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

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MONTHLY RESEARCH HIGHLIGHTS

For More Information: Dr. Anna McClung, Research Leader/Center Director
anna.mcclung@ars.usda.gov

- **Recent Scientific Publications**

This addresses USDA-ARS Research Goal: Genetically and phenotypically characterized genetic resources designed for elucidating gene function.

Ruang-areerate, P., Travis, A.T., **Pinson, S.R.M.**, Tarpley, L., **Eizenga, G.C.**, Guerinot, M.L., Salt, D.E., Douglas, A., Price, A.H., and Norton, G.J. 2020. Genome-wide association mapping for grain manganese in rice (*Oryza sativa* L.) using a multi-experiment approach. *Heredity*. https://doi.org/10.1038/s41437-020-00390-w

As a staple food for more than half the world's population, rice is a globally important source of energy and mineral elements. Manganese (Mn) is one of the essential elements in human nutrition. In plants, manganese deficiency (see picture on right) is common when plants are grown in water-logged soils, such as rice growing in flooded paddies. When animals consume manganese-deficient plant tissues or grains, they suffer nutritionally. A key step toward developing food crops with enhanced Mn content is the identification of genes that control how plants uptake and transport Mn to their edible tissues. By studying grain Mn concentrations in nearly 400 rice varieties collected from around the world, then grown in four different environments in Arkansas and Texas, we identified six chromosomal regions containing genes affecting the accumulation and concentration of Mn in rice grains as a result of either modifying the rate of Mn uptake by roots or transport of Mn between the tissues in the rice plant. Upon evaluation of functions of genes known to reside in these six chromosomal regions, we further identified 14 candidate genes associated with the wide (>3-fold) range in grain Mn concentration among these diverse rice varieties, including genes such as the known metal transporter gene *OsMTP8.1*. Molecular markers tagging the genes we identified can be used by breeders to develop rice varieties with enhanced nutritional value and plant health. Because genes often act similarly among many plant species, the genes identified here will be of interest to scientists interested in improving the health and nutritional value of other crops and, particularly, those grown in water-logged or Mn-deficient soils.

- **Technology Transfer**

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

  December 4th, Ms. Lorie Bernhardt, Computer Assistant for the Genetic Stocks Oryza (GSOR) collection, provided information to a graduate student at University of Arkansas-Little Rock regarding germination techniques for rice seeds, including embryo rescue.

  December 14th, Dr. Trevis Huggins, Geneticist and Curator of the Genetic Stocks *Oryza* (GSOR) Collection, provided information to a researcher at the University of Manitoba, Canada regarding growing rice in the greenhouse, including recommendations on fertilizer application and flood control.

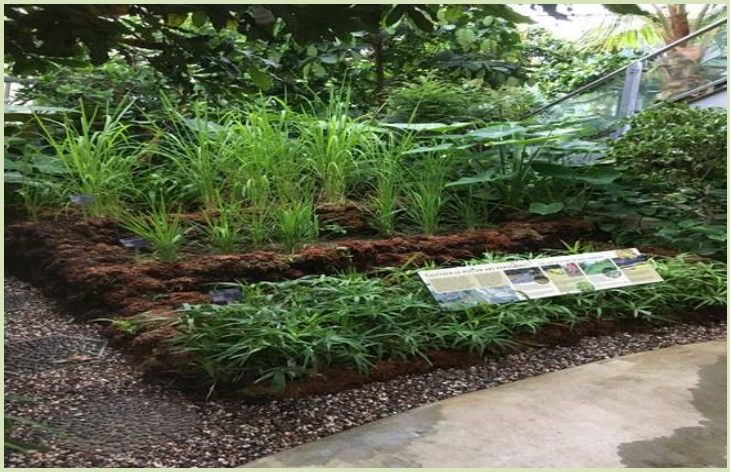
  ✓ **<u>Rice Germplasm Distributed</u>**

  During the month of December, 20 rice genetic stocks were shipped to researchers in the United States, Germany, India, and the United Kingdom.

- **Education and Outreach**

On December 3rd, Dr. Jinyoung Barnaby, Plant Physiologist, co-hosted the 2020 Korean American Women in Science and Engineering (KWiSE) forum on COVID-19 Research in the US and South Korea as a KWiSE Washington D.C. Chapter president. Two experts of international fame, Dr. Youngmee Jee, a special advisor to the Prime Minister of Health, South Korea, and Dr. Conni Schmaljohn, a director of the Integrated Research Facility at Ft. Detrick, MD, NIAID/NIH, USA, talked about "Infectious Disease R&D in Korea" and "COVID-19 studies at the NIAID", respectively. Women scientists from government (31%), academia (27.9%), industry (15.2%), others (15.2%) attended the forum.

Dr. Anna McClung provided seed of three rice varieties to The Montreal Botanical Garden in Canada as part of a tropical food plants educational display and these are being successfully grown in mini-rice paddies in their greenhouse.



December 6th, Dr. Yulin Jia gave an invited virtual seminar titled ‘Molecular basis of plant adaptive immunity’ to 27 graduate students and staff members of the Yunnan Academy of Agricultural Sciences, Kunming, China. Subsequently, a virtual roundtable discussiontook place with topics including how to utilize wild rice relatives for breeding for improved blast and bacterial blight diseases.

Dr. Jia, Stuttgart, AR pictured on presentation screen along with participants at the seminar in China.

Dr. Anna McClung provided information regarding rice production practices to a science journalist for New York University for an on-line blog “For coastal farmers, climate change rubs salt in their wounds” published Dec. 23, 2020. https://scienceline.org/2020/12/for-coastal-farmers-salt-in-their-wounds/

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/