

Fungicide resistance:



**Use chemical disease controls in moderation
and prolong the life of these valuable tools**

BY RICH HANRAHAN

When a product works well — a pest control product, for example — we're tempted to use it a lot, or even use

it exclusively. That can be a mistake. In the case of pest control products, the result can be that, in time, the product doesn't work as well. In the worst-case scenario, it won't work at all because the pest will have become resistant to it.

Fungicides' effectiveness can be reduced by light, irrigation, rainfall and mowing, and so we reapply. Fungicides must also be reapplied to protect against new disease growth.

Every time certain fungicides are applied, the odds that the organism may develop resis-

tance increase. Develop and implement a strategy to prevent the rise of resistance.

Why resistance develops

Fungicide resistance first appeared in the early 1970s with the registration and widespread use of benomyl, a site-specific fungicide. The size and significance of the problem has been growing ever since.

Resistance begins to develop when a fungus makes a genetic adjustment or undergoes a mutation that reduces its sensitivity to a particular fungicide. This adjustment or mutation allows the affected fungus to survive the fungicide. Naturally, the surviving organism is likely to become the dominant strain when the same fungicide is used frequently and exclusively with it. Over

time, the resistant strain replaces all other strains and the disease becomes increasingly difficult to control. This process can be underway before you realize it.

When resistance develops, it's typically not limited to individual chemical compounds. Usually, strains of fungi that have become resistant to a fungicide will be resistant to all fungicides in the same chemical class. Overexposure to one fungicide might destroy the usefulness of several.

Get a plan

A fungicide is just part of a successful disease control program that must also include proper cultural management practices.

Turf susceptibility to disease can be influenced by practices such as mowing and fertilization,

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Dollar spot (top right) can develop resistance but others, like brown rot, can be more of a problem.



Brown patch (left and right) is significantly less likely to develop resistance in your landscape.

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and diseases are often most damaging to intensely managed turf. So, before disease can be controlled effectively, evaluate whether you're performing all necessary cultural practices that promote healthy turf. Disease poses less of a problem on strong, vigorous turf. Plus, turf recovers from disease faster when it isn't already weakened by other stresses.

However, fungicide applications are still appropriate for even the best-maintained and heavily used turf that must be protected from damaging diseases.

Design a schedule for proper application timing. Sometimes a preventative application is best applied prior to a fast moving disease's appearance, but sometimes a curative application when a disease first appears is adequate.

Keep in mind, however, the risk of disease resistance. Generally, rotating chemistries will reduce the risk of developing fungicide-resistant fungal pathogens, ensuring longevity. Rotating and tankmixing chemistries in different chemical classes and with different modes of action is sensible fungicide resistance management.

Not all fungi created equal

Not all fungi and fungicides are

the same, especially when it comes to resistance. Some fungicides' chemistries are more likely to provoke resistance than others. Some fungi are more apt to develop resistance than others.

Fungi with higher reproductive rates are more likely to develop resistance because they pass on the mutated gene more quickly and broadly. Diseases that infect many stages of a plant under a wide range of environmental conditions are also more likely to develop resistance since the disease can attack in so many ways. Some fungi that have shown a propensity for developing resistance are *botrytis*, brown rot, and *phytophthora*, for example. In contrast, brown patch, *fusarium* and red thread are significantly less likely to develop resistance in your landscape.

Site-specific fungicides run a higher risk of resistance because they work by inhibiting just one vital function in the fungal cell. Once resistance develops to this site, the fungicide is ineffective. Multi-site fungicides, on the other hand, interfere with several vital functions of the fungal cell. They're less likely to foster resistant fungi because even if resistance develops to one site, the fungicide can still attack the fungus via another site.

The benzimidazole class is an example of a site-specific or sin-

gle-point fungicide class, as are phenylamides and strobilurins. The benzamide class represents a chemical class that's less likely to foster resistance because it provides a multi-site defense. Examples of other multi-site fungicides include fosetyl-AL, propamocarb and chlorothalonil. If fungi develop a mutation that protects them from one form of attack, they're still going to be susceptible to these fungicides' other attacks and therefore be controlled.

When rotated and used in tankmix combinations, certain fungicides can effectively control a broad spectrum of disease without the concern for resistance development.

The variety of fungicides available provides you with

Some fungi are more apt to develop resistance than others.

Healthy turf is the best defense

Healthy turf resists diseases better than stressed turf. It also recovers faster from attacks of disease. For healthy turf:

- ✔ Select appropriate species and varieties
- ✔ Maintain adequate soil moisture
- ✔ Avoid soil compaction
- ✔ Maintain proper mowing heights and frequency
- ✔ Ensure proper fertilization

Overusing any fungicide promotes resistance, so never make more applications than you need to.

many good tools to use in developing and running a successful disease resistance management program.

Using multiple fungicides from different chemical classes with varying modes of action is a key technique in managing resistance. The two basic approaches are rotation and tankmixing.

Why rotation?

The basic strategy behind both rotation and tankmixing is that if a fungus has developed resistance to one of your fungicides, using multiple fungicides will vastly increase your odds of ridding turf of

the fungus before it has a chance to spread and mutate further.

Rotation involves using two or more fungicides in sequence, each alone; tankmixing involves mixing two or more fungicides together so they can be applied simultaneously. Typically, your strategy would include both high- and low-risk fungicides, but tankmixing even multiple at-risk compounds can also reduce resistance, so long as those fungicides tankmixed have different modes of action. (Always tankmix in accordance with label recommendations.)

Always be sure to:

Reduce the frequency.

Over-using any fungicide promotes resistance, so never make more applications than you absolutely need to achieve disease control. Adding one more application "for good measure" is not a good idea in this case.

Apply at the right rate. On the other hand, when you do apply a fungicide, be sure to apply enough. "Cutting" the rate used in a single application will increase the likelihood of resistance development because you expose the organism to the fungicide without providing enough product to control it. Observe the recommended rates, and thoroughly cover the plants or areas of concern.

Reduce your dependence.

You can reduce your dependence on fungicides by developing an integrated pest management (IPM) approach. For

example, wherever possible, use plant species and/or varieties that are disease resistant. Make sure the landscape is properly planted and maintained so that its susceptibility to disease will be minimal. Watch the landscape for the first signs of disease so you can intervene before a problem is well established.

Fungicide selection

There are many fungicides on the market that claim to prevent or cure various common diseases. Be aware that although a product may be labeled for a particular disease, it doesn't guarantee it will solve *your* problem. Efficacy can vary from region to region, and different strains of certain diseases may require different fungicides to cure the disease. So, how do you know which to choose?

Trial and error can be expensive, inefficient, and may further damage the turf. You should talk with other landscape professionals in your area to see what's worked best for them. Consult with an expert such as a turf pathologist or university researcher to get a recommendation. Many universities have conducted extensive trials to test fungicide efficacy on a broad number of turfgrass species and varieties.

After gathering shared knowledge, you'll be ready to make an informed fungicide selection.

— *The author is technical development manager of fungicides for Chipco Professional Products.*

Find great disease information online

When you need help in diagnosing or controlling diseases on turfgrass and/or ornamentals, you can turn to several Web sites on the Internet.

Because so many diseases appear seasonally and/or regionally, start by checking if the turfgrass or horticulture department at your nearest land grant university has a site dedicated to diseases.

A quick search on Yahoo (typing in turfgrass disease) turned up excellent disease information from The Ohio State University, Purdue University, the University of Wisconsin, North Carolina State and Texas A&M. There are probably many others.

Also, Syngenta Professional Products' new electronic turfgrass disease identification guide is easy to navigate, has complete listings (with photos and maps) of all turfgrass diseases and offers practical control advice. As a quick reference, you may want to bookmark: www.syngentaprofessionalproducts.com/to/diseaseID/.

—Ron Hall