

Harvest Moisture and Rice Milling Quality



Southwest
Region

The question often arises as to why rice is harvested at high moisture if it must then be artificially dried down to 12%. The reason is that typically the highest whole grain milling yields are realized with this system. As rice grains continue to lose moisture below 20% during the natural drying process in the field, there is a potential for grain fissures (stress fractures) to develop in the endosperm. The exact mechanism that causes fissures is not completely understood. However, it is known that fissures typically occur more often when rice kernels are exposed to moisture after they have dried below a certain moisture level. When rice grains dry, they will shrink, and when exposed to moisture, they will expand. Apparently, at higher moisture levels, the grains can shrink and then expand

without damage (fissures). However, as the moisture level of the grain is reduced, the endosperm becomes less pliable, and the stresses associated with the cycles of shrinking and then expansion can lead to fissures in the kernels. The importance of this is that kernels are very susceptible to breaks along these fissures during harvesting, handling, milling and transporting. These breaks will lead to a lower percentage of whole grains after the milling process, which can greatly reduce the value of the milled rice.

The important question then becomes: What is the critical moisture below which rice is more susceptible to fissure development? Unfortunately, the answer can be somewhat complex. The critical moisture appears to differ among varieties and across environments. Perhaps the varietal differences are the most important. It is thought that the critical moisture range is between 13%-18% for most southern U.S. varieties.

The ability of a rice variety to maintain good whole grain milling yields as harvest moisture decreases is referred to as *milling stability*. The long-grain variety Cypress (released in 1992) was

the first southern U.S. long grain with very good milling quality and excellent milling stability. The milling stability of Cypress is thought to be mainly associated with a high level of genetic resistance to fissuring. Rice growers soon found that when growing Cypress, grain harvest moisture was less critical, and grain from fields harvested even at very low moisture tended to maintain high head rice yields after milling.

While none of the Louisiana long grains released since Cypress have equal milling stability, overall the newer varieties have fairly good stability. The Rice Research Station conducts various studies that provide insight into the milling stability of different varieties. Based on these studies, the more commonly grown Louisiana-released varieties have shown the following:

CL161—Comparable to Cypress – should try to harvest above 14% grain moisture.

CL131 & Cheniere—Good milling stability – should attempt to harvest above 16% grain moisture.

Cocodrie and Trenasse—Harvest moisture more critical – should attempt to harvest above 18%.

We have also done similar work with the RiceTec hybrids and have seen that harvest moisture is typically

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Special Dates of Interest:

Arkansas Rice Field Day
Wednesday, August 9, 2006
Stuttgart, Arkansas
Rice Outlook Conference
December 2-5, 2006
South Las Vegas, Nevada

Pest of the Quarter

Narrow Brown Leaf Spot and the Cercospora Complex

The fungus *Cercospora janseana* causes narrow brown leaf spot. Its severity varies from year to year and is more severe as rice approaches maturity. Spots are linear in shape and reddish-brown in color. On susceptible varieties, the lesions are wider, more numerous, and are lighter brown with gray necrotic centers. They tend to be narrower, shorter and darker on resistant varieties. Spots usually appear near heading and are slow to develop, taking up to 30 days from infection. Both young and old leaves are susceptible.

Seed heads can become infected, causing premature ripening and unfilled grain. Symptoms can be confused with rotten neck and panicle blast le-

sions. Narrow brown disease lesion symptoms usually are darker brown and develop in the internodal area of the neck. Sheaths and glumes can be infected, causing significant discoloration and necrosis.



On sheaths, the disease is referred to as "net blotch" because of the brown sheath cell walls and the tan-to-yellow intracellular areas that

form a net-like pattern. Grain infection appears as a diffuse brown discoloration. The disease also can be severe on the second crop.

Rice breeders have found resistance to narrow brown leaf spot, but new races of the pathogen develop rapidly. Low nitrogen appears to favor disease development. Fungicides used to reduce other diseases may reduce narrow brown leaf spot. Propiconazole (Tilt, PropiMax, Bumper, Stratego and Quilt) has the best activity of the labeled fungicides. No tests have been conducted to determine activity against all stages of this disease, and no yield increase or quality improvements have been determined.

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Harvest Moisture and Rice Milling Quality Cont.

very important. It is recommended to attempt to harvest these as close to 20% grain moisture as possible.

Remember that these are just guidelines, and the best and most consistent whole grain milling yields for all varieties are normally realized when harvest moisture is between 18%-20%.

Several LSU AgCenter scientists are participating in a USDA-funded, multi-institutional project called RiceCAP. One of the important goals of this project is the development of breeding markers for quality characteristics such as fissure resistance. This will allow breeders to fine-tune their ability to select for this important trait in the future.

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Crawfish Pond Autumn Flood Management

Establishment of the permanent flood in a crawfish pond begins the chain of events that culminates in commercial harvests of crawfish. Pond flooding facilitates the decomposition of vegetation – the mainstay food resource for crawfish and for the many other aquatic organisms that crawfish rely on as high quality nutrition items. Flooding also aids in the emergence of crawfish from summer burrows, where most reproduction occurs. Crawfish are confined to the burrow until the hard plug that seals the burrow is sufficiently softened by external moisture, such as

pond flooding and rainfall. A continuously flooded pond is also necessary to ensure survival and growth of young-of-the-year crawfish flushed from those burrows.

However, timing of the permanent flood in crawfish aquaculture is critical as is management after the flood. This is especially true for crawfish ponds managed in conjunction with a rice crop, which encompasses a majority of the acreage devoted to crawfish production in Louisiana. Because of the large amounts of dead plant matter in a field following the rice harvest,

"Water replacement in a pond should be achieved by draining off much of the poor water, without allowing the pond to drain completely, and then replenishing with fresh, fully oxygenated water."

Crawfish Pond Autumn Flood Management

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water quality conditions can deteriorate quickly upon the flood and can be difficult to correct, which in turn can be detrimental to crawfish survival and well-being.

Bailing or burning the straw following rice harvest may reduce the negative impact upon flooding, and frequent rainfall and/or irrigation between rice harvest and pond flooding may aid much of the decomposition before the permanent flood. However, because decomposition and water quality are largely functions of water temperature, the best management practice, regardless of pre-flood practices employed, is to time onset of the permanent flood with cooler autumn temperatures. For south Louisiana, this would be about mid October when temperatures are consistently lower, yet within the peak period of young-of-the-year recruitment.

Management subsequent to pond flooding should focus on maintaining adequate dissolved oxygen content for young growing crawfish. Thick stands of vegetation and rapid plant decomposition, especially in warm waters, make management difficult. Typically, the most effective practices for managing water quality after pond flooding consist of (1) thoroughly aerating any incoming water, (2) maintaining a very shallow flood until water temperatures cool below 65 degrees F, after which depths can be gradually increased, (3) setting overflow drains such that rainfall will help flush out stale water rather than simply increase flood depth, and (4) monitoring of dissolved oxygen levels and replacing water that consistently remains below about 1.5 ppm for several days. Water replacement in a pond should be achieved by draining off much of the poor water, without allowing the pond to drain completely, and then replenishing with fresh, fully oxygenated water.

Capturing large amounts of water in August or September from heavy rains or storms to save on pumping cost may be more costly in the long run if water quality can not be adequately maintained subsequently.

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Multi-Location Performance Trial of Marsh Plant California Bulrush

Research to improve marsh plants has been conducted extensively at the Rice Research Station for a number of years. Currently, multi-location performance trials are being conducted to evaluate the performance of California bulrush (*Shoenoplectus californicus*). Replicated blocks of selected California bulrush lines have been established at brackish and fresh marsh locations within the cheniere and deltaic plains, funded in part by CREST (Coastal Restoration and Enhancement through Science and Technology) and USDA CSREES (Cooperative States Research Extension and Education Service). Three sites were selected; Pointe Aux Chenes (Houma) and Cameron terraces for brackish environment, and Avoca island terraces near Morgan City for fresh water environment. The objective is to identify superior lines for possible release in fresh and brackish environments.

California bulrush lines included in the multi location trials were selected based on performance field evaluation of 48 California bulrush ecotypes collected across their geographical range within Louisiana. The evalua-

tions were conducted at the Rice Research Station in 2004 and 2005. Ten lines were selected based on productivity criteria, which included plant height, vigor, rate of spread, stem density, stem diameter, disease/insect resistance and seed production. In addition, eight lines were selected from the salinity screening studies (0 to 18 ppt) conducted in the laboratory and greenhouse completed in 2004. Selected plant lines were subsequently increased clonally and are currently maintained in isolated 15-foot-by-30-foot plots at the LSU AgCenter Rice Research Station.

Native to Louisiana, California bulrush is an herbaceous, rhizomatous perennial that forms dense vegetative colonies along shorelines, in open water or on mudflats. Plant stems are obtusely triangular ranging from 5 feet to 10 feet in height. An important characteristic of California bulrush is that it can grow in relatively deep water, and it is not uncommon for extensive colonies to grow in 36 inches or more of water. Colonies tend to grow parallel to and continuous along shorelines in solid somewhat circular stands that may exceed an acre or more.

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Multi-Location Performance Trial of Marsh Plant California Bulrush

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California bulrush is used primarily for erosion control along shorelines, canal banks, levees and other areas of soil-water interface. When planted as continuous vegetative barriers across open water, California bulrush can significantly reduce pond fetch and reduce wave energy. It provides an effective buffer that dissipates energy, reduces shoreline scouring, and traps suspended sediments and other solids.

Dense stands of California bulrush are efficient users of available nutrients, producing significant amounts of organic matter. The cumulative effects of organic matter production, sediment trapping and erosion control not only provide shoreline protection but also accelerate sediment accumulation and near-shore building, improve water quality and promote diverse communities of aquatic life. California bulrush, however, has a relatively low tolerance to salinity and is generally restricted to fresh and intermediate marsh habitats. Greater salt tolerance in California bulrush will increase its role in preserving and restoring salt marshes in Louisiana.



Figure A & C. Planting preparation for multi location trial
Figure B. Greenhouse screening for salt tolerant entries

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A Day in the Life of the Rice Research Station

Dedicated and hardworking people are the backbone of the Rice Research Station. On any typical summer day, these individuals perform a myriad of activities that all contribute to the productivity of this research center. The following series of photographs depict just a few of those activities on a July day in the summer of 2006.

Photos by Bruce Schultz



Rick Zaunbrecher hauls bundles of rice harvested for milling research.



Carl Dischler, far right, tosses a bundle of rice straw from the thresher while Rick Zaunbrecher, far left, keeps the machinery clean of debris and William Ohlenforst collects the threshed rice.



Brothers Shane and Brent Theunissen clean harvested rice of hulls and other plant material using a shaker and compressed air.



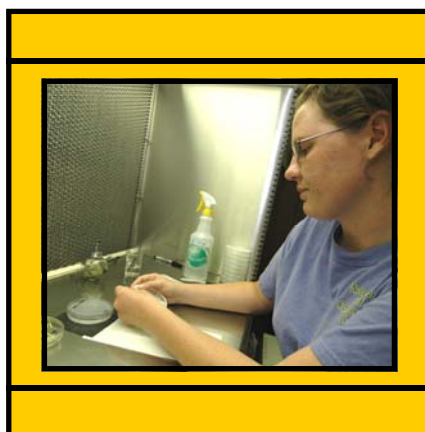
Ron Regan harvesting fertilizer research plots with an experimental plot combine.



Rebecca Sha prepares tissue samples in Petri dishes.

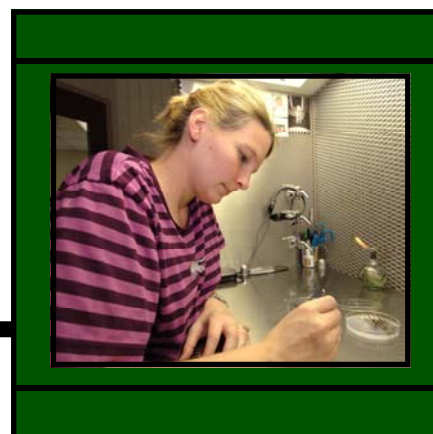


Mona Meche sterilizes beakers that have been used in the anther culture lab.



Kristel Groth prepares immature panicles in a Petri dish for rice anther culture research.

Christi Louvier plates immature panicles of Spartina.



Sara Melancon, at right, and Thomas Groth, in the hat, count rice water weevil larvae for entomology research.



Heidi Meyers places rice grains in a Petri dish to germinate for high protein screening.



Josh Regan grinds a smooth edge on a piece of metal in the maintenance shop.

Jada Monceaux places a cellophane sleeve over a rice panicle that has been cross-pollinated.



Jodie Gautreaux handling a phone call to the administrative office.

Erik Woodard sorts envelopes of seed for the bulrush research project.



Karen Bearb weighs a rice sample in the breeding lab for a milling test.



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Focus on Research Associates

Marty Frey has worked as a research associate at the Rice Research Station for 21 years.

He started working on pathology projects with Dr. Don Groth, but now he also works in entomology with Dr. Mike Stout.

Frey said the entomology assignment is a new challenge that he enjoys.

"I'm learning something extra I wasn't familiar with before," he said.

Frey grew up on a farm near Mowata, working with his father, Barry Frey, and grandfather Al Frey.

"I started driving a tractor when I was 11," he said.

He earned an associate degree in science at LSU-Eunice, then a bachelor's degree in agriculture at McNeese State University.

Frey said he's worried about the future of agriculture. "It's a little scary right now, but I think it's going to rebound."

Entomology offers the chance to help farmers with problems, just like working in pathology, he said.

"I'm hoping some of this will benefit the farmers," Frey said. "I just wish it would benefit them quicker."

He said the problem of not having a good insecticide to fight rice water weevils is especially frustrating.

"I wish things could move quicker because I don't think agriculture can wait," he said.

He lives in his grandfather's 110-year-old home at Mowata.

Frey, father of two sons and a daughter, enjoys gardening and yard work, with an occasional outing to a fish pond.



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