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is the key to preventing and controlling turfgrass diseases. Fungicides are one part of a management system, not the management system for disease control.

Miracle fungicides — not!

I always look with dismay at a turfgrass manager who tells me that he or she does not worry about disease "X" because a couple applications of fungicide "Z" easily takes care of the problem. My follow-up questions to them include: But why do you have the disease problem in the first place? And, what will you do when that pathogen develops resistance to that particular fungicide?

Dollar spot disease caused by *Sclerotinia homoeocarpa* is an excellent example of how fungicide use influences pathogen populations and eventually fungicide choices. The number of fungicide active ingredients this fungus has become resistant to in the United States is astounding. Field resistance to three different chemical fungicide groups has been documented in the dollar spot fungus. These include the benzimidazole, dicarboximide and DMI (sterol inhibitor) fungicide groups. Note the emphasis is on groups, meaning, for example, that the fungus is considered to have developed resistance to not just one DMI fungicide but to all fungicides in the DMI group.

Development of fungicide-resistant pathogens is not a recent phenomenon. One can find reports concerning the dollar spot fungus dating back to the late 1960's. Furthermore, it is not a natural phenomenon, but a man-made phenomenon directly related to fungicide applications.

An excellent study out of Canada reaffirms that the dollar spot fungus is not naturally resistant to the DMI fungicides, but that the extensive use of such fungicides has induced this resistance. Until recently (fall 1994), DMI fungicides were not registered in Canada for use on turfgrass. The research team collected 435 *Sclerotinia homoeocarpa* isolates from diseased turfgrass in Ontario during the summer of 1994, just prior to the legal use of DMI fungicides. Except for one population, which just hap-

pened to be near the U.S. border, the Canadian isolates were all very sensitive to DMI fungicides. Hopefully, the Canadian golf course superintendents will learn from the U.S. situation that the importance of cultural management should not be overlooked as part of a dollar spot control program.

Any practice that reduces disease pressure will also reduce the amount of fungicides required.

Another situation that concerns me are the phone calls from turfgrass managers indicating they have been applying fungicide "X" routinely, and yet they still have a disease problem. The disease observed usually turns out to be one that is not controlled by fungicide "X". This phenomenon occurred with the release of Heritage fungicide, which is a fungicide in the strobilurin chemical group. This fungicide is unusual because it does control a much wider range of fungi than most systemic fungicides. For example, it suppresses diseases caused by both *Pythium* and *Rhizoctonia*. However, Heritage has no effect on the dollar spot fungus. In some studies, it even appeared to increase dollar spot disease.

The point is that if you are going to use fungicides as part of a preventive program, it is imperative that you know exactly which diseases you are trying to control. After all protecting the turfgrass from one disease, only to see it die from another disease does not encourage good customer or membership relationships!

Growth regulation effects

Furthermore, instead of preventing diseases, fungicides can promote disease problems or turfgrass injury.

CORRECTION

Last month's article on the FQPA by Dr. David Gardner mistakenly noted that the product Cyproconazole was sold to Bayer. In fact, Syngenta still retains the use of it for coffee bean production.