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**Soybean pathogen found resistant to strobilurin fungicides; Crop experts call for judicious use**

BY JANE FYKSEN, CROPS EDITOR  
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The fungus that causes frogeye spot (FLS) in soybeans shows resistance to strobilurin fungicides.

That was the announcement last week by the University of Illinois and University of Tennessee that conducted research on the fungicide-resistant fungus (*Cercospora sojae*) that's showed up in a single soybean field in Tennessee.

"Strobilurin fungicides belong to the chemistry class known as the quinone outside inhibitors (QoIs), which are the most widely used group of foliar fungicides applied to field crops to manage plant diseases," reports Carl Bradley, University of Illinois plant pathologist. He says these fungicides can be sold as one-active ingredient products such as Headline (BASF) or Quadris (Syngenta) or in products that combine them with a fungicide in a different chemistry class known as the demethylation inhibitors, sometimes referred to as triazoles. Products that include a strobilurin-triazole combination of active ingredients include Quilt (Syngenta) and Stratego (Bayer Crop).

Strobilurin fungicides have been deemed high risk for fungal pathogens developing resistance (determined by the Fungicide Resistance Action Committee of FRAC, an international committee that evaluates fungicides' likelihood of developing resistance.)

"Plant pathogenic fungi developing resistance to strobilurin fungicides is not new," Bradley notes. "This has already occurred in potatoes and other crop and disease systems where multiple fungicide applications occur during the growing season."

"Every time you apply a fungicide, you increase the selection pressure and the opportunity to select out individuals in the pathogen population that have resistance or reduced sensitivity to the fungicide," he explains.

Because soybean fields in the U.S. are generally treated once during the season with a fungicide if they're treated at all, Bradley admits "we were somewhat surprised to find resistance so soon."

What does this mean for Wisconsin? UW-Madison soybean specialist Shawn Conley says "this serves as a very important reminder that the use of fungicides should be done based on several factors including knowledge of the variety planted and if there is resistance to the targeted diseases of interest, following by active scouting during the growing season to assess if conditions would warrant a fungicide application."

"Misuse or overuse of a foliar fungicide can increase the risk for resistance," Conley warns.

Specifically, for frogeye leaf spot in 2010, he saw symptoms in many fields in Wisconsin but severity was low on average. "This is the sort of information that should be used to build a working knowledge of the specific disease that may affect production fields in order to most effectively build a long-term management program," he advises.

"Based on our data from Wisconsin over the past several years, in the majority of situations, a foliar fungicide was not found to be needed and would have been an additional cost to production," Conley states.

Conley notes that the field in Tennessee was sprayed twice with a strobilurin fungicide but still had high levels of frogeye leaf spot. The finding was based on lab assays that examined the sensitivity of the isolate obtained in the field with baseline isolates and compared against active ingredients like azoxystrobin, pyraclostrobin and trifloxystrobin, which the UW specialist says are the active ingredients in fungicides such as Quadris, Headline and Stratego.

In 2008, Bradley's lab began a project funded by the Illinois Soybean Association to develop a fungicide resistance monitoring program. Since then, his lab has been obtaining samples, conducting tests and monitoring isolates collected from Illinois.

"This year, we decided to cast our net a little farther, particularly in the South," he notes. "Currently, Tennessee is the only state in which we have documented isolates like these, but we are continuing to perform tests on isolates collected from fields in Illinois and other states."

The assay results from the fungicide-resistant field in Tennessee indicated that spores from these isolates germinated at high concentrations of azoxystrobin, pyraclostrobin, and trifloxystrobin. It took approximately 200

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to 7,000 times higher fungicide concentrations to achieve spore germination inhibition with these isolates compared to the "baseline" isolates.

Echoing Conley, Bradley says FLS can be controlled with other management tactics such as planting soybean varieties with high levels FLS resistance or using effective triazole fungicides. He notes that work in Tennessee, where FLS is a big concern for growers, triazole fungicides have been shown to provide good control and can be used alone or tank-mixed with strobilurin fungicides if a grower is concerned with more than just FLS.

The most effective manner to slow the spread of resistant isolates is to only use a fungicide when needed, Bradley cautions. "If we overuse fungicide products, we won't be able to use them for very long because we will select out resistant populations," he says.

Bradley says if you plant a FLS-susceptible variety and are considering application of a fungicide, apply an effective triazole fungicide for control. Fungicides in the triazole chemistry class (also known as demethylation inhibitors) have a different site and mode of action on pathogenic fungi than strobilurin fungicides, and strobilurin-resistant isolates should not be cross-resistant to triazole fungicides.

"In situations where other foliar diseases may be present along with frogeye leaf spot and a strobilurin fungicide may be needed to control the other foliar diseases, do not spray a solo strobilurin product. Either apply a strobilurin-triazole tank-mix, or apply a product that contains both a strobilurin and a triazole product," he reiterates.

"There's a lot of marketing to use fungicides for yield increases, but little talk about where those increases come from. They come from protection of yield from diseases. In some cases they pay off because conditions have been favorable for diseases. But in years where conditions aren't favorable for disease, we generally don't see a big yield increase," Bradley states.

Bradley is expanding work in monitoring fungicide resistance in pathogens of corn, too. The University of Illinois is currently developing strobilurin sensitivity baselines for the gray leaf spot and northern corn leaf blight pathogens.

Bradley says that "so far," the only FLS isolates confirmed to have reduced sensitivity to strobilurin fungicides have come from "this single field in Tennessee."

"However, this does not mean that similar isolates are not elsewhere," he cautions.

Bradley reemphasizes that growers should only apply a foliar fungicide to control plant diseases. "Every time a fungicide application is made, a 'selection pressure' is applied that selects out individuals in the pathogen population that may have reduced sensitivity to fungicides. Applying a fungicide only when it is needed - based on disease risk and scouting observations - will reduce the selection pressure placed on the pathogen population and slow the development and spread of fungicide-resistant isolates."

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