University *of* California
Agriculture and Natural Resource

Rice Disease Update

Luis Espino, UCCE Farm Advisor

Last year I got several calls and reports about rice diseases. I saw one field affected with leaf blast in Colusa County early in the season, but it did not result in neck blast later. One field in Glenn County had quite a bit of kernel smut, significantly more than what I'm used to seeing. The grower in this field suspected a 10% yield reduction and a reduction in head rice yield. But the most calls and reports I got were of stem rot. In many cases, the field seemed to be fairly clean all the way to heading, and then stem rot severity increased rapidly during grain maturation and was very noticeable before harvest. One stem rot affected field I scouted had an approximate 25% yield loss.

Stem rot and aggregate sheath spot are common in most rice fields. In a disease survey I conducted in 2014, I found both diseases in all 54 fields inspected. Fields with excess N, that have had straw incorporated for several years, and with high plant densities are at risk of more severe infections.

All California public medium grain varieties are more or less equally susceptible to stem rot and aggregate sheath spot. Fungicides for disease management started being used in the late 1990s, and research has shown that applications made during early heading are effective at reducing aggregate sheath spot and blast severity (the intensity of the disease). Results on stem rot had been marginal. However, in 2013, fungicide trials showed that stem rot incidence (how many tillers show lesions) could be reduced by 35% using currently registered fungicides (see table below). Severity was not very high in these trials; it is not clear what the response to the fungicides would be under high severity conditions. In the same trials, aggregate sheath spot incidence was reduced by 65%.

Summary of fungicide trials conducted in 2013 (taken from the California Rice Research Board "Rice Disease Research and Management" project by Chris Greer).

Treatment	Aggregate sheath spot		Stem rot	
	Incidence (%)	Severity (0-4)	Incidence (%)	Severity (0-4)
Control	63.3	1.3	64.3	1.6
Quadris (12.5 fl oz/a), 5% heading	14.7	0.3	39.0	0.8
Quilt Xcel (21 fl oz/a), 5% heading	15.3	0.3	38.7	0.9
Quadris (12.5 fl oz/a), 70% heading	19.7	0.4	42.7	0.9
Quilt Xcel (21 fl oz/a), 70% heading	17.3	0.3	44.3	1.0

It is too early to tell what kind of disease year we will have. I have not seen leaf blast yet, which is a good sign. I am conducting fungicide trials in several locations and I am including an early fungicide timing (around 45 days after seeding) to see if better control of stem rot can be achieved. In September, I will also do a field survey of kernel smut to determine if this disease is becoming more prevalent in the rice production area. If you see kernel smut in your field, give me a call!

Time for Weedy Rice Scouting!

Whitney Brim‐DeForest, UCCE Rice Advisor

Now is the time of the season to be scouting for weedy rice (aka "red rice")! All herbicide applications should be made by mid-July, so if you notice watergrass-like plants in the field, please go check them. In order to check the plants, you will need to go out into the field, and take a look.
Key characteristics indicating that the suspected plants may be weedy rice:

1) Presence of a ligule and auricle on the leaf where it meets the stem
2) Rough leaves (pubescence)—if you run your fingers down the leaves, they will feel "sticky"
3) Leaves that stick up above the rice canopy
4) Leaves that are paler in color in comparison to your rice variety
5) If the plants have headed, any panicle that is NOT the variety you planted should be checked

If you think that you have suspicious plants, give your local UCCE Rice Advisor a call. We will go to your field to inspect, and if we think it may be weedy rice, we will take a sample. You will get your results back within 1-2 weeks.

Remember to also look at our new website, caweedyrice.com, where there are videos and photos that can help in identification.

Herbicide Resistance in Rice

Kassim Al‐Khatib, University of California, Davis

Herbicide resistance is due in large part to selection with repeated use of the same herbicide or products with the same mode of action. Herbicides do not "cause" resistance; instead, they select for naturally occurring resistance traits. On a population level, organisms occasionally have slight natural mutations in their genetics. Occasionally, one of these mutations affects the target site of an herbicide such that the herbicide does not affect the new biotype. Similarly, mutations can affect other plant processes in a way that reduces the plant's exposure to the herbicide due to reduced uptake or translocation or by more rapid detoxification. Whatever the cause, under continued selection pressure with the herbicide, resistant plants are not controlled and their progeny can build up in the population.

Although effective preplanting weed control and proper cultural practices including water management used for weed management in California rice, herbicides are considered the most important tool within the weed management program. With the excessive reliance on a few herbicides and lack of crop rotation, however, eight different weeds in rice fields have thus far evolved resistance to herbicides and that underscores the fragility of the rice cropping system. Resistance to cyhalofop (Clincher), clomazone (Cerano), thiobencarb (Bolero Ultramax, Abolish), propanil (RiceShot, Stam, SuperWham), bensulfuron (Londax), halosulfuron (Sandea, Halomax), orthosulfamuron (Strada), bispyribac (Regiment), and penoxsulam (Granite) have been confirmed in several weed species in California.

There are two general types of mechanisms conferring resistance to herbicides in weeds. There are mechanisms related to the specific site of action of the herbicide in the plant and others that involve processes not related to the mechanism by which herbicides kill plants; these are known as target site and non-target site mechanisms, respectively. Herbicides usually affect plants by disrupting the activity of a specific protein (enzyme) that plays a key role in plant biochemical process. Target site resistance occurs when the target enzyme becomes less sensitive or insensitive to the herbicide. These physical changes can impair the ability of one or more herbicides to attach to the specific binding site on the enzyme; thus reducing or eliminating herbicidal activity. Non-target-site resistance is due to several mechanisms that confer resistance to herbicides without involving the active site of the herbicide in the plant. Of these, the best known is the case of metabolic resistance due to an enhanced ability to metabolically degrade the herbicide. Reduction in herbicide absorption and translocation, however, can also contribute to herbicide resistance.

Resistance mitigation seeks to diversify weed control methods in order to delay the evolution process by reducing the selection pressure exerted using herbicides. Target-site resistance is conferred by an alteration causing loss of plant sensitivity to herbicides with a specific mechanism of action. It is, therefore, clear that one way of dealing with the problem is by switching to another herbicide effective on the same weed species, but having a different mechanism of action. The use of herbicide mixtures or sequences involving herbicides with different mechanisms of action can protect the herbicides and delay the evolution of resistance to both, since mutants with resistance to one herbicide would be controlled by the other herbicide and vice-versa. However, the recurrent use of the same herbicide mixture could theoretically select for biotypes with resistance to both herbicides (multiple resistance).

From this discussion of resistance mechanisms in herbicide resistant weeds, it should be clear that resistance cannot be mitigated only by switching or combining herbicides in production systems that rely solely on the intensive use of selective herbicides for weed control. Instead, herbicide resistance management requires the integrated diversification of chemical and non-chemical weed control methods and other cultural practices such as crop rotation, stale seedbed preparation, good water management, and the selection of proper and competitive cultivars to reduce selection pressure for resistant weed biotypes.

UCCE Yield Contest

Rice is heading and it's time to start thinking about harvest. Remember to sign up for the UCCE Yield Contest. Entry forms are only one page and are available at http://rice.ucanr.edu/Rice_Yield_Contest/. The last day to enter is August 30 at the Annual Rice Field Day. Entry forms can be submitted by mail, drop-off, text or email (details on bottom of Entry form). This has been an interesting year with late plantings and warm weather. We are not sure what it will mean in terms of what maximum yields will look like, but that is one of the reasons we run this contest – to learn things.

2nd Annual Rice Weed Course

Friday, September 15, 2017, 8:30am to 4:25pm
(Registration begins at 7:30am)

Rice Experiment Station, Biggs, CA
Hamilton Road Field (on West Hamilton Rd. between Hwy. 99 & Riceton Hwy.)

For a full agenda and registration go to:

http://wric.ucdavis.edu/events/rice_weed_course_2017.html