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H. Rouse Caffey RICE RESEARCH STATION NEWS

Volume 14 Issue 3 August 1, 2017

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52 released varieties

Southwest Region

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Use of Gas Chromatography in Breeding Research for Aromatic Rice

Aromatic rice varieties are very popular in South and Southeast Asia and have recently gained wider acceptance in the USA, Europe and East Asia, especially in China. Due to their characteristics such as aroma and flavor, they are highly favored and command higher market prices.

There are several chemical compounds that control the popcorn-like flavor. However, 2-acetyl-1-pyrroline (2-AP) was reported to be the dominant flavor component of aromatic rice. The aroma quality of aromatic rice in sensory evaluations showed a strong correlation to 2-AP concentration, which is formed in the stem, leaves and grain of rice plants during growth in paddy fields.

Therefore, leaves in young rice plants can be used in the breeding process to determine 2-AP content for screening aromatic rice lines. The target aromatic lines can be eliminated early in the breeding process when 2-AP levels are not acceptable, saving time and materials. In addition, the 2-AP concentration in the grain can also be measured once the rice plants reach maturity.

Analysis of 2-AP using gas chromatography is a simple and inexpensive method compared to other techniques. Our gas chromatography unit used for 2-AP analysis has two detectors: a flame thermionic detector for quantitative analysis in leaf and uncooked rice samples, and a flame ionization detector connected to an olfactory port for qualitative analysis for cooked rice.

Fig 1. Gas Chromatography Shimadzu model GC-2010 plus equipped with Head Space sample loading and olfactory port for aromatic rice analysis.

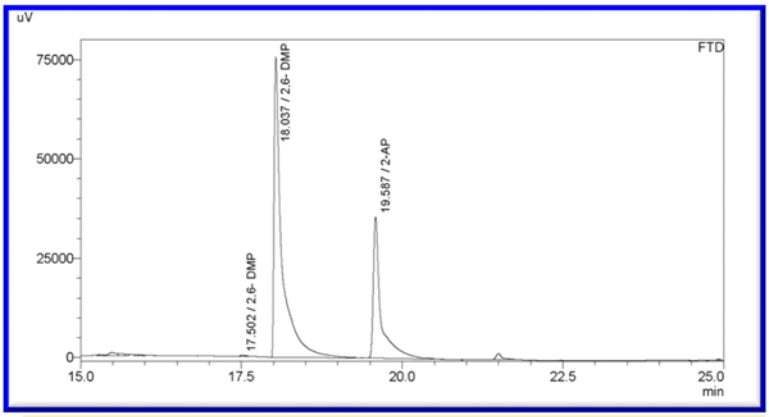


Fig 2. Chromatogram of 2-AP in grain sample of Clearfield Jazzman cultivar when using 2,6-DMP as internal standard. The sample was collected from the experimental plots at H. Rouse Caffey Rice Research Station in 2016.

Dr. Manoch Kongchum
mkongchum@agcenter.lsu.edu

Inside this Issue

Special Dates of Interest:

- **2017 USA Rice Outlook Conference**
  December 10-12, 2017, San Antonio, TX
- **H. Rouse Caffey Rice Research Station Annual Field Day**
  June 27, 2018

BAIT CONSIDERATIONS FOR THE UPCOMING CRAWFISH SEASON

While commercially manufactured crawfish baits have been on the market for several decades, cut fish has typically been the bait of choice for harvesting crawfish in the cooler parts of the season because it consistently generates larger catches. Gizzard shad and pogy (menhaden) are the most common fish used because they are the most economical and have typically been readily available. However, costs of fish baits have risen substantially in recent years and supplies have been limited at times. The price of fish baits are now approximately twice that of the manufactured crawfish baits. Moreover, nearly all fish baits require cutting into smaller portions, which is inconvenient and unpleasant, and fish bait must be kept frozen until used. Because of the costs and inconsistent supply of fish baits and because manufactured baits are easier to obtain and use, and need no refrigeration, manufactured baits are sometimes used during the cooler harvesting period despite their lower yields. However, this measure is often taken without realizing the economic consequences.

Therefore, to provide producers with a dataset of catch differentials based on bait type and water temperatures from which to draw on when making judgment calls regarding bait choice, a study was recently undertaken at the H. Rouse Caffey Rice Research Station to document crawfish catch based on cut fish versus an industry standard manufactured bait at various water temperatures over the course of a crawfish season. Crawfish yields from over 4,500 trap sets, occurring over 46 days spanning parts of 4 months, were documented in this study. Baits consisted of either fresh frozen cut pogy (menhaden) or Southern Pride manufactured crawfish bait. Trapping occurred from late January through mid-April encompassing average daily water temperatures ranging from 49.7-76.4°F. Although the results of this study were specific to a particular set of conditions – principally a relatively high population density of crawfish, which is usually associated with larger trap catches and smaller crawfish – these conditions were not atypical of many commercial ponds.

A summary of the results are presented in Figures 1 and 2. Many variables, other than water temperature, affect daily yields, such as weather patterns (pressure changes, moon phases, precipitation, etc.), pond water replenishment activity (pumping), trapping frequency, and molting patterns of the population as is evident by the scatter tendency of data points in figure 1; however, computer generated best-fit trend lines allow for better focus on the relative effects of bait type as influenced by temperature. It is clear from this chart that water temperature can have a dramatic effect on the efficacy of different baits. While we learned from previous research that water temperatures of 65-70°F was the threshold whereby manufactured baits efficacy was similar to that of cut fish, the results of this recent study document the increasing advantage with fish at decreasing water temperatures below 65°F. Those advantages are enumerated in Figure 2, showing an increase in catch of 176% with cut pogy at temperatures of 50–54°F.

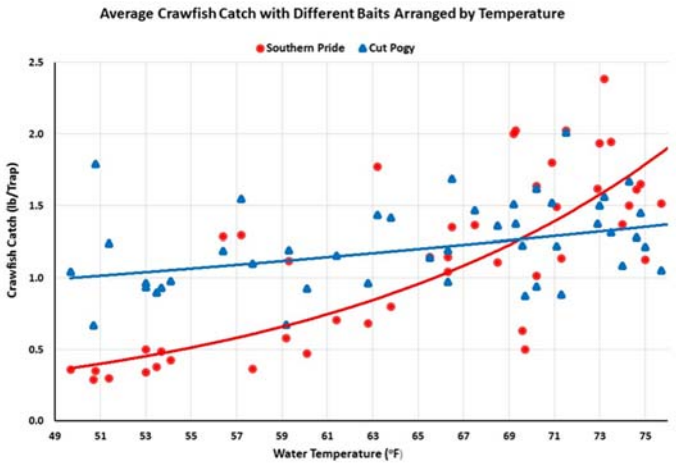


Figure 1. Average crawfish catch (lb/trap) by bait type for mean water temperatures ranging from 50 to 76°F. Trend lines are a best fit curve for the exponential data set.

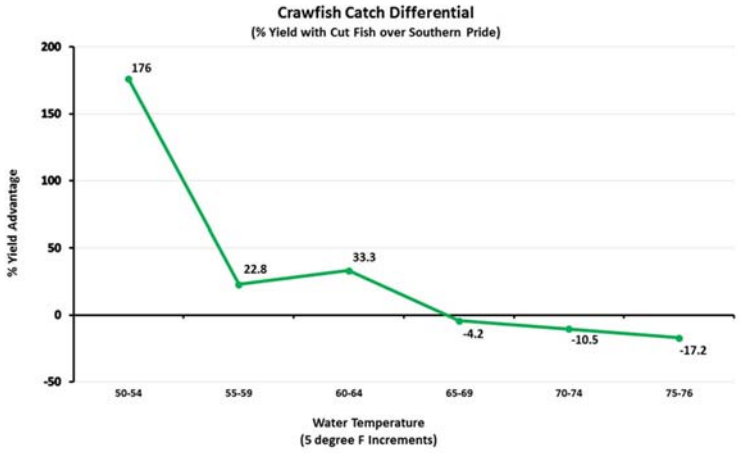


Figure 2. Crawfish catch differential expressed as average percentage increase (or decrease) in yield per trap set with cut fish as bait compared to yield with Southern Pride as bait for increasing increments of water temperature.

While water temperatures below 50°F were not encountered in this study, catch data from a preliminary study resulted in a 488% increase in catch with cut fish over manufactured bait at water temperatures of 46-49°F. Profit comparisons with each bait type may be analyzed based on cost differential of baits used, differences in crawfish catch per bait type, and price achieved for the catch. When realistic marketing prices are assigned to catch differentials achieved in this study, there is strong evidence that profits are being sacrificed when producers choose to use manufactured baits in lieu of fish baits at cooler water temperatures, even though the price of fish baits may be twice that of manufactured bait. Profit advantages increasingly favor the use of fish as water temperatures decrease below about 65°F and as the marketing price of crawfish increases. Therefore, one should probably do the math in a particular situation before relying too heavily on the easiest, least expensive bait choice in cool weather crawfish harvesting.

Dr. Ray McClain
rmcclain@agcenter.lsu.edu

Findings suggest that fish baits typically result in greater profits than manufactured crawfish baits when water temperatures are below about 65°F, even though the cost of cut-fish bait is much greater.

Pest of the Quarter - Weedy Rice

Clearfield rice became available to producers in 2002, offering an opportunity to control red rice with Newpath herbicide. For the first time, rice producers could selectively control red rice with a herbicide during cultivated rice production. In 2004, Beyond herbicide became available for use in Clearfield rice.

Crops are often associated with their respective weedy forms and for over 150 years, red rice has been a troublesome weed of cultivated rice. Clearfield hybrid rice seed has a history of dormancy and rapid seed shattering, and can become weedy when allowed to establish in succeeding growing seasons as a volunteer. Outcrossing between cultivated rice and red rice has been documented. This weed complex of red rice, Clearfield rice/red rice outcrosses, and volunteer Clearfield hybrid rice is often referred to as weedy rice, and can be resistant to Newpath and Beyond.

Red rice can become the dominant weed when present because of its high competitive ability. Dr. Roy J. Smith (former USDA weed scientist in Arkansas) suggested red rice competition can reduce cultivated rice yield by 80% and one plant per square yard can reduce cultivated rice yield by 195 lb/A after season-long competition. Other research has shown red rice populations of 2 plants per square yard can reduce yields up to 20%, and 40 plants per square yard can reduce cultivated rice yield by 90%. In 1979, Dr. Smith estimated total losses due to red rice was near $50 million.

Weedy rice plants can have many phenotypic characteristics including pubescent or glabrous leaves, medium or long grains, awned and/or awnless seed, and dark to light green vegetation color. Weedy rice grain color can vary from deep red/black to tan, and have increased plant height and increased tillering compared with cultivated rice. Due to these growth types of weedy rice, it is believed that weedy rice can utilize resources such as nutrients and light at a higher rate than cultivated rice in a competitive environment.

Many of the problems observed with weedy rice in Louisiana can and could be managed with crop rotation, and with crop rotation, herbicide rotation must be used as well. The use of the same herbicide program year after year in rice production or in the rotational crop should be avoided if possible.

In 2018, producers will have the option to grow a new herbicide resistant rice sold under the tradename Provisia. The herbicide will also be sold under the same tradename. There will be several herbicide program options for use in Provisia rice. Producers should consider using a residual herbicide as preemergence, delayed preemergence, or a very early postemergence application. Command plus Sharpen, pendimethalin plus Sharpen, or Facet plus Sharpen would allow for the control of grasses, troublesome broadleaf weeds, and rice flatsedge. Sharpen is especially useful when Permit resistant rice flatsedge is present.

Following the application of residual herbicides program, as previously mentioned, two applications of Provisia should be applied in a timely manner to control weedy rice. If a broadleaf or sedge herbicide is needed, it would be best to apply one after the first Provisia application and prior to the second Provisia application to prevent the potential of antagonism of Provisia by the additional herbicide in a tank-mix.

This new technology will help better manage weedy rice, while at the same time, help prolong the usefulness of Clearfield rice. It will be very important to follow the stewardship program established for Provisia rice. The most important thing is to never plant Provisia rice in consecutive years, and crop and herbicide rotation will also be important. Provisia can be an excellent tool for weedy rice, but it will be important to stay within the boundaries of the technology, and not try to push the technology beyond its limits.

Dr. Eric Webster
ewebster@agcenter.lsu.edu

PROVISIA RICE

WEEDY RICE

2017 RICE STATION FIELD DAY HIGHLIGHTS














Photos by:

Bruce Schultz

2017 RICE STATION FIELD DAY HIGHLIGHTS

Photos by:

Bruce Schultz

New Rice Varieties Offer Quality Improvements

Southern U.S. rice grain quality has been a major topic of discussion in the industry over the past eight years. Historically, the main quality factor in milled rice has been the milling yield with the primary emphasis placed on whole grain milling yields. Simply put, this is the percentage of whole (unbroken) kernels remaining after the rice has been milled. Typically, any whole grain milling yield over 60 percent is considered good. This means that if you begin with 100 pounds of paddy rice, you end up with 60 pounds of whole kernels after the milling process (removal of hulls, bran and embryo). However, recent quality issues have dealt primarily with milled grain appearance. The main appearance issue has been the amount of chalk in the milled kernels, while a secondary issue is non-uniformity of grain size. Chalkiness after milling is controlled by both genetics and environmental conditions. On the genetics side, some rice varieties are inherently more resistant to chalkiness under all conditions, some are always chalky and some show less chalk under certain environments and more under others. The environmental condition that typically leads to higher chalk levels would be high temperatures during the grain-filling period. These high temperatures lead to loose packing of the amyloplasts as the endosperm of the grain is filled. In other words, as the grain is filled with starch, because of high temperatures, this occurs at a more rapid rate, which leads to the cells being less perfectly aligned. When this occurs, the area between the cells contains trapped air, which is primarily responsible for the chalky appearance.

This topic came to the forefront in 2010 when a perfect storm of factors in that growing season led to a long-grain crop that year with significant quality issues. There were extremely high temperatures when most of the rice in Arkansas, Mississippi and Missouri was in the critical grain-filling stages. Also in that year, there was a very high percentage of rice acres planted to hybrids and varieties inherently more prone to show high chalk levels.

GRAIN CHARACTERISTICS OF SELECTED RICE VARIETIES

Variety	NIC Chalk	WIN Chalk	Grain Length (m)
CL151	35%	14.17%	6.5
CL163	32%	18.94%	6.8
CL111	24%	11.00%	6.9
CL153	14%	7.80%	6.7
CL172	11%	3.92%	6.9
PVL01	7%	2.86%	7.3

When the 2010 crop began to be marketed, it resulted in severe criticism of the quality of the U.S. long-grain rice being delivered. This was especially prevalent with some of our historical markets in Central America where quality has always been a critical factor. Even with more favorable growing environments since 2010, this issue has not gone away, primarily because the Southern U.S. continues to plant a high percentage of long-grain acreage to hybrids and varieties that tend to have more chalky grains regardless of the environment under which grain filling occurs.

Grain quality has always been an important consideration for Southern rice breeders in public programs. Very good examples here are the two newest releases from the H. Rouse Caffey Rice Research Station – CL153, a new Clearfield long grain, and PVL01, which is also a long grain and the first variety released for use with the new Provisia herbicide resistance system. Another example is the newest Clearfield release from the University of Arkansas rice breeding program, CL173, which is also a long grain. The table above shows two chalk evaluations for these lines compared to the predominant currently grown Clearfield long grains. The second column (Nic Chalk) is a very demanding chalk rating required for rice exports to Nicaragua, while the third column (Win Chalk) is the chalk analysis of the same lines from the use of the Winseedle Image Analyzer at the rice station. In both of these analyses, the new varieties show significant improvement over the current predominant Clearfield varieties.

Also of note is the last column, which is the calculated milled rice length in millimeters. PVL01 also has a very long milled grain length, which is another quality characteristic preferred by many end users.

slinscombe@agcenter.lsu.edu
Dr. Steve LInscombe

After 35 years of service to the LSU AgCenter, Dr. Steve Linscombe will be retiring on October 1, 2017. The faculty and staff of the H. Rouse Caffey Rice Research Station invite you to an informal get together for Steve on Wednesday, November 1, 2017 from 6:00-8:00pm to be held at the dryer located at the Rice Station. Please stop by and wish Steve well in his retirement!

**** A book of letters for Steve is being compiled. To be included, please send your letter to Karen Bearb at kbearb@agcenter.lsu.edu no later than September 30, 2017.****

RSVP by October 15, 2017 to kbearb@agcenter.lsu.edu or vdartez@agcenter.lsu.edu.

For more information, you can contact Valerie Dartez at 337-788-7531.

The Use of UAV's to Determine Mid-season N

Unmanned aerial vehicles (UAV), also known as drones, have many potential uses in rice production. Currently, UAVs are being used as an eye-in-the-sky to evaluate in-season crop variability. This is particularly valuable when evaluating problem areas, or after herbicide drift events. Some are also using them to scout levees during the season. This is especially helpful after large rainfall events when levees have the potential to blow out. I have even heard of some producers in other countries using them to evaluate daily water movement in very large fields, and for monitoring water depth by equipping the UAVs with thermal sensors.

One use that LSU AgCenter scientists at the Rice Research Station have been working on is determining mid-season nitrogen (N) fertilizer rates by equipping UAVs with multi-spectral cameras that provide plant information like the normalized difference vegetative index (NDVI). You may remember research conducted at the station a few years ago with the GreenSeeker plant sensor which also provided NDVI data. The GreenSeeker was found to be very good at accurately predicting mid-season N rates in rice. However, the GreenSeeker sensor was very heavy and bulky and was not really practical for use in a rice field. Smaller, handheld versions of the GreenSeeker are now currently available; however, these only provide data at the point at which you are standing and they do not account for the variability across the whole field. This is where UAV sensors really have an advantage because they can account for the variability across the field. Using this information, variable rate application maps can be easily made.

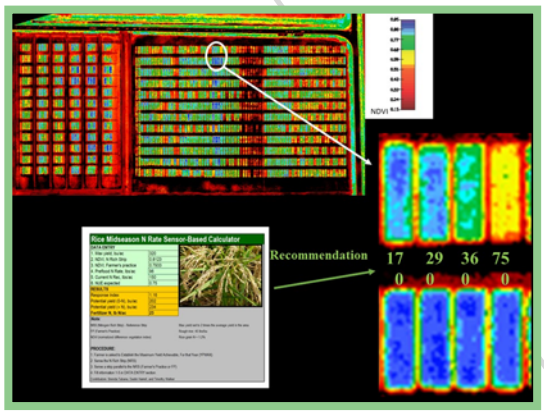
While only a handful of airplanes in the region have the technology to apply variable rates, the technology is available. Although there are some challenges in the use of variable rate technology with aircraft fertilizer applications, the generation of variable mid-season N rates would still be tremendously valuable to the grower. Mid-season rate decisions could still be formulated where one field may need the traditional 100 pounds of urea, another field may need 150 pounds of urea, and yet another field may not need a mid-season application at all. We believe this information would be tremendously valuable to growers and consultants and it would take the bias out of determining mid-season N rates. When was the last time you did not apply a mid-season N fertilizer application to your field?

One challenge to this is that multi-spectral cameras use sunlight as the light source for crop canopy measurements. This is challenging because a cloudy day would have a lower light intensity as compared to a sunny day. The time of day can also have an effect on NDVI measurements due to the angle of the sun. One thing that made the GreenSeeker sensor so successful was that it had its own light source; therefore, it did not matter what time of day or night the measurement was made, the reading would be the same. New light intensity sensors are now being used on the newer UAV multi-spectral cameras to help normalize the light intensity variability.

Coupling the previous research with the GreenSeeker sensor and the current work with the new UAV multi-spectral cameras has shown a lot of promise. The potential availability of this technology to accurately determining mid-season N rates and developing variable rate maps in rice may be available soon.

Dr. Dustin Harrell
dharrell@agcenter.lsu.edu

Past research has been done to use Normalized Difference Vegetative Index (NDVI) values derived from the GreenSeeker sensor to create an algorithm to produce accurate mid-season N recommendations in rice. This was done successfully and the derived N fertilizer recommendations found to be very accurate. However, the size of the sensors and the need to evaluate whole field variability made the use of the sensor impracticable.



Coupling the NDVI readings from a UAV multi-spectral camera with the previously calibrated Mid-season N Rate Sensor Calculator which was used with the GreenSeeker sensor has shown promise in determining mid-season N rates. Data was taken from the H. Rouse Caffey Rice Research Station in 2017. Circled plots are from a variety by nitrogen trial.

UAV equipped with a multi-spectral camera and light intensity sensor.

This newsletter is produced by:

Karen Bearb
Bruce Schultz
Don Groth
Darlene Regan
Steve Linscombe
Valerie Dartez

H. Rouse Caffey Rice Research Station
1373 Caffey Road
Rayne, LA 70578
Phone: 337-788-7531
Fax: 337-788-7553
E-mail: slinscombe@agcenter.lsu.edu
www.lsuagcenter.com/en/our_offices/research_stations/Rice/

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Focus

Brady Williams

Brady Williams first worked at the H. Rouse Caffey Rice Research Station as a student worker during summers from 2000 until 2003, and 13 years later he returned.

He graduated from Notre Dame High School in 2002, and then obtained an associate's degree in computer electronics from Louisiana Technical College the next year.

From there, he worked for the Acadia Parish Clerk of Court for 7 years as the information technology administrator.

Next, he worked with his father as a financial advisor for MetLife but he kept thinking about a job that would require him to work outside with his hands instead of being in an office looking at a computer screen. While employed with MetLife, he occasionally worked for his father-in-law, Clarence Berken of Thornwell and Crowley farmer Buck Leonards.

He learned about his current job through a friend, Brent Theunissen, research associate at the Rice Research Station.

He started work at the station in June 2016 as a research farm specialist in the hybrid breeding project. He obtained his drone pilot's license. "We will attempt to use a drone to hover over our isolation blocks to pollinate our rice crosses in the field."

Williams said one reason he enjoys working at the station is the people, and the variety.

"I enjoy being outside, and you never do the same thing from day to day."

Dr. Jim Oard, LSU AgCenter hybrid rice breeder, said Williams has become a valuable part of the hybrid team.

"Brady has learned over the past year several of the techniques and methods needed for a successful hybrid breeding project," Oard said. "Over the last few months, Brady has become the official drone expert at the Rice Station, and this skill will be very useful for hybrid seed production in our research plots."

He and his wife, the former Erin Berken, have a 6-year-old son, Ethan.

When he's not at work, he enjoys waterfowl hunting, saltwater fishing, cooking outdoors, visiting with family and friends and spending time at the Berken farm.

Bruce Schultz
bschultz@agcenter.lsu.edu

Research partially funded by the Louisiana Rice Research Board
Research partially funded by USDA-NIFA