Fungicide Resistance in Strobilurin or Strobilurin Analogues?

By Dr. Geunhwa Jung, *Department of Plant Pathology, University of Wisconsin-Madison*

Strobilurins are naturally occurring chemicals produced by wood decaying mushrooms. What is so fascinating about these fungicides? They are important broad-spectrum systemic fungicides recommended for the control of many fungi in a wide range of crops including turfgrass and have relatively low toxicity toward mammals. Fungicides of Strobilurin-Type Action and Resistance are called "STAR" or QoIs. They include kresoxim-methyl, azoxystrobin (Heritage® from Syngenta), trifloxystrobin (Compass® from Bayer) and famoxadone. Two new strobilurin fungicides [Insignia (pyraclostrobin) and Honor (unknown common name)] from BASF were developed for the control of turfgrass diseases. However, they are not yet registered. Personnel from BASF fungicide testing have informed me that Insignia will be registered next year and Honor will probably be registered in 2003.

These fungicides are potent inhibitors of spore germination, which makes them excellent protectants. In addition, they also have curative as well as the anti-sporulant activity. Some can move systemically through the xylem and have excellent root uptake. They also have translaminar movement in the leaf. This type of fungicide specifically inhibits electron transport in mitochondria, which are the fungi cells' "power houses." Basically, respiration of the phytopathogenic fungi will be inhibited.

Understanding the basic process of fungicide resistance in plant pathogens is beneficial when controlling diseases. First, fungal populations control a small number of resistant isolates. These resistant isolates occur naturally or are created by various mutagens, including fungicides. Then, the frequency of resistant isolates increases over time through the selection process of repeated fungicide application and migration of resistant isolates as well. How fast does the process take? It depends on the type of fungicides, pathogens, turfgrass species, disease management techniques, and environment. Therefore, the fungicides that used to work best for the control of the particular disease now have reduced efficacy.

The existence of mutant isolates resistant to strobilurins has been known for several years in a range of phytopathogenic organisms. For field crops there are reports on the development of resistance to strobilurin fungicides in some diseases. Through further investigation researchers found that most pathogenic fungi treated with strobilurins develop mutations in two regions of mitochondria. The risk of development of fungicide resistance when edible crops were treated with strobilurin fungicides ranges from low to high depending on the host and pathogen. Furthermore, it is believed that strobilurins might be subject to cross-resistance. That is, if a fungus resists one strobilurins, it will resist other strobilurins. For example, the dollar spot pathogen is cross-resistant to the benzimidazoles [benomyl (Tersan 1991®) and thiophanate-methyl (Fungo 50® and Cleary 3336®).

Several other strobilurin analogues are being developed as fungicides for the control of turfgrass diseases. Management strategies need to be developed so that fungicides can remain effective for long periods of time. Keep an eye on any unusual symptoms, or noticeable changes such as the reduced efficacy of control. If you are using these fungicides in your IPM plan and detect any noticeable changes, please let us know. Then we can make a trip to sample isolates for a test of fungicide resistance using the available DNA technology. We have excellent tools such as fungicides and our knowledge to use against our enemies, turfgrass diseases. How to use them skillfully and effectively is up to all of us.

For more information on the history of how the fungicides were first discovered and their mode of action, you can refer to an article about Strobilurins published in the Grass Roots by Jeff Gregos a few years ago (*The Grass Roots*, pages:22-23, March, 1999).

AMETEK®
ACCESS BOXES
Manufactured in
Sheboygan, Wisconsin
Specify AMETEK® ACCESS BOXES –
A Wisconsin Product!
10 LID GUARANTEE