

PHYTOTOXICITY ON AN ANNUAL BLUEGRASS PUTTING GREEN WITH VARIOUS SYNGENTA FUNGICIDES

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INTRODUCTION

An important factor in determining the suitability of fungicides used to control disease on golf course putting greens is the potential for phytotoxicity to desirable turfgrass species. For this reason, it is important to assess existing commercially available and experimental fungicides for their potential to injure turf. The objective of this research was to evaluate the injury potential of various Syngenta fungicides on an annual bluegrass putting green.

MATERIALS & METHODS

A one-year field study was initiated at the Valentine Turfgrass Research Center located in University Park, PA. Soil was a sandy loam with a pH of 7.1 and 2.6% organic matter. Annual bluegrass accounted for approximately 85% of the species within the study site when treatments were initiated on 8 Jul 2016, with creeping bentgrass (*Agrostis stolonifera*) accounting for the remaining 15%. All fungicide treatments were applied with a CO₂ pressurized (40 psi) sprayer equipped with an air-induction flat fan nozzle (TeeJet AI9508EVS) and calibrated to deliver 2.0 gal of water 1000 ft⁻². The area was mowed five days per week to a height of 0.110 in. Preventive fungicide applications were applied on a 14-day interval prior to the initiation of the trial using boscalid (0.18 oz 1000 ft⁻²) and tebuconazole (0.6 fl oz 1000 ft⁻²). No additional fungicides were applied after treatment initiation. Treatments were initiated on 8 Jul 2016 and reapplied according to the application schedule. All treatments are listed in the data tables.

Plots measured 3 ft x 6 ft and were arranged as a randomized complete block design with four replications. Injury was visually assessed on a 0 to 5 scale where 0 = no phytotoxicity and 5 = entire plot area injured by phytotoxicity. Turfgrass quality and



Figure 1. Phytotoxicity trial on a research putting green at the Joseph Valentine Turfgrass Research Center, 2016.

color were also visually assessed on a 1 to 9 scale where 1 = entire plot brown or dead and 9 = optimum greenness and/or 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 & DISCUSSION

Injury due to phytotoxicity was observed in several plots at various times during the duration of the trial. At no time during the trial was injury rated as unacceptable (≥ 3) and there were no significant differences among treatments when rated for injury (Table 1). Quality and color were acceptable (≥ 6) for all treatments on all rating dates and there were no significant differences among treatments on any rating date (Tables 1 and 2).

ACKNOWLEDGEMENTS

We thank Syngenta, the Pennsylvania Turfgrass Council, and the Joseph Valentine Turfgrass Research Center staff for supporting this research.

Table 1. Injury on a creeping bentgrass/annual bluegrass green following the application of various products, 2016.

Treatment and rate per 1000 ft ²	Application code ^y	Injury ^z									
		9 Jul	11 Jul	13 Jul	15 Jul	23 Jul	25 Jul	27 Jul	29 Jul	6 Aug	
1 A22070 3.0 fl oz	AC	0.0 a ^x	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
Daconil Weatherstik 3.6 fl oz	ABCD										
Secure 4.17 SC 0.5 fl oz	BD										
2 A22069 3.0 fl oz	AC	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
Daconil Weatherstik 3.6 fl oz	ABCD										
Secure 4.17 SC 0.5 fl oz	BD										
3 A19649 0.157 fl oz	AC	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
Heritage 50 WG 0.4 oz	AC										
Daconil Weatherstik 3.6 fl oz	ABCD										
Secure 4.17 SC 0.5 fl oz	BD										
4 A22070 6.0 fl oz	AC	0.0 a	0.5 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	
Daconil Weatherstik 3.6 fl oz	ABCD										
Secure 4.17 SC 0.5 fl oz	BD										
5 A22069 6.0 fl oz	AC	0.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.3 a	
Daconil Weatherstik 3.6 fl oz	ABCD										
Secure 4.17 SC 0.5 fl oz	BD										
6 A19649 0.315 fl oz	AC	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.5 a	
Heritage 50 WG 0.8 oz	AC										
Daconil Weatherstik 3.6 fl oz	ABCD										
Secure 4.17 SC 0.5 fl oz	BD										
7 Nontreated	-	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	

^z Turfgrass injury was visually assessed on a 0 to 5 scale where 0 = no injury present and 5 = entire plot brown or dead.

^y Treatments were applied on the following dates: A = 8 Jul, B= 22 Jul, C = 6 Jun, and D = 5 Aug.

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

Table 1 (con't). Injury on a creeping bentgrass/annual bluegrass green following the application of various products, 2016.

Treatment and rate per 1000 ft ²	Application	Injury ^z							
		8 Aug	10 Aug	12 Aug	19 Aug	22 Aug	24 Aug	26 Aug	5 Sep
1 A22070 3.0 fl oz.....	AC	0.0 a ^x	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Daconil Weatherstik 3.6 fl oz	ABCD								
Secure 4.17 SC 0.5 fl oz	BD								
2 A22069 3.0 fl oz.....	AC	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Daconil Weatherstik 3.6 fl oz	ABCD								
Secure 4.17 SC 0.5 fl oz	BD								
3 A19649 0.157 fl oz.....	AC	0.8 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Heritage 50 WG 0.4 oz	AC								
Daconil Weatherstik 3.6 fl oz	ABCD								
Secure 4.17 SC 0.5 fl oz	BD								
4 A22070 6.0 fl oz.....	AC	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Daconil Weatherstik 3.6 fl oz	ABCD								
Secure 4.17 SC 0.5 fl oz	BD								
5 A22069 6.0 fl oz.....	AC	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Daconil Weatherstik 3.6 fl oz	ABCD								
Secure 4.17 SC 0.5 fl oz	BD								
6 A19649 0.315 fl oz.....	AC	1.0 a	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
Heritage 50 WG 0.8 oz	AC								
Daconil Weatherstik 3.6 fl oz	ABCD								
Secure 4.17 SC 0.5 fl oz	BD								
7 Nontreated.....	-	0.3 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a

^z Turfgrass injury was visually assessed on a 0 to 5 scale where 0 = no injury present and 5 = entire plot brown or dead.

^y Treatments were applied on the following dates: A = 8 Jul, B = 22 Jul, C = 6 Jun, and D = 5 Aug.

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

Table 2. Color on a creeping bentgrass/annual bluegrass green following the application of various products, 2016.

Treatment and rate per 1000 ft ²	Application code ^y	Color ^z				
		9 Jul	23 May	6 Aug	19 Aug	5 Sep
1 A22070 3.0 fl oz	AC	7.0 a ^x	7.0 a	6.8 a	7.0 a	7.3 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
2 A22069 3.0 fl oz	AC	7.0 a	7.0 a	7.0 a	7.5 a	7.3 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
3 A19649 0.157 fl oz	AC	7.0 a	7.0 a	6.8 a	7.3 a	7.0 a
Heritage 50 WG 0.4 oz	AC					
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
4 A22070 6.0 fl oz	AC	7.0 a	6.8 a	6.8 a	6.8 a	6.8 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
5 A22069 6.0 fl oz	AC	7.0 a	6.8 a	7.0 a	7.3 a	7.3 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
6 A19649 0.315 fl oz	AC	7.0 a	7.0 a	6.8 a	7.3 a	7.5 a
Heritage 50 WG 0.8 oz	AC					
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
7 Nontreated	-	7.0 a	6.8 a	7.0 a	7.0 a	7.3 a

^z Color was visually assessed on a 1 to 9 scale where 1 = entire plot brown and 9 = optimum greenness.

^y Treatments were applied on the following dates: A = 8 Jul, B = 22 Jul, C = 6 Jun, and D = 5 Aug.

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

Table 3. Quality on a creeping bentgrass/annual bluegrass green following the application of various products, 2016.

Treatment and rate per 1000 ft ²	Application code ^y	Quality ^z				
		9 Jul	23 May	6 Aug	19 Aug	5 Sep
1 A22070 3.0 fl oz	AC	7.0 a ^x	6.8 a	6.8 a	7.0 a	6.8 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
2 A22069 3.0 fl oz	AC	7.0 a	7.0 a	6.8 a	7.0 a	7.0 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
3 A19649 0.157 fl oz	AC	7.0 a	6.8 a	6.8 a	7.3 a	7.0 a
Heritage 50 WG 0.4 oz	AC					
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
4 A22070 6.0 fl oz	AC	7.0 a	6.8 a	6.5 a	6.5 a	6.5 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
5 A22069 6.0 fl oz	AC	7.0 a	7.3 a	7.0 a	7.3 a	7.3 a
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
6 A19649 0.315 fl oz	AC	7.0 a	6.8 a	6.5 a	7.0 a	7.3 a
Heritage 50 WG 0.8 oz	AC					
Daconil Weatherstik 3.6 fl oz	ABCD					
Secure 4.17 SC 0.5 fl oz	BD					
7 Nontreated	-	7.0 a	6.8 a	6.8 a	7.0 a	6.8 a

^z Quality was visually assessed on a 1 to 9 scale where 1 = entire plot brown and 9 = optimum uniformity and density.

^y Treatments were applied on the following dates: A = 8 Jul, B = 22 Jul, C = 6 Jun, and D = 5 Aug.

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