

Research You Can Use

Dollar Spot Control

Treatment of this disease in creeping bentgrass fairway turf as influenced by fungicide spray volume and application timing.

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Dollar spot continues to be a difficult disease to control in creeping bentgrass fairways in many regions. Chlorothalonil is a contact fungicide that remains on plant surfaces and is perhaps the most common chemical used on turf for disease control. Furthermore, this fungicide is highly valued in disease resistance management programs, and methods for improving its performance need to be investigated. There have been no reported cases of pathogen resistance to chlorothalonil, but there have been resistance problems with other fungicides used to control turfgrass diseases.^{4,6} Propiconazole, commonly used to control dollar spot (DS), penetrates tissues and therefore generally provides a longer period of control than chlorothalonil.

Due to playability issues, pesticide exposure, and demands from golfers, superintendents normally make pesticide applications early in the morning. The effect of the presence of dew at the time a fungicide is applied is unknown. Furthermore, there has been little study on the impact of spray volume (SV) or water carrier volume on fungicide performance. Couch² evaluated chlorothalonil and triadimefon in SVs ranging from 0.5 to 32 gallons of water per 1,000 sq. ft. (gal/1,000ft²) for DS control in creeping bentgrass. He observed that chlorothalonil performed best at 1 gal/1,000ft², while triadimefon performed best when applied at 2 gal/1,000ft². Other researchers,^{1,6} however, reported that there were no differences in the level of DS control among SVs (0.5,



Dollar spot is characterized by circular spots one to two inches in diameter. This disease is difficult to control in creeping bentgrass turf.

1.0, 2, and 4 gal/1,000ft²) with chlorothalonil, triadimefon, or iprodione.

Due to conflicting research results and varying SVs and/or methods of application, further study is needed to evaluate the importance of SV as well as the presence or absence of dew on the ability of fungicides to control DS. For logistical reasons, superintendents would prefer to utilize lower rather than higher SVs. Hence, an important aspect of this study was to determine if the level of DS control would be diminished if a lower rather than higher SV were utilized. The purpose of this study was to investigate the efficacy of a contact (chlorothalonil) and a penetrant (propiconazole) fungicide for their ability to control DS as influenced by SV (1.1 and 2.5 gal/1,000ft²) and by the presence or

absence of dew (AM dew present or displaced, and PM dry turf).

EVALUATING SPRAY VOLUME AND APPLICATION TIMING ON DOLLAR SPOT CONTROL

Field studies were conducted from 2002 to 2004 at the University of Maryland in creeping bentgrass maintained as fairway turf. Treatments were applied with a CO₂ pressurized sprayer (35 psi) equipped with either an 8004 (1.1 gal/1,000ft², low SV) or 8010 (2.5 gal/1,000ft², high SV) flat fan nozzle. A reapplication threshold was subjectively established at 8 to 10 infection centers (ICs) or 0.5% plot area blighted (% PAB). In all years, AM treatments were applied at 8 AM and PM treatments were applied to a dry canopy.

Table 1
Number of *Sclerotinia homoeocarpa* infection centers as affected by chlorothalonil application timing and spray volume, 2002.

Timing [†]	Spray Volume (gallons per 1,000ft ²)	Infection Centers Plot ⁻¹		
		28 June	1 August	7 August
AM	1.1	3.8 bc [‡]	0.0 c	15.8 d
AM	2.5	11.5 b	3.5 b	45.8 b
PM	1.1	2.0 c	0.3 c	19.8 cd
PM	2.5	10.0 b	3.5 b	33.5 bc
—	Untreated Control	26.0 a	117.8 a	116.5 a

[†]Chlorothalonil was applied on 20 June and 21 July 2002.

[‡]Means in the same column followed by the same letter are not significantly different.

In 2003 and 2004, dew was displaced using the reverse side of an aluminum rake immediately before treatments were applied.

SITE DESCRIPTIONS AND TREATMENTS

L-93, Crenshaw, and Southshore creeping bentgrass were used in 2002, 2003, and 2004, respectively. In 2002, fungicide treatments were as follows: chlorothalonil alone (Daconil Ultrex WDG 82.5, Syngenta Crop Protection, Greensboro, N.C.) applied at 3.2 oz. product/1,000 ft² in the AM in the low dilution (1.1 gal/1,000ft², low SV)

or the high dilution (2.5 gal/1,000ft², high SV), and again to separate plots in the PM on the same day. There were two application timings (AM and PM) in 2002 and no “dew displaced” treatment. In 2003 and 2004, fungicide treatments were as follows: chlorothalonil alone, propiconazole alone (Banner MAXX 1.3 MC, Syngenta Crop Protection, Greensboro, N.C.), and a tank-mix combination of chlorothalonil and propiconazole were each applied in the AM with “dew present,” AM with “dew displaced,” and in the PM with the canopy dry. In 2003 and 2004, the chlorothalonil rate was 1.8

fl. oz. product/1,000ft². In 2003, the propiconazole rate was 1.0 fl. oz. product/1,000ft²; however, in 2004 it was reduced to 0.5 fl. oz. product/1,000ft², regardless of being applied alone or tank mixed.

Ratings were obtained by counting the number of dollar spot (*S. homoeocarpa*) ICs/plot or by estimating the % PAB once ICs coalesced. Percent of plot area blighted was assessed visually on a 0-to-100 scale with 0 = no DS and 100 = entire plot area blighted. Data were analyzed using several statistical methods as described by McDonald et al.³ In 2003 and 2004, preplanned contrasts were used to separate treatments of interest and are shown in Tables 2 and 3. A preplanned contrast is a statistical test that compares individual or groups of treatments against each other and can amplify differences that may exist between specific treatments. Area under disease progress curve (AUDPC) data were used to compare fungicide treatments during each of the three study periods. An AUDPC value provides a single value that expresses disease level over a defined period.

Table 2
Contrasts among spray volume, application timing, and fungicide treatments and their effect on dollar spot control, 2003.

Date	Contrast				
	Chlorothalonil 1.1 vs. 2.5 pgm ^x	Chlorothalonil AM dew present vs. AM dew displaced ^x	Chlorothalonil AM dew present vs. PM ^x	Chlorothalonil AM dew displaced vs. PM ^x	Propiconazole vs. Tank mix ^y
11 August	** ^z	NS	*	*	NS
13 August	NS	NS	NS	*	*
16 August	**	NS	NS	NS	***
18 August	NS	NS	NS	NS	***
7 September	***	NS	**	**	*
10 September	***	NS	**	*	*
12 September	***	NS	**	*	***
29 September	**	NS	**	**	NS
1 October	**	NS	**	**	NS
AUDPC	***	NS	***	***	**

^xChlorothalonil-alone treatments were applied on 23 July and 7 and 23 August 2003.

^yPropiconazole alone and tank mix were applied on 23 July and 19 August 2003.

^z*, **, ***, and NS refer to the 0.05, 0.01, 0.001 significance levels and non-significant, respectively.

Table 3
Contrasts among spray volume, application timing, and fungicide treatments and their effect on dollar spot control, 2004.

Date	Contrast				
	Chlorothalonil 1.1 vs. 2.5 pgm ^x	Chlorothalonil AM dew present vs. AM dew displaced ^x	Chlorothalonil AM dew present vs. PM ^x	Chlorothalonil AM dew displaced vs. PM ^x	Propiconazole vs. Tank mix ^y
2 June	^z NS	**	***	*	NS
3 June	NS	NS	**	NS	NS
8 June	NS	NS	*	NS	*
11 June	NS	NS	*	NS	*
13 June	*	NS	NS	NS	NS
15 June	***	NS	NS	NS	*
17 June	**	NS	NS	NS	NS
22 June	NS	*	**	NS	***
25 June	*	NS	**	NS	**
30 June	*	**	**	NS	***
2 July	NS	*	**	NS	***
7 July	**	NS	NS	NS	***
9 July	*	*	NS	NS	***
12 July	*	NS	NS	NS	**
16 July	***	NS	NS	NS	***
AUDPC	**	*	**	NS	***

^xChlorothalonil-alone treatments were applied on 12 May, 4 and 23 June 2004.

^yPropiconazole alone and tank mix were applied on 12 May and 18 June 2004.

^z*, **, ***, and NS refer to the 0.05, 0.01, 0.001 significance levels and non-significant, respectively.

THE INFLUENCE OF SPRAY VOLUME AND APPLICATION TIMING ON DOLLAR SPOT CONTROL

2002: Eight days after the initial fungicide application (28 June), all treatments significantly reduced DS levels when compared to the untreated control (Table 1). At this time, the PM application of chlorothalonil in the low SV provided better DS suppression (2 ICs) than both treatments applied in the high SV (10 to 12 ICs). Furthermore, on 29 July chlorothalonil applied in the low SV provided better DS control (2 to 4 ICs) versus those applied in the high SV (6 to 10 ICs). By 1 August, plots treated with chlorothalonil in the low SV and both timings had lower levels of DS (0.0 and 0.3 ICs), when compared to treatments applied in the high SV (3.5 ICs) and the untreated control (118 ICs).

2003: In 2003, dollar spot peaked on 16 August, at which time 7.9% PAB was observed in untreated plots. On 16 August, the SV contrast data showed that chlorothalonil applied in the low SV (0.1% PAB) gave better DS control when compared to plots treated with the high SV (0.2% PAB, Table 2). From that point on, the SV contrast data revealed that chlorothalonil applied in low SV provided better DS control when compared to treatments applied in the high SV (Table 2). Contrasts for the AUDPC values also showed that chlorothalonil alone provided better DS control when applied in the PM and in the low SV when compared to AM applications with dew present or displaced or in the high SV. Contrasts for data collected on 11 and 13 August and from 7 September to 1 October showed that chlorothalonil applied in the PM provided

better DS control when compared to AM applications with the dew displaced.

When comparing propiconazole-alone treatments among themselves, few differences were observed throughout 2003. However, the contrast statements showed that the tank mix provided better DS control than propiconazole alone on 9 of the 21 rating dates (Table 2, all data not shown).

2004: On 9 of 18 rating dates in 2004, chlorothalonil applied in the low SV provided better DS control when compared to treatments applied in the high SV. Data from early June 2004 showed that plots treated with chlorothalonil in the PM (1.9 ICs) had less DS when compared to plots treated with chlorothalonil in the AM with dew displaced (4.7 ICs). On 5 of 18 rating dates, chlorothalonil provided better DS control when applied in the

AM with the dew displaced when compared to the AM application with the dew present. Also, on 8 of 18 rating dates, chlorothalonil provided better DS control when applied in the PM when compared to AM treatments with the dew present.

No differences were observed on any 2004 rating date when propiconazole or tank-mix treatments were compared to themselves. However, the tank mix provided better dollar spot control than propiconazole alone on 11 of 18 rating dates.

SUMMARY AND RECOMMENDATIONS

On 25 of 46 dates over the three years, chlorothalonil applied alone provided better DS control when applied in 1.1 versus 2.5 gal/1,000ft². There were no dates in any year when the higher SV provided better DS control versus the low SV. Couch² previously reported

that chlorothalonil provided better DS control using a similar SV (1.0 gal/1,000ft²) when compared to higher SVs (≥ 2.0 gal/1,000ft²). Applying chlorothalonil to a dry canopy in the PM generally increased efficacy when compared to both AM treatments.

In 2003, there were no DS differences on any rating date between AM dew present and displaced treatments using chlorothalonil. On 5 of 16 rating dates in 2004, however, chlorothalonil applied in the AM with the dew displaced resulted in better DS control when compared to AM applications with the dew present. While there was no consistent benefit provided by displacing dew between years, 2004 data suggest that displacing dew can be beneficial when using chlorothalonil alone. Morning (8 AM) dew measurements were obtained on four days between 4 June and 22 August in 2003 and 2004 using the method described

by Williams et al.⁷ Dew levels ranged from 2.2 to 5.9 gal/1,000ft², with a mean of 4.3 gal/1,000ft². It is possible that significant amounts of chlorothalonil did not adhere to the foliage when it was applied in the higher SV or in the presence of dew.

No differences were observed in the level of DS control in either year among dew and SV treatments using propiconazole alone and propiconazole + chlorothalonil. Evidently, SV and the presence of dew did not affect the ability of effective levels of propiconazole to penetrate plants rapidly and move upwards. The tank mix, however, provided better and extended levels of DS control on 29 of 39 rating dates when compared to propiconazole alone. Previous research has shown that chlorothalonil tank mixed with a penetrant can improve the level of DS control when compared to either fungicide applied alone.^{4,5}



Control applications need to be timed to work both with the best timing for control of the disease as well as with the golf play schedule.



Field studies were conducted at the University of Maryland to investigate the ability of contact and penetrant fungicides to control dollar spot. The treatments included variations in spray volume and application timing.

Data showed that golf course superintendents can effectively use a 1.1 gal/1,000ft² SV for targeting DS in fairway-height turf with the fungicides evaluated. These results pertain only to preventive DS control programs in creeping bentgrass fairways with chlorothalonil and propiconazole. Applying fungicides in higher dilution may be more beneficial when targeting root pathogens or in curative programs for foliar diseases.

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