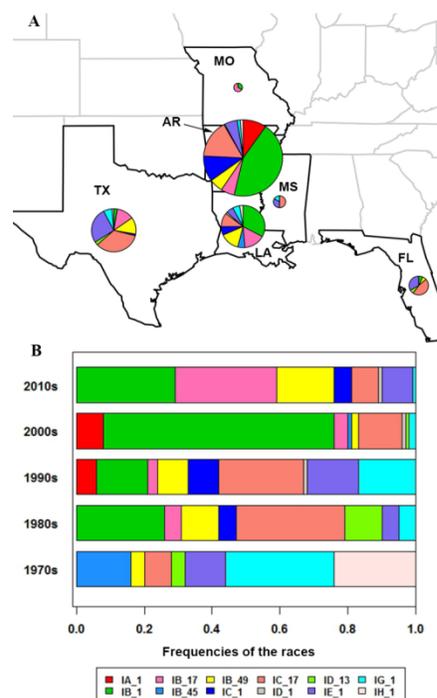
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1. Recently Accepted Publications

USDA-ARS Anticipated Products: Plants with resistance to diseases

Wang, X., Jia, Y., Wamishe, Y, Jia, M.H., and Valent, B.
Dynamic changes in the rice blast population in the USA over six decades. MPMI. Posted on July 5.
<https://doi.org/10.1094/MPMI-04-17-0101-R>

Rice blast disease caused by the fungus *Magnaporthe oryzae* is one of the major constraints for rice production in the southern USA and worldwide. *M. oryzae* has been known to be highly unstable and can rapidly overcome host resistance. In this study, we analyzed genetic profiles of 1022 US blast isolates collected from 1959 to 2015 with simple sequence repeat genetic markers and/or pathogenicity assays to guide resistance gene deployment. We showed that there are 6 genetic clusters in US blast isolates, and the virulence of pathogenic isolates has been increasing over time through asexual reproduction. The observed gene clusters were not associated with geographic origin of the isolates but associated with collection time periods. These findings suggest that host genotypes are a driving force for rapid adaptation of the rice blast fungus; and the resulting knowledge will benefit the identification of rice resistance genes for developing blast resistant rice varieties.



USDA-ARS Anticipated Products: Crop plants with enhanced nutritive quality.

Chen, M.-H., McClung, A.M., Bergman, C.J. 2017. **Phenolic content, anthocyanins and antiradical capacity of diverse purple bran rice genotypes as compared to other bran colors.** J. Cereal Sci. 77, 110-119.

Anthocyanins are a class of naturally occurring compounds found in plants that have health benefit in reducing the risk of developing chronic diseases in animal and human clinical trials. Fruits, such as berries and grapes are known to contain anthocyanins. In an effort to develop phytonutrient-rich whole grain rice, we evaluated the genetic variation for anthocyanin



concentration found in rice having purple (or black) bran. More than a 25-fold variation in total anthocyanin concentration was found among 25 global rice varieties having purple brans. Using a non-destructive colorimeter to measure the purple color of the whole grain rice, the color parameter b^* , measuring yellowness, negatively correlated with the concentration of total anthocyanins suggesting that this color parameter would be an efficient screening tool for selecting anthocyanins in whole grain rice. In conclusion, rice varieties with high concentration of anthocyanins were identified that can be used for breeding to enhance phytonutrients in rice.

USDA-ARS Anticipated Products: Crop plants with enhanced nutritive quality.

Chen, M.-H., Bergman, C.J., McClung, A.M., Everette, J.D., Tabien, R.E. 2017. **Resistant starch: variation among high amylose rice varieties and its relationship with apparent amylose content, pasting properties and cooking methods.** Food Chem. 234, 180-189.

Resistant starch, which isn't hydrolyzed in the small intestine and acts like dietary fiber, has proposed health benefits. We evaluated a set of 40 high amylose rice varieties for resistant starch levels in cooked rice and approximately a 1.9-fold difference was found. The highest ones had more than 2 fold greater resistant starch relative to a typical US long-grain intermediate-amylose rice. Two cooking methods were compared to evaluate the effects of water to rice ratio and the duration of cooking time on resistant starch levels using six varieties that had different functional properties. No difference in resistant starch level due to cooking protocol was found suggesting that preparing rice by common cooking methods will not alter genetic differences in resistant starch.



2. Technology Transfer

a. Formal Events:

To Non-research Stakeholders

On July 12th, twenty-eight rice industry representatives from southern Brazil visited the DBNRRC and were provided a tour of the facility by Dr. Dave Gealy. Dr. Gealy, Dr. Jai Rohila, and Dr. Jinyoung Barnaby discussed their field and greenhouse studies to improve rice so that it can be grown under reduced irrigation management while maximizing grain production and minimizing weed competition and greenhouse gas emissions.



On July 13th, Dr. Anna McClung was an invited speaker at the Annual Rice Field Day at the Texas Agrilife Research and Extension Center in Beaumont, TX. In addition to the conventional research being conducted at the station, a special field tour and workshop on organic rice research was conducted. Dr. McClung presented

an update on organic rice research being conducted in Arkansas that is part of a multi-state grant funded by USDA-NIFA-OREI. The workshop was attended by about 30 growers.

On July 14th, the National Public Radio station in Milwaukee, WI featured a story about research being conducted by Dr. Michael Schlappi at Marquette University that is a result of a collaborative effort with Dr. Georgia Eizenga from DBNRRC. The story “Marquette University Scientist Out to Prove YES You Can Grow Rice in Wisconsin” talks about small fields of rice being established using a Russian rice variety that was identified from the USDA rice mini-core collection that was adapted for production in WI.



Research being conducted by Dr. Ming-Hsuan Chen in collaboration with Stephen Boue at the Southern Regional Research Center in New Orleans was highlighted in the July 2017 issue of AgResearch Magazine – “Rice Compounds Show Anti-diabetic Potential.” <https://agresearchmag.ars.usda.gov/2017/jul/rice/>

To Research Community

Dr. Dave Gealy attended the 8th World Congress on Allelopathy in Marseille, France from July 24-28, 2017. He presented a talk “Phenotypic Evaluation of Weed-competitive Traits and Yield of Rice RILs from an Indica x Tropical Japonica Mapping Population” in the session on Allelopathy in Crops“. Approximately 200 people from more than 25 countries participated.

b. Informal Contacts

On July 5th, Dr. Anna McClung provided samples of 14 rice varieties differing in cooking and processing qualities to university researchers.

On July 26, 2017 and July 27, 2017, Dr. Yulin Jia provided information on methods to analyze genetic diversity of the fungus *Magnaportheles* to a researcher in a foreign country. *Magnaportheles* contains over 200 species including rice blast fungus *Magnaporthe oryzae* that causes significant rice crop losses worldwide.

The DBNRRC Genomics facility provided information to four rice seed companies regarding detection of offtypes in seed production fields.

c. Germplasm Exchanged:

During July, 87 rice accessions from the Genetics Stocks Oryza (GSOR) collection were distributed to researchers in the US and South Korea.

3. Education and Outreach

4. New Significant Research Collaborations