HERBICIDE DRIFT

A Concern in the Past and in the Future

In 2014, I had fewer calls about herbicide drift than I have had in previous years. However, the drift complaints I investigated this year were more severe than in the past. I believe the number of drift complaints has dropped because of the educational efforts of the LSU AgCenter and the Louisiana Department of Agriculture and Forestry. For the past several years, I have discussed herbicide drift at winter meetings and field days, and I believe the overall effort by all of the folks with a stake in pesticide application has helped reduce herbicide drift.

Even though the complaints are down, herbicide drift is still a major issue. In many cases it is difficult to recognize drift when a comparison crop, or a non-impacted field, is not nearby. This became evident when observing Dr. Steve Linscombe's off-station variety trials. In each of his trials, both Clearfield and traditional rice lines are planted side by side, and this allows us to have a check if a drift event of Newpath or Beyond occurs over the test location. Also, the trials are treated with uniform applications of conventional herbicides without the use of Newpath or Beyond. I had the opportunity to view a couple of these off-station locations, and if the Clearfield lines were not present, it would have been difficult to see any drift symptoms on the non-Clearfield lines. In each case it was quite evident, even to the untrained eye, there was an issue with Newpath or Beyond drift. Unfortunately, we may not be able to gauge the amount of drift just based on complaints.

I do believe applicators are more conscientious than before; however, I still think there is too much herbicide being applied in stable atmospheres, often referred to as an inversion. Most applicators are trying to avoid windy conditions, but herbicide drift is more widespread under inversion conditions versus windy conditions. Drift from wind-blown herbicides may be more severe, but it is generally more confined and moves shorter distances. A majority of the complaints I look at are due to inversion conditions present at the time of application. In my opinion, during the summer months in Louisiana, an inversion is present in the early morning hours at least 90 percent of the time. In the summer months, I hate to see applications being made prior to 7:30 a.m. or 8 a.m. and after 4 p.m., especially when there is a low level fog. It is always best to wait for a gentle breeze of 2 to 5 miles per hour. This slight wind will generally blow in more than one direction and aid in the dilution of the herbicide mixture in the environment, thus reducing off-site movement.

As many of you are aware, there are new herbicide-resistant crops under development, including soybean and cotton resistant to 2,4-D or dicamba. I think the ability to develop a plant like cotton to be resistant to 2,4-D is worthy of a Nobel Prize. Those involved with rice production understand the potential for 2,4-D drift to non-target crops and plants. It is my understanding that crops resistant to 2,4-D and dicamba will also be resistant to glyphosate, better known as Roundup. I do not think the drift of 2,4-D or dicamba to rice is going to be an issue; however, I think it will be rare that these herbicides will be applied without Roundup as a mixture herbicide. Rice can handle the 2,4-D and dicamba, but the Roundup is a different story. If drift of one of these combinations occurs over a rice field, it may be easier to track due to the activity dicamba and 2,4-D have on broadleaf plants. Restrictions will be in place that will limit the application of 2,4-D and dicamba by ground application only. Initially, aerial application will be prohibited. This should help reduce off-site movement of the herbicides, but not eliminate it.

The development of 2,4-D began with the discovery of plant growth hormones in the 1920s. In the late 1930s and early 1940s, researchers in Great Britain and the United States were working with growth regulators similar to 2,4-D. By 1941, the synthesis of 2,4-D had been reported. The herbicide was originally evaluated for use during World War II, but the war ended before 2,4-D could be used in the active theater. In 1945, researchers around the United States began to evaluate the product for weed control in crops. At the same time 2,4-D became commercially available to producers.

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Special points of interest:

- **USA Rice Outlook Conference**
  December 7-9, 2014
  Little Rock , Arkansas
- **Rice Research Station Field Day**
  Wednesday, July 1, 2015
  Crowley, LA

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HERBICIDE DRIFT Cont.

Almost immediately, 2,4-D was observed to move off-site to non-target plants in the form of drift. Soon it was determined that the reason for the drift was the volatility of the ester formulations that made up most of the available commercial formulations. Research continued to evaluate other formulations, and the acid and amine formulations were found to be up to 90 percent less volatile than the ester formulations. Researchers and extension personnel soon identified management practices for application of 2,4-D and helped implement restrictions that could be used to help reduce or prevent drift. Just because a formulation is considered non-volatile does not mean the herbicide will not drift. Both 2,4-D and dicamba are considered plant growth regulators, and they mimic the activity of plant hormones. This means they are extremely active at extremely low rates. I have seen data that suggest 2,4-D at rates of 0.000001 lb ai/A or 0.0000032 oz/A can cause symptoms on susceptible crops like cotton. Simply put, "it doesn't take much."

I think all applicators should be aware of the need to thoroughly clean spray rigs that have been used to apply 2,4-D or dicamba before spraying a crop that is not resistant to either herbicide. The effort needed to clean the spray rig will take significant time, and just running a little clean water through the system will not be adequate. Crops resistant to 2,4-D or dicamba are not cross-resistant to the other technology. In other words, dicamba-resistant soybean is not resistant to 2,4-D and vice versa. Those who plan to apply these herbicides must be aware of restrictions on applications, i.e. application volume, pressure, nozzle selection, weather restrictions, etc.

Drift issues with 2,4-D have been a problem since the 1940s. In 2007, the state of Arkansas further restricted the application of 2,4-D in certain parts of the state. The new restrictions occurred after approximately 200,000 to 250,000 acres of cotton were injured by drift in 2006. The numbers of complaints have dropped significantly since the new regulations were enacted. Other states, including Louisiana, have also implemented further restrictions for 2,4-D use.

With the development of cotton and soybean resistant to 2,4-D and dicamba, there will be an effort to roll back some of these restrictions. Researchers, extension agents and specialists, applicators, consultants and producers should all work together before restrictions are relaxed. History tells us that anytime restrictions are relaxed, drift complaints increase.

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Pest of the Quarter - Borers

Stem borers – insects that create holes in rice stems, enter the stems through the holes and feed internally within the stems – are found in all important rice-producing regions of the world, and stem borers as a group probably cause more yield losses on a global scale than any other type of insect pest. It is the larval stages (caterpillars) of these insects that feed internally and cause losses; the adults of most of the important stem-boring species are moths that do not feed on rice plants. In Louisiana, three stem-boring species are important: the sugarcane borer, the rice stalk borer and the Mexican rice borer. Of these three species in Louisiana, the sugarcane borer is the most widespread and is historically the most important species. Infestations of this insect have been known to cause losses as high as 70 to 95 percent on some farms in some years in central Louisiana. The Mexican rice borer is an invasive stem-boring species that has become established in Louisiana within the past several years. The rice stalk borer has long been noted as a sporadic pest of rice in Louisiana. In 2014, infestations of stem borers were low throughout Louisiana, but the few stem borers found in rice plots at the Rice Research Station were rice stalk borers. These three species of borers are similar in appearance, but larvae and adults can be distinguished using pictures found on the "rice scout" mobile app or webpage (ricescout.lsuagcenter.com).

The life histories of these various stem borers are similar. Egg masses are laid by female moths on rice leaves, usually in clusters of 2-100 eggs with individual eggs overlapping. Young larvae feed on leaf blades or in between the leaf sheath and the stem, leaving characteristic yellowish-orange feeding lesions. Later, larvae bore into stems, where they pass through four or five additional larval stages and a pupal stage in four to five weeks. Feeding injures the vascular tissues of rice plants and can sever the growing portion of the plant from the base of the plant. When feeding occurs during the vegetative stage of rice plant development, the tiller in which the larva is present often dies and fails to produce a panicle (deadheart). When feeding occurs after panicle initiation, injury results in drying of the panicle. Affected panicles may not emerge or, if they do, do not produce grains, remain straight and appear whitish (whitehead). However, feeding inside the stem does not always produce visible symptoms. All three species pass through multiple generations in a year and generally spend winters as large larvae within rice stubble or non-crop hosts. There are subtle differences in the biology of the three Louisiana species; for example, the Mexican rice borer prefers older, senesced leaves for egg-laying, while the sugarcane borer prefers younger leaves for egg-laying.

For unknown reasons, stem borers are more damaging pests in Texas than in Louisiana. In a recent four-year study conducted in rice plots in Texas, a mixture of sugarcane borer and Mexican rice borer reduced rice yields an average of almost 15 percent in untreated plots. Yield losses from borers are rarely this high in Louisiana, but there is concern that borers could become more damaging in Louisiana as populations of the Mexican rice borer increase. Stem borers are difficult to control with conventional foliar insecticides because their internal feeding habit shields them from contact with insecticide residues. Planting rice seeds treated with Dermacor X-100 can reduce stem borer infestations by as much as 80 percent. Cultural practices, such as early planting and destruction of stubble after harvest, can reduce problems with stem borers. Research on other tactics for managing stem borers, such as varietal resistance and amendment of soils with silicon, are currently being investigated.

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Rice Fungicide Activity

Rice fungicide applications are getting more complicated each year with the addition of new fungicides. This year we saw three new fungicides labeled Sercadis, Convoy and Equation. Next year I anticipate several additional fungicides will be available. It is important to understand the characteristics of these fungicides to know which to use on a specific disease. The three traits you need to know are: the active ingredient, the FRAC group it's in and its effectiveness on a specific disease.

Fungicide label showing active ingredient and FRAC group.

The patent on azoxystrobin (Quadris) expired this year. As when the propiconazole (Tilt) patent expired, generic or new fungicides (PropiMax and Bumper) became available. Equation was the first generic azoxystrobin fungicide available this year, and more are expected. The formulations should be the same, and the activity will be similar if not identical. The important fact to remember is that there may be a new fungicide available, but it does the same thing as the original. If you have strobilurin-resistant *Rhizoctonia solani*, they will be resistant to these new strobilurin fungicides.

The Fungicide Resistance Action Committee (FRAC), which consists of representatives from universities, agricultural chemical companies, producers and other interested people, was established to develop protocols to prevent or delay resistance in fungal populations to fungicides. One of their accomplishments is characterizing all fungicides by mode of action and assigning a FRAC number to that mode of action. All of the strobilurins (Quadris, Equation and Gem) have the same mode of action and are in FRAC Group 11. Propiconazole fungicides are in the Group 3 mode of action. The tank mixes, such as Quilt and Quilt Xcel (azoxystrobin + propiconazole) and Stratego (trifloxystrobin + propiconazole), will be designated as Group 3, 11 because they have both active ingredients. Sercadis (Xemium) and Convoy (flutolanil) have different active ingredients but are in FRAC Group 7. You need to know what type of activity each fungicide has to allow you to rotate mode of action to prevent or at least delay fungicide resistance development. Also, if you already have the strobilurin (Group 11) -resistant sheath blight fungus, you will know which fungicide will have activity and which will not. Check the label for the mode of action by finding the FRAC number.

The final trait you need to know is how effective each fungicide is against each disease. All of the fungicides labeled for rice have activity against sheath blight. However, there is a big difference in how effective each is. Propiconazole is fairly weak against sheath blight while azoxystrobin has excellent activity. Only the strobilurins have blast activity with trifloxystrobin being slightly more active than azoxystrobin. Propiconazole has the best kernel smut, false smut and Cercospora activity.

Knowing a fungicide's active ingredient, mode of action and effectiveness against each disease will help you select the best treatment for your rice diseases. However, you will still need to pay attention to the fungicide rate and timing to maximize disease control. In general, cutting rates should be avoided except under very light disease pressure (late disease, less susceptible varieties, or unfavorable environmental conditions). Timing a fungicide too early or late can make or break a fungicide application. Contact your local LSU AgCenter extension agent for the latest information on rice fungicides.

Table 1. Currently labeled rice fungicides

Fungicide	Active Ingredient	FRAC Group
Quadris	Azoxystrobin	11
Equation	Azoxystrobin	11
Gem	Trifloxystrobin	11
Tilt	Propiconazole	3
Bumper	Propiconazole	3
PropiMax	Propiconazole	3
Sercadis	Xemium	7
Convoy	Flutolanil	7
Quilt Xcel	Azoxystrobin + Propiconazole	3,11
Quilt	Azoxystrobin + Propiconazole	3,11
Stratego	Trifloxystrobin + Propiconazole	3,11

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Rice Inbred Varieties for Louisiana for 2015

Rice variety selection is one of the first and most important decisions made by a rice producer prior to planting the crop. Each year LSU AgCenter rice scientists meet to review the previous year's research and make decisions on information to provide to Louisiana rice producers to assist them in deciding which varieties to use. This information is compiled each year into the LSU AgCenter publication (#2270) "Rice Varieties and Management Tips." The 2015 publication will soon be available at parish extension offices in rice-producing parishes, as well as at the Rice webpage at www.lsuagcenter.com.

In 2015, there will be five conventional long grains recommended for statewide production – Catahoula, Cheniere, Cocodrie, Mermentau and Roy J. The first four all have semidwarf plant types and are fairly similar in maturity. These four varieties typically will average between 35-38 inches in height at maturity and will range from 120-125 days from emergence to harvest maturity with a March to mid-April planting date. Roy J is a conventional-height variety released from Arkansas. It averages about 4-5 inches taller than the semidwarfs and is 4 to 5days later in maturity. All of these varieties have good yield potential and milling quality. In addition, they all have shown good potential to produce a ratoon (second) crop. Catahoula, Cocodrie, Cheniere and Mermentau are rated as susceptible to sheath blight. Cheniere and Cocodrie are rated moderately susceptible to blast disease, while Mermentau is rated susceptible and Catahoula is rated resistant. Roy J is rated susceptible to blast and straighthead and moderately resistant to sheath blight. Of the group, Cheniere displays the most resistance to straighthead disorder.

Two conventional medium-grain varieties are recommended this year. Caffey and Jupiter are both short-stature lines averaging 34-38 inches in height at maturity. Both varieties have excellent yield potential and good milling quality. Ratoon crop production is possible with these varieties but typically is not as consistent as observed with most long grains. Caffey is rated moderately resistant to blast, while Jupiter is rated moderately susceptible. Both are rated moderately susceptible to sheath blight. Jupiter is the most resistant to straighthead.

There are three Clearfield long grains recommended for production this year (CL111, CL151 and CL152). CL111 was the most widely grown rice variety in Louisiana in 2014. Of the three varieties, CL151 has historically shown the highest yield potential followed by CL111 then CL152. However, the excessive blast disease pressure observed in the 2012 rice crop in Louisiana showed that CL151 was the most susceptible of this group to this disease. CL111 proved to be the most resistant, and CL152 was rated between these two lines for this disease. CL151 and CL152 are rated susceptible to sheath blight, while CL111 is rated very susceptible. CL111 and CL152 consistently have shown superior grain quality when compared with CL151. CL152 has the best resistance to lodging among these three varieties, while CL111 is the earliest maturing, averaging 3 to 4 days earlier. All three lines have very good ratoon crop potential.

CL261 and CL271 are the Clearfield medium grains currently available. These varieties have very good first and ratoon crop yield potential and excellent grain quality. CL261 is very susceptible to blast disease and susceptible to sheath blight. CL271 is moderately resistant to blast and susceptible to sheath blight. CL261 is moderately resistant to lodging, while CL271 is moderately susceptible. Both varieties are similar to the conventional medium grains in plant height and maturity.

In recent years, the Rice Research Station has released two varieties with cooking, aroma and grain quality characteristics similar to imported Thai jasmine – Jazzman (2009) and Jazzman-2 (2011). Jazzman is 3 to 5 days later in maturity and 4-6 inches taller at maturity than Jazzman 2. Jazzman also has somewhat higher yield potential, but Jazzman-2 displays better grain quality, aroma and lodging resistance. Both of these varieties will normally show acceptable milling quality numbers. Both are rated moderately resistant to blast disease. Jazzman is rated moderately susceptible to sheath blight, while Jazzman 2 is rated susceptible. Jazzman has shown more resistance to straighthead disorder. While both varieties can produce an acceptable ratoon crop, neither is typically as consistent as the conventional and Clearfield long grains currently grown in the region.

Most rice producers will grow several different varieties each year. This is highly recommended to avoid having the entire crop in one or two varieties that might prove to be more susceptible to a disease than previously thought. Planting varieties of different maturity groups also helps to spread out the harvest season somewhat, and including different grain types as well as some acreage of a Jazzman type will facilitate marketing options.

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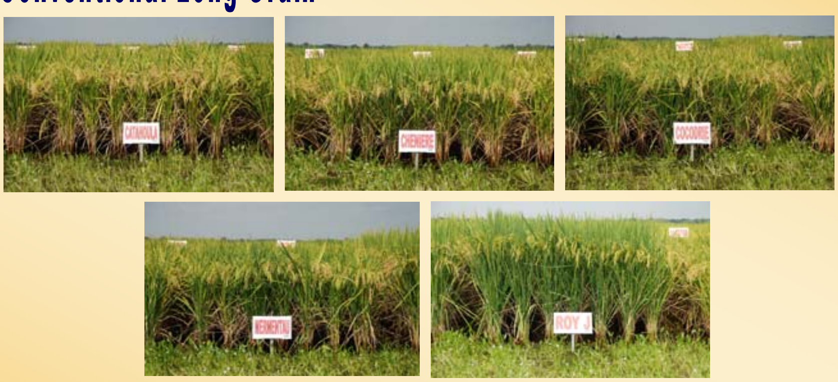
Conventional Long Grain



Conventional Medium Grain

Clearfield Long Grain

Clearfield Medium Grain

Identifying and Managing Zinc in Rice

Zinc (Zn) is an important and essential nutrient in rice. Zinc is considered a micronutrient in rice because it is only needed in a very low amount, typically less than a pound per acre. Deficiencies in Zn can cause significant stand and yield losses. In some cases, losses in excess of 60% have been reported. When rice is deficient in Zn, the resulting nutrient imbalance causes the plant to uncharacteristically take up other soluble metals, such as iron and aluminum, at excessive and sometimes toxic levels. It is believed that iron and/or aluminum toxicity is what ultimately causes the stand decline and the characteristic "bronzing" discolorations associated with Zn deficiency in rice.

Zinc deficiency generally occurs between the 2-leaf and mid-tillering stages in rice. One of the first visual Zn deficiency symptoms in seedling rice is the yellowing of older leaves (chlorosis) from the base of the leaf to the leaf tip. This symptom is similar to nitrogen deficiency and is, consequently, the hardest symptom to positively identify. This Zn deficiency symptom can often be seen in very young rice seedlings in response to cold temperatures. As Zn deficiency advances, easily identifiable reddish-brown irregular blotches on the leaf blades begin to occur (Picture 1). This often is referred to as "bronzing." Eventually, the entire leaf may turn this color. The rice plant will begin to die, beginning with the oldest leaves and working its way inward on the plant. Establishment of the flood aggravates Zn deficiency and speeds the onset of symptoms.

Picture 1. Characteristic "bronzing" symptom in rice.

A soil test and soil pH can be used to determine the potential need for Zn fertilization. Generally, a soil test value less than 1 ppm (Mehlich III) is considered to be deficient in Zn. However, we must also be on the lookout for high soil pH (≥7) and alkaline irrigation water, which can also complicate Zn availability. This is because the solubility, and thus plant availability, is decreased 100 times for each pH unit above 6. Therefore, it is possible to have a soil that tests medium to high in soil test extractable Zn and still have rice susceptible to Zn deficiency. Current Zn fertilizer recommendations for rice can be seen in Table 1. The recommendations were calibrated using granular zinc sulfate as the Zn source; however, other Zn sources can be used in rice. It is important, however, that only sources which are 50% or more water soluble be used. It is also important to avoid zinc oxide-based fertilizer sources because this form of Zn will not be immediately available for plant uptake after application.

Foliar Zn applications can also be used. Foliar-applied Zn products are often recommended at rates of 1-2 pounds of Zn per acre. Unfortunately, low-rate foliar applications like this only treat the current crop and do not have the benefit of building up soil Zn levels and potentially eliminating the Zn deficiency problem for future crops. Many liquid Zn products can be safely tank mixed with herbicides, eliminating additional application costs. However, you must be sure to carefully read all labels and conduct a jar test for compatibility before attempting this application method. Liquid Zn fertilizers can also be used at higher rates when soil applied prior to rice emergence.

I personally believe in an active and aggressive approach to addressing Zn fertility in rice and eliminating potential yield losses. This approach utilizes interpretation of soil test results prior to planting and, if needed, fertilization with Zn prior to the onset of deficiency symptoms. Unfortunately, a reactive approach to Zn deficiency is generally the approach taken by many rice producers. This is where Zn fertilization is only used after Zn deficiency symptoms have occurred. The only problem with this approach is that once a deficiency symptom has occurred, some of the yield potential has already been lost and cannot be recovered!

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

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

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

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Focus

Glenn Schexnayder

Glenn Schexnayder's job as maintenance manager at the Rice Research Station is to make sure everything runs well.

"If I can't fix it, I address it and get it fixed," he said.

Glenn Schexnayder with a device he built to fill super bags with seed.

Schexnayder grew up surrounded by agriculture. His father managed a sugarcane plantation near Donaldsonville.

After graduating from high school in 1967, Schexnayder attended Nicholls State University, majoring in agriculture, then switched to LSU in industrial technology. During his senior year, he left college to help his father and uncle raise sugarcane after they both suffered heart attacks.

Schexnayder later farmed with his brother, growing cane, wheat, grain sorghum and soybeans.

After selling the farm, he started work for the LSU AgCenter as a research associate in 2004 for wheat breeder Steve Harrison at the Central Research Station south of Baton Rouge. Schexnayder said his job involved seed processing, equipment maintenance and harvesting seed crops at other research stations.

In 2010, Schexnayder started his current job at the Rice Research Station to replace Mike Dronet, who retired.

He said in his current job, he uses his skills he learned from a lifetime of fixing and making things, including learning blacksmithing as a boy on a sugarcane plantation.

Sometimes he has to make special tools to maintain equipment or modify parts to adapt equipment to the station's needs. For example, he said, he converted an old planter into a fertilizer applicator for research plots used for Dr. Dustin Harrell's agronomy research.

Dr. Steve Linscombe, director of the Rice Research Station, said Schexnayder is a valuable asset to the station. "He will not rest until a project is completed. He understands the importance of getting equipment repaired as quickly as possible, which is often critical in a research setting."

In Schexnayder's care are 32 vehicles, 54 buildings, two dozen tractors, six combines and supporting field equipment.

"I enjoy what I'm doing," Schexnayder said. "I want to make sure the researchers here at the station are able to complete their projects without a mechanical interruption. That's my goal."

He has three children – two daughters in Baton Rouge and a son, Glenn Schexnayder Jr. of Covington, who is an engineer for Boh Brothers.

In his spare time, Schexnayder reads, hunts and enjoys cooking.

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