Integrating fungicide and genetic host resistance for control of dollar spot on creeping bentgrass

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SUMMARY: Dollar spot, caused by *Sclerotinia homoeocarpa*, is a common disease of creeping bentgrass (*Agrostis stolonifera*). The pathogen is most active during moist periods of warm days (70-85°F) and cool nights (60°F) during the growing season. Therefore, outbreaks can occur from spring through fall. Reducing the severity of dollar spot outbreaks is a concern for many golf course superintendents. Cultural practices, genetic host resistance and chemical fungicides all contribute to dollar spot control, but cultural practices alone cannot provide acceptable levels of control. Synthetic fungicides provide effective reliable control of the disease, but they must be applied repeatedly and therefore, are very expensive. Recently, several relatively new cultivars of creeping bentgrass have been shown to have good resistance to dollar spot infection. Our research was designed to investigate whether host resistance in a resistant (less susceptible) cultivar (Declaration) could be exploited to achieve acceptable levels of dollar spot control with reduced amounts of fungicide compared to more susceptible cultivars (Penncross and Independence). Results from 2011 demonstrate that dollar spot epidemics were less severe on Declaration than on Penncross and Independence. However, unlike implications of other studies, outbreaks on Declaration can become quite severe over time. This research also showed that, according to AUDPC values, dollar spot outbreaks were less severe in plots of Declaration treated with Daconil Ultrex at 1.8 oz/1000 ft^2 than in plots of Penncross and Independence treated with twice as much fungicide (Daconil Ultrex at 3.6 oz/1000ft^2).

MATERIALS AND METHODS

Creeping bentgrass cultivars Declaration, Penncross, and Independence were selected to represent cultivars with high, medium, and low levels of dollar spot resistance, respectively (Bonos, 2005). Seeds of each cultivar were planted in field plots (3.3 ft x 6.6 ft) arranged in a completely randomized block design with 3 replications at the Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN., on August 15, 2010. Research was initiated the following summer after turf was well established at the experimental site. Three rates (equivalent to 0, 1.8 and 3.6 oz/1000 ft^2) of Daconil Ultrex 82.5WDG were applied to plots of each cultivar beginning on July 6, 2011.

Throughout the season, fungicide was re-applied when the average number of dollar infection centers in plots of each cultivar in each fungicide treatment reached the threshold of 8.0 per plot--or was applied 7 days after the previous application if the average number of dollar spots did not decrease below the 8.0 threshold by that time. The experiment was competed on October 4, 2011. Fungicide applications were made using a custom-built boom sprayer. Three Tee-Jet air induction nozzles (AI9503EVS for the middle, AIUB8503EVS for both sides) were mounted approximately 12 inches apart on the boom located 14 inches from the ground. The sprayer was calibrated to deliver 2.0 gal/1000 ft^2 at 40 psi. Infection centers were counted and recorded at 2- to 3-day intervals throughout the experimental period. Area under the disease progress curve (AUDPC) values were calculated from dollar spot counts in plots of each cultivar and fungicide combination (Latin, 2011). A two-way ANOVA test was applied to account for variation among treatments. A Tukey means separation procedure was used to demonstrate statistical significance among cultivar/fungicide combinations.

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Results and Discussion

With no fungicide application, disease severity in plots of all three cultivars increased during the experimental period (Fig. 1). AUDPC values for Declaration, Penncross, and Independence were 3293, 5043, and 7914, respectively. Interestingly, disease severity increased to highly unacceptable levels after 60 days in all plots that were not treated with fungicide—including those of the "resistant" cultivar Declaration. This result does not agree with other published trials involving creeping bentgrass cultivars and dollar spot resistance.

Less disease occurred in plots of Declaration treated with the low rate (1.8 oz/1000 ft^2) of Daconil Ultrex than in plots of Independence and Penncross treated with the high rate (3.6 oz/1000 ft^2) of Daconil Ultrex. Based on AUDPC values, less fungicide was required to limit dollar spot to certain levels on Declaration that on the other two cultivars. Furthermore, lower AUDPC values on Declaration were sustained with only 5 applications of Daconil Ultrex compared to 6-8 applications on Penncross and Independence (Table 1). From this preliminary research, it appears that resistance in Declaration can be utilized to limit dollar spot progress with less fungicide. However, in this experiment, acceptable levels of control were not achieved throughout the experiment. Although it is possible that the fungicide lacked sufficient efficacy to provide season-long control, it is more likely that the application threshold must be decreased (resulting in more frequent application) to limit the rate of disease progress and suppress symptom expression to levels acceptable for quality putting surface.

References

Latin, R. 2011. A Practical Guide to Turfgrass Fungicides. APS Press. St. Paul, MN.

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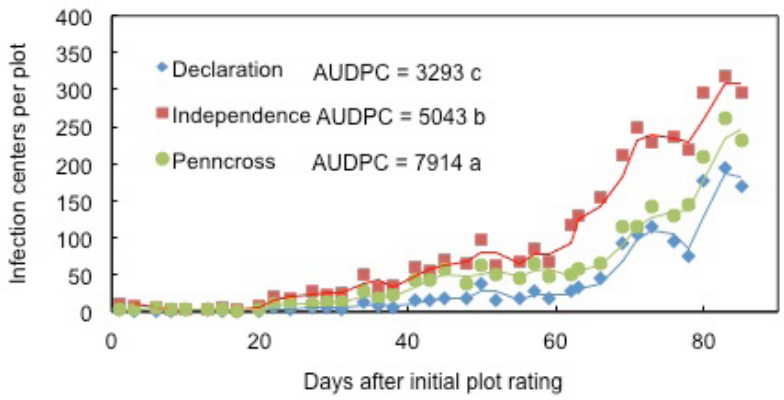

Figure 1. Dollar spot disease progress curves and corresponding AUDPC values for plots of Declaration, Independence, and Penncross that were not treated with fungicide.

Table 1. Mean AUDPC for three cultivars treated with Daconil Ultrex at 1.8 and 3.6 oz/1000 ft^2.

Treatmentx and rate/1000 ft ^{2}	Cultivar	Number of applications	AUDPC
Daconil Ultrex 82.5WDG, 1.8 oz	Independence	8	2393.2 a[y]
Daconil Ultrex 82.5WDG, 1.8 oz	Penncross	8	1658.7 ab
Daconil Ultrex 82.5WDG, 1.8 oz	Declaration	5	820.0 bc
Daconil Ultrex 82.5WDG, 3.6 oz	Independence	8	1251.0 bc
Daconil Ultrex 82.5WDG, 3.6 oz	Penncross	6	1001.3 bc
Daconil Ultrex 82.5WDG, 3.6 oz	Declaration	5	614.5 c

[x] Treatments were applied at a threshold of 8 spots per plot or, after 7 days if the number of infection centers was not reduced below the 8 spot threshold..

[y] Values followed by the same letter are not significantly different using the Tukey test (α =0.05).