RICE2013

MISSISSIPPI MAFES AGRICULTURAL & FORESTRY EXPERIMENT STATION

Mississippi Rice Promotion Board

MISSISSIPPI STATE UNIVERSITY™
EXTENSION SERVICE

PROMOTION BOARD

The Mississippi Rice Promotion Board is a group of 12 individuals appointed by the Mississippi Governor's Office to oversee the expenditure of research and promotion funds generated by the state's rice farmers. Each year, research and extension scientists submit proposals to address key issues pertaining to rice production. The board strives to fund proposals that advance rice production in a holistic, programmatic manner, with a major emphasis on applied research.

This report highlights projects funded during the 2013–2014 funding cycle. We hope you find it enlightening and informative. Any time issues arise on your farm that you believe should be addressed, please speak with one of the board members or contact any of the scientists who contributed to this report.

We appreciate your support of the Mississippi Rice Check-Off Program and wish you much success in 2014.

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CONTENTS

2013 **OVERVIEW**

T. W. Walker

The USDA Farm Service Agency certified 122,641 planted acres of rice in the Delta counties of Mississippi. This amount represented a 3 percent decrease in acreage from 2012 and a 44 percent decrease from the 10-year average. It is the lowest acreage in Mississippi since 1977. The effects of lower yields and prices in 2010 and 2011, coupled with high soybean and corn prices, lingered to keep rice acreage low. Sixteen Delta counties planted rice in 2013. Bolivar County planted the most at approximately 34,000 acres. Tunica County planted approximately 25,000 acres. Rice producers planted 15 cultivars on this acreage. The most popular cultivar was CLXL745, which was planted to 19 percent of the acreage. Rex and CL152 were each planted to 15 percent of the acreage. Clearfield® acreage totaled 65 percent of the rice planted, with pure lines comprising 35 percent and hybrids 30 percent. Twenty-six percent of the acreage was planted to conventional pure lines, and the remaining 8 percent was planted to conventional hybrid. For the first year since 2001, Rex replaced Cocodrie as the most widely planted conventional pure line. In general, Rex performed well across the Delta.

Rice planting began as early as March 14; however, due to a relatively cool and wet spring, planting and stand establishment were slow. Specifically, about 13 percent of the acreage was planted by the end of April, compared with 95 percent planted by that time in 2012. Over the previous 5 years, an average of 64 percent of the crop was planted by late April. In 2013, planted acreage did not reach 95 percent until the end of May. Based on Stoneville weather records, temperatures from March to June averaged between 3 and 4 degrees cooler than the 84-year average. This deviation from the average caused the 2013 growing season to be ranked as one of the coolest on record. After a slow start, crop progress was slower compared with 2012 and the recent 5-year average.

The mild growing season positively impacted rice grain yield and quality. Mississippi farmers averaged 7,400 pounds per acre (164 bushels per acre), which set a new yield record for the state. The previous record of 7,350 pounds per acre (163 bushels per acre) was set in 2007. Producers across the state reported favorable yields. In general, late-planted rice in 2013 also performed better than normal. Excessive daytime and nighttime temperatures have been shown to decrease whole milled rice and increase grain opaqueness (chalk). The mild temperatures of 2013 produced good milling and improved the appearance of polished white rice. Finally, harvest weather was excellent until late September, allowing the crop to be gathered at a good pace. Though rains became more frequent in late September through October, lodging was minimal relative to recent years. This benefit partly resulted from the state's producers planting more stiff-strawed cultivars like Rex and CL152.

Palisade® Rates and Nitrogen Fertilization on 'CL151' Lodging

J. L. Corbin, T. W. Walker, P. W. Fitts, R. L. Atwill

The cultivar CL151 has become a popular variety for Southern rice production because of its high yield potential and red rice control. On average, 10 percent of the planted rice in Mississippi was planted in CL151 during 2012–2013. Expansion of CL151 has been tempered because of its propensity to lodge, which can decrease harvest efficiency, grain quality, and yield. We conducted a study to evaluate the effectiveness of Palisade® (trinexapac-ethyl), a plant growth regulator, in controlling the lodging problem for CL151.

This study was conducted in 2012 and 2013 on a Sharkey clay soil, a Dundee silt loam, and a Commerce silt loam. The experiment consisted of a combination of treatments: applications of Palisade® at rates of 0, 1.37, 2.75, or 5.5 ounces per acre; all nitrogen applied preflood or 75 percent applied preflood and 25 percent applied at panicle differentiation; and Palisade® applied at panicle differentiation or panicle differentiation plus 14 days. The study measured lodging (percent of the plot and severity), plant height, and grain yield.

For the Dundee silt loam in 2012, lodging rate was greatest when no Palisade® was applied. The rate of 1.37 ounces per acre reduced lodging to less than 2 percent. Likewise, lodging was much more severe without Palisade® than when the highest rate was applied. Plant height decreased as the rate of Palisade® was increased; it was reduced by 18 percent with the highest application rate. Plant heights were greatest when 100 percent of nitrogen was applied at preflood. Grain yield decreased from 12,165 pounds per acre with no Palisade® application to 9,588 pounds per acre when the highest rate was used.

In 2013 on the Sharkey clay soil, lodging was highest when no Palisade® was applied and nitrogen was applied at 100 percent preflood. Lodging was much more severe without Palisade® than when the highest rate was applied. On Sharkey clay and Commerce silt loam soil types, plant heights were greatest when no Palisade® was applied and shortest when the highest rate was applied at the panicle differentiation plus 14 days. Also, plant heights were greatest when nitrogen was applied preflood. On Commerce silt loam, grain yield was 11,334 pounds per acre without Palisade® and decreased to 10,543 pounds per acre when the highest rate was used. On the Sharkey clay soil, grain yield was 11,213 pounds per acre when nitrogen was applied preflood and decreased to 10,420 pounds per acre.

In summary, these data suggest that Palisade® is effective in reducing plant height, which in turn can reduce lodging incidence. However, it is also evident that higher rates of Palisade® can potentially have a negative impact on grain.

Rice Planting Date Effects on Yield and Grain Quality

T. W. Walker, R. L. Atwill, J. L. Corbin, P. W. Fitts, B. R. Golden

The impacts of planting date on rice grain yield are well established. However, changes in weather patterns, genetics, and cultural practices often impact the optimum dates for planting. Climatic conditions during flowering through grain maturation also impact yield and quality. Our study was conducted to evaluate the impacts of planting date on grain yield and quality factors, including whole milled rice and chalk content.

We conducted studies from 2007 to 2013 at the MSU Delta Research and Extension Center on Sharkey clay soil. Multiple pure line cultivars and F1 hybrids, largely selected based on grower popularity, were drill-seeded at five to seven planting dates starting as early as March 7 and as late as June 12. Planting dates were separated by an average 2 weeks each year. The area for each planting date was managed using pest control strategies similar to those recommended by the MSU Extension Service. Plots were fertilized with 150 pounds nitrogen per acre when rice reached the five- to six-leaf stage and within 2 days before permanent flood establishment. Plots were drained 10 to 14 days before harvest. We analyzed the data to determine the optimum period of planting and the rate of change when rice was planted after the optimum.

Results indicated that the optimum planting period for rice in Mississippi was from March 20 to April 23. After April 23, rice yields declined by 0.2 percent per day. During 2013, an interaction between planting date and cultivar was present for chalk. Chalk percentages for Bowman, Cheniere, CL152, Presidio, and Taggart were unaffected by planting date, and pooled over planting date, these five cultivars resulted in the lowest amount of chalk. XL753 averaged 10.4 percent chalk, but it was highly variable due to a drastic improvement when planted in June. Pooled over all cultivars, June-planted rice resulted in the least amount of chalk. Whole milled rice followed a similar trend. The June-planted rice pooled over cultivar produced the greatest whole milling percent. Pooled over planting date, Taggart and CLXL745 resulted in the lowest whole milled rice at 49 and 51 percent, respectively. However, both increased dramatically from early planting to the latest planting. On average, Cheniere and Mermentau were two of the highest milling cultivars, producing a 63 percent yield, but yield only increased by 6 percent when comparing the earliest planting date to the last planting date.

These data demonstrate the impacts of the interaction of cultivar and environment on yield and grain quality. Research like this can be implemented in breeding and agronomic research programs to develop cultivars that are more stable across a wider range of environments so that end users have a less variable product.

Validation of N-STaR in Mississippi

R. L. Atwill, T. W. Walker, J. L. Corbin, P. W. Fitts

Historically, rice cultivars were subjected to classical nitrogen rate studies on multiple soil types over multiple years to determine the "recommended" fertilizer rate. This approach was used because of the dynamic nature of nitrogen, especially in the dry-seeded, delayed-flood rice culture common to much of the South. The recent development of the Nitrogen Soil Test for Rice (N-STaR) has made it possible to predict nitrogen needs on a field-by-field basis for coarse- and fine-textured soils. Our study tested the model's effectiveness for Mississippi soils where rice is produced.

We conducted nitrogen rate response experiments in Mississippi in 2012 and 2013 on clay and silt loam soils. Nitrogen rates ranged from 0–210 pounds per acre on silt loam soils and 0–240 pounds per acre on clay soils. In addition, a strip trial was conducted on Sharkey clay soils with nitrogen rates ranging from 0–225 pounds per acre. Soil samples were collected in the spring of each year and analyzed by the University of Arkansas N-STaR soil test laboratory. The 95 percent and 100 percent relative grain yield N-STaR recommendations were compared to the nitrogen rate response data from these experiments. We analyzed the data to determine the nitrogen rate at which the maximum grain yield was achieved in the Mississippi study. This maximum grain yield was compared with yield potentials from the N-STaR recommendations.

In three of the four silt loam soil locations, the 95 percent relative grain yield N-STaR recommendation was higher compared with that of the classical approach. Grain yield increases at the same three locations were 4–5 percent. The N-STaR

recommendation for 100 percent relative grain yield on silt loam soils resulted in nitrogen rate reduction at all sites compared with the traditional approach. Three of the four sites showed no difference in grain yield compared with the classical approach. The fourth site resulted in an 8 percent yield loss when both the 95 percent and 100 percent relative grain yield N-STaR recommendations were used. For the clay soil sites, the N-STaR recommendations were consistently lower, averaging 71 pounds of nitrogen per acre less than the classical-based recommendation. Using the 95 and 100 percent relative grain yield N-STaR recommendations resulted in 10–12 percent grain yield losses compared with the classical approach.

These data suggest the N-STaR recommendations for Mississippi silt loam soils can potentially maintain grain yield and reduce nitrogen rates. However, for clay soils, the N-STaR system is insufficient at optimizing nitrogen recommendations for rice production. In Mississippi, research is needed to more closely correlate and calibrate the current N-STaR recommendation model.

Row-Crop Irrigation Science Extension and Research (RISER)

J. H. Massey, T. W. Walker

Mississippi State University has a new program to help Delta producers irrigate row crops more efficiently and economically by employing a multifaceted approach to water conservation—dubbed Row-Crop Irrigation Science and Extension Research (RISER). We are working with producers to help reduce irrigation water use while maintaining or improving crop yields and profitability.

The RISER approach is based on years of research. In 2004–2005, water use was measured at three Mississippi field sites and two Arkansas sites with an average plot size of about 40 acres. Usage was measured in side-by-side comparisons of continuous and intermittent flooding in straight-levee fields using multiple-inlet rice irrigation.

The 10-year average irrigation water use is 21 acre-inches per acre for Mississippi rice growers using multiple-inlet flood distribution with intermittent flood management with no or slight improvements in rough rice yields for 15 commercial rice varieties and hybrids. This value is on par with that of zero-grade rice systems and represents a savings of 10 acre-inches per acre relative to straight-levee fields using multiple-inlet irrigation alone. The approach saves more than 299,000 gallons of water and about $35 in fuel expenditures. Rice milling quality was unaffected by up to eight wetting and drying cycles.

We recommend using multiple-inlet rice irrigation to optimize flood distribution and ease management by eliminating the need to overfill upper paddies. Also recommended is the use of flow meters to measure irrigation inputs and to determine the numbers of gates needed for each paddy.

One depth gauge per paddy also aids in flood management. An irrigation rate of 24 acre-inches per acre is an achievable target for rice grown in clay soils. Growers should maintain freeboard in paddies to capture rainfall and reduce runoff. In this system, levee gates act as “emergency spills” during heavy rainfall. This strategy keeps water and chemicals from moving between paddies for improved agronomic benefit and efficiency.

We recommend trying intermittent flooding on smaller fields with low weed and disease pressures and well capacities of at least 16 gallons per minute per acre. The initial flood should be maintained for 10 days to stabilize nitrogen fertilizer, and then it can be allowed to naturally subside. A full flood should be maintained at full boot or R3 stage through first yellowing of rice hulls or R7 reproductive growth stages.

Intermittent Rice Flooding

J. H. Massey

Use of intermittent rice flooding is increasing in Asia, but its adoption in the U.S. is limited by a number of agronomic and scalability concerns. A study in producer-managed fields examined the compatibility of intermittent flooding with commercial rice production practices used in Mississippi.

When intermittent flooding was coupled with multiple-inlet irrigation, the quantities and qualities of rice yields were maintained, relative to continuously flooded controls, for five commercial rice varieties and one hybrid. Only one variety exhibited a decrease in total head rice when milled after being subjected to five or more wetting-drying cycles over 80-day flood periods. Water savings over the 3-year study averaged 32 percent above that of comparable systems not using intermittent flooding and were on par with the zero-grade system, which is traditionally the most efficient rice irrigation method used in Mississippi. The positive yield responses of CL162 to intermittent flooding and preflood urea-nitrogen rates, particularly the 0-nitrogen controls, support research showing that rice tolerates well, and may actually benefit from, properly timed wetting and drying periods.

Our results further suggest that when rice is grown on clay soils, 24 acre-inches per acre of applied irrigation is a realistic target under most production settings in Mississippi. Even partial adoption of intermittent flooding to improve rainfall capture could reduce demand for rice irrigation and help to alleviate overdraft of the Mississippi River Valley alluvial aquifer, a resource of national and international significance.

Screening Cultivars for High Temperature Tolerance

K. R. Reddy, T. W. Walker

Temperature is one of the key factors affecting life on Earth. Most plants have developed a variety of overlapping but distinct responses to elevated temperatures that minimize damage to physical structures and functions. However, each species functions under a narrow range known as “cardinal temperatures” — the minimum where the growth begins, optimum where growth is at its best, and maximum or ceiling temperature where growth stops completely. Cardinal temperatures vary depending on a variety of factors.

In the Midsouth, rice flowering coincides with high temperatures in each and every season. Each season, however, is unique in timing of rain, temperatures, radiation load, and other climatic events. When the uniqueness of the weather is combined with individuality of cultural practices, such as soils and variety characteristics, the rice production manager needs simple tools to help make cultivar selection decisions. High temperatures during panicle initiation and grain fill can substantially reduce grain yield and cause quality problems such as chalkiness. Scientists have hypothesized that rice cultivars vary in their response to high temperatures and that variability in grain production can be exploited to develop relative scores for the cultivars that grow in Mississippi and beyond. The first step is to screen large numbers of genotypes available on the market for grain fill and grain yield under high temperatures. The objective of our study was to characterize cultivar responses to high temperatures.

We conducted an experiment in the state-of-the-art sunlit plant growth chambers known as Soil-Plant-Atmosphere-Research (SPAR) units using 21 rice cultivars that are grown in the Mississippi Delta.

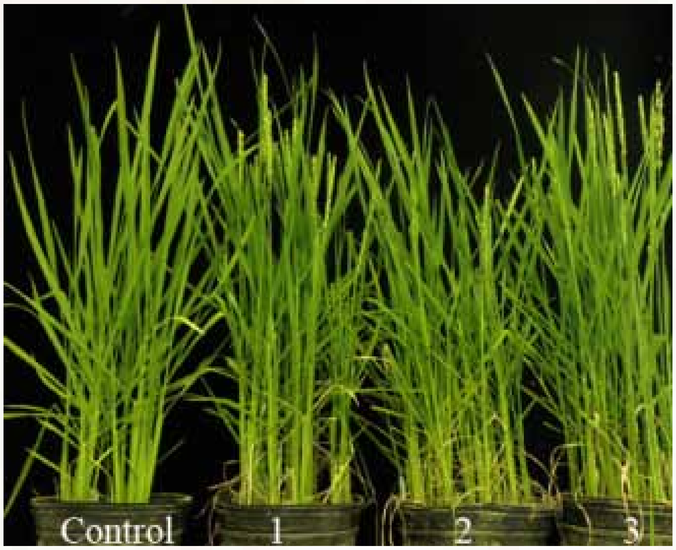
We grew the cultivars in pots under optimum water and nutrients and in an outdoor environment and then transferred them to SPAR chambers before panicle initiation. The study imposed three day/night temperature treatments until grain maturity: 82/68°F (optimum); 90/75°F (moderately high); and 97/82°F (high).

We found there are significant differences in total biomass, physiological parameters, grain-fill percentage, and filled grain weight and numbers among the cultivars in response to moderately high and high temperatures. CLXL 745 showed greater potential and relatively higher tolerance to heat compared with other cultivars, such as REX, which is moderately heat tolerant, and Bowman, which is heat sensitive. We plan to provide heat tolerance scores for each of the cultivars, which will be a valuable resource in developing heat-tolerant cultivars in the rice breeding programs. The relative scores, along with cultivar-specific yield potential in a given region, will be useful for rice producers to select cultivars for a niche environment and planting date.

Genes Regulating Flowering Time in Rice

Z. Peng

Regulating flowering time is an effective approach to avoid crop stresses, such as extreme heat and cold. The regulation of flowering time also may contribute to water conservation. Identifying the genes controlling the flowering traits is very critical for targeted improvement of rice cultivars. We have cloned a gene (called JHM) that controls flowering time in rice. Overexpression of the gene in rice leads to flowering 2 to 3 weeks ahead of control plants. Future research will further refine and verify these results.



'CLX4122' Reaches Final Stages of Testing

T. W. Walker

Rex, released by the Mississippi Rice Breeding Program in 2011, has performed exceptionally well in commercial production. Another promising line set to be released by the breeding program is CLX4122, a semidwarf line that offers resistance to the imidazolinone herbicides Newpath®, Clearpath®, and Beyond®. Additionally, it has the "Dixiebelle" cereal chemistry profile that includes an extra-high amylose content, which makes it suitable for parboil rice, as well as products for cultures that prefer a firmer cooking rice. The line has been evaluated in 35 yield trials covering every Southern rice-growing state, as well as multiple Mississippi sites, in each of the last 3 years.

CLX4122 has excellent yield potential similar to CL111 and CL151. Furthermore, it averages 38–40 inches tall. It is not as resilient to lodging as Rex but is an improvement compared to CL151. CLX4122 reaches 50 percent heading a few days later than CL151.

The U.S.A. Rice Federation Marketing and Competitiveness Task Force has recommended that breeders thoroughly test rice through participating mills in an attempt to address some of the quality concerns that have become apparent in the U.S. rice industry. With that in mind, approximately 3,000 panicles were selected, threshed, and planted in 4,000 10-foot rows in the Puerto Rico Winter Nursery in September 2013. With collaboration of the LSU Rice Breeding Program and Horizon Ag. LLC, CLX4122 was harvested on February 6, 2014, in Lajas, Puerto Rico. Much of the 4,000 pounds of seed harvested in Puerto Rico will be planted in Mississippi in the spring of 2014. The seed produced in 2014 will be used in final testing to validate its fit in the U.S. rice market, as well as to supply seed to be classified as foundation seed in the event final testing is satisfactory.

The Puerto Rico Nursery is extremely valuable for the Mississippi Rice Breeding Program. Also, collaboration between the rice breeding states of Arkansas, Louisiana, Mississippi, Missouri, and Texas is important to keep public institutions competitive with privately produced seed.

Rice Response to Simulated Herbicide Drift

J. A. Bond

Glyphosate-resistant weeds, primarily Palmer amaranth, are the principal weed control issues facing growers in Mississippi. Rice is not directly affected by glyphosate resistance, but it is impacted indirectly through off-target movement of herbicides applied to control resistant weeds in adjacent fields. Previous research has thoroughly evaluated the rice response to simulated drift of different herbicides, primarily glyphosate. As problems with glyphosate-resistant weeds intensify, growers are relying more on applications of paraquat plus residual herbicides to control Palmer amaranth emerged at planting. Injury symptoms from these applications are complex, and the residual herbicide is often difficult to identify from visual symptoms.

We initiated a study in 2013 at the MSU Delta Research and Extension Center to evaluate the effect of simulated herbicide drift on rice growth and yield. The study included simulated drift applications at rates that represented 3.2, 6.3, 12.5, and 25 percent of the use rates of Gramoxone SL, Reflex, and Metribuzin. We applied these treatments at two application timings, including an early-postemergence treatment to rice in the one-leaf stage and a late-postemergence treatment to rice in the four-leaf to one-tiller stage. Our study included a nontreated control for comparison. We visually estimated rice injury at 3–28 days after each application and determined rice yield, mature plant height, and days to 50 percent heading.

Gramoxone SL injured rice more following late-postemergence applications at 7, 14, 21, and 28 days after application, regardless of application rate. Heading was delayed 4–14 days after Gramoxone SL exposure, and delays were greater with late-postemergence applications at 6.3 and 12.5 percent of the use rate. Mature height was only affected when the two highest rates of Gramoxone SL were applied late postemergence. Rice yield was reduced more after late-postemergence applications of Gramoxone SL at the two highest rates.

The highest rice injury from Reflex was 8 percent, which was observed after application of 25 percent of the use rate at both timings. Reflex did not influence rice maturity. Rice yield was 94 percent of the nontreated control after Reflex was applied at 25 percent of the use rate, regardless of application timing. Rice yield was not impacted by other Reflex treatments.

The Metribuzin late-postemergence treatments generally injured rice more than the early-postemergence applications. However, at 14 days after application, rice injury was similar for the two highest rates at both application timings. Rice yield was 86 percent of the nontreated control after an application of Metribuzin at 25 percent of the use rate, regardless of application timing. Other Metribuzin treatments did not impact yield.

Rice recovered from early-season injury from simulated drift of Reflex and Metribuzin with no reductions in rice yield after 12.5 percent or less of the use rate at either timing. Rice growth, development, and yield were influenced more by simulated drift of Gramoxone SL applied late postemergence. Growers should be extremely cautious when making herbicide applications containing Gramoxone SL near rice fields, especially when applications coincide with the early-tillering stage of rice.

Rice Cultivar Tolerance to Sharpen

G. B. Montgomery, J. A. Bond

Sharpen is a PPOase-inhibiting herbicide that exhibits postemergence and residual activity. It is currently labeled for burndown in corn, cotton, soybean, and a variety of other crops. In 2011, Sharpen labeling was updated to include burndown in rice, but applications are restricted to 15 days before planting. Labeling may be updated to include in-season applications in the future.

We have evaluated Sharpen efficacy in rice at the MSU Delta Research and Extension Center since 2011. This work has demonstrated that postemergence applications of Sharpen control hemp sesbania and ivyleaf morningglory as well as Aim, which is another PPOase-inhibiting herbicide currently labeled for postemergence application to rice. Furthermore, Sharpen controlled Palmer amaranth better than Aim after early- and late-postemergence applications. To avoid early-season injury, crop oil concentrate should be used as the adjuvant system for Sharpen applications to rice.

Previous research with other herbicides indicated that rice cultivar and growth stage can impact rice tolerance to herbicide applications. Little is known about how rice cultivars respond to postemergence applications of Sharpen. A study at the Delta R&E Center in 2012 and 2013 evaluated rice cultivar tolerance to postemergence applications of Sharpen.

Cultivars evaluated included inbred long-grain cultivars Cheniere and CL151, inbred medium-grain cultivars Caffey and CL261, and the hybrid long-grain cultivar CLXL745. Herbicide treatments consisted of an untreated control, Sharpen at 2 ounces per acre, and Aim at 2 ounces per acre. Treatments were applied when rice reached the three- to four-leaf stage. Rice injury was visually estimated at 3–28 days after treatment. Normalized difference vegetative index was assessed approximately 4 weeks after flooding. Days to 50 percent heading were recorded as an indication of rice maturity. Rough rice yield and whole and total milled rice yield were determined at the end of the season.

We observed no differences in level of injury on individual cultivars treated with Sharpen or Aim. However, cultivars did respond differently. CLXL745 was injured more than CL151 or Cheniere. Rice injury was similar at 3 and 7 days after treatment, regardless of cultivar or herbicide treatment. Injury declined to 5 percent at 14 days after treatment, and by 28 days after treatment, injury was only 1 percent. In the five rice cultivars treated with Sharpen or Aim, we observed no differences in days to 50 percent heading, rice yield (rough, whole, and total milled rice), and normalized difference vegetative index.

Although we noted differences in level of injury among the cultivars evaluated, the injury following Sharpen was similar to that following Aim, which is currently labeled for in-season applications. We observed moderate injury after applications of Sharpen at two times the proposed label rate. Rice was able to recover from injury observed after herbicide application with no negative impact on maturity or rough, whole, and total milled rice yield. Results indicate that, even though rice injury occurs following application, Sharpen is safe for application to rice cultivars currently grown in the Southern rice belt.

Management of Rice Water Weevil with Endigo ZCX in Rice

J. Gore, W. Wood, C. Dobbins, D. R. Cook

The rice water weevil is the most important early-season insect pest of rice in Mississippi. Every acre of rice in Mississippi is infested annually with rice water weevil at some level. In most situations, those populations are high enough for economic losses to occur. As a result, insecticide seed treatments are recommended for rice water weevil control in Mississippi. However, not all rice planted in Mississippi has an insecticide seed treatment, and management options with foliar insecticides need to be evaluated.


University of Arkansas

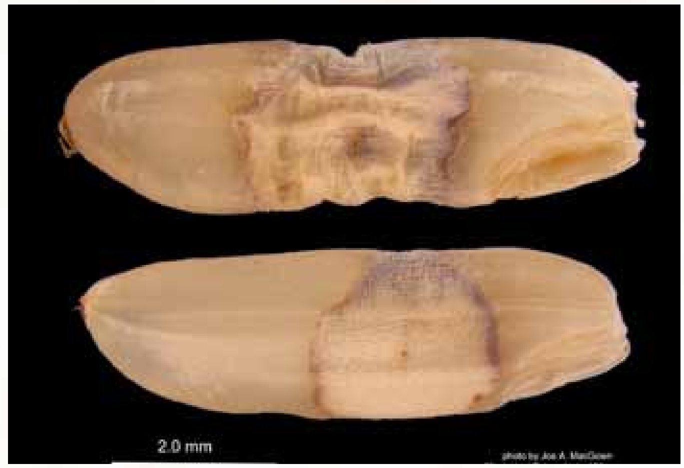
We conducted an experiment at the MSU Delta Research and Extension Center to compare the experimental insecticide Endigo ZCX to the commercial standard, Karate. Plots were sprayed with a hand boom calibrated to deliver 10 gallons per acre through 8002 flat fan nozzles. Treatments were sprayed at the time the permanent flood was established. Densities of rice water weevil larvae were determined by taking core samples from each plot 4 weeks after the permanent flood was established. Plots were harvested at the end of the season to determine final yields.

All of the insecticide treatments reduced rice water weevil densities below the untreated control. Both rates of Endigo ZCX provided better control than all other insecticide treatments. All of the insecticide treatments resulted in yields higher than the untreated control. We observed no differences in yield among insecticide treatments. Overall, rice water weevil densities were low in this trial, with an average of about 10 larvae per core in the untreated control. In situations where higher rice water weevil pressure occurs, differences among insecticide treatments would be more likely.

Endigo ZCX is a premix insecticide that includes a neonicotinoid and a pyrethroid as the active ingredients. It is currently labeled in multiple crops, but it does not have a federal registration in rice at this time. The label is expected in the near future, and this insecticide will be a valuable tool for managing rice water weevil in Mississippi.

Management of Rice Stink Bug with Various Insecticides

J. Gore, C. Dobbins, W. Wood, B. Olivi, D. R. Cook



The rice stink bug is the most important late-season insect pest of rice in Mississippi. It can cause significant yield losses and severe grain quality reduction if not properly managed. Rice stink bugs feed by piercing individual rice kernels with their needle-like mouthparts and injecting digestive enzymes into the kernel. This type of feeding can cause kernel abortion (blank kernels), reduced grain weight, and kernel discoloration often termed “pecky” rice. The pest is controlled almost exclusively with foliar-applied insecticides during the grain development stages in rice.

We conducted multiple experiments at the MSU Delta Research and Extension Center to evaluate rice stink bug management in rice. All treatments were sprayed with a hand boom calibrated to deliver 10 gallons per acre through 8002 flat fan nozzles. Plots were sampled at various times after each application with a sweep net. A sample consisted of 10 consecutive sweeps that covered the entire length of the 15-foot plot. After each sample of 10 sweeps, we determined and recorded the total number of rice stink bug adults and nymphs.

In general, the pyrethroids provided acceptable control of rice stink bug in all trials. Similarly, the organophosphate malathion provided acceptable control of rice stink bug. We also tested new and experimental insecticides over the last 2 years. Tenchu is a new insecticide in the neonicotinoid class. It provided control of rice stink bug similar to that observed with the pyrethroids. Endigo ZCX is an insecticide labeled in multiple crops, but not in rice at this time. It is a premix insecticide that includes both a pyrethroid and a neonicotinoid. It is expected to be registered in the future. In our trials, Endigo provided good initial knockdown control of rice stink bug. This insecticide appeared to provide better residual control of rice stink bug than the other insecticides evaluated.

Although it is not yet registered in rice, Endigo will likely be an important component of rice stink bug management in Mississippi, especially in years when rice stink bug pressure is high. Based on the trials we conducted, all of the currently labeled insecticides should provide good control of rice stink bug in Mississippi.

Thresholds for Rice Stink Bug in Mississippi Rice

J. Gore, G. Awuni, D. R. Cook

Based on results from cage experiments conducted over the last 4 years, the MSU Extension Service has changed its recommended treatment threshold for rice stink bugs. The previous threshold called for treatment when there was an average of 5 rice stink bugs per 10 sweeps during the first 2 weeks of heading and the average increased to 10 rice stink bugs per 10 sweeps after 2 weeks. However, our results suggest that significant yield losses and injury can still occur after the 2-week time period.

Multiple factors can impact the development time of rice grains within an individual panicle and across multiple panicles within a field. Adverse environmental conditions may delay development. Additionally, in hybrid rice where seeding rates are very low, individual plants produce more tillers than an inbred variety. As a result, the panicles on each tiller within a particular plant will flower and develop at different rates. Either of these factors can result in an unacceptable number of rice grains being susceptible to rice stink bug injury beyond the first 2 weeks of heading. As a result, thresholds should be based on grain development stages rather than time.

To address this, the 2014 Insect Control Guide for Agronomic Crops recommends treating when there is an average of 5 stink bugs per 10 sweeps from panicle emergence through soft dough and an average of 10 stink bugs per 10 sweeps after soft dough. Based on a more complete analysis of the data, the future thresholds will likely be lowered to less than 5 and 10 rice stink bugs at those stages. Significant yield losses and grain injury were observed at the current threshold level of 5 stink bugs per 10 sweeps through the soft dough stage. In response to this finding, the threshold will be lowered to 2–3 rice stink bugs per 10 sweeps from panicle emergence through soft dough and 5–6 stink bugs per 10 sweeps after soft dough. This change is not reflected in the 2014 Insect Control Guide because the data had not been fully analyzed when the guide went to press. All of the changes to the rice stink bug threshold will be included in the next edition of the Insect Control Guide.

Foliar Sprays to Supplement Seed Treatments in Hybrid Rice

J. Gore, D. R. Cook, C. Dobbins, W. Wood, B. Olivi

Scientists have found that seed treatments in rice provide significant benefits. However, the seed treatments do not provide 100 percent control of rice water weevil. Because control is not absolute, a foliar insecticide application may be necessary to maximize control in some situations.

We conducted an experiment at the MSU Delta Research and Extension Center to determine the impact of foliar insecticide sprays on hybrid rice treated with a seed treatment against rice water weevil. Plots were planted on May 15, 2013. The treatments at the time of planting included hybrid rice treated with CruiserMaxx Rice and an untreated control. A total of 16 plots were planted for each seed treatment.

At the time of the permanent flood, eight plots of each treatment were sprayed with Karate Z. This step gave us four total treatments: CruiserMaxx rice sprayed with Karate Z; CruiserMaxx rice not sprayed; rice without seed treatment sprayed with Karate Z; and rice without seed treatment or foliar insecticide. Four weeks after the flood was established, core samples were taken to determine the number of rice water weevil larvae in each plot. Plots were harvested at the end of the season.

Overall, rice water weevil densities were low in this trial. Rice water weevil densities were lower in the sprayed CruiserMaxx plots compared with all other treatments. This finding suggests that rice treated with CruiserMaxx may need to be sprayed with a pyrethroid in some situations. Yields in the trial averaged 264.8 bushels for sprayed CruiserMaxx compared with 255.1 bushels for unsprayed

CruiserMaxx rice. Sprayed untreated rice averaged 241.2 bushels, while unsprayed and untreated rice averaged 239.2 bushels.

Based on these data, unsprayed CruiserMaxx rice yielded more than sprayed untreated rice, suggesting that CruiserMaxx rice is a valuable component of rice water weevil management in hybrid rice. However, control is not absolute, and foliar sprays may provide additional benefits for rice water weevil control and yield in hybrid rice treated with CruiserMaxx. Therefore, rice treated with a seed treatment should be scouted on a regular basis. If evidence of adult feeding on rice leaves is observed, a foliar insecticide application may be needed to minimize injury and maximize yields.

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