UK COOPERATIVE EXTENSION SERVICE
University of Kentucky – College of Agriculture

Lexington, KY 40546

KENTUCKY PEST NEWS

ENTOMOLOGY · PLANT PATHOLOGY · WEED SCIENCE
Online at: www.uky.edu/Agriculture/kpn/kpnhome.htm

Number 1212 **September 15, 2009**

GRAIN CROPS

Update on Fungicides for "Plant Health"

By Paul Vincelli and Don Hershman

In February, we wrote a *Kentucky Pest News* article on the supplementary label for Headline® fungicide which permitted the use of this pesticide for growth promotion and stress tolerance (http://www.uky.edu/Ag/kpn/kpn_09/pn_090224.html#Corn). While Headline® and related strobilurin fungicides are excellent for control of certain diseases, the claims made go well beyond disease control to include enhanced growth efficiency, improved stress tolerance, improved tolerance to frost and hail, and so on. The past article presented our concerns about these uses. Last month, the American Phytopathological Society held a symposium entitled, "The Use of Fungicides to Promote Plant Physiological Benefits in Crops". Scientists from land grant universities, government and industry participated in this symposium, and everyone had a chance to see relevant data from a variety of sources, as well as to participate in the discussion. This article presents a capsule of the updated situation as we understand it. We focus this article on Headline® because, to date, this is the only fungicide with a supplemental label which promotes uses in corn and soybean beyond disease control.

Corn

A thorough review of all available, validly conducted field research shows that there are numerous instances where Headline® and other strobilurin fungicides enhance yield in the absence of significant disease pressure. Indeed, it is impressive to see yield increases in corn as high as 36 bu/acre from a single application of Headline®, in fields with very little disease pressure. On the other hand, yield loss as great as -21 bu/acre from Headline® have been recorded as well. Overall, the best available data indicate that a Headline® application met or exceeded a breakeven point of 7 bu/acre in 45% of the 203 trials examined, in the absence of significant disease pressure. (With corn prices dropping and the current high cost of fungicide application, a breakeven point above 7 bu/acre is probably justifiable, but to be conservative, we'll keep it at the 7 bu figure discussed at the symposium.)

A 45% breakeven scenario in the absence of significant disease pressure is pretty impressive, if you consider that we're talking about a fungicide. However, 45% is still not even equal to a coin toss. In other words, in the absence of significant disease pressure, application of Headline® to corn is not likely to pay for itself.

One of the conclusions from university data for corn is that this "yield bump" in the absence of significant disease is unpredictable. There are no convincing data that give guidance to a producer, so that s/he knows when they can expect the yield bump. University research shows clearly that some corn hybrids get a greater yield bump than others. However, university studies also show that the effect is inconsistent from one environment to another. In other words, just because you got the yield bump in Hybrid X in one field in one year, you are not necessarily going to see it in another.

The claims of improved stalk health are valid to a degree. Improved stalk health certainly can result from the application of Headline®. However, in most university trials where this effect is seen, it relates to control of foliar diseases. In a small number of trials, improved stalk health was reported in the absence of foliar disease. In these cases, it might relate to the "greening effect" extending the presence of green leaf tissue. However, overall, most cases of improved stalk health relate to foliar disease control. This is important because it gives guidance about how to best make the decision to apply the fungicide, as we will summarize at the end of this article.

The claims of improved tolerance to hail damage are exciting but aren't necessarily based on valid research. The only studies we are aware of that properly test these claims have not shown any benefit of Headline® in helping corn tolerate hail damage.

Soybean

Most interest surrounding the use of fungicides in soybean involves application of strobilurins, like Headline and Quadris®, or strobilurin + triazole premixes, such as Quilt® and Stratego®. In 2005 and 2006, data from university trials were summarized for different fungicides, including Headline®, applied at early pod development. In the absence of significant disease, a statistically significant yield increase occurred about 18-41% of the time, depending on the year, location, and fungicide. In early 2009, Pioneer Hi-Bred International published the findings of a multi-year, multi-variety replicated study (Foliar Fungicide Effect on Soybean Yield Pioneer Agronomy Sciences, Crop Insights Vol. 19 No. 1). They found that Headline® and Quadris® produced an economic yield result 51% and 47% of the time, respectively, in the absence of significant disease pressure. We wrote extensively about the use of fungicides in soybean in a recent KPN article (http://www.uky.edu/Ag/kpn/kpn_09/pn_090714.html).

As with corn, soybean is most likely to experience an economic (or statistically significant) yield response to a fungicide when there is an elevated disease risk. In the absence of significant, visible disease, the probability of achieving an economic response is about the same as if you had flipped a coin. We still have not seen any data which has convinced us that fungicides should be applied to soybean when the risk of disease is negligible. Said a different way, it is our opinion that growth efficiency and stress tolerance benefits, while they occur from time to time in soybean treated with Headline® (and other strobilurin fungicides), are currently not predictable and, therefore, should not be the basis for applying a foliar fungicide.

Concluding Points

Strobilurin fungicides, and strobilurin-triazole premixes, are excellent fungicides for disease control in both corn and soybean. Strobilurin fungicides can also enhance plant growth and crop performance under certain (as of yet undefined) conditions. However, in validly conducted trials, the growth-promoting and/or stress tolerance benefits, in the absence of significant disease, are not predictable in either corn or soybean. Furthermore, based on results of validly conducted studies in low disease circumstances to date, treatment with Headline® and other strobilurins are only likely to produce an economic benefit about half the time. The other half of the time the grower will lose money. Unfortunately, neither the Headline® supplemental label, nor the section 3 product label, provide farmers with specific instructions or guidance for achieving the growth efficiency/stress tolerance benefits. The supplemental label also fails to define the realistic limitations for the benefits. For example, should a producer realistically expect to see a drought tolerance benefit if Headline® is applied to a crop that is already under significant drought stress? The supplemental label is mute on points of practical application such as this.

Possible negative consequences from the use of fungicides for growth promotion include speeding the development of fungicide resistance, added drying costs because of increased grain moisture content, increased human exposure to strobilurin chemistry, increased environmental contamination, and other concerns. These are just some of the reasons why it is critical to avoid any and all fungicide uses that cannot be well-justified.

Bottom line: Use strobilurin fungicides based on disease risk. The higher the risk of diseases like gray leaf spot of corn and frogeye leaf spot of soybean, the better the case for using a fungicide. Don't base fungicide spray decisions on unpredictable growth-promoting and stress-tolerance properties.

FRUIT CROPS

Rotten Apples?

By John Hartman

Apple harvest is well underway in Kentucky. A good apple crop can be ruined due to decay caused by parasitic fungi. Several of the fungi that cause fruit rot disease can begin their infections at bloom or shortly thereafter. The fungi may invade killed fruitlets, infect sepals, or exist in a latent phase in healthy fruit, only to begin decaying them when they reach full size. Apple fruit rots can occur both in the orchard and in storage after harvest. Decayed fruit represent a significant loss to growers because much of the investment in the crop is made before the fruits show any indication of decay.

Rainy periods in spring and summer were an obstacle that apple growers faced when trying to manage apple diseases this year. Rains interfered with early spring pruning and sanitation efforts and prevented timely applications of preventive fungicides. Continued rainy weather and cooler than normal weather for parts of the summer likely also affected the kinds of diseases affecting apples, particularly fruit rot diseases. Based on weather patterns this spring and summer, it seems likely that black rot fruit decay and sooty blotch and flyspeck will predominate on apples at harvest. However, there have been sufficient episodes of hot and humid weather which would favor diseases such as white rot and bitter rot.

Black rot is caused by the fungus *Botryosphaeria obtusa*. The fungus infects blossoms and leaves (causing frog-eye leaf spot) as well as twigs, branches, and fruits. Black rot inoculum originates from colonized dead wood within the tree or from mummified fruit and fruitlets. Fruit with black rot infections at the calyx end usually result from sepal infections that occurred early in the season (Figure 1). These infections, which may happen as soon as the flower bud scales loosen, typically develop into blossom end rot. If black rot infections appear on the sides of growing fruit in summer, the source of inoculum can often be traced to one or more killed fruitlets located above the infection site within the tree canopy. Late fruit infections occur through cracks in the cuticle, wounds and lenticels. Black rot fruit infections are favored by temperatures about 70 degrees F with prolonged wetness. The black rot fungus can also be one of several different fungi that may be present in fruit with moldy core. Infected fruits eventually shrivel and dry down to pycnidia-covered mummies (Figure 1, inset) which remain attached to the tree, serving as inoculum sources in the spring of the following year.

Figure 1. Progression of apple fruit decay resulting from black rot disease. Inset shows apple mummy caused by black rot. (C. Kaiser photo)

Bitter rot is usually found in summer and fall in Kentucky apple orchards. It is especially damaging in summers when hot, humid weather predominates. Decay lesions are circular, slightly sunken, and under moist conditions, often covered with a creamy mass of salmon-pink spores produced by acervuli scattered in concentric rings on the decayed fruit surface (Figure 2). In cross section, the firm, brown decay appears V-shaped

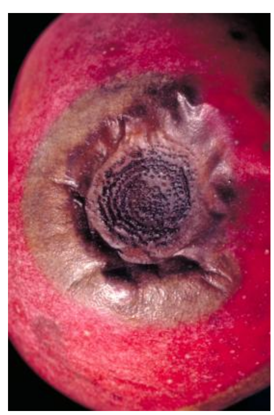

Figure 2. Apple bitter rot. "Ring" of black fungal sporulating tissue in this photo is salmon-pink color at earlier stages of disease. (C. Kaiser photo)

(Figure 3). Fruit are susceptible to infection from 3 weeks after petal fall until harvest and the disease develops most favorably at temperatures of 80 to 90 degrees F. The disease is caused by the fungus *Colletotrichum gloeosporioides* or by *C. acutatum*. Peaches, nectarines, grapes, strawberries, and blueberries are also attacked by *C. acutatum*.

Figure 3. Decay inside apple fruits. Bitter rot appears as dark brown "v-shaped" lesion on lower part of apple fruit at right. White rot appears as light brown decay on fruit at left. Small lesion on upper part of apple on right is bitter pit and is associated with calcium deficiency.

<u>White rot</u> of apple appears as a circular brown decay on the fruit surface (Figure 4), and is caused by the fungus *Botryosphaeria dothidea*. The fungus is ubiquitous in nature, causing diseases on a wide variety of other woody hosts such as birch, chestnut, willow, mountain ash, quince, pear, sweet gum, Rhododendron, grape, roses, stone fruit, blueberry, blackberry, currant and gooseberry. As with black rot, the white rot fungus can also infect woody tissue and cause cankers. The white rot fungus does not infect apple leaf tissue. Latent infections may occur on immature fruit up to 7 weeks after petal fall. Fruit infections can occur throughout the growing season, but rot symptoms usually do not appear before soluble solids reach near 10 percent. Fruit infection can occur in as few as 2 to 4 hours at 80 degrees F. Under warm conditions exceeding 80 degrees F the decay is soft, watery and a light tan color extending as a cylinder of decay from the surface to the core (Figure 3). Under cooler temperatures, the decay is usually firmer and a darker tan. Most rotted fruits drop, but some may shrivel and remain attached to the tree, serving as a source of inoculum for further fruit infection.

Figure 4. White rot lesion on apple fruit surface. (APS photo)

DIAGNOSTIC LAB HIGHLIGHTS

By Julie Beale and Paul Bachi

Recent agronomic samples in the PDDL have included Diplodia ear rot, southern rust and northern leaf blight on corn; rust on switchgrass; frogeye leaf spot, Cercospora leaf spot and sudden death syndrome on soybean; blue mold, frogeye, hollow stalk, potato virus Y, tobacco etch virus and tobacco vein mottling virus on tobacco.

On fruit and vegetable samples, we have diagnosed Phyllosticta leaf spot on blueberry; cane borer injury and Sphaerulina leaf spot on raspberry; anthracnose, downy mildew, powdery mildew and potyvirus on cucurbits; early blight, Septoria leaf spot, late blight, bacterial spot and anthracnose (ripe rot) on tomato.

On ornamentals and turf, we have seen Rhizoctonia and Pythium root rots on chrysanthemum; Cercospora leaf spot on peony; powdery mildew on lilac; Cercospora leaf spot on rose and hydrangea; anthracnose, tar spot, Phyllosticta leaf spot and Verticillium wilt on maple; Actinopelte leaf spot on ash and oak; bacterial leaf scorch on sycamore and oak; black leaf spot on elm; brown patch on bentgrass; anthracnose and rust on bluegrass; brown patch on tall fescue; and large patch on zoysiagrass.

INSECT TRAP COUNTS

By Patricia Lucas

August 28-September 3

Location	**Princeton, KY**	**Lexington, KY**
Black cutworm	12	3
Armyworm	32	54
Corn earworm	116	27
European corn borer	3	2
Southwestern corn borer	5	0
Fall armyworm	116	16

September 3-11

Location	**Princeton, KY**	**Lexington, KY**
Black cutworm	2	0
Armyworm	6	30
Corn earworm	25	27
European corn borer	0	3
Southwestern corn borer	3	0
Fall armyworm	21	15

Graphs of insect trap counts for the 2009 season are available on the IPM web **site** at - http://www.uky.edu/Ag/IPM/ipm.htm.
View trap counts for Fulton County, Kentucky at - http://ces2.ca.uky.edu/fulton/InsectTraps

COOPERATIVE
EXTENSION
SERVICE

UNIVERSITY OF KENTUCKY
College of Agriculture

Cooperative Extension Service

University of Kentucky
Entomology Department
Ag Distribution Center
229 Stadium View Road
Lexington KY 40546-0229

Official Business