

## Development of improved medium grain rice variety for Southern US – challenges and opportunities

Xueyan Sha

Rice Research and Extension Center, University of Arkansas Division of Agriculture, Stuttgart, AR 72160, U.S.A.

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Medium-grain rice is an important component of the US rice industry, and occupies about 24% of total US harvested rice acreage during last 10 years. About 70% of US medium grain rice is produced in California and marketed as the premium Calrose rice, while the remaining 30% is grown in Southern US, primarily in Arkansas and Louisiana. Unlike Calrose rice that is predominantly marketed as table rice for the export markets in East Asia, Southern medium grain rice is primarily used as a less expensive alternative to the Calrose rice as ingredients for the breakfast cereals and snacks. Therefore, Southern medium grain rice acreage varies dramatically from season to season depending on the crop size of California medium grain rice and the overall demand. Historically, medium-grain rice had a yield advantage over long-grain rice, however such yield advantage vanished in recent years. For example, the Arkansas medium-grain rice average yield increased only 2.8 t/ha, from 5.4 in 1983 to 8.2 t/ha in 2012, meanwhile, long-grain rice yield increased 3.7 t/ha during the same period, from 4.7 to 8.4 t/ha. This difference might be attributed to the disproportional breeding efforts placed on long-grain rice during last three decades, as well as the narrow genetic diversity within the southern medium-grain gene pool. By broadening the genetic diversity, refocusing research priority and improving the efficiency, we should be able to achieve similar genetic gain in medium-grain rice.

Grain quality that including physical appearance and cooking and processing characteristics has been one of the defining features of US rice. The brown rice of typical southern U.S medium grain rice measures 5.51 to 6.6 mm in length with a length/width ratio of 2.1 to 3.0. The milled medium grain rice has a low amylose content of 15-18% and a low gelatinization temperature of 60-69°C. Jupiter, released in 2004 by Louisiana State University Agricultural Center (LSU AgCenter), has been the predominant medium grain variety in southern US in last decade. To control the weedy red rice, three Clearfield<sup>®</sup> medium grain varieties CL 261, CL 271, and CL 272 have been developed by LSU AgCenter since 2009 and have been grown on a limited acreage.

Sheath blight caused by *Rhizoctonia solani* Kühn and blast caused by *Pyricularia grisea* Sacc. are two major diseases that pose a constant threat to medium grain rice production in the southern US. Since the most effective and wide spectrum major blast resistance gene *Pi-ta2* only exists in the US long grain rice gene pool, effort is underway to incorporate the gene into elite

medium lines from long grain rice. A bacterium (*Burkholderia glumae*) was recently identified as the causal agent of a perennial medium grain rice problem known as panicle blight that resulted in severe yield and quality losses in the medium-grain variety Bengal rice in 1999 and 2000. High-level resistance to bacterial panicle blight has yet to be identified, however current breeding effort is focused on partial resistance that exists in Jupiter.