

## Plant Pathology Fact Sheet

# Reducing the Risk of Resistance to Fungicides Used to Control Diseases of Turfgrasses

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## Introduction

Fungicides can be an important tactic in an overall integrated program for turf disease control. In order to insure that products available today remain available in the future, golf course superintendents should be aware of the need to use fungicides in ways that minimize the risk of fungicide resistance.

Fungicide resistance occurs when a fungus naturally develops a mutation that allows it to grow and reproduce in the presence of a fungicide. Once a pathogenic fungus develops resistance, a disease can quickly get out of control in spite of the use of the fungicide, even with frequent applications at high rates.

The development of fungicide resistance is a very real possibility for a number of turf fungicides, particularly for many of the newest systemic fungicides. These new fungicides are excellent materials because



GRAY LEAF SPOT DAMAGE TO A PERENNIAL RYEGRASS GOLF COURSE FAIRWAY RESULTING FROM A FUNGICIDE-RESISTANT STRAIN OF THE CAUSAL FUNGUS.

they can often be used at very low rates, thus having minimal environmental impact. However, they often have very specific modes of action, attacking fungi at only one specific biochemical reaction among the tens of thousands of biochemical reactions that occur in a living fungus. Research and field

experience has shown us that fungicides with very specific modes of action often are at risk for the development of resistance.

Keep in mind that most failures of fungicides to control disease are not due to fungicide resistance. Improper timing, inadequate rate, poor coverage, poor efficacy against some diseases, incompatibility, etc., are more likely explanations for control failures than is the development of fungicide resistance. However, fungicide resistance occasionally does occur. When it does, not only is there a sudden loss of disease control, but your fungicide options for controlling diseases in the future may become limited.

### **Reducing Fungicide Risk**

Plant pathologists generally agree that the following practices can reduce the risk of fungicide resistance.

#### **DO NOT RELY ON FUNGICIDES ALONE**

Integrate several disease management practices so that there is less selection pressure on the fungus to develop resistance. For example, avoid using highly susceptible cultivars to common diseases. Following good cultural practices that promote turfgrass health can also help reduce the reliance on fungicides.

#### **ROTATE OR MIX FUNGICIDES WITH DIFFERENT MODES OF ACTION**

Repeated use of the same or similar fungicides allows resistant fungal spores to increase and spread quickly. Rotating or mixing fungicides with different biochemical modes of action helps prevent the buildup of resistance because fungal spores resistant to Fungicide A are killed by Fungicide B, and vice versa. Take note, however: they must be fungicides with different modes of action. Fungicides with similar modes of action are the same product from the point of view of the fungus, even if the fungicides

have different names and are manufactured by different corporations. Once a fungus develops resistance to one product, it has resistance to all similar products.

#### **USE PROTECTANT FUNGICIDES**

Fungicide resistance has been extremely rare with protectant fungicides, so rotating to—or mixing with—protectant fungicides is a good practice to reduce the risk of fungicide resistance. Examples of protectant fungicides include: Terraneb SP, Proturf Fungicide V, Daconil 2787, Fore, Dithane DF, Manzate 200, Terraclor, Turfcide, and Spotrete.

#### **USE PROPER NOZZLES AND ADEQUATE GALLONAGE**

This is especially important when you are tank-mixing a contact fungicide with an at-risk fungicide. This will help ensure thorough coverage of all plant surfaces with the contact.

### **FRAC Codes**

The Fungicide Resistance Action Committee, a worldwide consortium of scientists representing fungicide manufacturers, assigns a number (FRAC code) to each fungicide based on its chemical mode of action. Those with similar modes of action are grouped together. Turfgrass managers can rotate among (or tank-mix) fungicides having different biochemical target sites by simply choosing among products that do not share the same FRAC code. A complete listing of these codes is available on the Web (refer to resources listed below). Remember: Before tank-mixing pesticides, producers should refer to product labels to ensure compatibility and to prevent phytotoxicity.

### **Fungicide Resistance in Kentucky**

In Kentucky, fungicide resistance has been confirmed in numerous instances for each of the following diseases and fungicide groups [FRAC codes are listed in brackets]:

- Anthracnose to QoI (= strobilurin) fungicides [11] and to thiophanate-methyl [1]
- Dollar spot to thiophanate-methyl [1] and/or DMI fungicides [3]
- Gray leaf spot to QoI 2 (= strobilurin) fungicides [11]
- Pythium blight to phenylamide fungicides [4].

In addition to these cases, examples reported from other states include resistance to the following:

- Pink snow mold to benzimidazole fungicides [1]
- Pythium blight to QoI (= strobilurin) fungicides [11]

## **Additional Resources**

- Chemical Control of Turfgrass Diseases, PPA-1 (University of Kentucky)  
<http://www.ca.uky.edu/agc/pubs/ppa/ppa1/ppa1.pdf>
- Fungicide Research Action Committee (FRAC)  
<http://www.frac.info/frac/index.htm>

*(Revised August 2009)*

*Photo by Paul Vincelli, University of Kentucky*