

Tips

Fungicide Use

How to Prevent Resistance

BY RICH HANRAHAN

I've known some superintendents to work and play in excess, learning the hard way that everything is best in moderation. This can also be said for turf management.

When a product works well — a pest-control product, for example — it's tempting to use it a lot or even exclusively. That can be a mistake. In the case of pest-control products, the result can be that in time the product won't work as well. In the worst-case scenario, it won't work at all. The pest will have become resistant to it.

Fungicides can be vulnerable to light, irrigation, rainfall and mowing, which may reduce their effectiveness, so we reapply. Fungicides must also be reapplied to protect against new disease growth. But every time certain fungicides are applied, the odds increase that the organism may develop resistance.

To preserve the usefulness of your fungicides, you should develop a strategy to prevent resistance. 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 more difficult to control. This process is often well under way before you realize it has begun.

When resistance develops, it is 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. In other words, overexposure to just one fungicide might destroy the usefulness of several.

About resistance

A strategy must be designed for proper application timing. Sometimes a preventative application is best applied prior to a fast-moving disease's appearance. In other situations, a curative application at the first sign of disease is adequate.

Reducing the risk of disease resistance should always be top of mind to preserve a fungicide's future use. Generally, rotating chemistries will reduce the risk of developing fungicide-resistant fungal pathogens, ensuring a product's longevity. Rotating and tank-mixing chemistries in different chemical classes and with different modes of action are important when planning for fungicide resistance management.

You must also remember:

- Not all fungi and fungicides are the same, especially when it comes to resistance. The chemistries of some fungicides are much more inclined to provoke resistance than others, and 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 range of environmental conditions are also more likely to develop resistance because the disease can attack in so many ways. Some fungi that have shown a propensity for developing resistance are botrytis, brown rot and phytophthora. Brown



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patch, fusarium and red thread, in contrast, are significantly less likely to develop resistance.

- Site-specific fungicides run a higher risk of resistance because they work by inhibiting just one 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 are less likely to foster resistant fungi because even if resistance develops to one site, the fungicide can still attack the fungus through another site.

The benzimidazole class is an example of a site-specific or single-point class of fungicides. So are phenylamides and strobilurins.

The benzamide class represents a class of chemicals that is less likely to foster resistance because it provides a multi-site attack. Examples of other multi-site fungicides include fosetyl-aluminum, propamocarb, and chlorothalonil. If fungi develop a mutation that protects them from one form of attack, they are still going to be susceptible to these fungicides' other attacks and therefore controlled.

When rotated and used in tank-mix combinations, certain fungicides can effectively control a broad spectrum of diseases without the concern for resistance development. The variety of fungicides available provide you with

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

Mix it up

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 tank mixing.

The basic strategy behind both rotation and tank mixing is that if a fungus has developed resistance to one of your fungicides, 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; tank mixing involves mixing two or more fungicides together so they can be applied simultaneously. Typically, your strategy would include both high-risk and low-risk fungicides, but tank mixing even multiple at-risk compounds can also reduce resistance, as long as those tank-mixed fungicides have different modes of action. (Always be sure to tank mix in accordance with label recommendations.)

Reduce the frequency

Overusing any fungicide promotes resistance, so never make more applications than you need to achieve control. The fewer applications you make, the less the fungus is exposed to the chemical class and the fewer opportunities the fungus has to develop resistance to it. Adding one more application "for good measure" is not a good idea.

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 developing. This is because you expose the organism to the fungicide without providing enough product to control it. Always observe the recom-

mended rates and strive to achieve complete coverage of the plants.

Reduce your dependence

Of course, the only way to prevent fungicide resistance completely is by avoiding at-risk fungicides altogether. While this may be impossible, you can reduce your dependence on fungicides by developing an integrated pest management approach. For example, whenever possible, use plant species and/or varieties that are disease resistant.

Fungicide selection

There are many fungicides on the market that claim to prevent or cure various common diseases. However, be aware that although a product may be labeled for a particular disease, it does not guarantee it will solve your problem. Efficacy can vary from geographic 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 colleagues in your area to see what has worked best for them. Consult with an expert such as a turf pathologist or university researcher to get recommendations. Many universities have conducted extensive trials to test fungicide efficacy on a number of turfgrass species and varieties. After gathering shared knowledge, you will be ready to make an informed fungicide selection. Your best choice will be a fungicide with little or no cases of documented resistance and one that provides additional turf-enhancing qualities. ■

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