

The DMIs (De-methylation Inhibitors) are an important group of turfgrass fungicides that have been around since the late 1970s and early 1980s. As a group DMIs control a broad spectrum of turf diseases caused by several foliar and root pathogens. The DMIs are often referred to by their mode of action as sterol biosynthesis inhibitors (SBIs).

Sterols are found in plants, animals and humans and are important components of cell membranes, helping to provide proper permeability and fluidity. Cholesterol is a sterol that is a vital component found in animals and humans, while ergosterol is the primary sterol present in cell membranes of fungi. Cholesterol and ergosterol are similar in their function. Given that ergosterol is absent or found in minor amounts in plants, it is a primary target to exploit with antifungal products whether natural or synthetic.

The DMIs are systemic fungicides that, depending on the fungicide, are either locally systemic or xylem mobile — thus the relatively long disease control they provide as a preventative application. Be cautious when applying DMIs to creeping bentgrass and bermudagrass greens in the summer when there are prolonged periods of high temperatures. There have been reports of turf injury with DMI applications under summer stress.

It is possible for some diseases, like dollar spot, to develop resistance to the DMIs. The resistance occurs gradually. In general, resistance initially appears as a reduction in the length of control. In contrast, resistance to benzimidazole fungicides occurs quickly with a rapid loss of control. The relative slow rate of resistance buildup to DMIs is due to the need of the fungus to accumulate several mutations along the sterol biosynthesis pathway.

Cross-resistance can occur among the DMI fungicides and with benzimidazole and dicarboximide fungicides. The fitness or how the resistant fungi survive in the wild in the absence of the fungicide may vary. It appears that the fungal population may shift partially back to a proportionally more sensitive or wild type population over time in the absence of the DMIs. In

A concern for the DMIs

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contrast, benzimidazole resistance is highly fit. The population will rarely, if ever, shift back to a wild-type population. To minimize or slow the potential resistance, apply DMIs judiciously and avoid excessive rates and applications.

Besides being described according to their mode of action, the DMIs are referred to by their chemical structure as triazoles (metaconazole, myclobutanil, propiconazole, triadimefon) and pyrimidines (fenarimol). In addition to the fungicides, the plant growth regulators (PGRs) paclobutrazol is a triazole, while flurprimidol is a pyrimidine.

Both paclobutrazol and flurprimidol have demonstrated fungicidal activity in suppressing certain diseases, including dollar spot. Both PGRs are effective in regulating growth and have the added benefit of suppressing annual bluegrass in creeping bentgrass. Originally, these products were applied once or twice during the growing season for annual bluegrass control.

Currently, paclobutrazol and flurprimidol are being applied on a regular basis through the growing season to control/manage annual bluegrass on greens. Generally, these programs consist of applying paclobutrazol or flurprimidol on a two- to three-week basis through the growing season at a relatively low rate and then gradually increasing the rate during the fall. In general, this type of program (or similar programs) have been successful and are growing in popularity.

The concern I have — and it needs to be balanced against the positive (annual bluegrass control) — is are we putting a whole class of fungicides (DMI) at a greater risk for resistance by frequently applying these PGRs?

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