# H. Rouse Caffey Rice Research Station News

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***Special Dates of Interest:***

- Rice Technical Working Group Meeting
  Perdido Beach Resort
  Orange Beach, AL
  February 24-27, 2020
- H. Rouse Caffey Rice Research Station Annual Field Day
  July 1, 2020

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## Developing New Rice Varieties for the Central American Export Markets

Central America is a major export destination for Louisiana and U.S. rice and has been a top market for many years. However, the volume of U.S. rice exported to this region has dropped significantly over the last decade. For example, there was a 40% reduction in exported rice from the U.S. to Central America from 2007 to 2014. Undesired grain quality attributes are a major factor behind the decline in exports, with the primary concerns expressed by Central America being grain appearance and cooking texture of U.S. rice.

Grain appearance is largely defined by grain chalk and grain length, with the desirable grain type for Central American market being a long grain with very low chalk. Chalk is a physiological defect that is caused by improperly packed starch granules during grain filling that gives the grain an opaque look. The texture of the typical southern U.S. long-grain varieties is stickier and chalkier than what is desired for Central American markets. The texture of rice is largely influenced by the amylose content. Amylose is a crystallized form of starch made up of unbranched polysaccharide chains and is usually measured in percentage of total starch. Higher amylose content is associated with less sticky cooked rice. Other properties of rice that affect cooked texture are gelatinization temperature, known as gel temp, and gel consistency. The gel temp of rice marks the temperature where it begins to cook or gelatinize.

The Latin American market prefers rice with high amylose content and a low gelatinization temperature, which is a quality profile that is not typical within modern U.S. rice varieties and hybrids. Long-grain varieties grown in Louisiana and the southern United States generally have intermediate amylose and intermediate gel temp, resulting in a rice that requires longer cooking time and is slightly sticky with a hardened texture upon cooling. Hybrids, which are increasingly planted on more acres, also tend to have undesirable cooking quality with higher chalk and less uniform cooking properties than inbred varieties. Thus, to increase the marketability of U.S. rice to Central America, it is important to ensure suitable varieties are available that meet the market demands.

One of the challenges to developing new varieties suitable for Latin American markets is the lack of a well-defined consensus of desired quality parameters, beyond having non-sticky texture with low chalk. To address some of these challenges, the breeding project at the H. Rouse Caffey Rice Research Station is working with the rice industry in the United States and in some key Latin American countries through the support of a grant from the USA Rice Federation.

A primary objective of this work is to create a clear understanding of the grain quality characteristics desired by the Latin American market and define quantitative, non-subjective approaches that establish clear breeding targets.

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This project was partially supported by USDA National Institute of Food and Agriculture and the Louisiana Rice Research Board.

Recently, a Rapid Visco Analyzer (RVA) (Figure 1) was procured through the grant support of the USA Rice Federation. This equipment collects quantitative measurements of multiple grain quality cooking attributes. The RVA equipment measures the viscosity of rice flour across time at different temperatures and tests gelatinization temperature and gel consistency. Grain appearance parameters, including length and chalk, are now routinely measured using the grain imaging equipment SeedCount (Figure 2), which was recently purchased through the support of the Louisiana Rice Research Board.

Research activities are now being conducted using the RVA to characterize a collection of high-quality Latin American rice varieties and packaged products. This analysis will provide an understanding of which cooking and quality parameters are most critical to meet the desired Latin American quality parameters. Upon identifying these profiles, we will then screen a panel of 380 modern and historical U.S. rice varieties and breeding germplasm to determine which varieties in our collection are most similar to the desired cooking parameters and might be suitable varieties for export in the short term.

In addition, efforts are underway to develop new varieties from crossing U.S. lines that contain high amylose with lines that contain low gel temperature. Beginning in 2018, crosses were made to combine low gel temp and high amylose. Through marker-assisted selection, 300 lines have been identified that fit in the desirable amylose and gel temp class. A subset of these lines will be evaluated in yield and grain quality tests in 2020, where the top yielding lines will be advanced and further evaluated for cooking characteristics with the RVA and for appearance traits using the SeedCount equipment.

Longer term breeding efforts include importing elite varieties from Central and South America to evaluate their performance and grain quality in Louisiana. The best lines will be used to make breeding crosses with adapted Louisiana varieties and assure that appearance and cooking quality parameters are satisfied without sacrificing yield or the option of including herbicide-resistance.

There is a clear interest from the Latin American rice industry to import U.S. rice, and that demand should significantly increase if varieties were available that met the desired grain quality attributes. The efforts being made at the H. Rouse Caffey Rice Research Station to identify and/or develop a suitable variety are being done in consultation and collaboration with members in the U.S. and Latin American rice industries. Candidate lines will be evaluated for grain quality and cooking attributes by Latin American rice importers to get their feedback on their perceived quality of a given line. The goal of this research is to increase the demand for Louisiana- and U.S.-grown rice and to help reclaim some of the export market that has been lost over the last 15 years.

*Figure 1. PhD student Raul Guerra is leading research efforts focused on improving grain quality for the Latin American export market. The Rapid Visco Analyzer is a key piece of equipment used to characterize the cooking and quality properties of rice.*

*Figure 2. The SeedCount grain analyzer was purchased through the support of the Louisiana Rice Research Board and facilitates the screening of 1,000s of entries per year for grain appearance traits.*

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# Rice Disease Management Practices for 2020

The large amounts of false and kernel smuts last year have increased the amount of inoculum that could over winter and affect next year's crop. If we have favorable weather conditions again this year for grain smuts, we could have another epidemic. To reduce this risk, cultural and chemical management practices need to be used to reduce potential damage this year. Culturally, earlier planted rice has less smuts than later planted rice. Also, high nitrogen rates favor grain smuts and should be avoided. Both of these factors are true for most of our diseases. Chemically, fungicides with smut activity must be applied at the correct growth stage to get effective control. Only the triazole fungicides, propiconazole and difenoconazole, have good activity against the smuts. The early boot stage, 2- to 4-inch head, is critical since late boot and heading applications have little to no effect on smut development. Full labeled rates, 6 to 10 oz/acre (or equivalent) for propiconazole, should be used. Systemic seed treatments are not effective since these fungi infect the rice floret rather than the seedling. Unfortunately, propiconazole is weak against sheath blight and has no activity against blast.

Fungicide timing must be based on the most damaging disease present in a field. This is determined by knowing the varietal susceptibility, field disease history, what is occurring in your area, and most importantly, by scouting for disease in the field multiple times during the growing season. Unfortunately, more smut pressure in 2019 may mean more disease pressure in 2020. Combine that with no effective scouting methods for smuts means preventative applications at boot for kernel or false smut must be used. If sheath blight or Cercospora are the main concern, a boot application with a triazole for smut and another fungicide for the other diseases would be appropriate against all the diseases. If blast is important and grain smuts are a risk, a heading application of a strobilurin fungicide must be made at 50-70% heading, but a triazole fungicide would also be needed at boot (Figure 1).

If the same mode of fungicide action is used year after year against a disease, resistance may and probably will develop in the pathogen population. That is what happened with sheath blight and why we have resistant strains of the pathogen to the strobilurins. To reduce the risk of this developing, a few important practices must be followed. Use full labeled fungicide rates since lower rates encourage resistance development. Rotate the mode of fungicide action and/or use fungicides with multiple modes as premixes or tank mixes. Apply fungicides at the correct growth stage to maximize activity. Allowing a pathogen to become out of control exposes more individuals to the fungicide. Do not apply a fungicide if it is not needed. Blanket applications tend to expose large populations of the pathogen thereby increasing the risk of resistance. There is only one mode of action for smuts (triazoles) and blast (strobilurins) so rotation is not available. If these products are overcome, no other fungicide options are available.

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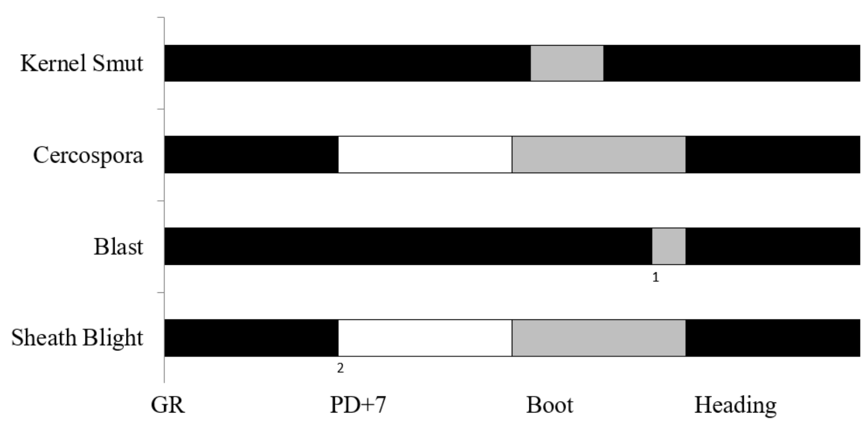
Figure 1. Rice Fungicide Timing




[1] A boot application followed by the heading spray may be necessary if diseases pressure is high and the variety is susceptible.
[2] An early application may be necessary if sheath blight appears early and is severe followed by the boot to heading application.

Do not apply | Application may be needed | Best application timing

# Starter Nitrogen Fertilizer Applications in Rice

There are always many questions that come up every year about starter nitrogen (N) applications in the drill-seeded, delayed flood rice. I thought it would be prudent to answer some of these questions now, so that you can determine if you want to include a starter N application this spring. The most common question I generally get is, "Will a starter N application result in a yield response at the end of the year?" Previous research on starter N applications in Louisiana and Mississippi has shown that a starter N application of 20 pounds of N per acre will not always result in a grain yield increase at the end of the year. However, you are more likely to see a starter fertilizer N yield response in a clay soil as compared to silt loam soil. This is most likely due to the ability of clay soils to "fix" or make ammonium-N temporarily unavailable for uptake and the slower diffusion rate of ammonium-N observed in clay soils. Coincidently, these are also the same reasons that we often see that we typically need 30 pounds of N per acre more on clay soils as compared to silt loam soils.

Another oft asked question is, "Is there an agronomic advantage to using a starter N application in rice?" The answer here is an emphatic yes. While you should not expect a yield advantage from a starter N application every year, there are advantages of the application that cannot be denied. One advantage is that it will stimulate faster vegetative growth. This is especially evident in cooler weather when the rice seems to grow very slowly. Faster early-season growth will lead to a rice stand that is more competitive with weeds and, in turn, will result in a stand that can be flooded a week or so earlier than rice not utilizing a starter fertilizer application. This is highly beneficial for rice because the flood is our biggest weed control tool that we have in our toolbox. Starter N applications will also stimulate uptake of other plant essential nutrients like phosphorus (P), potassium (K), sulfur (S), and zinc (Zn).

One of the biggest negatives about starter N applications in rice is the efficiency of the application. Only about 2 pounds of the N from a 20-pound-per-acre application actually makes it into the rice plant prior to the tillering stage of development and flood establishment. The remaining 18 pounds of the applied N will be in the nitrate-N form by the time the flood is established. The nitrate-N will be turned into a gas and be lost through a natural process called denitrification once the flood is established and the oxygen is depleted from the submerged soil. This is why you should never count the starter N fertilizer application in your seasonal N target.

I personally like to use starter N applications in rice because of all the positive things they bring to the table, even though they are probably not going to result in a measurable economic advantage at the end of the season. If you do decide to use a starter N application this year, consider the following. Be sure to incorporate the fertilizer N into the soil quickly with an irrigation event (or rainfall) to get the nutrient to the roots of the plant. This is especially important if you are using urea. If you are using urea and cannot irrigate the N in quickly, consider treating the urea with a urease inhibitor. Since the application is so inefficient, consider not using more than 21 pounds of N per acre. If you are not incorporating the N into the soil prior to planting, consider applying the N around the 2-leaf stage of development just prior to an irrigation event.

*Figure 1. Diammonium phosphate and potash fertilizer blend applied at planting.*

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# Focus

## Kim Landry

Kim Landry has been working as a research associate in the entomology department since April 2019.

He enjoys his work for a variety of reasons. He likes learning new things. "It's always changing, and I enjoy being part of the rice industry and working for the LSU AgCenter gives me that opportunity."

He said he also enjoys the different tasks involved with insect control research, and he obtains the satisfaction of knowing what he does will benefit farmers.

"It feels like you are on a farm and you're in a farm environment. I really enjoy working with rice production," he said. "It's a systematic endeavor and I enjoy that."

"Kim has emerged as a valuable asset to the Entomology Research Program," said Dr. Blake Wilson, LSU AgCenter entomologist. "He brings our program a wealth of diverse knowledge about all aspects of rice production."

Wilson said, "Kim's responsibilities include overseeing the planting, maintenance, and harvesting of entomology field plots. He also works closely with graduate students in their data collection and supervises all activities of our summer student workers."

Wilson said Kim has taken the initiative to oversee new projects involving off-station work with insect pheromone traps and working with John Sonnier to conduct crawfish toxicity assays in the South Farm wet lab. "While we have only had Kim with the program for one field season, it is clear that he will help keep this program moving in the right direction for years to come."

Kim grew up in Lacassine on a rice, cattle, and soybean farm run by his father, Gerald Landry.

He graduated from McNeese University in 1990 with a major in animal science and a minor in agronomy, and he later earned a master's degree from LSU in vocational education. He worked for the LSU AgCenter as a 4-H agent in West Baton Rouge and Evangeline parishes, then he worked with the LSU AgCenter Rice Verification Program under Dr. Johnny Saichuk.

He worked as a sale representative and consultant for an agriculture company before rejoining the LSU AgCenter last year.

When he's not working, Kim enjoys spending time with his teenage daughter, Madison. He also has a herd of 20 Simbrah cattle.

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This newsletter is produced by Valerie Dartez, Bruce Schultz, Donald Groth, and Darlene Regan.