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

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MONTHLY RESEARCH HIGHLIGHTS

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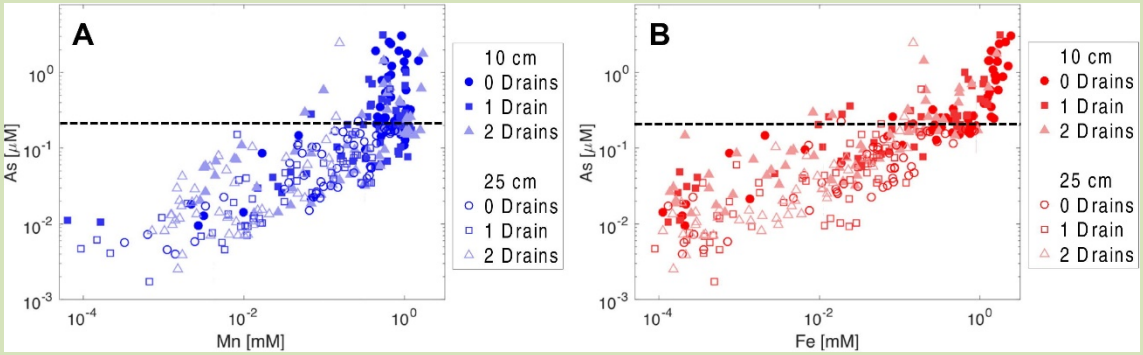
- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: Crop plants with enhanced nutritional quality

Maguffin, S.C.; Abu-Ali, L.; Tappero, R.V.; Pena, J.; **Rohila, J.S.; McClung, A.M.**; Reid, M.C. 2020. Influence of manganese abundances on iron and arsenic solubility in rice paddy soils. Geochimica et Cosmochimica Acta. 276: 50-69. doi: 10.1016/j.gca.2020.02.012

Arsenic (As) naturally occurs in soils like other minerals. However, due to complex soil chemistry processes, it is readily available for plant uptake in water-logged soils. Although rice is typically grown in flooded paddies, when alternate-wetting-and drying (AWD) irrigation management is used, it has been found effective in reducing the accumulation of As in the grain as compared to rice produced in saturated soils. This is due, in part, to the changing redox potential of the soil as it cycles from saturated to a dried condition that drives many bio-geo-chemical processes and the availability of various soil minerals for plant uptake. This study found that manganese (Mn) and iron (Fe) ratios in paddy soils impact the dissolved concentration of As in soil pore water that is available for plant uptake. A single severe soil dry-down (up to -30 kPa) was effective in reducing As in the porewater for about a month due to the formation of Fe- and Mn-oxides. The biggest decrease in As availability occurred in the top 4 inches (10cm) of soil where field draining had a greater effect on soil drying (and where the roots are more concentrated) than at a depth of 10 inches (25 cm) where soil moisture and availability of As, Mn, and Fe changed less with field dry downs. This demonstrates why soil dry downs during AWD irrigation management are effective in reducing As availability for rice plant uptake.



- **Technology Transfer**

  - ✓ **<u>Interactions with the Research Community</u>**

    On April 20th, Dr. Yulin Jia, Research Molecular Plant Pathologist, provided information for evaluation of blast disease in rice to a researcher at University of Arkansas, Rice Research and Extension Center, Stuttgart, Arkansas.

    On April 20-21st, the rice genomics lab, under the direction of Dr. Jeremy Edwards and with technical analysis by Ms. Melissa Jia, provided information on genetic markers linked with rice blast disease resistance genes to private rice breeding companies in California and Texas.

  - ✓ **<u>Rice Germplasm Distributed</u>**

    During the month of April, 595 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the United States. Seed of the ARS rice variety Sierra was provided to a small commercial grower in Maryland.

- **Stakeholder Interactions**

  On April 20th, Dr. Anna McClung, provided information to a home meal delivery service company regarding nutritional aspects of green (immature) rice, citing the publication by colleague, Dr. Ming Chen: Chen, M.H. and Bergman, C.J., 2016. Vitamin E Homologs and γ-Oryzanol Levels in Rice (Oryza sativa L.) During Seed Development. *Cereal Chemistry*, *93*(2), pp.182-188.

  A company which sources rice for parboiling and canning purposes contacted Dr. Anna McClung on April 23rd regarding information on current rice varieties that have superior processing quality.

  On April 27th, Ms. Lorie Bernhardt, who oversees the Genetic Stocks *Oryza* (GSOR) collection, provided information to a researcher at University of Arkansas regarding proper APHIS/PPQ grain import procedures for brown rice to be used in grain chemistry analysis.

- **Education and Outreach**

  On April 17th, Dr. Anna McClung, Research Geneticist, provided background information to journalist, Lisa Held, regarding issues facing the US rice industry as a result of changing production practices and variable climate. The comprehensive article, involving many sources, was published April 23rd on-line in "Civil Eats".
  https://civileats.com/2020/04/23/rice-farming-has-a-huge-carbon-footprint-could-it-become-a-climate-solution/

On April 27th, Dr. Yulin Jia participated in a thesis defense seminar of Mr. Gaurav Thapa Chhetri via video conferencing. His thesis topic was on "Overexpression of the Candidate *Pi-ta2* Gene in Rice (*Oryza sativa* L. japonica cv. Katy) for Resistance Against Blast Fungus (*Magnaporthe oryzae*)" and he is under the supervision of Dr. Muthusamy Manoharan, faculty and Interim Associate Dean for Research, School of Agriculture, Fisheries and Human Sciences at the University of Arkansas at Pine Bluff, an 1890s land grant institution.

- **New Research Grants**

Dr. Yulin Jia, is one of the investigators to receive a grant of $2.6 million provided by the National Science Foundation for research to mitigate an invasive weedy rice biotype that hinders rice production but also possesses disease resistance genes that may have value in development of new rice varieties. The principal investigator for the grant is Dr. Kenneth Olsen, Professor of Biology at Washington University, St. Louis, along with Co-PIs from the University of Massachusetts and the Donald Danforth Plant Science Center.