

CURATIVE AND PREVENTIVE SUPPRESSION OF DOLLAR SPOT ON A GOLF COURSE PUTTING GREEN WITH VARIOUS FUNGICIDES, 2010

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INTRODUCTION

Dollar spot (*Sclerotinia homoeocarpa*) is a common disease of golf course putting greens throughout Pennsylvania and the entire United States. Although there are several cultural management practices that can assist in reducing disease severity, the use of protective chemicals usually is necessary to control the disease during periods favorable for growth of the pathogen. Typical fungicide applications either occur prior to or after the onset of disease symptoms. While preventive applications generally are recommended, the ability of fungicides to rapidly suppress symptoms is also important. The objectives of this study were to evaluate the ability of various fungicides and fungicide tank-mix combinations to provide curative and continued suppression of dollar spot.

MATERIALS & METHODS

This study was initiated at the Valentine Turfgrass Research Center located in University Park, PA. Soil was a sandy loam with a pH 7.4 and an OM of 1.77%. Turfgrass used for the fungicide evaluation was a mixed stand of predominantly creeping bentgrass (*Agrostis stolonifera*) with approximately 10 to 15% annual bluegrass (*Poa annua*). The area was maintained as a bentgrass green and mowed six times per week to a height of 0.125 in. All fungicide treatments were applied with a CO₂ pressurized (40 psi) sprayer equipped with an air-induction flat fan nozzle (AI9508E), and calibrated to deliver 2.0 gal water per 1000 ft². The area was treated with chlorothalonil (Daconil Ultrex) on 24 May (1.8oz/1000ft²) and 9 June (3.2oz/1000ft²) to provide moderate suppression of existing dollar spot symptoms. Moderate to severe dollar spot symptoms were present when treatments were initiated. Treatments were initially applied on 22 June and reapplied four times approximately every 14 days. All treatments and application dates are listed in the data tables.

Plots measured 3 ft x 6 ft and were arranged in a randomized complete block with four replications. Dollar spot severity was assessed by counting the number of infection centers within each plot or by estimating the disease severity on a 0 to 100% scale where 0 = no disease present and 100 = entire plot area affected by dollar spot. Turfgrass quality was also visually rated on a 1 to 9 scale where 1 = entire plot brown or dead and 9 = optimum greenness and density. All data were subjected to analysis of variance and means were separated at $P \leq 0.05$ according to Fisher's Protected Least Significant Difference Test.

RESULTS

Dollar spot. Dollar spot symptoms began to develop in late May and quickly became severe. Although Daconil Ultrex was applied twice prior to treatment initiation, active signs of the pathogen were present when treatments were applied on 22 Jun. On 28 Jun (approximately 6 days after treatment; DAT), plots treated with QP Ipro 2SE (2.0 fl oz), QP Ipro 2SE (4.0 fl oz) + Disarm (0.36 fl oz), and Heritage TL (2.0 fl oz) + Daconil Ultrex (5.0 oz) had the lowest number of infection centers (DSIC) (2 to 6 per plot; Table 1). In addition to the aforementioned fungicides, plots treated with QP Ipro 2SE (4.0 fl oz), QP Myclobutanil + Disarm (both rates), and QP T-Methyl (2.0 fl oz) + Disarm (0.36 fl oz) all had fewer DSIC when compared to the untreated control plots.

Treatments were continued on a 14-d interval and when treatments were rated on 16 Jul (9 DAT), excellent (< 0.5%) to complete suppression of dollar spot was achieved within plots treated with QP Ipro 2SE (4.0 fl oz), QP Ipro 2SE + Disarm (both rates), and Heritage TL + Daconil Ultrex (Table 2). The aforementioned treatments provided the greatest suppression of dollar spot for up to 10 days after the

final application. During the study, all treatments reduced dollar spot when compared to the untreated control except for QP T-Methyl (both rates). However, only moderate to poor suppression of dollar spot occurred within plots treated with Disarm (both rates, QP Myclobutanil (both rates). A slight improvement in disease suppression was achieved when Disarm + Myclobutanil were applied together.

DISCUSSION

Results from this study suggest that applications of the tested fungicides could provide moderate to good levels of curative dollar spot suppression. The most effective curative suppression was achieved in plots treated with QP Ipro or Daconil Ultrex. Once disease suppression was achieved, these fungicides continued to provide good to excellent disease suppression during the study period. Based on the data from this study, it appears that resistance to thiophanate-methyl and some level of insensitivity to the DMI fungicide myclobutanil may be present at the site. However, the tank-mix of QP-Myclobutanil + Disarm did reduce disease severity on a few rating dates when compared with disease within plots treated with each fungicide individually.

Future research should look to assess the potential tank-mix partners for fungicides used to control dollar spot and other diseases over the course of a season. Programmatic approaches to disease management are becoming increasingly popular due to their effectiveness against a wide array of turf diseases and their potential ability to reduce or delay pathogen resistance. The apparent resistance and insensitivity of fungicides at this study site may provide an excellent opportunity to evaluate the suppression of multiple diseases with fungicide programs throughout the season. This assessment may provide some insight to golf course managers dealing with known cases of DMI and/or benzimidazole resistance at their golf course.

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Table 1. Dollar spot incidence on a creeping bentgrass putting green following the application of various fungicides, 2010.

Treatment and rate per 1000 sq ft ^y	Dollar spot infection centers ^z	
	8 Jun	28 Jun
1 Disarm 0.18 fl oz.....	94 a ^x	19 a-e
2 Disarm 0.36 fl oz	75 a	29 a-d
3 QP Ipro 2SE 2.0 fl oz.....	52 a	6 e
4 QP Ipro 2SE 4.0 fl oz.....	54 a	8 de
5 QP Myclobutanil 0.5 fl oz.....	83 a	15 a-e
6 QP Myclobutanil 1.0 fl oz.....	62 a	13 b-e
7 QP T-Methyl 1.0 fl oz.....	63 a	37 a
8 QP T-Methyl 2.0 fl oz.....	56 a	23 a-e
9 QP Ipro 2SE 2.0 fl oz + Disarm 0.18 fl oz	50 a	19 a-e
10 QP Ipro 2SE 4.0 fl oz + Disarm 0.36 fl oz	64 a	5 e
11 QP Myclobutanil 0.5 fl oz + Disarm 0.18 fl oz	51 a	12 cde
12 QP Myclobutanil 1.0 fl oz + Disarm 0.36 fl oz	96 a	12 cde
13 QP T-Methyl 1.0 fl oz + Disarm 0.18 fl oz	69 a	31 abc
14 QP T-Methyl 2.0 fl oz + Disarm 0.36 fl oz	63 a	8 de
15 Heritage TL 2.0 fl oz + Daconil Ultrex 5.0 oz.....	52 a	2 e
16 Untreated.....	49 a	35 ab

^z Dollar spot was rated by counting the number of infection centers per plot.

^y Treatments were applied on 22 Jun, 7 and 20 Jul, and 3 Aug.

^x Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ level according to the Fisher's protected least significant difference t-test.

Table 2. Dollar spot severity on a creeping bentgrass putting green following the application of various fungicides, 2010.

Treatment and rate per 1000 sq ft ^y	Percent dollar spot ^z				
	16 Jul	28 Jul	13 Aug	26 Aug	8 Sep
1 Disarm 0.18 fl oz	3.5 cde ^x	8.5 b	16.5 b	45.0 b	36.5 bc
2 Disarm 0.36 fl oz	2.3 def	4.3 bcd	9.8 cd	24.3 cde	18.5 e
3 QP Ipro 2SE 2.0 fl oz	0.9 ef	1.0 cd	0.4 fg	11.3 fgh	13.0 ef
4 QP Ipro 2SE 4.0 fl oz	0.2 f	0.0 d	0.0 g	6.0 gh	8.3 fg
5 QP Myclobutanil 0.5 fl oz	3.5 cde	6.8 bc	12.5 bc	35.5 bc	29.5 cd
6 QP Myclobutanil 1.0 fl oz	1.8 def	4.5 bcd	8.0 cde	22.0 def	20.0 de
7 QP T-Methyl 1.0 fl oz	8.0 ab	17.3 a	28.5 a	58.5 a	46.5 ab
8 QP T-Methyl 2.0 fl oz	6.8 abc	19.0 a	34.0 a	65.0 a	42.0.ab
9 QP Ipro 2SE 2.0 fl oz + Disarm 0.18 fl oz.....	0.1 f	0.0 d	0.0 g	3.5 gh	6.5 fg
10 QP Ipro 2SE 4.0 fl oz + Disarm 0.36 fl oz.....	0.0 f	0.0 d	0.0 g	1.6 h	1.8 g
11 QP Myclobutanil 0.5 fl oz + Disarm 0.18 fl oz....	0.6 ef	1.0 cd	3.3 efg	15.0 efg	14.5 ef
12 QP Myclobutanil 1.0 fl oz + Disarm 0.36 fl oz....	0.5 ef	1.3 cd	1.1 fg	10.0 fgh	11.0 efg
13 QP T-Methyl 1.0 fl oz + Disarm 0.18 fl oz.....	5.0 bcd	6.3 bcd	10.8 bcd	28.0 cd	29.0 cd
14 QP T-Methyl 2.0 fl oz + Disarm 0.36 fl oz.....	0.9 ef	2.3 bcd	6.3 def	15.3 efg	13.0 ef
15 Heritage TL 2.0 fl oz + Daconil Ultrex 5.0 oz	0.0 f	0.0 d	0.0 g	1.2 h	2.1 g
16 Untreated	8.6 a	21.0 a	34.0 a	64.0 a	47.5 a

^z Dollar spot was rated by visually assessing the percent disease on a 0 to 100 scale where 0 = no disease symptoms present and 100 = entire plot area affected by dollar spot.

^y Treatments were applied on 22 Jun, 7 and 20 Jul, and 3 Aug.

^x Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ level according to the Fisher's protected least significant difference t-test.

Table 3. Overall turfgrass quality of a creeping bentgrass putting green following the application of various fungicides, 2010.

Treatment and rate per 1000 sq ft ^y	Quality (1-9) ^z				
	8 Jun	28 Jun	16 Jul	28 Jul	13 Aug
1 Disarm 0.18 fl oz	7.5 a ^x	8.0 a	7.5 bcd	7.0 a	5.0 g
2 Disarm 0.36 fl oz	7.5 a	7.3 a	7.5 bcd	7.8 a	5.5 efg
3 QP Ipro 2SE 2.0 fl oz	7.5 a	8.0 a	8.0 ab	7.5 a	7.5 bc
4 QP Ipro 2SE 4.0 fl oz	7.8 a	8.0 a	8.0 ab	8.0 a	8.0 ab
5 QP Myclobutanil 0.5 fl oz	7.8 a	7.3 a	7.0 cde	6.8 a	5.0 g
6 QP Myclobutanil 1.0 fl oz	7.8 a	7.5 a	7.8 abc	6.8 a	5.5 efg
7 QP T-Methyl 1.0 fl oz	7.5 a	7.8 a	6.5 e	7.0 a	4.0 h
8 QP T-Methyl 2.0 fl oz	7.5 a	7.5 a	7.0 cde	7.0 a	4.0 h
9 QP Ipro 2SE 2.0 fl oz + Disarm 0.18 fl oz.....	7.5 a	7.0 a	8.0 ab	7.8 a	7.5 bc
10 QP Ipro 2SE 4.0 fl oz + Disarm 0.36 fl oz.....	7.5 a	7.3 a	7.8 abc	7.3 a	7.3 bc
11 QP Myclobutanil 0.5 fl oz + Disarm 0.18 fl oz.....	7.5 a	7.5 a	7.0 cde	7.0 a	6.0 def
12 QP Myclobutanil 1.0 fl oz + Disarm 0.36 fl oz.....	7.5 a	7.3 a	8.3 ab	6.8 a	6.8 cd
13 QP T-Methyl 1.0 fl oz + Disarm 0.18 fl oz.....	7.5 a	7.3 a	6.8 de	7.0 a	5.3 efg
14 QP T-Methyl 2.0 fl oz + Disarm 0.36 fl oz.....	7.8 a	8.0 a	7.8 abc	7.5 a	6.3 de
15 Heritage TL 2.0 fl oz + Daconil Ultrex 5.0 oz.....	7.5 a	7.8 a	8.5 a	8.5 a	8.5 a
16 Untreated	7.5 a	8.0 a	7.0 cde	7.0 a	3.8 h

^z Creeping bentgrass quality was rated on a 1 to 9 scale where 1 = entire plot area brown or dead; 7 = minimum acceptable quality for a golf course putting green; and 9 = optimum greenness and density.

^y Treatments were applied on 22 Jun, 6 Jul and 20 Jul, and 3 Aug.

^x Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ level according to the Fisher's protected least significant difference t-test.