September 2017

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

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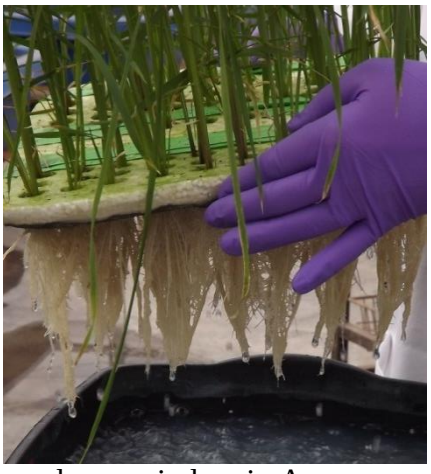
1. Recently Accepted Publications –

USDA-ARS Anticipated Products: Crop plants with enhanced nutritive quality and increased resistance to disease.

Heuschele, D.J., Pinson, S.R.M., Smith, A.P. 2017. **Metabolic responses to arsenite in rice seedlings that differed in grain arsenic concentration.** Crop Sci. 57, 2671-2687. doi:10.2135/cropsci2016.06.0493

There is public concern over the amount of arsenic (As) contained in rice and rice food products. The flooded paddies under which most rice is grown makes soil arsenic more available for absorption by the plant and transport of the As into the grain. Arsenic uptake by rice plants is also associated with the physiological condition known as straighthead which causes sterility in the developing seedhead. This study identified genetically controlled physiological mechanisms rice plants use to limit accumulation of As in the grain. We started with six rice varieties known to have either high or low in grain arsenic concentrations (a.k.a. As grain-accumulators or grain-excluders, respectively), and conducted a hydroponics study to ask if they exhibited differences for rates of As uptake, transport, sequestration, and/or detoxification of secondary stress compounds in seedling roots and leaves. The most striking difference was that high arsenic exposure induced leaves of all three grain-excluders to have twice as much glutathione, a compound necessary for sequestration of As into cell vacuoles found in leaves, as compared to grain-accumulators. This suggests that breeding for enhanced ability to sequester As in leaf vacuoles can lead to the development of rice varieties that produce grain low in As concentration, and resistance to straighthead may also be increased.



2. Technology Transfer

a. Formal Events:

To Non-research Stakeholders

To Research Community

b. Informal Contacts

On September 7, 2017, Dr. David Gealy consulted with the site manager at a new solar energy installation near Stuttgart, AR regarding anticipated weed management issues at the site.

On Sept. 7-11, 2017, DBNRRC hosted Dr. Scott Maguffin on a collaborative research project with Cornell University, funded by the National Science Foundation, assessing soil processes that transform arsenic, making it available for plant uptake.

On September 8, 2017, Dr. Jai Rohila presented an invited talk to the Department of Biochemistry & Molecular Biology at Oklahoma State University, Stillwater, OK. The audience included faculty, staff, post-docs, graduate and undergraduate students. Dr. Rohila's presentation was entitled "In the field what makes rice tolerate water stress".

On September 14, 2017, Dr. David Gealy hosted three scientists from the National Agriculture and Food Research Organization, Tohoku Agricultural Research Center in Japan. The visitors toured the DBNRRC facilities and participated in a roundtable discussion with rice experts from DBNRRC and University of Arkansas to discuss production practices, weed management, and economics of rice-soybean rotations used in Arkansas and the southern USA.

From September 17 – 19, 2017, Dr. Yulin Jia and his staff hosted Dr. Qinghua Pan and Ms. Ling Wang, Plant Pathologists from South China Agricultural University, Guangzhou, China. On September 18, Dr. Pan gave a seminar titled 'One Concept, Two Loci, Three Aspects, and Four Perspectives-A Case Study on Gene-for-Gene Interactions in the Rice Blast Pathosystem' followed by a round table discussion and building and field tour.

From September 20 – 22, 2017, Dr. Yulin Jia and his staff hosted Adam Famoso, Assistant Professor, LSU AgCenter, Rice Research Station and Nathan Pumplin, Project Scientist, UC Davis. Dr. Jia demonstrated blast pathogen isolation, purification, and inoculation methods. On September 21, Drs. Famoso and Pumplin gave a team seminar titled 'Rice Blast Resistance: Synergistic breeding and molecular genetic approaches to develop resistant germplasm", followed by a round table discussion, and building and field tour.

c. <u>Germplasm Exchanged:</u>

During September, 301 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the US, Germany and the United Kingdom. The Genetics/Breeding program provided samples of rice varieties to university researchers studying high throughput grain phenotyping and starch structure.

3. Education and Outreach

On September 11, 2017, Melissa Jia gave an invited talk to the University of Arkansas, Little Rock for the biology seminar series. Her talk was entitled "Translational Genomics in Rice at DBNRRC". Upper Level undergraduates, graduate students and several faculty members attended the seminar.

Ms. Emily Sookaserm, high school student at Arkansas School for Math, Science and the Arts, Hot Springs, AR, met with Drs. Dave Gealy, Jai Rohila, and Anna McClung on September 29, 2017 to discuss establishing a research project on allelopathy in rice.

New Significant Research Collaborations

n/a