Volume 11 Issue 3 August 1, 2014

RICE RESEARCH STATION NEWS

Southwest Region

Rice Research Check-off Program Back on Line

More than 40 years ago very far-sighted Louisiana rice industry leaders understood the importance of research to improve rice production technology. Through legislative action, the rice research check-off program was established. As a result of an October 2013 Louisiana Supreme Court ruling, this highly successful check-off program was declared unconstitutional. Basically, the court ruled that the check-off program per se was not an issue, but rather the legislation that created it was flawed in the way the program was implemented. However, through the diligent efforts of numerous individuals, the research program was re-established in this year's legislative session. The new program will maintain the check-off level of 5 cents per hundredweight of rough rice at point of first sale and does have a refund provision. The program will continue to be administered by a board made up of Louisiana rice producers. This board is appointed by the governor from nominations submitted by statewide rice producer organizations. The new Louisiana Rice Research Board will be made up of 15 members, and these members serve with no remuneration. All of their services are totally voluntary.

A few examples of the value of the check-off program to the rice industry follow:

Louisiana rice yields have increased from 3,800 pounds per acre in 1972 (initial year of the check-off program) to 7,500 pounds per acre in 2013. Much of this increase is attributable to new varieties and technology developed by LSU AgCenter scientists, whose projects have been partially funded by these check-off funds. In fact, since 1972, 37 new rice varieties have been released by the Rice Research Station, and 19 of these have been released in the past 10 years. These include conventional long and medium grains, Clearfield long and medium grains and several specialty types, including Jazzman types. The Jazzman varieties have actually created an entire new industry for Louisiana producers and processors. Several of these Louisiana-developed varieties are the only southern U.S. rice varieties approved by Kellogg's, which is a major purchaser of Louisiana rice.

Several years ago, the Rice Pathology Project identified bacteria as the causal agent of the important rice disease bacterial panicle blight. This has allowed for screening and selection of new varieties with more resistance to this disease. In addition, in 2011, this project also identified several fields with a *Rhizoctonia solani* strain resistant to the strobin fungicides commonly used to control this major disease. The scientists then quickly worked with industry and LDAF personnel to make Sercadis fungicide available the following year for use in those fields where resistance existed.

The Rice Agronomy Project has conducted extensive research that has resulted in widespread adoption of conservation tillage systems. This allows for timelier planting and cost savings, as well as significant environmental benefits. Other research identified early zinc deficiency as the cause of the "mystery malady" syndrome, which had plagued many Louisiana rice fields for several years. Recently, this project has committed extensive resources to addressing the arsenic issue in rice. This research is paramount in providing science-based data to combat misinformation.

The Rice Entomology Project has been instrumental in working with industry to make more effective, safer insecticides for use in rice production. This work has resulted in the development of several seed treatment insecticides that have done a better job of controlling major insects, such as the rice water weevil. These seed treatment insecticides have also minimized detrimental effects of rice insecticides on nearby crawfish production fields. This project has monitored the spread of the Mexican rice borer, a new pest of Louisiana rice production, and has been conducting pro-active research to minimize its detrimental effect.

The Rice Weed Control Project has been a worldwide leader in conducting research on more effectively and economically controlling rice weeds. This project has developed effective strategies for controlling newly emerging weed problems. This project is also noted for its groundbreaking work on controlling weeds that have become resistant to the herbicides used in the Clearfield production system.

These are just a few examples of how check-off funds have returned dividends to the rice industry many times over. These research efforts are essential for the long-term viability of the Louisiana rice industry. These check-off funds are definitely money well spent.

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Special points of interest:

- **USA Rice Outlook Conference**
  December 7-9, 2014
  Little Rock , Arkansas
- **Rice Research Station Field Day**
  Wednesday, July 1, 2015
  Crowley, LA

Inside this Issue

Consumption of Rice Seed by Crawfish

Crawfish has become a common and key rotational crop with rice in southern Louisiana. Of the more than 180,000 acres devoted to crawfish production in the state, a large percentage occurs in a field rotational cropping system with rice. Rice is also planted as a forage crop for crawfish but not harvested in another large portion of the crawfish acreage. It has been well documented that crawfish will eat small, tender rice seedlings as well as rice seeds that sit on the surface of flooded fields. Little is known, however, how well adept crawfish are at locating and consuming seed buried beneath the soil surface. Therefore, an initial study was devised to obtain some preliminary data regarding the ability of crawfish to find and consume rice seeds below the soil surface.

Crawfish that were acclimated to laboratory conditions and accustomed to eating rice seed were individually placed in 10-gallon buckets with soil, water, and supplemental aeration (Figure 1). Prior to placement of water and crawfish into buckets, hull-on rice seed (six seeds per bucket) were randomly positioned in the buckets at various depths in well-tilled soil (Table 1). Seed depth constituted the experimental treatments. In one of the treatments, rice seed was planted about two weeks earlier, resulting in 1.5-inch seedlings at the start of the study. There were six replications of each treatment. Crawfish were allowed to forage undisturbed in the micro-habitats for three consecutive days, after which the crawfish were removed, water was drained, and soil was washed through a fine-mesh (1.7-mm mesh) screen to recover uneaten seeds.

With little else to feed upon in this study, the crawfish were very proficient at finding and consuming rice seed, at least when the seeds were not beyond 1-inch deep. Though remnants of seed hulls were discovered at termination, few intact seeds were recovered (Table 2), and no recognizable endosperm pieces were detected. Crawfish consumed 97 percent of the seeds, on average, when placed from the soil surface up to ¼-inch deep. When buried ½- to 1-inch deep, crawfish found and consumed approximately 85 percent of the seeds. Even when rice seeds were placed 1-inch deep and allowed to sprout, crawfish consumed the sprouted seed along with most of the seedlings. Consumption was also very high (94 percent) when half of the non-sprouted seeds were positioned on the soil surface and half 1-inch deep, although it was not possible to differentiate at what level the recovered intact seeds initially resided.

Although the data represents findings under a limited set of conditions, the proficiency with which crawfish located and consumed rice seeds beneath the soil in this study may represent implications on a couple of different levels. The potential for negative impact on stands of newly planted rice under flooded conditions where populations of crawfish are high may be significant, especially for flood durations lasting several days or more. However, the propensity for crawfish to find and consume rice seed below the soil surface may be somewhat beneficial for mitigating problems associated with red rice, a weed species, in rice culture systems. Crawfish produced in a field rotation with rice may provide some level of control of red rice by consumption of dormant red rice seed that lie beneath the soil surface. Further research is planned to determine the efficacy of crawfish at finding and consuming rice seed under varying field conditions.

Table 1. Description of the 6 treatments used for the crawfish rice seed consumption study.

Treatment	Seed Number - Seed Depth (inches)	Seed Status	Average Crawfish Wt. (g)
On Surface	6 – on surface	Non Sprouted	27.6
¼-Inch Deep	6 – ¼ inch deep	Non Sprouted	29.1
½-Inch Deep	6 – half inch deep	Non Sprouted	29.7
1-Inch Deep	6 – one inch deep	Non Sprouted	30.4
On Surface and 1-Inch Deep	3 – on surface; 3 – one inch deep	Non Sprouted	29.1
1-Inch Deep-Sprouted	6 – one inch deep	Sprouted	27.5

Table 2. Average percentage of rice seeds consumed by crawfish, by seed depth, in a short-term laboratory study.

Treatment	Avg. Number of Intact Seeds Recovered	% Consumption
On Surface	0.3	94.4
¼-Inch Deep	0.0	100.0
½-Inch Deep	1.0	83.3
1-Inch Deep	0.8	86.1
On Surface and 1-Inch Deep	0.3	94.4
1-Inch Deep-Sprouted	0.7	88.9
Overall Average		91.2

Figure 1. Experimental system used for crawfish seed consumption study.

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Mexican Rice Borer in Louisiana

The Mexican rice borer (MRB) is an invasive pest of rice, sugarcane, and other grass crops that has recently invaded and is becoming established in southwest Louisiana. The MRB invaded south Texas from Mexico in the early 1980s, rapidly becoming the major pest of Texas sugarcane. Its range expanded through the Texas rice production area and reached Louisiana in 2008.

The availability of pheromone-baited traps (Figure 1) for the MRB has allowed the invasion of the MRB in Texas and Louisiana to be closely monitored. Pheromones are chemicals that insects produce to communicate with one another and can be used as lures. Pheromone-baited traps attract only males, which do not lay eggs. Therefore, trapping does not pose a risk of attracting MRB populations to new areas.

Figure 1. A Mexican rice borer pheromone trap in noncrop habitat in Calcasieu Parish.

These pheromone traps provide a powerful tool for early detection of MRB populations and often catch adult insects two to three years before larval infestations are seen in surrounding fields. Cooperative monitoring efforts between the LSU AgCenter and the Louisiana Department of Agriculture and Forestry track the movement of MRB populations in Louisiana as the insect spreads into southwestern parishes (Figure 2). Currently, more than 100 traps are being monitored across 13 south Louisiana parishes. To date, MRB moths have been detected in eight southwest Louisiana parishes, most recently in Evangeline Parish (one specimen in May 2014). Since the first record of MRB in Louisiana, the leading edge of the invasion has been moving eastward at approximately 13 miles per year. The easternmost location where MRB has been detected is in Vermilion Parish south of Rayne, LA. Because the MRB feeds on several weed grasses in addition to multiple crop hosts, there is little chance of eradicating the pest or preventing further range expansion.

The life history of MRB is similar to that of other stem-boring pests of rice, such as the sugarcane borer. Eggs are laid on leaves and newly hatched larvae feed on leaf blades or in between the leaf sheath and the stem, leaving characteristic feeding lesions. Later, larvae bore into stems where feeding injures vascular tissues and can sever the growing portion of the plant. When feeding occurs during the vegetative stage of plant development, the tiller often dies and fails to produce a panicle (deadheart). When feeding occurs after panicle initiation, injury results in drying of the panicle. Affected panicles may not emerge or if they do, do not produce grains, remain straight, and appear whitish (whitehead). However, feeding inside the stem does not always produce visible symptoms.

In a four-year field study conducted in Texas, it was estimated that a combination of the MRB and the sugarcane borer reduced rice yields an average of 14 percent when infestations were left untreated. Some growers in Texas automatically make two pyrethroid applications to late-season rice for control of stem borers. Currently, only pyrethroids are labeled for stem borer control in rice. In Calcasieu and Jefferson Davis parishes, where the insect has been established for a few years, trap catches recorded in 2013 were relatively high, and larval infestations likely caused economic losses, with whitehead densities attaining 13 whiteheads/m^2 in fields without insecticidal protection. Infestations were largely controlled in fields planted with Dermacor X-100® treated seed. Pheromone trap captures in 2014 are comparable to those of the previous year, indicating the cold winter did not significantly reduce MRB populations.

Other stem-boring insects have been pests of rice in Louisiana for almost as long as rice has been grown in the state but typically have not caused large losses. It remains to be seen how damaging the MRB will be in Louisiana rice, but the situation is being monitored closely.

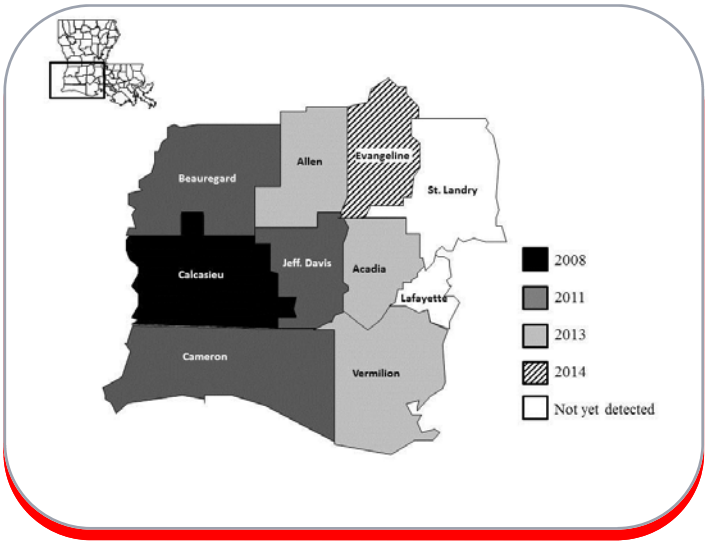

Figure 2. Current status of the MRB invasion in Louisiana. Years refer to the first year in which MRB adults were captured in pheromone traps in a parish

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National Rice Month Scholarship Program
$8,500 in Scholarship Awards

Grand-prize Scholarship – $4,000 ● 2nd Place – $3,000 ● 3rd Place – $1,500

Promoting Rice and National Rice Month

September celebrates the 24th year of National Rice Month and provides a rice scholarship opportunity for eligible high school seniors in rice-growing counties in Arkansas, California, Louisiana, Mississippi, Missouri, and Texas. For more information on eligibility, rules and restrictions - and for information on U.S.-grown rice - see www.usarice.com.

Put your creativity to work

To enter, eligible students must conduct a promotion activity for U.S.-grown rice in September.

Sample topics/themes include, but are not limited to:

- Nutritional benefits of U.S.-grown rice
- Culinary versatility of U.S.-grown rice
- Economic importance of U.S. rice production and processing
- Conservation and environmental benefits of the U.S. rice industry

What type of promotion activity should be conducted? The type and duration of the promotion activity is up to the individual student's creativity, as long as it is conducted in the month of September. Entries will be judged on creativity and impact in promoting U.S.-grown rice, National Rice Month and the importance of rice to the student's state.

Sample ideas include, but are not limited to:

- Rice education activities for school and/or community groups
- Developing and utilizing rice education/promotion materials
- Rice promotion displays at local events

Remember: The most creative ideas will likely be the ones that students develop on their own to best highlight the topic or theme of their interest.

Submitting entries: Entries must be submitted by Oct. 13, 2014, and should include details of the promotion, including but not limited to a full description, photos, electronic albums, sample promotional materials, videos, and pre-and post- event publicity. Digital or electronic submissions (CD, DVD, PPT, video or any combination thereof) are encouraged. However, all submissions will be judged equally whether electronic or hard copy. Entries must be accompanied by a completed and signed application form available on www.usarice.com.

For questions, contact Amy Doane at adoane@usarice.com, or (703) 236-1454.

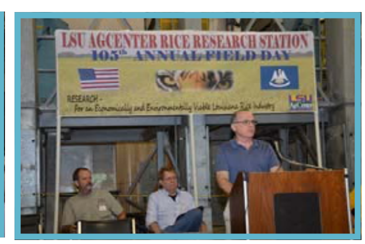
Good luck!

Scholarships sponsored by:

Dow AgroSciences

2014 RICE STATION FIELD DAY HIGHLIGHTS

2014 RICE STATION FIELD DAY HIGHLIGHTS



Pest of the Quarter

Hemp sesbania

Hemp sesbania (*Sesbania herbacea*), which was previously classified as *Sesbania exaltata* and *Sesbania macrocarpa*, also has several common names. Depending on your location, it is known as coffeeweed and coffeebean, and some refer to it as indigo. Hemp sesbania is believed to be native to North America and is often found in cultivated fields, pastures, fallow fields, ditches, road sides, and shallow flooded areas. This weed has the ability to live both in upland and flooded environments.

Hemp sesbania is a nodulating legume, which gives it the ability to fix nitrogen, making it competitive as a weed with several row crops such as rice, soybean, cotton, grain sorghum, sunflowers, and corn. This weed is a summer annual that can reach heights of 10 to 12 feet and produce up to 21,000 seed per plant. Hemp sesbania can cause a multitude of problems in row crops. It can reduce yield by shading crop plants, compete for water, reduce harvest efficiency by damaging combine blades, clog combines, and increase drying costs. In my research plots, I have noticed increased disease pressure on rice directly under the hemp sesbania canopy. This increase in disease may be due to moisture or dew because drying takes longer during the day, preventing contact of fungicides on the rice foliage.

A serious concern of hemp sesbania is that it can be toxic to livestock if consumed. The toxic effects include depression, colic, diarrhea, and overall weakness. If poisoning is severe enough, death can occur.

Hemp sesbania can be very competitive with rice. In 1968, the late Dr. Roy Smith ,Jr., USDA weed scientist, reported 1, 2, 4, and 9 plants/yd^2 can cause a 10%, 15%, 27% and 40% yield loss, respectively. In 2013, results of a sphere of influence trial conducted at the LSU AgCenter Rice Research Station indicated that yield was reduced by 10% when rice is located within 7 inches of a sesbania plant. In 2013, we found a 25% rice yield loss with a hemp sesbania population of 1 plant/yd^2 and a 90% yield loss with a population of 15 plants/yd^2. Based on competition alone, this weed is considered one of the top 10 weeds in rice production in Arkansas, Louisiana, Mississippi and Texas.

Key identifying characteristics of hemp sesbania seedlings include cotyledons that are lance- to spoon-shaped, and the first true leaf is simple (see photo). Characteristics of a mature hemp sesbania plant include a large tap root with a tall erect stem with little to no pubescence or hairs, and the stem becomes woody as the plant matures. The compound leaves have an alternate arrangement on the stem, and a leaf can reach 12 inches long with 20 to 70 leaflets. The fruit resembles a very slender black eye pea pod, and a pod can reach 8 inches long with 20 to 40 seeds per pod. The seeds are brown with black spots and are very hard. They can remain dormant for several years after maturity.

There are very few options available for control of hemp sesbania in rice preemergence, but several herbicides provide postemergence activity. This weed always seems to be a late-season problem in rice, and growers often are relegated to a salvage application. Products like Blazer and Permit are two of the best options late-season to help manage this weed. Total control is seldom achieved with salvage treatments, but reducing seed production is often the major benefit to these late applications.

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Large hemp sesbania seedling.

Hemp sesbania seed – Brown hemp sesbania seed with black markings.

Hemp sesbania seedling with cotyledons and simple first true leaf.

Update on Hybrid Breeding Program

Hybrid rice, produced from the first generation (F_1) of seeds between a cross of two genetically dissimilar pure line (inbred) parents, represents a relatively new option for Louisiana farmers. Commercial hybrids typically yield 10 percent to 20 percent more than the best inbreds grown under similar conditions, which is believed to be the result of hybrid vigor or heterosis from crossing the two parents. Research goals of the hybrid rice program at the Rice Research Station include: 1) development of and identifying male sterile lines (cytoplasmic A or environmental sensitive S), and restorer (R) and maintainer (B) lines adapted to the southern U.S. environmental conditions; 2) identifying elite cross combinations through extensive test-crossing; and 3) exploring the feasibility of economical hybrid seed production.

Multilocation hybrid yield trials are conducted each year to evaluate agronomic and milling performance of experimental hybrids for maturity, height, grain yield and head rice yields. Heading dates (days from sowing to flowering) for three new hybrid combinations in 2013 ranged from 87 to 101 days across four locations, while plant height varied from 38 inches to 48 inches. The hybrids LAH10, LAH25 and LAH28 have consistently produced high yield potential with good milling performance over the past two years in multilocation trials.

LAH10 was the top line among 200 for grain yield over the past two years in the multistate (Louisiana, Arkansas, Mississippi, Texas and Missouri) Uniform Regional Rice Nursery. In 2013, in variety x nitrogen trials at three Louisiana locations, LAH10 produced an average 11,115 lb/A (main and ratoon crop) with 60 lb/A nitrogen treatment and 11,468 lb/A yield with 90 lb/A nitrogen. In a separate trial, grain yields at or above 10,500 lb/A for LAH10 were achieved at seeding rates of 25 and 35 lb/A, which are similar to commercial hybrid planting densities. In a 2013 trial, the Clearfield experimental hybrid 08CL161 produced higher grain yield than commercial hybrid CLXL745 and approached the grain yield (93%) of CLXL729. Fifteen selected hybrids, along with LAH10 and LAH25, exhibited moderate to high levels of resistance in 2013 to sheath blight, leaf blast and narrow brown leaf spot vs. inbred varieties CL111, CL151 and CL152.

The Testcross Observational Trial was carried out in 2013 to identify new hybrid F_1 combinations derived from introduced Chinese male sterile lines mated with elite Louisiana long-grain or Chinese genotypes. Major traits for selection included high grain yield, good milling performance, low chalk, height, maturity, lodging and grain retention. From 2,040 plots, 59 selected cross combinations, consisting of 25 three-line and 34 two-line candidate hybrids, produced greater than 10% higher yields than the inbred check CL111. Fifty-three experimental hybrids produced greater yields than the commercial check XL723. Five selected hybrids produced greater than 20% grain yield vs. CL111, and three selections produced higher yields than the commercial hybrid CLXL729. Milling performance of selected lines was similar to that of the check CL111. From all new hybrid selections, eight were identified with low chalk values similar to those of CL152 and CL111. In related studies, 28 southern long-grain varieties/lines were found to have either partial or full restoring ability to Chinese 3-line male steriles, and 36 southern long-grain varieties/lines were found to have either partial or full restoring ability to Chinese 2-line male sterile lines.

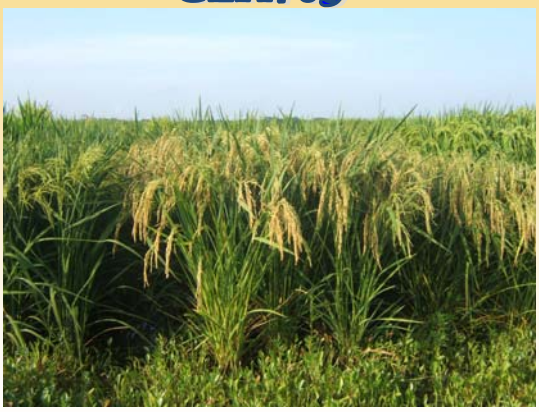
The Hybrid Breeding program has strong research ties with Dr. Steve Linscombe's variety development program, Dr. Dustin Harrell's agronomy program and Dr. Don Groth's disease control program. Louisiana inbred varieties are used extensively in the development of new hybrid experimental lines. Multilocation yield trials and evaluation of disease resistance are crucial aspects to rapid development of superior hybrids for the Louisiana rice industry. Public plant breeders from Arkansas, California, Louisiana, Missouri, Mississippi and Texas have established a cooperative network for development and release of improved hybrid varieties for the U.S. rice industry. In 2013, we initiated germplasm exchange with Dr. Greg Berger's hybrid program in Arkansas, and cooperative research in 2014 was extended to include yield trials of Louisiana and Arkansas hybrid selections in both states.

Major research areas in 2014 include multilocation yield trials to evaluate eight new hybrid experimentals. The Testcross Observational Trial consists of some 1,200 new hybrid combinations for the first time. In addition, 35 new hybrid combinations are being tested in small-scale yield plots at Crowley, and one hybrid is being evaluated for multiple traits in the Uniform Regional Rice Nursery. In related studies, validation of new DNA marker technology for low grain chalk is being conducted in cooperative Louisiana and Arkansas field trials. Additional research involves development and testing of new inbred lines for disease resistance under inoculated field plot conditions.

CLH131

Clearfield hybrid with CL131 as male parent; very early maturity and 43 inch plant height.

CLH703



Conventional hybrid; very early maturity and 43 inch plant height. Milling yield of 67-72 in 2013.

LAH169

Conventional hybrid; very early maturity and plant height of 41 inches. Milling yield of 66-71 in 2013.

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Focus

Weike Li

Weike Li, hybrid rice breeder at the Rice Research Station, started working in the rice paddies in southern China at age 7 with his parents, transplanting seedlings and harvesting rice by hand.

"I like growing rice very much," Li said. "From a very young age, I wanted to continue rice farming."

Li said a typical Chinese rice farm consists of about 2 acres. In southern China, after rice is harvested, seedlings grown in a greenhouse for another crop are immediately transplanted into the flooded field. Harvested rice grains are dried on a large concrete surface before being swept up and placed in storage.

Li, 56, said he studied agriculture at Guangxi Agricultural Academy where he earned his master's and doctoral degrees in rice breeding.

He has studied rice breeding and worked on hybrid projects in Thailand, the Philippines and India, in addition to studying genetics in Poitier, France.

Steve Linscombe, rice breeder and director of the Rice Research Station, said he met Li during a visit to the Guangxi Agricultural Academy. "I was quite impressed with Li and was very pleased when the Rice Station was able to hire him."

Li came to the United States to work on the LSU AgCenter hybrid rice program in 2009 until September 2010. He returned in 2012 to continue his work.

Jim Oard, LSU AgCenter hybrid breeder, works with Li and said he is an invaluable member of the hybrid breeding program. "At our Rice Research Station, Li is a tireless researcher who is using innovative ideas and methods to create elite germplasm for development of new Louisiana hybrids."

His son, Jifeng Li, is working on his master's degree in agronomy at LSU and expects to graduate next spring. "So far he has made only one B and all other grades are an A."

Li eats the rice that he grows. "I eat rice almost every day. I need to taste which rice is good for selections."

Li said the hybrid program is progressing well, and several lines show promise with good milling quality, short stature and excellent yields. "I can say I'm quite sure we will be successful," he said.

When he isn't working on rice, he's working in a garden. But for a getaway, Li and his wife, Wenfen Liang, go shopping.

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