


RICE
2011 RESEARCH

A brief review of the many agronomy, breeding, pest management, soil fertility, and water conservation research projects funded by more than $708,000 of your check-off dollars.


Contents

The Mississippi Rice Promotion Board is made of a group of 12 individuals appointed by the Governor of Mississippi to oversee the expenditure of funds generated by the state check-off program. In 2011, approximately $708,000 was granted to scientists to conduct research projects related to the disciplines of agronomy, breeding and genetics, pest management, soil fertility and water conservation. The 2011 edition of Research Highlights features many of the research projects conducted throughout the growing season. We hope that you will find this information beneficial to your individual farming operation. Please notify a promotion board member or contact one of the many scientists who are highlighted in this report if you have challenges on your farm that can be addressed through the research and Extension efforts funded by your check-off dollars.

Thank you for your continued support of our rice research efforts through your service and check-off dollars.

Mississippi Rice Promotion Board

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High temperatures melt profits

BY NATHAN BUEHRING
Mississippi Rice Specialist

Temperatures consistently topping the 100-degree mark coupled with a lack of rainfall in 2011 challenged the Delta's rice growers and lowered the state's rice yield potential.

In 2011, South Delta growers experienced near-normal early season weather conditions and few planting delays. Rice acreage north of Clarksdale, Miss., however, was inundated with early season rains that delayed planting. In addition, weather conditions in 2011 kept disease incidences to a minimum, with very few repeat fungicide applications made by Delta growers.

It was the season-long hot and dry weather conditions, though, that wreaked havoc on the region's rice yields. In the Stoneville, Miss., area, temperatures of 105 degrees or better had a lot of play in the lower yields Delta producers saw in both 2010 and 2011.

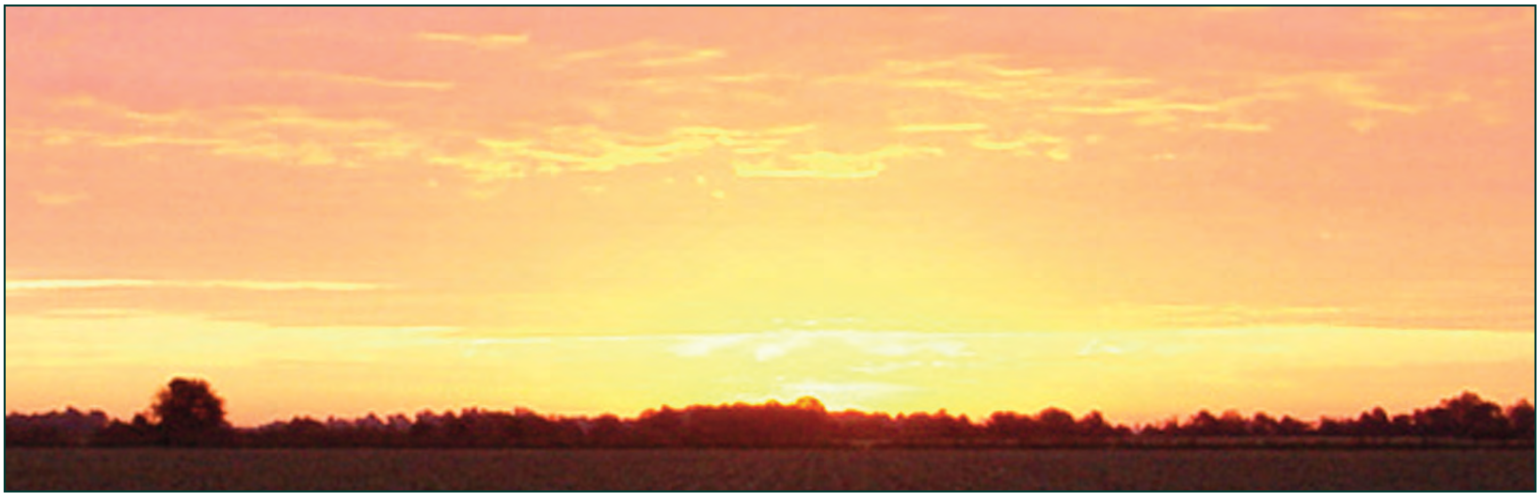
Rice yields varied greatly based on planting date with as much as a 50-bushel per acre difference between rice planted in late March and rice planted in June of 2011. In Mississippi, an early, late March to early April planting date consistently results in higher rice yields in Mississippi. That is not to say Delta growers can't make good rice later, but the probability of that happening greatly decreases. Early planting has shown to be the best avoidance mechanism for low yields attributed to weather conditions such as extreme heat.

At least partly to blame for the lower yields is the fact that rice is most sensitive to high temperatures during flowering. At no other time during the growing season, is the rice plant as susceptible to the yield-limiting effects of extremely hot and dry weather conditions as it is during the flowering stage.

Declines in rice yield equal heat stress during pollination, because the rice plant is not allowed to cool off at night. Typically, threshold temperatures range between 93 degrees and 95 degrees Fahrenheit. Rice typically pollinates from about 10 to 11 a.m., and one or two degrees can make a substantial difference in the success of pollination, with cooler temperatures leading to bigger and bolder grains.

In comparison, high temperatures do not allow the pollen grains to swell, and if they do not swell, they cannot shed properly. Pollen adhesion to the stigma also may be reduced. Temperatures during pollination are the most critical, and in 2011, high nighttime and daytime temperatures went hand-in-hand, and were often associated with high relative humidity. Unlike other rice growing regions such as California, high daytime temperatures in Mississippi often lead to high nighttime temperatures. Coupled with high humidity, this can result in a less productive plant at pollination.

Those rice varieties with panicle exertion above the canopy may be more adversely affected by extreme temperatures during pollination. For example, CL111 heads at the top of the canopy while CL162 has more leaves at the top, which may help panicles cool off better and not be as negatively affected by extreme heat. Also, rice varieties can differ in their time of first flowering. If a rice crop is pollinating later in the day instead of at 10 a.m., that may decrease pollination. Again, a few hours can make a big difference.



Forecasting 2012 weather patterns

With weather patterns currently in a weak to neutral LaNina pattern, Mississippi's weather is predicted to be mild overall in 2012. However, don't let that weather outlook lull you into a false sense of security as brief periods of unpredictability are also forecasted for 2012.

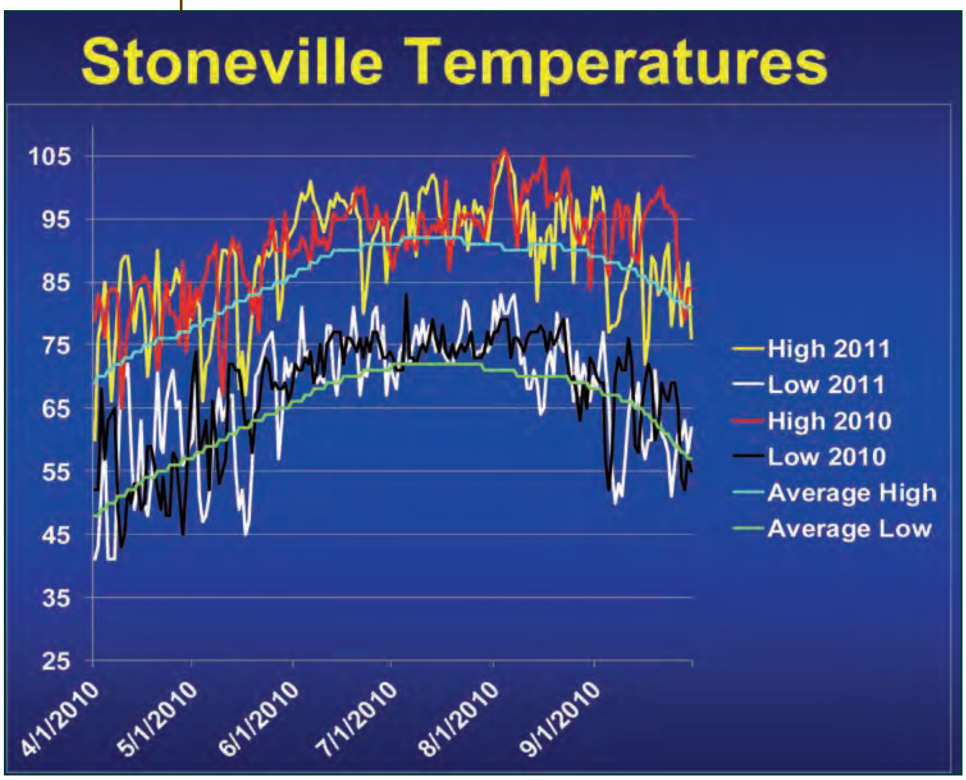
According to P. Grady Dixon, a climatologist with Mississippi State University, Mississippians should expect a warmer than normal winter but with extreme minimums possible and active swings in weather patterns also possible. The chances of increased weather volatility are especially high during the months of January and February because it is predicted that La Nina will be neutral by mid-March.

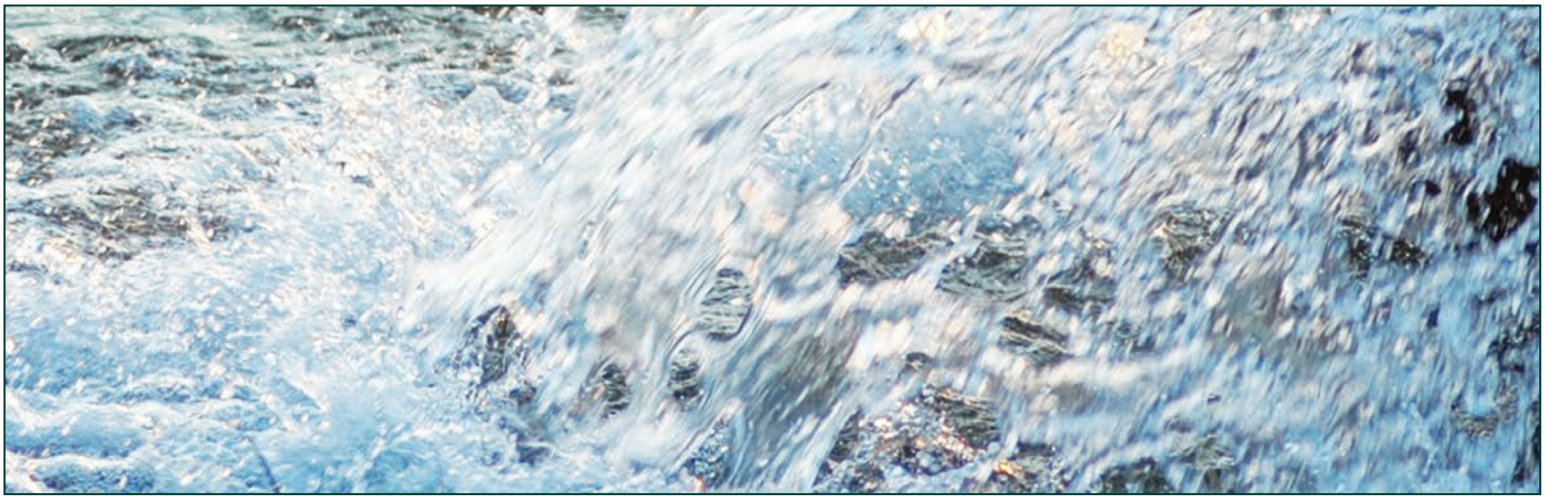
In a LaNina weather system, the water in the Pacific Ocean is colder than normal.

Overall, for Mississippi this means a winter that is dryer than normal, with more hurricanes and dramatic short-term changes in temperature. It also could translate into a greater likelihood of drought conditions during the second half of the year, much like some of what the Mississippi Delta experienced in 2011.

"The one thing you should expect in 2012 is volatility in weather patterns," Dixon says. "The swings will cancel out the averages. It will all depend on how far south the jet stream dips during these weather pattern swings in these quick spurts."

The probability is for above average temperatures accompanied by an active jet stream pattern producing volatile weather variations between the months of January and June. Dixon says farmers should expect a long spring, beginning during the late winter months. "This variable jet stream may lead to more severe weather. When the cold air swings in to warmer temperatures, you get fireworks," he says.





Irrigating for a yield boost

BY JOE MASSEY
Agronomist

A second year's worth of data from on-farm research in the Mississippi Delta further substantiates the notion that utilizing an intermittent flood irrigation system can save growers money while also preserving yield potential.

To measure the effect of intermittent flooding versus a continuous flood irrigation system on rice yield and milling quality, replicated on-farm trials were conducted on a Bolivar County production rice field. The 2011 study compared eight Clearfield rice varieties including: CL111, CL131, CL151, CL152, CL162, CL181-AR, CL142-AR, and CLXL745.

The research test plots were planted at the tops and bottoms of the second paddy of the rice field. The plots in the upper paddy underwent eight wetting and drying cycles, while the plots in the lower paddy underwent one wet-dry cycle. During the study period, a total of 18 inches of irrigation water was pumped on the field. In addition, the field received 7.6 inches of rainfall. The plots, both top and bottom, were fertilized with 150 pounds of nitrogen per acre.

In addition to the variety plot research, a study was conducted to compare nitrogen rate by intermittent flood impacts on rice yield and milling quality. In this study, CL162 was planted at the tops and bottoms of the paddy and different levels of nitrogen ranging from zero to 240 pounds per acre were applied.

There were statistical differences in rice yield between varieties and nitrogen rates, but there were no differences recorded between the yields of rice when comparing the top of paddy irrigated with the intermittent flood system versus the bottom plots irrigated under a continuous flood system.

These results agree favorably with those of the 2010 field trials that compared rice yields of 15 varieties planted in the top and bottom of the rice paddy.

On-farm research results continue to indicate that commercially-available varieties of rice can be successfully grown using intermittent flooding which increases water and energy savings to levels approaching those of zero-grade systems.

The *X* factor in CL151 management

BY TIM WALKER
Associate Agronomist

The rice variety CL151 remains very popular with Mississippi rice growers because of its yield potential. The variety's biggest drawback, however, is its tendency to lodge. Over the past few years, research studies have attempted to pinpoint those management factors that could minimize lodging, including fertility practices.

One key factor in determining the lodging potential of CL151 is the rate of nitrogen applied to the crop. According to the ongoing research, CL151 requires a significantly lower rate of nitrogen to reach its yield potential, as compared to the conventional rice variety, Cocodrie. On clay soil, the average nitrogen rate needed to obtain maximum yield is 194 pounds applied in a single pre-flood treatment.

In comparison, approximately 95 percent of yield potential is achieved at 120 pounds of nitrogen. This translates to a 74-pound difference between the nitrogen required to reach 100 percent yield potential and the nitrogen required to reach 95 percent yield potential. Is that economical?

For example, if a rice crop has a 190-bushel yield potential, that would put that crop's 95 percent yield potential at 181 bushels per acre. In essence, about $54 worth of additional nitrogen fertilizer resulted in only a nine-bushel yield gain. That's a net loss, and the additional fertilizer could result in a lodged rice crop. The resulting five-percent yield bump is simply not economical, when the cost of the additional fertilizer is factored into a crop budget.

Current research studies suggest an optimum fertilizer rate of 120 to 130 pounds of nitrogen per acre. Nitrogen rates greater than 135 pounds per acre, and prior to mid-season, resulted in an increased potential for lodging. The higher the nitrogen rate, the more severe the study's documented lodging.

In the 2010 study, a rate of 135 pounds of nitrogen per acre yielded 8,627 pounds of rice, whereas 180 pounds of nitrogen per acre yielded 8,858 pounds of rice. And, 225 pounds of nitrogen per acre actually decreased rice yields to 8,393 pounds per acre. At the same time, a nitrogen rate of 180 pounds per acre resulted in a "falling, and falling fast" lodging rate, and at 225 pounds of nitrogen per acre, the rice in the study was essentially flat on the ground.

Another management factor that can play a part in the lodging of CL151 is seeding rate. All fertilizer treatment rates in the 2010 study had a seeding rate component in which three treatments were evaluated. The per acre seeding rates of 30 pounds, 60 pounds, and 90 pounds, demonstrated that the higher end of the seeding rate resulted in a higher propensity of lodging.

Currently, the recommended seeding rate is 30 seeds per square foot or 60 to 65 pounds of seed per acre.

Fertility - From the lab to the field

BY TIM WALKER
Agronomist

Several years of research data is confirming what growers have suspected. The use of a fertilizer additive to minimize nitrogen volatilization may be worth the added cost.

Nitrogen (N) is typically the most expensive fertilizer input in commercial rice production. In drill-seeded, delayed flood rice production, nitrogen is often applied in a split-application with two-thirds applied just prior to permanent flood establishment and the remaining one-third at midseason. Because pre-flood fertilizer can remain on the soil surface for up to 10 days until a flood is established, urea is susceptible to volatilization loss of nitrogen as ammonia.

The number of products on the market claiming to "stabilize" nitrogen has escalated in recent years. Often times, the active ingredients in these products have not been scientifically proven. Studies at the Delta Research and Extension Center in Stoneville, Miss., aim to correct that through the evaluation of several nitrogen stabilization products.

Aerobic laboratory incubation studies are used to quantify ammonia volatilization of urea with and without a "stabilizer" product such as Agrotain, Arborite, Nutrisphere-N, N-ZONE, N-FIXX, and Upgrade.
Prior to incubation the volumetric water content of the dried, ground, topsoil was adjusted to 20 percent v/v and 50 grams of soil were added to each diffusion chamber. Replicated fertilizer treatments were added to the surface of the soil within the diffusion chambers to equal a rate of 150 pounds of nitrogen per acre on an area basis. Petri dishes were placed within the diffusion chamber lids that contained a boric acid indicator solution. Immediately following fertilizer application the modified lids containing the petri dishes with boric acid were used to seal the diffusion chambers. Samples were incubated at 25° C within the laboratory. Lids were removed and the petri dishes containing boric acid were replaced with a new petri dishes containing boric acid and resealed within 30 seconds on 3 to 4 day increments for a total of 15 to 21 days after application. The volume of acid required to titrate the sample was used to determine the mass of volatilized nitrogen.

In addition, small-plot field studies in Louisiana and Mississippi tested Agrotain, Arborite, and N-ZONE on Crowley silt loam and Sharkey clay soils. Urea and nitrogen "stabilizers" were applied in three or four application timings prior to permanent flood establishment. An in-field, static chamber method was used to estimate ammonia volatilization loss.

Laboratory results indicated that Agrotain, Arborite, and N-FIXX were highly effective in minimizing volatilization loss. These products have N-(n-butyl) thiophosphoric triamide (NBPT) as the active ingredient which is a proven urease inhibitor. Nutrisphere-N, N-ZONE and Upgrade did not minimize volatilization loss compared to urea alone. Static chamber results were similar in that Arborite and Agrotain were effective in minimizing volatilization loss whereas N-ZONE was not. Clay soils in Mississippi did not lose more than 10 percent of nitrogen applied as urea to volatilization in laboratory or field studies.

However, silt loam soil studies found urea and nitrogen 'stablizers' less effective, routinely losing 25 percent or more to ammonia volatilization.Grain yields were reduced by as much as 15 percent when loss occurred.

Managing the state's newest releases

Production tips for growing Mississippi's Rex and CL162

BY TIM WALKER
Agronomist

Mississippi released two new varieties – Rex in 2010 and CL162 in 2011. A year of commercial production later, Mississippi State University agronomists are tailoring their production management suggestions for these new rice varieties.

Named for Mississippi rice pioneer Rex Kimbriel, **Rex** performed exceptionally well in 2011, averaging 236 bushels per acre. Rex resulted from the breeding cross of Rosemont, Rexmont and IR36.

The conventional variety is an early maturing semi-dwarf with excellent yield potential and excellent straw strength, which makes it rate moderately resistant to lodging. In fact, no lodging was observed at any of the six Mississippi variety testing locations in 2011.

Rex grain yields have been high over the past four years of testing averaging 214 bushels per acre. In addition, yields have been extremely stable ranging from a low in 2010 of 211 bushels per acre and a high in 2011 of 236 bushels per acre. Milling yields for Rex during the same period of time has averaged 58 percent whole and 69 percent total. In 2010, Rex averaged 59 percent whole and 68 percent total milled rice. Its maturity is very similar to Cocodrie and CL151.

When Rex is planted in clay soils, Mississippi State University recommends applying 120 to 135 pounds of nitrogen per acre at pre-flood followed by a mid-season treatment of 45 pounds of nitrogen per acre. The recommendation for silt loam soils is a preflood application of 120 pounds of nitrogen per acre followed by a 45-pound per acre mid-season shot of nitrogen.

Rex is rated as susceptible to sheath blight, blast, kernel smut, and bacterial panicle blight diseases. It also is rated moderately susceptible to straighthead disorder. Currently, it is recommended that Rex be planted at a seeding rate of 75 to 90 pounds per acre with a fungicide, insecticide, and GA3 seed treatment.

After Mississippi State University finalized the licensing agreement with BASF, **CL162** was produced as registered seed in 2011. In addition, a small quantity was sold as certified seed to commercial producers. The variety performed well in 2011 production. It was superior to CL131 and CL181-AR, and similar to CL152, a new release developed at the LSU AgCenter. CL162 has had favorable reviews for its grain size and milled appearance. It also offers better standability that CL151 and CL111.

As with all varieties, CL162 offers the greatest yield potential when planted early in the planting window. It has good seedling vigor and should be planted at 70 to 80 pounds of seed per acre. When planted in late March, CL162 yielded within three percent of CL151 and CL111. Under the heat stress of 2010 and 2011, CL162 performed much greater than CL151.

CL162 is rated susceptible to sheath blight and is rated moderately susceptible to blast, straighthead, and bacterial panicle blight. Based on two years of nitrogen response, CL162 requires only 180 pounds of nitrogen to achieve its maximum yield potential.

Fungicides protect against loss

BY TOM ALLEN
Plant pathologist

Sheath blight remains one of the most important yield-limiting diseases of rice production in Mississippi. To date, resistant cultivars are not available and fungicides remain the only means of disease management and yield loss prevention.

Annual ratings gathered by inoculating the Uniform Regional Rice Nursery (URRN), and rating for the severity of sheath blight, suggests that some tolerance is present within rice lines. However, fungicides have served the purpose of disease management well, especially with the aid of compounds that are either composed primarily of a strobilurin or are a pre-mix containing a strobilurin and triazole. Even with late fungicide applications made post-heading with a labeled product, yield loss can be limited under moderate to heavy infection pressure.

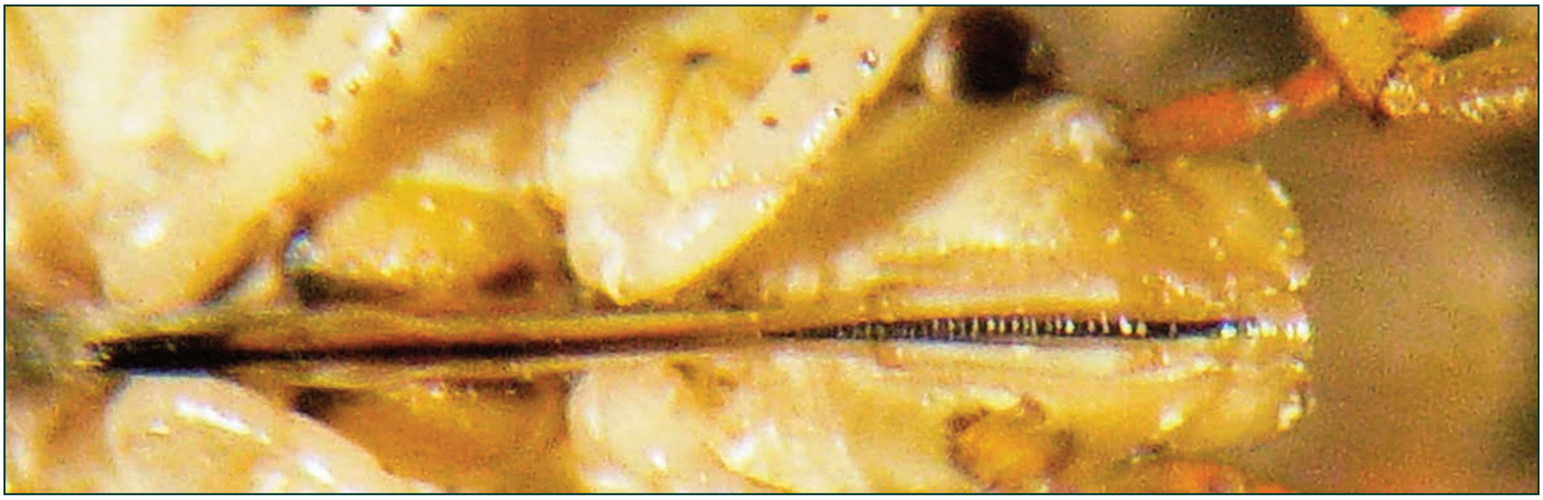
In studies conducted at the Delta Research and Extension Center, fungicides were applied within the pre-harvest interval so as to limit a crop residue issue. Four fungicide trials were conducted during the 2011 season to make comparisons between some of the newer fungicide products and product formulations available commercially including Gem, Quilt Xcel, and Stratego YLD.

Inoculum in the form of popcorn infested with Rhizoctonia solani was added to plots to be sprayed with fungicides the first week of August. Rice plots were sprayed later than the normal panicle differentiation plus 14 growth stage application due to poor infection prior to the typical application stage, and to determine if fungicides were still able to manage sheath blight at advanced plant growth stages.

Comparisons were made between two new BASF fungicide products, a numbered compound BAS 700 and Priaxor, Headline, and two rates of Quadris (6.0 and 10 fluid ounces per acre) to determine the best products to manage yield losses attributed to sheath blight. Priaxor has proven effective against aerial web blight of soybean, also caused by R. solani, in trials conducted in eastern Mississippi over the past two growing seasons.

In addition, comparisons were made between several products already available for managing sheath blight. Head-to-head comparisons were made between Evito, Gem, Quadris, Stratego YLD, and Quilt Xcel. Quadris outperformed the other products in three out of the four trials. In the fourth trial, Gem outperformed the other products and resulted in a greater reduction in yield loss when compared with the untreated check.

Developing situation: Presently, azoxystrobin-resistant Rhizoctonia solani has not been detected in the Mississippi rice producing area. However, members of the MSU Extension and research team are carefully monitoring the developing situation in Louisiana. With this in mind, if there are specific concerns regarding the performance of fungicide applications on the sheath blight fungus please bring this to our attention. Proper application techniques following the specific guidelines on a fungicide label are important to limit the risks attributed to the development of fungicide resistance. Please follow the restrictions and always apply a full, labeled rate.



Water amps up weevil populations

BY ANDREW ADAMS, JEFF GORE, DON COOK, GEORGE AWUNI & FRED MUSSER
Entomologists

Ongoing research aims to provide a better understanding of how water management practices impact the efficacy of seed treatments to control the rice water weevil. Experiments, conducted at the Delta Research and Extension Center in Stoneville, Miss., in 2011, examined the time from planting to permanent flood and the number of flushes before permanent flood.

Prior to 2010, foliar application with a pyrethroid insecticide was the only control option available for rice water weevil management. Then in 2010, Syngenta's Cruiser® 5FS and Dupont's Dermacor® X-100 were granted full labels. Generally, rice treated with an insecticide seed treatment produces about eight to 12 bushels of rice more than untreated rice or rice treated with a foliar pyrethroid application. However, there are instances where significant yield increases are not observed even in the presence of moderate to high weevil populations.

In the 2011 research, rice seed treated with either Dermacor, Cruiser, or Nipsit, and an untreated control were planted on three dates, spaced two weeks apart. All of the plots were flooded on the same date to establish flood timings of four weeks, six weeks, and eight weeks after planting. Extremely hot dry weather resulted in a lack of stand establishment for the four-week treatment. Rice water weevil densities were determined four weeks after flood by washing two cores from each plot and recording the number of larvae per core. At the end of the season, all plots were harvested and grain weight in bushels per acre was recorded.

Based on the results of this experiment, the time from planting to permanent flood did not have a significant impact on the efficacy of insecticide seed treatments against rice water weevil. At the six-week flood timing, all of the seed treatments reduced larval numbers below that in the untreated control. Similar results were observed for the eight-week flood timing.

A second experiment includes the same seed treatments, but with zero, one, or two flushes with water between planting and permanent flood. The permanent flood was established six weeks after planting. The first flush was applied three weeks after planting and the second flush was applied 10 days after the first flush.

Flushing with water significantly impacted the percent control of all three insecticide seed treatments. Percent control was lower in plots flushed once, and flushing the field twice reduced percent control even further. In terms of yield, there were no significant differences between zero flushes and one flush for any of the insecticides. In contrast, yields for Cruiser and Nipsit were significantly lower in plots that were flushed twice compared to plots that did not receive a flush or plots that were flushed once. Based on these results, all of the insecticide seed treatments can be negatively affected by flushing. Based on yields, Dermacor appears to be less sensitive to flushing than Cruiser or Nipsit.

Growers should be aware that when their fields are flushed to overcome dry conditions or to activate residual herbicides the efficacy of insecticide seed treatments may be compromised. In some situations, a supplemental application with a foliar insecticide may be warranted, especially on fields that are flushed more than one time.

How to treat hybrids for pests

BY JEFF GORE AND DON COOK
Entomologists

Hybrid rice was recently introduced as a high yielding alternative to traditional cultivars. Hybrid rice produces more tillers than traditional cultivars and thus can be planted at much lower seeding rates. Seeding rates for hybrid rice can be as low as 20 to 25 pounds of seed per acre; whereas, traditional seeding rates are normally in the range of 70 to 90 pounds of seed per acre. This can have an impact on seed treatment rates because the rate of insecticide per acre is directly proportional to the seeding rate.

In the case of Cruiser 5 FS, the labeled rate is 3.3 fluid ounces per 100 pounds of seed regardless of seeding rate. In contrast, the rate of Dermacor X-100 varies based on seeding rate. Dermacor rates range from a low of 1.5 fluid ounces per 100 pounds of seed at a seeding rate of 120 pounds per acre up to 6 fluid ounces per 100 pounds of seed at a seeding rate of 30 pounds per acre. Because of this, research needs to be conducted on hybrid rice to determine the optimum seed treatment rates per 100 pounds of seed for Cruiser 5FS and Dermacor X-100.

Experiments were conducted at five locations including the Delta Research and Extension Center in Stoneville, Miss., and grower farms in Bolivar and Tunica counties to determine the optimum seed treatment rates for hybrid rice. Hybrid rice seed was planted at 25 pounds of seed per acre with different rates of Cruiser 5FS, Dermacor X-100, and Nipsit INSIDE. The rates for Cruiser 5FS were 3.3 and 9.0 fluid ounces per hundredweight. The rates for Dermacor X-100 were 5.0 and 6.0 fluid ounces per hundredweight. The rates for Nipsit were 1.9 and 4.0 fluid ounces per hundredweight.

Rice water weevil densities were determined four weeks after flood. Plots were harvested at the end of the season and grain yields were determined.

When averaged across all locations, rice water weevil densities were statistically similar among the different rates for all of the seed treatments. In general, rice water weevil densities were higher on the lower seed treatment rates. The highest rate of each seed treatment (9.0 ounces of Cruiser, 6.0 ounces of Dermacor, and 4.0 ounces of Nipsit) provided the greatest level of rice water weevil control.

In terms of yield, all of the seed treatments and rates had significantly higher yields than the untreated control. However, the high rate of each seed treatment produced higher yields compared to the lower rates of each insecticide. Of those higher rates, only Dermacor at 6 fluid onces per hundredweight is a legal treatment. For Cruiser the highest labeled rate is 3.3 fluid ounces per hundredweight. Nipsit is not registered at this time, but the maximum labeled rate will likely be 1.9 fluid ounces per hundredweight.

In conclusion, an insecticide seed treatment should be used on hybrid rice. If Cruiser or Nipsit is used, an additional foliar application with a pyrethroid may be needed when high populations of rice water weevil occur.

Finding a home in Italian ryegrass

BY GEORGE AWUNI, JEFF GORE, DON COOK, ANDREW ADAMS, & FRED MUSSER
Entomologists

Rice stink bug populations continue to grow, with population spikes seen throughout the Delta in 2011. New research is attributing the renewed health of this pest to a readily available supply of Italian ryegrass that is proving to be an amiable host to the pest.

The rice stink bug is an important pest of rice in Mississippi. Direct yield losses in rice result from their feeding on developing kernels during the early stages of panicle development. Indirect losses are the result of feeding during the later stages of panicle development that causes discolored kernels. Additionally, kernels that have been fed on by rice stink bug can break during the milling process and result in low milling turnout.

Rice stink bug populations were extremely high in the southern United States during the 2011 growing season. Research on the population dynamics of rice stink bug shows some of the factors that may have contributed to the population outbreak in 2011.

A survey of rice stink bug populations on numerous grass hosts was conducted in Washington and Bolivar counties during 2011. Native and cultivated hosts were sampled weekly with a 15-inch diameter sweep net. A total of 10 sweeps were done at 10 sites within a location on each host for a total of 100 sweeps on each host at a location. The number of stink bug adults and nymphs per 10 sweeps was recorded. Sampling was initiated in mid-April prior to rice stink bug emergence from overwintering and continued through August. The first stink bugs collected were on heading wheat and Italian ryegrass.

Italian ryegrass continued to support high populations into late May and early June. As the Italian ryegrass began to mature, large numbers of stink bugs began to migrate to other grass hosts including; bahiagrass, dallisgrass, johnsongrass, and prairiegrass. Other grass species that supported significant populations of rice stink bug included barnyardgrass, junglerice, Southwestern cupgrass, yellow foxtail, browntop millet, crabgrass, broadleaf signalgrass, and rice.

The abundance of glyphosate resistant Italian ryegrass in the central Delta of Mississippi appears to be an important component of rice stink bug population dynamics. Italian ryegrass continues to produce and hold seed longer into the season than wheat. This gives rice stink bugs a site for feeding and reproduction until other grass species begin to flower and produce seed.

Growers should attempt to prevent grass species from flowering and producing seed throughout the entire growing season. Minimizing the amount of Italian ryegrass and other grass species that produce seed adjacent to rice fields may help to minimize rice stink bug populations in those areas.

Evaluating treatments

BY JEFF GORE AND DON COOK
Entomologists

The rice stink bug is an important pest of rice in Mississippi. Insecticide applications are needed to control this insect annually on most fields. Pyrethroids such as Karate or Mustang Max are the standards for rice stink bug control. They are relatively inexpensive and have continued to provide good control in Mississippi, even when high populations occur. Even though the pyrethroids have continued to provide good control of rice stink bugs, alternative chemistries are needed to ensure the sustainability of these pesticides over time.

Experiments were conducted in 2010 and 2011 to determine the efficacy of Fyfanon Plus ULV against rice stink bug in rice. Fyfanon Plus ULV is a new premix that includes an organophosphate (malathion) and a pyrethroid (gamma-cyhalothrin).

Treatments were applied to large blocks of rice with an airplane and compared to Karate at 2.56 fluid ounces per acre (one gallon to 50 acres). The Fyfanon Plus ULV was applied as an ultra-low volume (one quart total volume per acre) spray in modified vegetable oil at a rate of 9.0 fluid ounces per acre (one gallon to 14.2 acres). The Karate was applied at a total volume of five gallons per acre.

Rice stink bug densities were determined with a sweep net by taking five sets of 10 sweeps in each plot. The average number of rice stink bugs per 10 sweeps was recorded.

Results for rice stink bug control were similar in 2010 and 2011. In 2010, rice stink bug densities were slightly over threshold at the time of treatment. At five and 12 days after treatment, rice stink bug densities were similar between the Fyfanon and Karate.

During 2011, rice stink bug densities were approximately 10 times the threshold level. Even under these high populations, both Fyfanon and Karate provided good control of rice stink bugs. Fyfanon Plus ULV is not labeled in rice at this time, but a full registration is anticipated in the near future.

In addition to testing new insecticides, the susceptibility of rice stink bug to the pyrethroids was monitored using an adult vial test. Glass vials were treated with multiple doses of pyrethroid, cypermethrin, diluted in acetone. One half a milliliter of each cypermethrin-acetone solution was put into each vial, which was then rolled on a hot dog roller with the heating element disabled until the acetone evaporated. This method leaves a uniform film of the insecticide coated on the inside surface of the vial. Cypermethrin was used as a representative of the pyrethroid class because it was one of the early pyrethroids used and it is the best candidate to make comparisons to historical data. A single rice stink bug adult was placed in each vial and mortality was rated at 24 hours. A total of six doses of cypermethrin were used plus a non-treated control to determine what concentration of insecticide would kill half of the pest population. Based on the experiment, rice stink bugs in Mississippi are still highly susceptible to the pyrethroids and growers should be able to get good control with these insecticides.

Finding the right tankmix

BY JASON BOND
Weed scientist

Rarely does a rice field contain only one type of broadleaf weed, which explains the need for research to evaluate tank mixes of Newpath and Beyond with broadleaf herbicides.

In 2011 research, propanil formulations improved barnyardgrass control when mixed with Newpath but not with Beyond. Tank mixtures also increased the spectrum of control with a single application. In addition, tank mixtures of RiceBeaux with Newpath or Beyond effectively controlled barnyardgrass, Amazon sprangletop, hemp sesbania, and red rice.

The best strategy for herbicide resistance management in rice is utilizing multiple applications of combinations of postemergence and residual herbicides with different modes of action. Barnyardgrass resistant to Newpath has been identified in isolated fields in Mississippi. This problem will continue to spread if Newpath and/or Beyond are used exclusively for barnyardgrass control in Clearfield rice. The addition of RiceBeaux to Newpath or Beyond in Clearfield rice makes use of three separate herbicide modes of action that all are active on barnyardgrass.

In 2011 research performed jointly with the LSU AgCenter's Rice Research Station in Crowley, La., Newpath was applied at four fluid ounces per acre when rice, barnyardgrass, and/or red rice were in the two- to three-leaf stages of growth. In separate studies, Beyond was applied at five fluid ounces per acre at the same growth stages. Tank mixtures with Newpath and Beyond included RiceBeaux (1 or 2 quarts per acre), RiceShot (0.75 or 1.5 quarts per acre), and Bolero (0.75 or 1.5 pints per acre).

Rates of RiceBeaux, RiceShot, and Bolero were lower than what would be used if these products were applied alone in order to see if these mixtures influenced control of different weeds with Newpath or Beyond.

RiceBeaux is a prepackaged mixture of RiceShot (propanil) and Bolero (thiobencarb). Therefore, when a tank mixture with Newpath or Beyond included RiceShot or Bolero, the rates of these were the equivalent of propanil and thiobencarb in RiceBeaux. For instance, two quarts per acre of RiceBeaux contains the equivalent of 1.5 quarts per acre of RiceShot and 1.5 pints per acre of Bolero.

Control of barnyardgrass, Amazon sprangletop, hemp sesbania, and red rice was evaluated at seven and 14 days after application.

Tank mixtures of Newpath plus RiceBeaux controlled barnyardgrass better than Newpath or RiceBeaux applied alone. Beyond plus RiceBeaux controlled barnyardgrass better than RiceBeaux applied alone but not Beyond applied alone. RiceShot plus Newpath or Beyond controlled more barnyardgrass than Newpath, Beyond, or RiceShot applied alone.

Red rice control was improved when RiceBeaux or RiceShot were combined with Newpath or Beyond. Amazon sprangletop control was not increased with tank-mix applications. RiceBeaux and RiceShot were as effective alone for Amazon sprangletop control as tank mixtures of RiceBeaux or RiceShot plus Newpath or Beyond.

Numerical increases in control from tank-mixtures with Bolero suggest the emulsifiable concentrates may be acting as additional surfactant for Newpath and Beyond. This potential will be investigated further in 2012.

Timing postemergence treatments

BY JASON BOND
Weed scientist

Which is more effective for red rice and/or barnyardgrass control - Newpath or Beyond? Recent research suggests that Beyond is more effective than Newpath for control of tillering red rice and barnyardgrass. However, since Beyond does not exhibit residual activity, optimum red rice and barnyardgrass control will be achieved when Newpath is applied first and then Beyond is used to control weeds that escaped the first application of Newpath.

The first postemergence application of Newpath should be made when red rice and barnyardgrass are in the one- to two-leaf stage. This early application will provide residual control and slow new emergence of these species. Although Beyond will effectively control seedling red rice and barnyardgrass, it was also effective on larger weeds.

Newpath was the imidazolinone herbicide first labeled for use in Clearfield rice, and labeling requires that two applications be made prior to rice flooding. However, red rice plants left uncontrolled following Newpath application can outcross with cultivated Clearfield rice, transferring the herbicide resistance trait to red rice.

As a result, the imidazolinone herbicide Beyond was labeled in Clearfield rice to control red rice plants left uncontrolled following two applications of Newpath. While Beyond was often used as a salvage treatment after flooding,.current labeling allows a Beyond application prior to flood.

However, applications of Beyond must follow at least one application of Newpath. The first application in Clearfield rice must be Newpath because it offers soil residual control of red rice, while Beyond only controls emerged red rice.

Two studies were conducted at DREC in 2011. One study targeted red rice and the other focused on barnyardgrass, with the objective of both studies to compare the efficacy of Newpath and Beyond applied at different pre-flood timings. Newpath, at a rate of four fluid ounces per acre, and Beyond, at a rate of five fluid ounces per acre, were applied to red rice or barnyardgrass in the one- to two-leaf, three- to four-leaf, one- to two-tiller, and three- to four-tiller stages of growth. Then, weed control was evaluated at seven, 14, and 28 days after each application.

Newpath controlled red rice better at the one- to two-leaf stage than at later stages. Conversely, red rice control with Beyond was lowest when applied at the earliest timing. This was because Beyond provides no residual control of red rice and subsequently cannot control new emerging weeds. Newpath, however, controlled emerged red rice at the early timing and then its residual component prevented new emergence. At seven days after flood, Newpath controlled red rice better than Beyond when one- to two-leaf red rice was targeted. However, Beyond was more effective than Newpath for controlling large red rice.

In contrast to observations with red rice, Beyond controlled barnyardgrass better than Newpath regardless of application timing. Newpath was most effective for controlling barnyardgrass when applied to one- to two-leaf grass compared with later timings. Barnyardgrass control with Beyond was reduced if application was delayed until barnyardgrass was tillering. However, Beyond was more effective than Newpath when applications were made to three- to four-leaf grass.

Better timing for better yields

BY TIM WALKER
Agronomist

The advent of new rice varieties combined with six years worth of planting date evaluations at the Delta Research and Extension Center, is shedding new light on the optimum planting window for maximum yield potential.

In research studies from 2006 to 2009, the maximum yield achieved (> 95% relative yield) for hybrids was achieved at the late March planting date. Yields declined with increasing planting date in a linear manner at the rate of 0.08 percent per day. To put this in perspective, even if hybrid rice was planted on June 5, 90 percent of the relative yield potential could still be achieved.

Varieties responded differently. Greater than 95 percent relative yield could be achieved with varieties as long as they were planted in the window of March 20 through May 4. However, if rice was planted after May 4, yield decreased with increasing planting date at a rate of 0.38 percent per day. To put this in perspective, if rice was planted on June 5, 84 percent of the relative yield could be achieved. These data suggest that hybrids were more stable over the broad planting dates during 2006 through 2009 with respect to relative yield potential compared to inbred varieties.

More recently, planting date evaluations have highlighted an optimum planting window from March 20 to April 25 in order to reach a crop's potential yield of 95 percent or greater. This represents a shortening of 10 days when compared to the 2006 through 2009 data. After April 25, rice yields declined 0.4 percent per day reaching a low of 76 percent relative yield with a planting date of June 9.

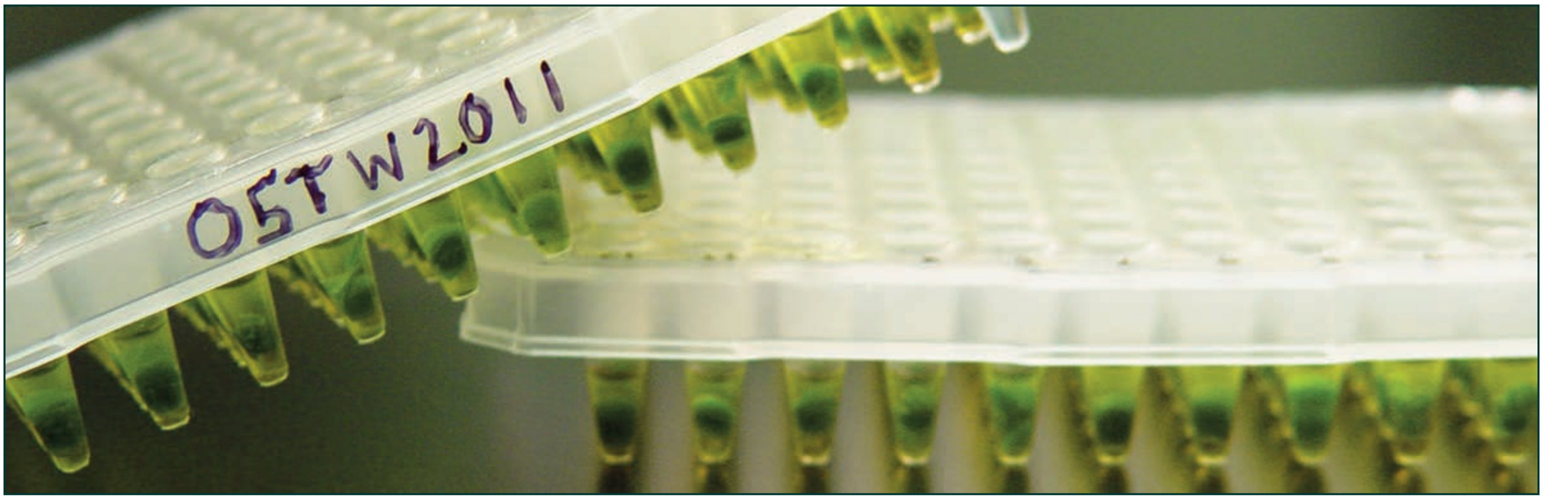
Extremely hot days and nights were present in 2010 and 2011 during the critical pollination period for a considerable percentage of the state's planted acreage. These data were largely responsible for shifting the optimum planting window up 10 days compared to the 2006-2009 predicted optimum. Regardless of the length of the window, the most stable and greatest yields were always achieved in the early portion of the planting window.

Not every acre can be planted in the optimum window, and sometimes even planting during the "optimum" timeframe can result in decreased yields, as occurred in 2010 and 2011. Even an optimum planting window can be negated by unfavorable weather conditions.

No hybrid data currently exists with which to accurately assess the effects of the abnormally hot environments encountered in 2010 and 2011. However, based on field observations, and work in other states, it appears hybrids may be more tolerant to high temperature compared to varieties.

With respect to varieties, CL142-AR and CL162 have been the most stable Clearfield varieties across planting dates and years. Rex has been the most stable conventional variety across dates and years. Rex also has been the highest yielding conventional inbred variety when planted in June; whereas CL142-AR and CL151 have performed the best of Clearfield inbred varieties planted in June.

Based on research data, we recommend that varieties be planted starting between March 20 and 25. If rice planting occurs after April 15 and hybrids are included on the farm, then plant hybrids after varieties. If rice is being planted in a later than optimum window, variety selection becomes more important to minimize yield loss.



Marking molecular traits

Earlier flowering varieties may prove better for Mississippi rice production

BY ZHAOHUA PENG
Biochemistry, Molecular Biology, Entomology & Plant Pathology

Early flowering and high seed setting are very important agricultural traits of crops. Proper flowering time, or heading date, enables plants to adapt to seasonal changes and make maximum use of the temperature and sunlight that are available under specific ecological conditions and lead to increase yearly crop production by allowing two or more crops per year. It also leads to conserved resources such as water, pesticides, fertilizer, and other crop inputs.

To that end, researchers have isolated a rice mutant with an early flowering and high seed setting phenotype. Molecular biologists are also now further characterizing the rice mutant to understand the underlying molecular mechanisms. The research is being undertaken with support from Mississippi Rice Promotion Board.

Molecular traits, also referred to as "markers," can facilitate the breeding process for commodities such as rice. Because crops usually have a long life cycle, molecular traits can help breeders select the candidate plants in the early stage of the life cycle. In addition, many traits display phenotype only under particular growth conditions. For example, we don't run into temperature stresses every year. The molecular traits can help molecular biologists and breeders select the stress related traits under the conditions without the stress.

Mississippi researchers have isolated the genomic DNA of the mutant to examine the mutation sites in the mutant genome. The rice mutant was isolated by screening a T-DNA insertion library, which is ordered from Japan.

Currently, those scientists involved in the research are searching for a natural mutation of the corresponding gene, and intend to introduce the mutated gene, via crossing, into rice cultivars currently grown by farmers. In addition, scientists involved in the laboratory studies will make RNAi constructs to modify the rice using the genetic engineering approach.

The mutant is early flowering and has an excellent seed setting rate. Preliminary results indicate the seed setting rate was good under both high and low temperature stresses, suggesting a general stress response of the mutant. Further experiments will be conducted to validate the results. Furthermore, getting this trait in adapted cultivars that have acceptable agronomic and grain quality traits will require much time and effort. However, the benefits of less water usage and heat tolerance will help southern USA rice production be more sustainable.

Mississippi Rice Promotion Board
c/o Tim Walker
P.O. Box 197
82 Stoneville Road
Stoneville, MS 38776

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