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Southwest Region

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Rice Research Station News

Volume 9 Issue 1
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Rice Fields Need Sufficient Zinc

Fertilizer decisions need to be made soon as we begin to gear up for the coming rice season. We hope those fertilizer decisions will be based on current soil test results and will consider proper fertilizer application timing(s), source, placement and rate. One plant essential micronutrient that we need to pay close attention to in rice is zinc (Zn). Zinc is often overlooked because less than a pound per acre is needed to grow a rice crop. Even though very little Zn is needed, a deficiency of Zn can cause severe yield losses in rice. In fact, Zn deficiencies in rice have been reported to reduce grain yields anywhere from 10 to 60 percent in U.S. rice. In severe cases, a complete loss of the stand can occur in Zn-deficient hotspots in the field.

A soil test is the first step in determining the potential need for Zn fertilization. Generally, a soil test value less than 1 ppm (Mehlich III) is considered to be deficient in Zn. However, we must also be on the lookout for high pH soils (≥ 7) and alkaline irrigation water, which can also complicate Zn availability. This is because the solubility, and thus plant availability, is decreased 100 times for each pH unit above 6. Therefore, it is possible to have soil that tests medium to high in soil test extractable Zn and still have rice susceptible to Zn deficiency. Unfortunately, soil pH is not considered in our current LSU AgCenter soil test based fertilizer recommendations. However, ongoing research with Zn fertilization response trials on several farms across southwest Louisiana has led to the development of the Zn recommendations found in Table 1. These recommendations can be used as a guideline when granular Zn fertilizer sources are used. It is important that only Zn fertilizer sources that are 50 percent or more water soluble be used. It is also important to avoid Zn oxide-based fertilizer sources because this form of Zn will not be immediately available for plant uptake after application.

Table 1. Recommendation for granular zinc fertilizer sources for rice production†

Soil Test	≤ 1 ppm		1 - 1.5 ppm			1.6 - 2 ppm	
pH	≥ 7	< 7	≥ 7	6.9 - 6.0	< 6	≥ 7	< 7
Granular fertilizer recommendation	15 lb/A	10 lb/A	10 lb/A	5 lb/A‡	none	5 lb/A	none

† The granular zinc fertilizer source must be at least 50% water soluble or higher rates of zinc may be needed.

‡ Even distribution of most granular zinc fertilizer sources at rates of less than 10 lb/A is difficult to achieve, however, it can be achieved when the zinc is premixed with a starter N application using 50 -100 lb. ammonium sulfate.

Fertilization with liquid Zn products is an alternative to using granular Zn fertilizers. Generally, a liquid Zn fertilizer can be soil-applied prior to rice emergence at half the application rates listed in Table 1. Lower rates can be used because the distribution of the Zn is improved when using a liquid. Chelated Zn fertilizer sources are excellent choices here because the chelation helps keep the Zn from being tied up in the soil, making it more available for a longer period of time. Foliar Zn applications can also be used. Foliar applied Zn products are often recommended at rates of 1-2 pounds of Zn per acre. Unfortunately, low rate foliar applications like this only treat the current crop and do not have the benefit of building up soil Zn levels and potentially eliminating the Zn deficiency problem for future crops. Many liquid Zn products can be safely tank-mixed with herbicides eliminating additional application costs. However, you must be sure to carefully read all labels and conduct a jar test for compatibility before attempting this application method.

An active approach to Zn fertility is the best form of defense to avoid Zn problems in rice production. This approach uses a soil test report and results in Zn fertilization prior to the onset of deficiency symptoms, thus maximizing yields. Unfortunately, a reactive approach to Zn deficiency is generally the approach taken by many rice producers. This is where Zn fertilization is only used after Zn deficiency symptoms have occurred. The only problem with this approach is that once a deficiency symptom has occurred, some of the yield potential has already been lost and cannot be recovered!

Several visual symptoms can be used to identify Zn deficiency in rice during the season. One of the first visual Zn deficiency symptoms in seedling rice is the yellowing of older leaves (chlorosis) from the base of the leaf to the leaf tip. This symptom is similar to N deficiency and is,

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Special Dates of Interest:

National Conservation Systems Cotton and Rice Conf.
Tunica, MS, January 31-February 1, 2012

34th Rice Technical Working Group Mtg.
Hot Springs, AR, February 27-March 1, 2012

Rice Research Station Annual Field Day
Thursday, June 28, 2012

Rice Fields Need Sufficient Zinc Cont.

consequently, the hardest symptom to positively identify in my opinion. This Zn deficiency symptom can often be seen in very young rice seedlings in response to cold temperatures. The most common and most easily identifiable Zn deficiency symptom is the occurrence of reddish-brown irregular blotches on the leaf blades (see picture), which is often referred to as "bronzing." Another common symptom of Zn deficiency after flooding the field is the occurrence of leaves that have lost their rigidity and tend to float on top of the water.

Once any of these deficiency symptoms have been identified, the flood water (if present) should be drained immediately. After the water has been drained, granular applications of Zn fertilizer can be applied. However, if a foliar application is used, it is best to wait until the rice recovers (begins to have new growth) before it is applied. This generally takes at least one week after draining. Nitrogen fertilizer in the form of ammonium sulfate is recommended to replace lost N due to draining prior to reestablishing the flood.

Dr. Dustin Harrell
dharrell@agcenter.lsu.edu

Bronzing on rice leaf blades due to Zn deficiency.

MERMENTAU

New Conventional Long-Grain Rice

Mermentau is a semidwarf, early-maturing long-grain rice variety with good grain and milling yields and excellent grain quality. It was developed using the pedigree selection method at the LSU AgCenter Rice Research Station in Crowley, La. Mermentau was selected from the cross AR1188/Cocodrie//9502088/LaGrue that was made in 2001. AR1188 is a long-grain experimental line developed in Arkansas, while Cocodrie is a very early, long-grain semidwarf variety developed at the Rice Station. The experimental long-grain breeding line, 9502008, was developed at the Rice Station, while LaGrue is a conventional height long-grain variety developed in Arkansas. Mermentau originated as a bulk of a single progeny row in 2005. It was evaluated in the preliminary yield nursery in Crowley in the summer of 2006 with the experimental designation 06PY732 before being entered into the Cooperative Uniform Regional Rice Nurseries in 2007 with the designation RU072085.

Mermentau has averaged slightly higher yield levels than Cheniere and Catahoula over four years of multi-location testing. While head rice yields are comparable for the three varieties, Mermentau has slightly longer and more uniform grain length as well as lower chalk levels in most growing environments. Mermentau averaged 37 inches in height in yield tests across Louisiana, which is the same height as Cheniere and Catahoula. At 82 days from emergence to 50 percent heading, Mermentau is the same as Cheniere and one day earlier than Catahoula for this characteristic.

The leaves, lemma and palea of Mermentau are glabrous. The spikelet is straw-colored. The apiculus color is purple at heading and fades slightly as the grain approaches maturity. The grain is nonaromatic. Mermentau has typical long-grain cooking quality with intermediate amylose content and intermediate gelatinization temperature. The average amylose content of Mermentau is 22.6 percent, compared with 25.6 percent for Cheniere and 22.7 percent for Catahoula. The average alkali spread value of Mermentau is 4; Cheniere, 4; and Catahoula, 3.8.

Mermentau is susceptible to rice sheath blight and bacterial panicle blight and moderately susceptible to straighthead disorder and blast. Limited amounts of foundation seed of Mermentau may be available from the Rice Research Station. More information may be obtained by contacting Steve Linscombe at slinscombe@agcenter.lsu.edu.

Dr. Steve Linscombe
slinscombe@agcenter.lsu.edu

LSU AgCenter Releases

Della~2 Specialty Rice

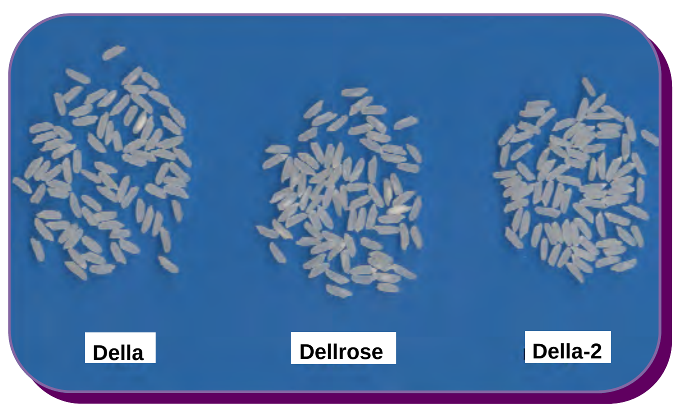
Della-2 (experimental designation LA2140) is the latest aromatic specialty rice variety to be developed at the LSU AgCenter Rice Research Station. It was developed by pedigree selection from a three-way cross Cypress//(L-205/Della)F_1 in the winter of 2001. The aromatic parent Della is a tall, lodging-susceptible variety with a very low yield potential, which was released by the LSU AgCenter 38 years ago for certain domestic consumers who prefer a fluffy long-grain cooking texture yet a strong popcorn-like aroma. Even though several semidwarf Della-type varieties – including Dellrose, Dellmont and A-301 – were released in the early- to mid-1990s, they not only failed to maintain Della's superior quality but also lagged in yield potential to current conventional varieties. A concerted effort to improve Della's agronomic characteristics while maintaining its superior quality led to the release of Della-2.

Della-2 is a short-stature, moderately early-maturing Della-type aromatic long-grain experimental rice variety with very good grain yield, good milling yields and excellent grain quality. Della-2 averaged 40 inches in height in yield tests across Louisiana compared with 36 for Cheniere and 39 for Dellrose. It has moderately early maturity similar to both Cheniere and Dellrose. The average number of days from emergence to 50 percent heading is 87, 86 and 87 for Della-2, Cheniere and Dellrose, respectively. In 16 head-to-head yield comparisons between Della-2 and Dellrose, Della-2 outyielded Dellrose in 13 of those trials. Della-2 is moderately susceptible to rice sheath blight, bacterial panicle blight and straighthead disorder but moderately resistant to blast.

Della-2 foundation seed field, Crowley, LA, 2011.

Both Della-2 and Dellrose have a similar broad flag leaf; however, the flag leaf of Della-2 is longer than that of Dellrose. The leaves, lemma, and palea of Della-2 are glabrous. The spikelet is straw-colored. The apiculus color is light green at heading and straw at maturity. The grain is aromatic.

Della-2 has the typical Della-type cooking quality with intermediate amylose content, intermediate gelatinization temperature and very strong aroma. The average amylose content of Della-2 is 21.8%, compared with 24% for Chenier and 23.1% for Dellrose. The average alkali spread value of Della-2, Cheniere and Dellrose is 4.1, 4.7, and 3.8, respectively. The average 2-acetyl-pyroline (2-AP) content of Della-2 is 678 ng g-1, which is significantly higher than the 582 ng g-1of Dellrose. The milled rice of Della-2 is longer, more slender and more translucent than that of Dellrose and Della. Limited amounts of foundation seed of Della-2 may be available from the Rice Research Station. More information may be obtained by contacting Steve Linscombe at slinscombe@agcenter.lsu.edu .



Milled rice of Della, Dellrose, and Della-2.

Dr. Xueyan Sha
xsha@agcenter.lsu.edu

The History of U.S. Rice Production-Part 1

The Carolina Connection

Rice has been an important crop in the economy and history of southwest Louisiana. Many people may not know, however, that the cultivation of rice in what is now the United States began in the Carolina colonies. The first recorded effort at rice cultivation was conducted by Dr. Henry Woodward of Charleston, SC, in 1685. Dr. Woodward obtained the rice seed from Captain John Thurber, who had sailed his ship to Charleston from the island of Madagascar. The production of rice spread rapidly in this area, and by 1695, rice was being used for the payments of rent to the British Proprietors. In 1691, Peter Guerard was granted a colonial patent for the development of a pendulum engine to remove rice hulls. By 1700, South Carolina was exporting 400,000 pounds of rice annually.

At that time, rice production depended on ponds and rainwater. Because labor was scarce in the region, Carolina planters began importing slave labor from Africa to plant and harvest rice. Because rice was being grown in many areas of Africa during these times, the Africans contributed their own methods of planting, hoeing, harvesting, threshing and polishing, which dramatically improved rice production capabilities. Production reached more than 1.5 million pounds by 1710 and more than 20 million pounds by 1720. The colony adopted a standard of weights and measurements for rice in 1714 that specified the size of the barrel used to ship rice, which is the origin of the barrel (162 lb) still used for measuring rice yields in southwest Louisiana today.

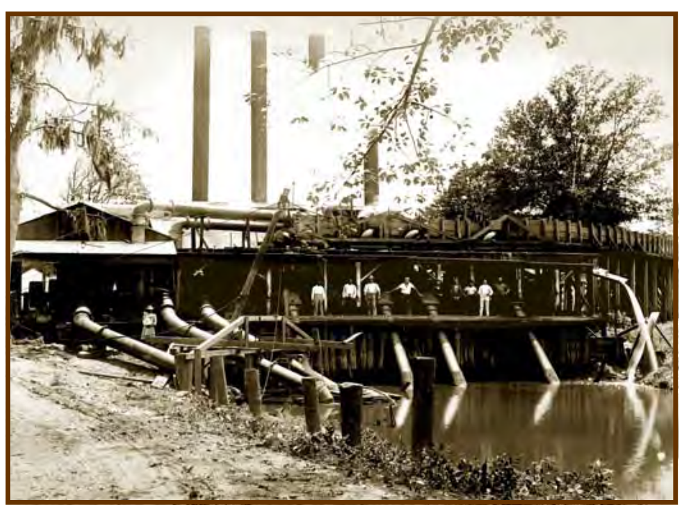
Rice cultivation and yields in the region greatly improved after 1750, when planters developed a system to use the tidal flow of coastal rivers to flood rice fields. The Atlantic Ocean tides, when rising, forced fresh water ahead of the seawater, which raised the fresh water level upriver. Around 1750, Mr. Mckewn Johnstone began devising a system of water gates that were forced open when the tides rose and closed as the tides receded. Using these gates, as well as levees along the rivers, he was able to capture this fresh water and effectively use it to flood his rice production fields. Individual fields could be flooded and the water level adjusted independently of adjacent fields. This ingenious system opened thousands of new acres to rice production.

A second innovation that improved the industry was an improved, tidal-powered rice mill that was developed by Jonathan Lucas of Charleston in the late 1700s. He realized that the tidal water used to flood rice fields could also turn a waterwheel. Using the mortal and pestle milling approach, Lucas developed a water-driven milling system that could mill more than 100 barrels per day. Many such mills were constructed throughout the Carolinas and Georgia as well as in England, where they were used to mill rough rice imported from the colonies.

By the 1780s, production in the region (South Carolina and Georgia) had reached 80,000,000 pounds. Then, as today, about half of the annual rice production was exported and half was consumed in the United States.

Rice Moves to Louisiana

Several factors changed the face of U.S. rice production in the mid 1800s. The introduction of steam power allowed for steam-powered pumps, which assisted the development of rice production along the Mississippi River in Louisiana. Water was pumped over levees into rice fields. Roller mills that had been first developed for use with wheat were adapted for use with rice. After 1850, a great deal of production developed along the Mississippi River, and New Orleans rapidly became the new center of rice milling and marketing activities. Events during this time – the Civil War, the end of slavery and the lack of available capital – caused serious problems for the U.S. rice industry between 1865 and 1880. Rice production along the East Coast declined rapidly. Most production during this period was on small areas along the Mississippi River, and these fields were often threatened by eroding levees and periodic floods.



Dr. Steve Linscombe
slinscombe@agcenter.lsu.edu

Progress on Breeding for Enhanced Protein in Rice

Dr. Ida Wenefrida

The grain quality enhancement project at the Rice Research Station continues to work on improving protein content and amino acid composition in the rice grain. Rice is the major food in both developing and industrial countries. Protein is a crucial nutrient that the human body needs to grow and maintain itself. Proteins are made from amino acids, and there are 20 different kinds of amino acids. Each has its unique molecular configuration with specific biological and chemical properties. From food consumed every day, the body takes these amino acids and assembles them into many biological forms, including muscles, enzymes, hormones, blood cells, and antibodies to carry out various functions. All of the different proteins are needed by the body to function properly. Nine of the amino acids are called essential, meaning that the body cannot make them. These essential amino acids must, therefore, be obtained from the foods consumed. Foods that do not provide a good balance of all the essential amino acids are considered lower quality proteins. Most plant foods contain lower quality proteins because they are low in one or more of the essential amino acids.

Among the essential amino acids, lysine is the most limiting amino acid in rice. Enhancing the content of these amino acids has both economical and humanitarian interest. In the United States, the interest of developing high protein rice can be connected directly to the emerging market demand associated with a healthier lifestyle. In developing countries, where plants directly account for the majority of the food, the high protein rice developed can be used to fulfill both humanitarian and economical purposes.

A long list of research efforts to improve the content of essential amino acids in the grain is well documented in the literature, spanning from the basic breeding technique to genetic engineering.

In genetic engineering research, seed-specific promoters can be used to target the expression of specific traits of interest to be seed specific. The high lysine corn cultivar LY038, for example, was developed through genetic engineering.

There is also the opportunity to increase protein levels in crops through techniques other than genetic engineering. These approaches have been carried out in many crops, and one of the most successful results was obtained in corn, generating quality protein corn (QPM) cultivars. These cultivars are enriched in lysine and, to some extent, tryptophan in their seeds. In general, however, genetic approaches have resulted in relatively limited success in other crop species. This is mostly due to limited availability of genetic resources for plant breeding, and the fact that genetic traits for high contents of lysine, tryptophan or methionine are generally associated with abnormal plant growth because these traits do not operate in a seed-specific manner. Our multi-year mutational breeding efforts have recovered high protein and high lysine rice lines that have acceptable growth characteristics.

The top five high lysine rice lines developed from mutational breeding techniques have lysine improvement ranging from 32.2 to 79.1 percent. Experimental line 05PWLS100115 has a percent increase of 79.1 in lysine content, 06PCY122425 of 54.1, 05PWLS100063 of 50.0, 06PCY120024 of 45.8, and 07PCC201570 of 32.2. Both 05PWLS100115 and 05PWLS100063 were derived from cultivar Wells, while 06PCY122425 and 06PCY120024 were derived from cultivar Cypress and 07PCC201570 from cultivar Cocodrie.

The line with the most improved lysine content (05PWLS100115) has a moderate yield of 5,685 lb/A with milling of 50.4% (head weight) and 68.9% (total weight). However, the line with a moderate increase in lysine content (07PCC201570; 32.21%) has an excellent yield of 8,029 lb/A [milling: 51.95 (head weight) and 68.32 (total weight)]. The grain yields of other high lysine rice lines [(06PCY122425 (54.17%); 05PWLS100063 (50%); 06PCY120024 (45.83%)], are 5,879 lb/A [milling: 56.6 (head weight) and 69.9 (total weight)], 4,904 lb/A [milling: 47.4 (head weight) and 68.0 (total weight)], and 6,003 lb/A [milling: 57.4 (head weight) and 70.0 (total weight)], respectively. These top lines will be increased and multi-location trials will be carried out.

Dr. Ida Wenefrida
iwenefrida@agcenter.lsu.edu

The 34th Rice Technical Working Group Meeting (RTWG) will be held February 27 - March 1, 2012, at the Hot Springs Convention Center, Hot Springs, Arkansas. The RTWG is a biennial meeting held to provide a forum for the continuous exchange of information, cooperative planning and periodic review of all phases of rice research and extension being carried out by the U.S. rice producing states and the federal government as well as cooperating agencies. The meeting is also attended by a number of scientists and others from other rice producing countries. The RTWG Web Page will soon be available at http://www.rtwg.net/ . The RTWG is a very informative meeting and anyone with an interest in the rice industry is encouraged to attend. The meeting rotates between Arkansas, California, Louisiana, Mississippi & Texas. The 2014 meeting will be hosted by Louisiana and held in New Orleans.

MEETING

Hot Springs Convention Center

134 Convention Boulevard

Hot Springs, AR 71901

ACCOMODATIONS

Embassy Suites Hot Springs - Hotel & Spa

400 Convention Boulevard

Hot Springs, AR 71901

Pest of the Quarter - STEM ROT

Stem rot occurs erratically on Louisiana rice. The disease typically appears late in the season when control practices are ineffective or prohibited. Infection tends to cause seed sterility and lodging, which makes harvest. The disease is favored by low soil potassium and high nitrogen levels. Stem rot is more serious in fields that have been in continuous rice for several years. The pathogen overwinters as sclerotia in the upper 2-4 inches of soil and in plant debris. Once the flood is established, sclerotia float to the surface, come in contact with the plant, germinate and infect the leaf sheath near the water surface. The first symptoms are black angular lesions that usually develop after tillering. (As the lesions develop, the leaf sheath may die and the fungus can penetrate into the inner sheaths and stem. These become discolored black or dark brown and shrivel. At maturity, the weakened stem breaks, plants lodge, and numerous small black round sclerotia develop in the dead tissue.

The most important management practice is to apply potassium fertilizer to the field based on soil test recommendations. Other cultural practices include crop rotation and burning stubble to reduce sclerotia numbers. Fungicides applied against other, more economically important, diseases may reduce stem rot damage. Under normal field conditions, disease pressure is not high enough to justify a fungicide application for stem rot alone. Some varieties are less susceptible than others. Ask an LSU AgCenter extension agent in your parish for the latest information for stem rot management.

Dr. Don Groth
dgroth@agcenter.lsu.edu

The Rice Research Station has foundation seed of the following varieties:

CHENIERE

COCODRIE

CYRESS

CAFFEY

JUPITER

DELLA-2

Contact Larry White at
lwhite@agcenter.lsu.edu
337-788-7531

Rice Research Station
1373 Caffey Road
Rayne, LA 70578
Phone: 337-788-7531
Fax: 337-788-7553
E-mail: **slinscombe@agcenter.lsu.edu**

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This newsletter is produced by:
Karen Bearb
Bruce Schultz
Don Groth
Darlene Regan
Steve Linscombe
Linda Benedict

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https://store.lsuagcenter.com/

RICE RESEARCH STATION 1909-2009

Focus

Reed Enjoys Many Jobs at Rice Station

If you ask Thomas "Odd-maus" Reed what he did before he started working at the Rice Research Station 17 years ago, there isn't a short answer. Crane rigger, burying telephone cable, roughneck, oilfield production technician, seafood processor and foundation work are some of what he did.

Ask what he does at the station, and there's also a long list of jobs – everything from running tractors, repairing equipment, spraying herbicides, helping with the seed dryer and cleaner, carpentry and anything else that needs to be done around the station.

"I don't mind jumping to something different," Reed said. "I like a little bit of everything. It's always interesting."

He found out about the job opening as farm specialist at the station from the late Tim Miller.

Reed remembers earning money as early as age 9. He had a trap line and used his bicycle to ride along rice field levees to see if he had caught anything. Back then, fur brought a respectable amount of money, he said, with a raccoon pelt going for $10-$12 and a fox up to $50. From his earnings at trapping, Reed saved enough money to buy a pickup when he was a teenager.

He graduated from Iota High School in 1983, and then went to work for a foundation company.

When he's not working, he stays busy tending cattle on 30 acres, fishing and hunting deer and hogs.

He is married to Sherry and is the father of three stepchildren and three children.

Bruce Schultz
bschultz@agcenter.lsu.edu

Research partially funded by the Louisiana Rice Research Board