



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



**MAY 2021**

**MONTHLY RESEARCH HIGHLIGHTS**

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- **Recent Scientific Publications**

*This addresses USDA-ARS Research Goal: Crop plants with superior product quality for consumers and producers*

**Chen, M.-H., McClung, A.M., Rohila, J.S., Barnaby, J.Y.** 2021. Effects of alternate wetting and drying irrigation management and air temperature during grainfill on rice grain physicochemical and functionality traits of US inbred varieties. *Cereal Chemistry*.  
<https://doi.org/10.1002/cche.10440>.

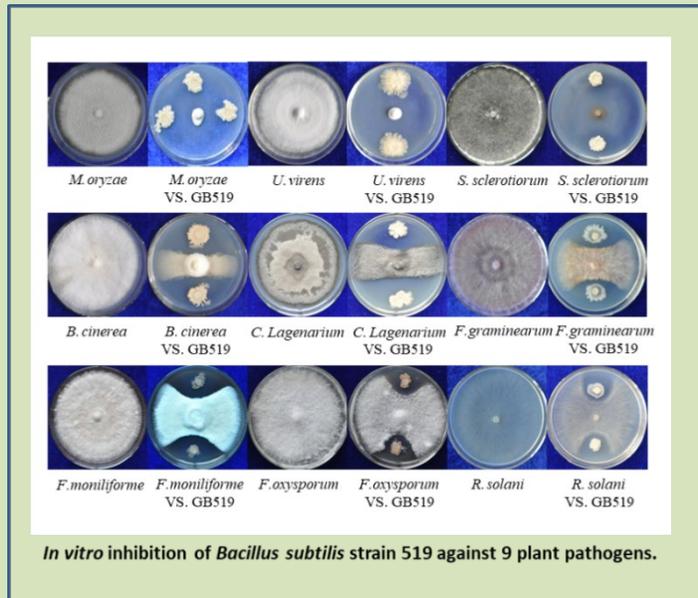
Declining irrigation resources present challenges to rice production in the USA. Alternate wetting and drying (AWD) management conserves water and maintains field harvest yield. However, post-harvest rice grain quality, which is equally important for the profitability of the rice crop, has not been explored extensively. We evaluated the impact of AWD during vegetative growth on post-harvest grain quality of eight US varieties that had widely different cooking properties. The results showed that AWD had no significant impact on rice grain quality of chalkiness, milling yield, and other grain nutritional and functional traits. However, our study found some varieties were more sensitive to air temperature changes during grain development. Thus, future efforts in breeding rice varieties adapted for AWD management should focus on enhancing yield potential and heat stress tolerant properties.



*This addresses USDA-ARS Research Goal: Enhanced knowledge of how plant microbiomes influence crop performance at the genetic, molecular, and physiological levels*

**Zhu, F., Wang, J., Jia, Y., Tian, C., Wu, X., Zhao, D., Liu, Y., Qi, S., Wang, D., Liu, X., Li, L., Jiang, Z., and Li, Y.** 2021. *Bacillus subtilis* GB519 promotes rice growth and reduces the damages caused by rice blast fungus *Magnaporthe oryzae*. *Phytofrontiers*.  
<https://doi.org/10.1094/PHYTOFR-12-20-0041-R>.

Blast disease of rice is one of the most challenging diseases that significantly impacts stable rice production worldwide. Beneficial microbes associated with rice roots can be found that help plant growth and reduce damages by the rice blast fungus. In this study, we identified and isolated the bacterium *Bacillus subtilis* GB519 from the rhizosphere of rice paddy soils and showed that GB519 promoted plant growth and inhibited 9 fungal pathogens of rice *in vitro*. Among them, the greatest inhibition was observed for the rice blast fungus. Under a 2 year greenhouse study, after the rice was exposed to GB519, we found that there was a 70% reduction in blast disease that coincided with accumulated hydrolytic enzymes such as amylases, proteases, chitinase and lipases, along with an increase in the defense enzyme activity associated with total antioxidant capacity (TAOC), catalase (CAT), and superoxide dismutase (SOD). These findings demonstrate that GB519 shows promise as a biological control agent to control rice blast disease.



- **Technology Transfer**

- ✓ **Interactions with the Research Community**

On May 3, Dr. Anna McClung provided seed of waxy (sweet) rice varieties for a researcher at the University of Arkansas studying rice functionality.

On May 7, Ms. Lorie Bernhardt, Computer Assistant for the Genetic Stocks Oryza (GSOR) collection, provided phytosanitary information to a scientist in California about shipping rice seeds to Arkansas.

On May 13, Dr. Anna McClung provided seed of three diverse rice varieties for herbicide response trials at Clemson's Coastal Research and Education Center in Charleston, South Carolina.

- ✓ **Rice Germplasm Distributed**

During the month of May, 695 rice genetic stocks were shipped to researchers in the United States, Belgium, Canada and Italy from the Genetic Stocks Oryza (GSOR) collection.

- **Stakeholder Interactions**

On May 3, Dr. Anna McClung, worked with a small business entity and University of Arkansas, Pine Bluff for production of a specialty rice variety and potential market development for the Arkansas Delta area.

On May 17, Dr. Anna McClung provided information on rice varieties and production methods for an interested grower in Kenya.

On May 28, Dr. Anna McClung gave an update on the development and release of Santee Gold rice to the Carolina Gold Rice Foundation via a zoom board meeting.

- **Education and Outreach**

On May 3, Dr. Jinyoung Barnaby responded to questions from a journalist interested in her research on the impact of alternate wetting and drying rice cultivation on accumulation of arsenic from the soil.

On May 11, Dr. Anna McClung provided information and contacts of other researchers, extension agents, and rice growers for an article by a New York Times journalist on rice production in response to a changing climate.

On May 26, Dr. Yulin Jia provided information to a journalist from the Wall Street Journal on the global impact of hybrid rice for an obituary about Yuan Longping, the father of hybrid rice in China.

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/>