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Water volume doesn't matter...or does it?

Research examines the effect of different water carrier volumes on fungicide efficacy for dollar spot control.

As a turfgrass pathology PhD student under Dr. Jim Kerns, I study virtually all aspects of dollar spot, from where the pathogen is coming from to how it infects its hosts, and even the molecular mechanisms governing host resistance. This summer, we added another project to my research: evaluating the effect of different water carrier volumes on fungicide efficacy for dollar spot control. This has become an increasingly popular subject in recent years because many view carrier volume as a variable that can be manipulated to optimize disease control. With the many issues complicating dollar spot management, getting the most out of available fungicides is no trivial matter.

Editor's Note

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Our goal with this study is to determine if altering carrier volume enhances the efficacy or expands the duration of dollar spot suppression provided by Chipco26GT and two relative newcomers to the market, Secure and Daconil Action.

THE STUDY. This study commenced this past summer and was performed on a creeping bentgrass (cultivar 'Alpha') fairway maintained at a height of 0.5 inches at the O.J. Noer Turfgrass Research Center. All possible combinations of four water carrier volumes and six fungicide regimes were utilized as treatments and were replicated four times in a randomized complete block design (Table 1). An initial spray was put out on June 14, 2012, at which time no active dollar spot infection centers were present. Dollar spot severity ratings were made weekly by counting the number of active infection centers present in each plot.

Fungicide reapplications were made based on a 1% spray threshold; thus, when infection centers covered greater than 1% of the area in a single plot, the treatment in that plot was reapplied to all four replicate plots for the treatment. This allowed us to determine not just fungicide efficacy, but also differences in duration of control for our different treatment regimes. Based on our 1% threshold, two reapplications were made for treatments 5 and 20, but only one reapplication was needed for all other treatments (Table 1). At the end of the trial, severity data was con-

Table 1. Treatments for trial on the effects of carrier volume for dollar spot control

Treatment	Fungicide(s)	Carrier Volume (gal/1000ft²)	Rate
1	Nontreated control	0.5	
2	Nontreated control	1.0	
3	Nontreated control	1.5	
4	Nontreated control	2.0	
5	Daconil Action	0.5	2 FL OZ/1000FT²
6	Daconil Action	1.0	2 FL OZ/1000FT²
7	Daconil Action	1.5	2 FL OZ/1000FT²
8	Daconil Action	2.0	2 FL OZ/1000FT²
9	Chipco26GT	0.5	4 FL OZ/1000FT²
10	Chipco26GT	1.0	4 FL OZ/1000FT²
11	Chipco26GT	1.5	4 FL OZ/1000FT²
12	Chipco26GT	2.0	4 FL OZ/1000FT²
13	Secure	0.5	0.96 FL OZ/1000FT²
14	Secure	1.0	0.96 FL OZ/1000FT²
15	Secure	1.5	0.96 FL OZ/1000FT²
16	Secure	2.0	0.96 FL OZ/1000FT²
17	Daconil Action Chipco26GT	0.5	2 FL OZ/1000FT² 4 FL OZ/1000FT²
18	Daconil Action Chipco26GT	1.0	2 FL OZ/1000FT² 4 FL OZ/1000FT²
19	Daconil Action Chipco26GT	1.5	2 FL OZ/1000FT² 4 FL OZ/1000FT²
20	Daconil Action Chipco26GT	2.0	2 FL OZ/1000FT² 4 FL OZ/1000FT²
21	Daconil Action Secure	0.5	2 FL OZ/1000FT² 0.96 FL OZ/1000FT²
22	Daconil Action Secure	1.0	2 FL OZ/1000FT² 0.96 FL OZ/1000FT²
23	Daconil Action Secure	1.5	2 FL OZ/1000FT² 0.96 FL OZ/1000FT²
24	Daconil Action Secure	2.0	2 FL OZ/1000FT² 0.96 FL OZ/1000FT²

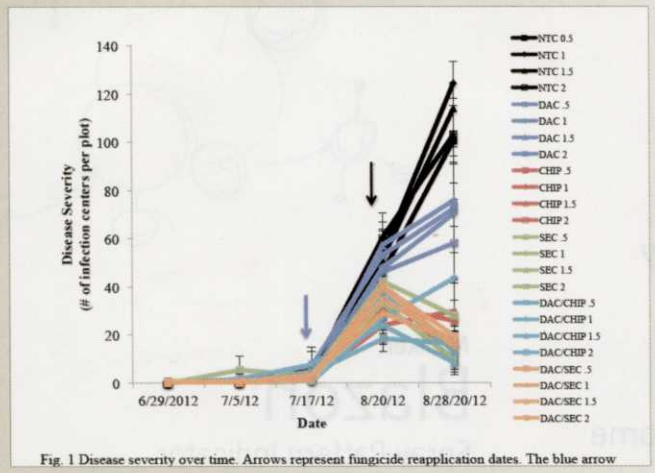

Fig. 1 Disease severity over time. Arrows represent fungicide reapplication dates. The blue arrow

Fig. 1. Disease severity over time. Arrows represent fungicide reapplication dates. The blue arrow represents reapplication of treatments 5 and 20 only. The black arrow represents reapplication of all fungicide treatments.

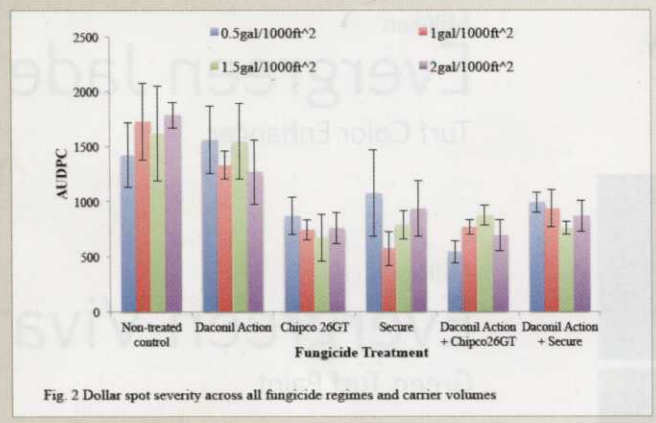

Fig. 2 Dollar spot severity across all fungicide regimes and carrier volumes

Fig. 2. Dollar spot severity across all fungicide regimes and carrier volumes

verted to area under the disease progress curve (AUDPC), which gives a single value for disease progress over time, and means were separated using the Waller Duncan test. We looked for effects of fungicide treatment, carrier volume and interaction between fungicide treatment and carrier volume.

THE RESULTS. Unfortunately the hot dry conditions we experienced this summer were not particularly conducive for dollar spot and much of this trial went without significant symptom development (Fig. 1). Around mid-July, we experienced moderate disease pressure and this resulted in the extra reapplication mentioned before for treatments 5 and 20. Following this outbreak, another hot stretch limited disease development until mid-August. Conditions around this time were highly conducive for dollar spot and all the plots got hammered, resulting in reapplication of all treatments (Fig. 1).

Based on our disease severity over time, the combination of Daconil Action and Chipco26GT or Secure provided the best suppression of dollar spot (Table 2). All other treatments, with the exception of Daconil Action alone, provided disease suppression similar to that of the Daconil Action/Chipco26GT mix. Daconil Action by itself provided poor dollar spot control across all water volumes and its performance was not statistically different from that of the non-treated controls. This was not a surprise, as the hot, dry conditions in Madison this summer prevented application of the fungicide until it was likely too late to truly prevent dollar spot development. It does, however, reaffirm the need to mix different active ingredients when dollar spot development is extreme. This was evident from both Chipco26GT/Daconil Action and Secure/Daconil Action performing well in our trial. When applied alone, the newest fungicide in our treatment list, Secure, also performed reasonably well when compared to the non-treated control, though not as well as when applied in combination with Daconil Action.

In this year of the study, water carrier volume had very little effect across all of our fungicide treatments (Table 3). Consequently, no difference was detected for carrier volume or the interaction between fungicide regime and carrier volume. These results are reinforced by a comparison across all treatments and carrier volumes (Fig. 2). In general, those fungicide regimes that performed well did so across all carrier volumes and those fungicide regimes that did not perform so well also did so regardless of carrier volume.

SUMMARY. With a single year of data and less than ideal conditions for both dollar spot development and fungicide application, we are unable to make any conclusions about the influence of carrier volume on fungicide efficacy for dollar spot suppression. Though results from this year indicate a minimal influence of carrier volume, we may see a different trend next summer. Another year of data will improve our understanding of the role of carrier volume on dollar spot suppression. This will allow for the selection of carrier volumes that optimize the efficacy and longevity of fungicide applications for dollar spot management. **GCI**

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Table 2. Dollar spot severity over time as affected by fungicide

Treatment	AUDPC[1]
Nontreated Control	1638.4 a
Daconil Action	1427.1 a
Chipco26GT	884.4 b
Secure	859.0 b
Daconil Action Chipco26GT	758.4 b
Daconil Action Secure	715.5 b

[1]AUDPC values followed by the same letter do not differ significantly (Waller Duncan test, p=0.05)

Table 3. Dollar spot severity over time as affected by carrier volume

Carrier Volume	AUDPC[1]
0.5gal/100ft^2	1075.2 a
1.0gal/100ft^2	1048.3 a
1.5gal/100ft^2	1042.4 a
2.0gal/100ft^2	1029.8 a

[1]AUDPC values followed by the same letter do not differ significantly (Waller Duncan test, p=0.05)