



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



AUGUST 2018

MONTHLY RESEARCH HIGHLIGHTS

For More Information: Dr. Anna McClung, Research Leader/Center Director
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• Recent Scientific Publications

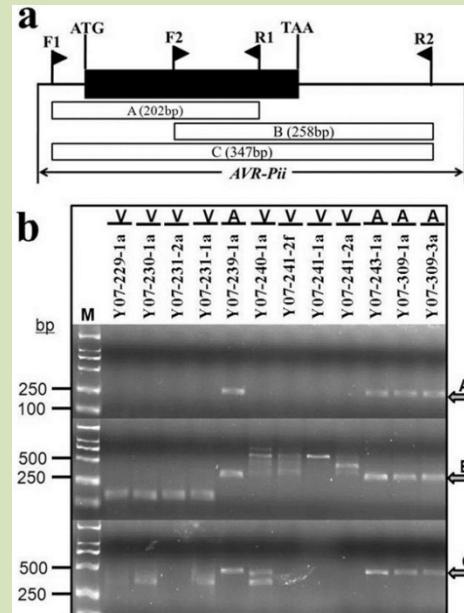
This addresses USDA-ARS Research Goal: Enhanced knowledge of existing diversity in crop plant interactions with biotic factors

Yu, L., Wang, Q., Jia, Y., Bi, Q., Li, Y., Fan, H, and Li, J. 2018. Selection and Mutation of the Avirulence Gene *AVR-Pii* of the Rice Blast Fungus *Magnaporthe oryzae*. 2018. Published on August 22. Plant Pathology. doi: 10.1111/ppa.12935

Rice blast disease caused by the fungus *Magnaporthe oryzae* is one of the most destructive crop diseases worldwide. The resistance (*R*) gene *Pii* is effective in preventing infections of *M. oryzae* isolates that contain the corresponding avirulence (*AVR*) gene *AVR-Pii*. We analyzed DNA sequences of *AVR-Pii* in *M. oryzae* isolates collected from rice fields in Yunnan, China to identify mutations in *AVR-Pii* that will cause the fungus to infect rice varieties with *Pii* resistance. Results showed that 82 isolates of *M. oryzae* carried *AVR-Pii* suggesting that *Pii* is effective for these isolates. Three haplotypes, encoding two novel *AVR-Pii* variants, were identified. Among them, a single nucleotide change in one *AVR-Pii* haplotype was correlated with disease susceptibility of rice varieties with *Pii*. These results suggest that *AVR-Pii* is under selection pressure and mutations in *AVR-Pii* are responsible for defeating plant resistance. This knowledge is useful to predict the long term effectiveness of blast resistance mediated by the rice *R* gene *Pii*.

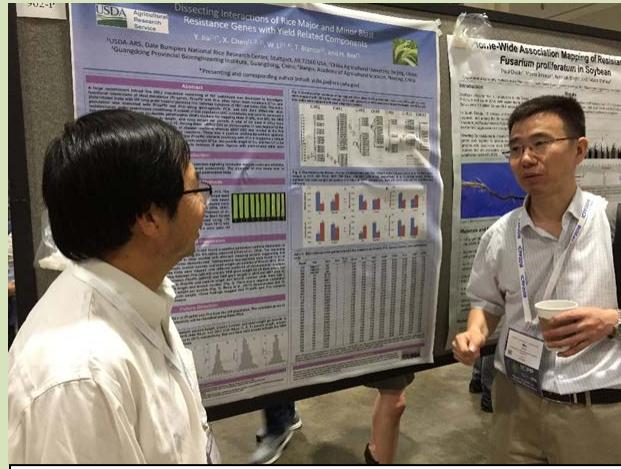
• Technology Transfer

✓ Interactions with the Research Community



From July 30th to August 3rd, 2018, Dr. Yulin Jia attended and presented at the 2018 International Congress of Plant Pathology, in Boston, MA. On July 30th, Dr. Jia chaired American Phytopathology Society (APS) and Chinese Society of Plant Pathology (CSPP) working group meeting. Over 10 years, Dr. Jia has chaired this working group with the goals of facilitating mutually beneficial interactions through scientific exchanges and joint memberships and publications.

On August 2, Dr. Jia presented a poster titled "Dissecting interactions of rice major and minor blast resistance genes with yield related components." On August 3, Dr. Jia co-organized and Chaired a symposium entitled CRISPR/Cas9 genome editing for plant pathology and disease management and presented an invited talk titled "Surprises learned from plant immunity- challenges and opportunities for crop protection." There were about 250 researchers attending this talk.



Dr. Jia (left) discusses research with attendee, Dr. Bo Zhou (right) from International Rice Research Institute (IRRI), Philippines.

On August 2, Dr. Bruce Linquist, Department of Plant Sciences at UC Davis, visited the DBNRRRC and presented a seminar titled "Alternate wetting and drying (AWD): Optimizing the drying period." Following the seminar, water stress field trials being conducted by Dr. Jai Rohila were visited and research discussed.



Dr. Michael Purugganan, Silver Professor of Biology and currently Dean of Science at New York University, NYC, presented a seminar to the DBNRRRC staff on Aug. 16 titled "The evolutionary genomics of rice." Afterwards he visited with Drs. Shannon Pinson, Jai Rohila, and Jeremy Edwards and toured various field research projects that are exploring global germplasm for stress tolerance.



✓ **Rice Germplasm Distributed**

During August, 54 rice accessions from the Genetics Stocks *Oryza* (GSOR) collection were distributed to researchers in the United States and Belgium.

• **Stakeholder Interactions**

DBNRRRC scientists set up two displays as part of the Rice Field Day 2018 held August 3, 2018 at the University of Arkansas, Rice Research and Extension Center, Stuttgart, AR with approximately 500 members of the U.S. rice industry and research community in attendance. One display entitled “Helping Rice



Thrive with Less Water: Let's Dig to The Roots?” highlighted research conducted by Drs. Jai Rohila, David Gealy, Trevis Huggins, Jinyoung Barnaby, and Shannon Pinson to explore root diversity as a means of developing rice that can be produced using less water. The second display was on “Improving the Shelf Life and Health Beneficial Components of Brown Rice”, presented by Dr. Ming-Hsuan Chen, Dr. Anna McClung, Mr. Jace Everette, Mr. Matthew Schuckmann, and Ms. Laduska Sells.

On August 3, Dr. Anna McClung hosted a visit with Mr. Anthony Rivera from the University of Puerto Rico, Lajas. Mr. Rivera oversees the winter rice nursery operations in Puerto Rico that have been an integral part of generation advance in the development of genetic mapping populations and seed rejuvenation of the rice NSGC accessions that are not adapted to production in the US latitudes. They discussed development of a new research agreement to continue this collaboration.

Drs. Jai Rohila and Jeremy Edwards attended the Mississippi County Water Management Field Day in Osceola, AR on August 6, 2018 to get firsthand experience on the latest on farm trials where AWD, furrow, cascade, and conventional flood irrigation systems were being compared, and to interact with rice growers, industry and peer groups working on irrigation water management in rice. It was a half-day event solely focused on irrigation water management including few indoor sessions and outdoor rice field tours where four different types of irrigation methods were being conducted by USDA-ARS Jonesboro unit in

collaboration with local rice grower Mr. Mike Sullivan. Industry speakers addressed implementing irrigation water management tools such as ultrasonic water level sensors that farmers can employ to increase farm's irrigation efficiency in rice production. The large gathering of stakeholders demonstrates the increasing interest in water savings practices for rice production in the southern US.



On August 13, Dr. Anna McClung met with Tim and Robin Ralston, Arkansas River Valley farms, Atkins, AR to discuss development of new specialty rice varieties.

- **Education and Outreach**



Dr. Jinyoung Barnaby completed a summer internship program with two undergraduate students, Mr. Gabriel Martinez (on left), International American University of Puerto Rico, and Mr. Ramiro Nava (on right), Texas Lutheran University. They used hyperspectral imaging to screen 1700 putative mutants derived from the rice variety, Katy. They identified 43 potential grain mutants using visible IR and near-infrared spectroscopy.

Graduate student, Ms. Mirae Oh (on left), has completed data collection for a project on “Infrared fingerprint profiles of compatible and incompatible interactions of the rice blast pathogen using FTIR spectroscopy” in collaboration with Drs. Jinyoung Barnaby (on right), Yulin Jia, and Anna McClung of DBNRRRC along with Drs. John Hammond (Floral and Nursery Plants Research Unit), and Moon Kim (Environmental Microbial & Food Safety Laboratory) located at BARC. Ms. Oh will return to Korea on Aug 31, 2018 to complete her PhD.

