

Influence of fungicides on the curative and preventive suppression of select diseases of golf course putting greens, 2009-2010

J.E. Kaminski and T. Lulis

Department of Crop and Soil Science
The Pennsylvania State University, University Park

INTRODUCTION

Golf course putting greens may be affected by various turfgrass pests. Fungicide applications are often necessary on either a preventive or curative basis and may target more than one disease. The initial objective of this trial was to assess the ability of various fungicides to provide curative suppression of Type II fairy ring symptoms on a creeping bentgrass (*Agrostis stolonifera*) putting green. During the trial data was collected on two other turfgrass diseases that developed naturally in the study area. Additional disease data was collected on dollar spot and red leaf spot which are caused by the pathogens *Sclerotinia homoeocarpa* and *Dreschlera erythrospila*, respectively. The study was initiated in August 2009 and treatments were continued at various timings until 2010.

MATERIALS & METHODS

This study was initiated at the Valentine Turfgrass Research Center located in University Park, PA. Turf was grown on a sand-based soil with a pH of 7.8 and 0.27% organic matter. Turfgrass used for the fungicide evaluation was predominantly a stand of 'Penncross' creeping bentgrass (*Agrostis stolonifera*) with approximately 10% to 15% annual bluegrass (*Poa annua*). The area was maintained as a bentgrass green and mowed six days 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, and calibrated to deliver 2.0 gal water per 1000 ft². Treatments were initiated on 25 Aug and 15 Sept 2009 and again on 8 and 29 July in 2010. All treatments and application dates are listed in the data tables.

Plots measured 5 ft x 5 ft and were arranged in a randomized complete block with four replications. Plots were visually rated percent disease, including ratings for fairy ring, dollar spot and red leaf spot. All diseases were rated by visually assessing the percent plot area affected by the pathogen on a 0 to 100% scale.

RESULTS

Fairy ring. Fairy ring symptoms were present when applications were first applied on 25 Aug 2009 (Table 1). Initial disease ratings on 24 Aug revealed an even distribution of symptoms throughout the study site with an average of 13 to 27% Type II symptoms present. When plots were rated prior to the second application of the fungicides (15 Sept), all fairy ring symptoms had subsided. In 2010, treatments were once again applied despite the lack of presence of fairy ring symptoms. Disease symptoms did not reappear throughout the study.

Red leaf spot. Red leaf spot is a fairly uncommon disease on creeping bentgrass putting greens, but the study site routinely is infested with this pathogen. Disease symptoms were not present at the time of the initial applications, but developed naturally within the site in early Sept. Symptoms of red leaf spot were considered severe and a total of 32% of the plot area was affected by the disease in the untreated control plots (Table 2). Excellent suppression ($\leq 1.0\%$) was achieved within plots treated with A9898A, QP-myclobutanil (alone or tank-mixed with Heritage), Heritage (alone or tank-mixed with Revolution), and Insignia. Statistically similar levels of control were also observed within plots treated with Disarm (alone or tank-mixed with Revolution), and Emerald. Plots treated with Triton FLO, ProStar, ProStar + Revolution, and Revolution alone did not suppress disease symptoms when compared to the untreated control.

Dollar spot. Dollar spot symptoms developed in both years. Despite applications on 25 Aug 2009, disease symptoms were severe within three weeks and percent plot area affected by *S. homoeocarpa* ranged from 3.0 to 8.7% (Table 3). No differences among treatments were observed on this rating date and no other ratings were made in 2009. In 2010, disease symptoms developed during the study and severe symptoms appeared on 16 Aug. When plots were rated on 20 Aug, the untreated control plots had an average of 23% dollar spot. The greatest level of suppression ($\leq 1.0\%$) was observed within plots treated with either QP Myclobutinol + Heritage and Emerald. There were no differences in percent dollar spot from the aforementioned treatments and those plots treated with A9898A, QP Myclobutanil, Insignia, Triton FLO (both rates), Heritage + Revolution, and Disarm + Revolution. Plots treated with ProStar, ProStar + Revolution, and Revolution alone provided no dollar spot suppression when compared to the untreated control.

DISCUSSION

Fairy ring fungicide evaluations are difficult to perform due to the elusive nature of the symptoms in the field. Although fairy ring was present when the trial was initiated, all symptoms disappeared regardless of treatment in the study area shortly after treatments were applied. Subsequent treatments were applied in 2010 in an attempt to evaluate fairy ring control on a preventive basis, but symptoms did not recur. Despite this, data was obtained for a red leaf spot and dollar spot. Red leaf spot is a relatively poorly studied pathogen and disease control information is limited. Based on the results of this study, fungicides within the QoI chemical class performed good to excellent for the control of this disease. Mixed results were obtained from the sterol inhibiting class of chemistry. Data from this study indicate that myclobutanil is a highly effective active ingredient for suppressing red leaf spot. On the other hand, poor control was observed within plots treated with Triton FLO (triticonazole). Emerald, which is effective against a limited range of pathogens, provided moderate suppression of this disease. Dollar spot was suppressed by several fungicides including some from the QoI chemical class. Emerald and QP myclobutanil + Heritage provided the greatest level of suppression. The QoI fungicides are typically known to provide only moderate suppression of dollar spot whereas fungicides within the sterol inhibiting class (myclobutanil and triticonazole) generally provide excellent control. At the Valentine Turfgrass Research Facility, dollar spot exhibits reduced sensitivity to the sterol inhibiting class of fungicides. In this study, few differences existing among these products, but it appeared that the tank mix of QP-Myclobutanil and Heritage improved dollar spot suppression.

Future work should continue to evaluate the efficacy of these products for their ability to suppress various diseases. The prevalence of red leaf spot at the study site also makes this an excellent location for future comparison of different chemical classes for the control of red leaf spot. The unusual findings regarding the tank-mix of the sterol-inhibiting fungicide with a fungicide from the QoI class is worth investigating further, particularly in situations where reduced sensitivity has been documented.

ACKNOWLEDGEMENTS

We thank David Livingston and the staff at the Valentine Turfgrass Research Facility for assisting in the maintenance of the research plots. This research was funded in part by Bayer Environmental Science, Quali-Pro and Syngenta.

Table 1. Percent plot area affected by Type II fairy ring on a creeping bentgrass putting green following treatment with various fungicides.

Treatment and rate per 1000 sq ft ^y	Fairy ring (%) ^z	
	24 Aug 2009	15 Sept 2010
A9898A 1.3 fl oz	27 a ^x	0 a
QP-Myclobutanil 2.4 fl oz	22 a	0 a
Heritage 2.0 fl oz	13 a	0 a
QP-Myclobutanil 2.4 fl oz + Heritage 2.0 fl oz...	14 a	0 a
Disarm 0.36 fl oz.....	21 a	0 a
Insignia 0.9 oz	16 a	0 a
Triton FLO 0.5 fl oz.....	23 a	0 a
Triton FLO 1.0 fl oz.....	13 a	0 a
Emerald 0.18 oz	21 a	0 a
ProStar 2.2 oz.....	16 a	0 a
ProStar 4.5 oz.....	23 a	0 a
Heritage 2.0 fl oz + Revolution 6.0 fl oz	17 a	0 a
Disarm 0.36 fl oz + Revolution 6.0 fl oz.....	21 a	0 a
ProStar 2.2 oz + Revolution 6.0 fl oz.....	23 a	0 a
Revolution 6.0 fl oz.....	17 a	0 a
Untreated control	20 a	0 a

^z Percent plot area affected by fairy ring was visually rated on a 0 to 100% scale where 0 = no disease symptoms were present and 100% = entire plot area exhibiting fairy ring symptoms.

^y Treatments were applied on 25 Aug and 15 Sept 2009 and on 8 and 29 July in 2010.

^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. Percent plot area affected by red leaf spot (*Dreschlera erythrospila*) on a creeping bentgrass putting green following treatment with various fungicides.

Treatment and rate per 1000 sq ft ^y	Red leaf spot (%) ^z
	15 Sept 2009
A9898A 1.3 fl oz	0.2 ^x
QP-Myclobutanil 2.4 fl oz	0.0 d
Heritage 2.0 fl oz	0.3 d
QP-Myclobutanil 2.4 fl oz + Heritage 2.0 fl oz...	0.0 d
Disarm 0.36 fl oz.....	4.7 d
Insignia 0.9 oz	0.3 d
Triton FLO 0.5 fl oz.....	24.7 abc
Triton FLO 1.0 fl oz.....	16.7 bcd
Emerald 0.18 oz	9.7 cd
ProStar 2.2 oz.....	31.3 ab
ProStar 4.5 oz.....	27.3 ab
Heritage 2.0 fl oz + Revolution 6.0 fl oz	0.0 d
Disarm 0.36 fl oz + Revolution 6.0 fl oz.....	4.0 d
ProStar 2.2 oz + Revolution 6.0 fl oz.....	22.0 bc
Revolution 6.0 fl oz.....	39.0 a
Untreated control	32.0 ab

^z Percent plot area affected by red leaf spot was visually rated on a 0 to 100% scale where 0 = no disease symptoms were present and 100% = entire plot area exhibiting red leaf spot symptoms.

^y Treatments were applied on 25 Aug and 15 Sept 2009 and on 8 and 29 July in 2010.

^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. Percent plot area affected by dollar spot (*Sclerotinia homoeocarpa*) on a creeping bentgrass putting green following treatment with various fungicides.

Treatment and rate per 1000 sq ft ^y	Dollar spot (%) ^z	
	15 Sept 2009	20 Aug 2010
A9898A 1.3 fl oz	8.0 a ^x	3.3 gh
QP-Myclobutanil 2.4 fl oz	4.7 a	7.0 e-h
Heritage 2.0 fl oz	4.0 a	12.7 b-f
QP-Myclobutanil 2.4 fl oz + Heritage 2.0 fl oz...	4.3 a	0.5 h
Disarm 0.36 fl oz.....	5.3 a	13.7 b-e
Insignia 0.9 oz	3.7 a	7.7 d-h
Triton FLO 0.5 fl oz.....	6.7 a	10.0 c-g
Triton FLO 1.0 fl oz.....	5.3 a	8.7 d-h
Emerald 0.18 oz	3.0 a	0.1 h
ProStar 2.2 oz.....	7.0 a	21.3 ab
ProStar 4.5 oz.....	8.7 a	21.3 ab
Heritage 2.0 fl oz + Revolution 6.0 fl oz	3.0 a	3.7 fgh
Disarm 0.36 fl oz + Revolution 6.0 fl oz.....	5.3 a	8.3 d-h
ProStar 2.2 oz + Revolution 6.0 fl oz.....	7.7 a	18.7 abc
Revolution 6.0 fl oz.....	7.3 a	16.7 a-d
Untreated control	7.3 a	23.3 a

^z Percent plot area affected by dollar spot was visually rated on a 0 to 100% scale where 0 = no dollar spot symptoms were present and 100% = entire plot area exhibiting dollar spot symptoms.

^y Treatments were applied on 25 Aug and 15 Sept 2009 and on 8 and 29 July in 2010.

^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.