Survey of *Sclerotinia homoeocarpa* isolates in Indiana for sensitivity to three fungicides

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Objective

To investigate the sensitivity of isolates of *Sclerotinia homoeocarpa* to selected fungicides commonly used for dollar spot control.

Rationale

Dollar spot, caused by *Sclerotinia homoeocarpa*, is a common disease of creeping bentgrass throughout the Midwestern United States. Acceptable control of dollar spot on golf turf is unlikely without repeated use of fungicides. Systemic and local systemic fungicides are an integral component of dollar spot management, but there have been numerous reports of the failure of some of these fungicides to control dollar spot. This research is part of a continuing effort to characterize the sensitivity of Indiana populations of the dollar spot fungus to iprodione, propiconazole, and thiophanate methyl. This information will help golf course superintendents use fungicides more efficiently, and it will improve our knowledge about the extent of fungicide insensitivity in Indiana.

How It Was Done

Samples of turf with dollar spot symptoms were collected from different golf courses throughout Indiana during the summers of 2001 and 2002 (Figure 1). The pathogen was isolated from each of these samples and stored on filter paper for later use. Seventeen of these isolates collected in 2001 were evaluated for sensitivity to iprodione, propiconazole, and thiophanate methyl. For each of the three fungicides, potato dextrose agar (PDA) was amended with seven dilutions of fungicide and poured into 9 cm diameter Petri dishes. For each experiment, there were eight Petri dishes per isolate: seven dishes amended with different dilutions of fungicide and one control dish (Figures 2, 3). These isolates were recovered from filter paper storage and grown on PDA. A 5 mm plug of PDA from each of the seventeen isolates was transferred to one Petri dish of fungicide-amended PDA per dilution. The culture dishes were incubated on a laboratory bench at 23° C. Colony diameters were measured 4 days after transfer. The experiment was repeated for each fungicide. Data from these assays were used to determine a discriminatory dose for each fungicide. The sensitivity of 26 isolates collected in 2001 and 28 from 2002 was evaluated by comparing growth on PDA amended with the discriminatory dose of fungicide and growth on non-amended PDA.

Results to date

For the original 17 isolates, sensitivity was expressed in terms of EC_{50} (effective concentration 50%) values. The EC_{50} value represents the concentration of fungicide necessary to restrict growth of a particular isolate to half (50%) of the same isolate's growth on non-amended PDA. Log transformed EC_{50} values for each of the 17 isolates are shown in Figures 4, 5, and 6. Isolates with a log 10 EC_{50} value greater than 1 are designated as insensitive to that particular fungicide. Significant differences in log 10 EC_{50} values were observed among isolates for each fungicide.

For the 54 isolates evaluated by a discriminatory dose of fungicide, each isolate was classified into a disease control class (Figure 7). The disease control class

of an isolate indicates the level of control (%) expected with a particular fungicide. An isolate's disease control class is determined from the relative growth (%) of the isolate.

Equation 1:

$$\text{relative growth} = \frac{\text{growth on discriminatory dose}}{\text{growth on control}} \times 100$$

Equation 2:

$$\text{disease control class} = 100 - \text{relative growth (\%)}$$

This type of assay also demonstrates the nature of the sensitivity distribution characteristic of each fungicide. The qualitative distribution (thiophanate methyl) shows no intermediate sensitivity classes. In such cases, increased fungicide rates or decreased application intervals will not result in acceptable control. Conversely, iprodione and propiconazole are characterized by quantitative distributions. In most of these cases, adequate control could be achieved with shortened application intervals and increased rates.

From the results of our study, we have found that dollar spot resistant to thiophanate methyl, iprodione and/or propiconazole is present in Indiana. Though resistance may not be responsible for some "apparent" fungicide failures in IN, it could be present on golf courses with a long history of aggressive fungicide use. The awareness of resistance outbreaks over the state will provide superintendents with incentive to take appropriate measures to avoid development of resistance. The results from our study should help superintendents make better choices on if, when, and what fungicides should be applied, which will help decrease fungicide use in the long term and help save money for the golf course.

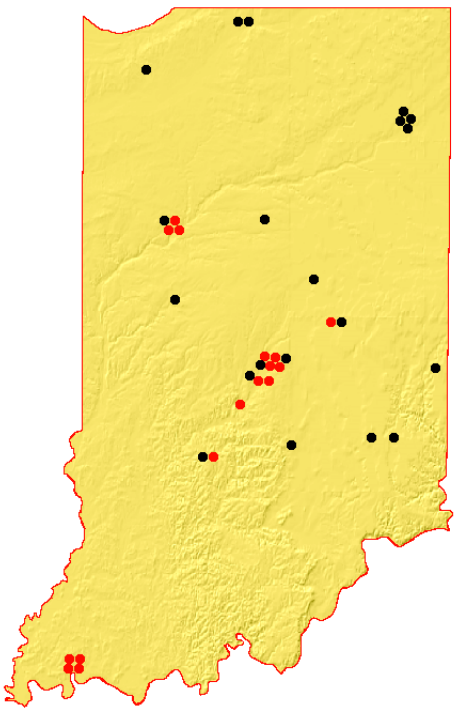

Figure 1. Red dots indicate locations of original 17 isolates. Black dots represent locations included in discriminatory dose assays.

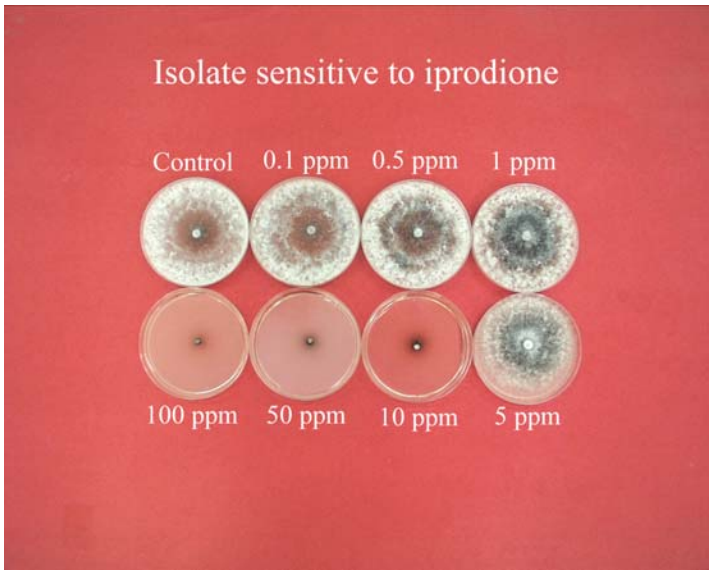

Figure 2. Growth of a sensitive isolate (L01025) after 4 days on iprodione-amended PDA.

Figure 3. Iprodione-insensitive isolate (L01137) after 4 days on iprodione-amended PDA.

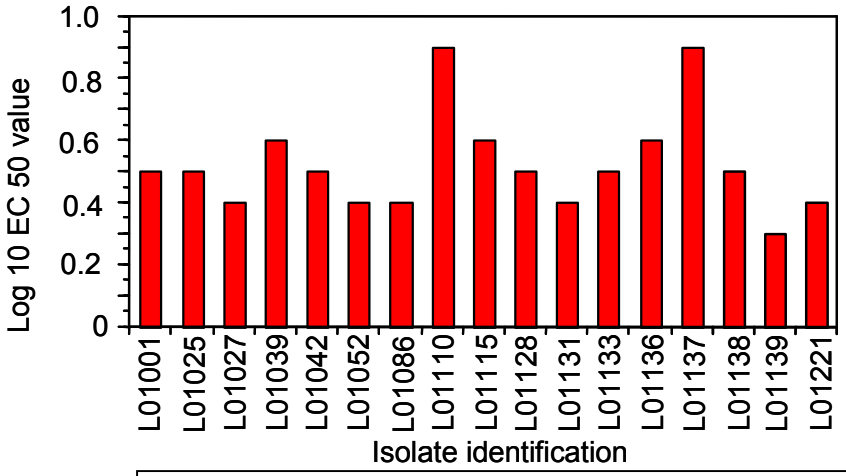

Figure 4. Sensitivity of 17 isolates to iprodione. Isolates L01110 and L01137 were consistently insensitive to iprodione.

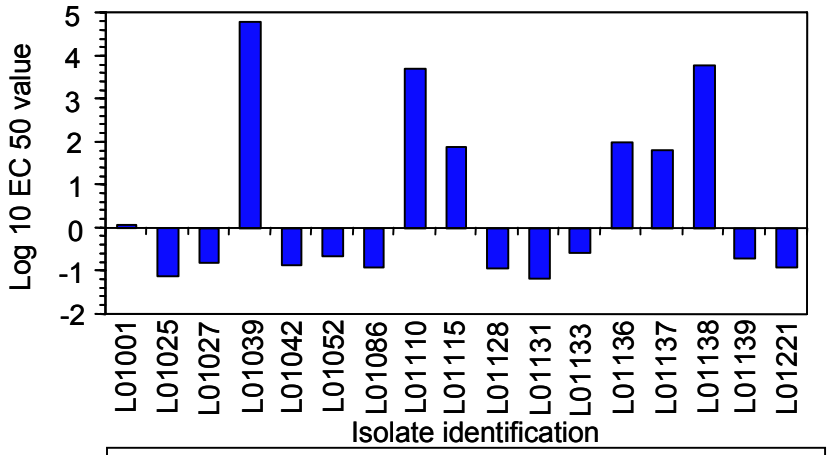

Figure 5. Sensitivity of 17 isolates to propiconazole. The value of 0 on the vertical axis represents 1 ppm propiconazole. Isolates with EC50 values greater than 0 are considered insensitive.

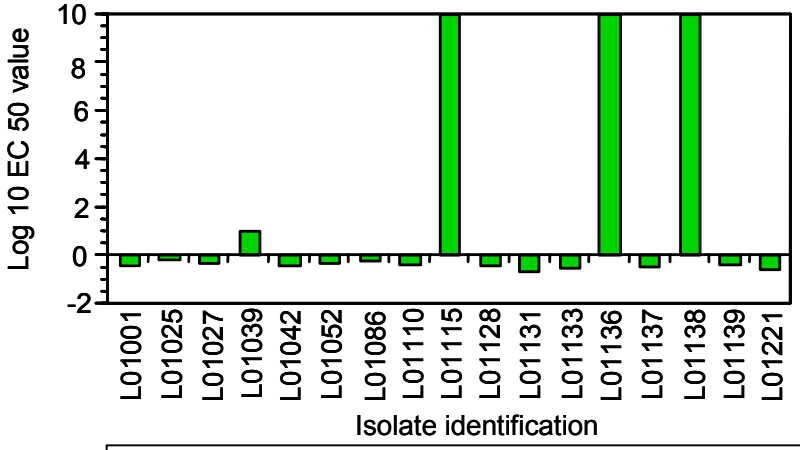

Figure 6. Sensitivity of 17 isolates to thiophanate methyl. The value of 0 on the vertical axis represents 1 ppm thiophanate methyl. Isolates with EC50 values greater than 0 are considered insensitive.

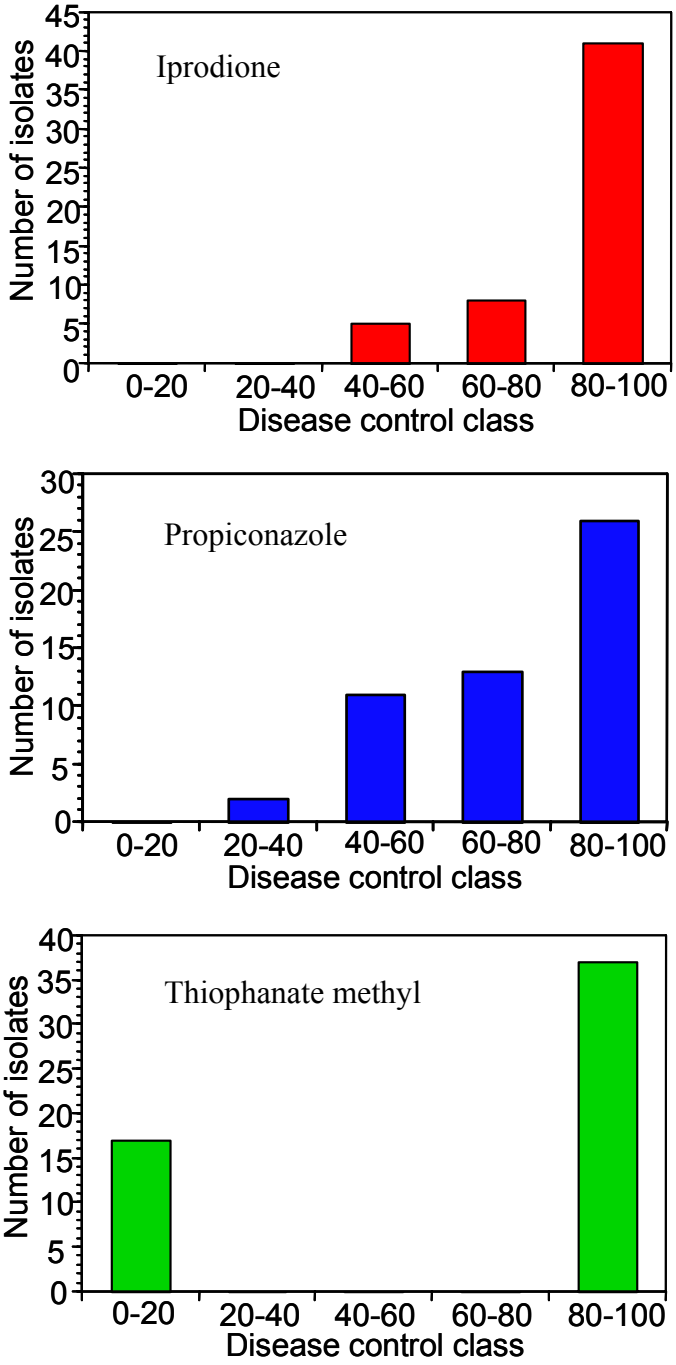

Figure 7. Distributions of 54 isolates of *S. homoeocarpa* based on disease control class. Disease control class of an isolate indicates the level of control (%) expected with a particular fungicide. An isolate's disease control class is determined from the relative growth (%) of the isolate as expressed in Equations 1 and 2 in the text.