

2002 RUTGERS Turfgrass Proceedings



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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University of New Jersey in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. Through this forum, these professionals also reach a more general audience, which includes the public.

This publication includes lecture notes of papers presented at the 2002 New Jersey Turfgrass Expo. Publication of these lectures provides a readily available source of information covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann Brooks Gould, Editor
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EVALUATION OF FUNGICIDES FOR THE CONTROL OF ANTHRACNOSE BASAL ROT ON ANNUAL BLUEGRASS

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Fungicides were evaluated in 2002 for their ability to control anthracnose basal rot (caused by *Colletotrichum graminicola*) on a practice putting green at the Ridgewood Country Club in Paramus, NJ. The green was established in 1965 on an 80:20 (sand:soil) base. Turf was composed of approximately 70% annual bluegrass and 30% creeping bentgrass. Mowing was performed six times weekly at a height of 0.115 inch from April to June, 0.125 inch during July, and 0.135 inch thereafter with clippings collected. The site was irrigated as needed to prevent drought stress. Fertilizer was applied as Endoroots 3-3-4 (0.6 lb N/1000 ft²) on 14 April, a custom greens mix including Roots 1-2-3 and Plant Food 20-0-0 (0.13 lb N/1000 ft²) on 30 April, Plant Food 20-0-0 (0.2 lb N/1000 ft²) on 6, 20, and 28 May, and Plant Food 20-0-0 (0.1 lb N/1000 ft²) on 10, 17, and 24 June. Additional nutritional supplements and micronutrients were applied as Roots 1-2-3 (0.75 lb/1000 ft²) on 2 April and Roots 1-2-3 (0.38 lb/1000 ft²) on 20 and 28 May and 10, 17, and 24 June. Localized dry spots were controlled with LescoFlo wetting agent (8 fl oz/1000 ft²) on 20 May. Insect pests were controlled with Chlorpyrifos Pro 4E (1.5 fl oz/1000 ft²) on 6 May, Triumph 4E (0.75 fl oz/1000 ft²) on 20 May, and Merit 75W (0.15 oz/1000 ft²) and Tempo 20W (0.17 oz/1000 ft²) on 1 July.

Prior to the initiation of treatments, diseases were suppressed with Chipco Aliette Signature 80WG (8 oz/1000 ft²) + Daconil Ultrex 82.5SDG (3.7 oz/1000 ft²) on 1 April, Chipco Aliette Signature 80WG (4 oz/1000 ft²) + Daconil Ultrex 82.5SDG (3.7 oz/1000 ft²) on 24 April, and Banner MAXX 1.3MC (4 fl oz/1000 ft²) on 6 May. Proxy 2L (5 fl oz/1000 ft²) and Primo 1.1 MC (0.125 fl oz/1000 ft²) growth regulators were applied on 2 April. The green was topdressed with 0.03 inch of Harford TD 1000 85:15 (sand:peat) mix on 15 February and 13 March, 0.25 inch on 15 April, and 0.03 inch on 6, 13, and 20 May and 2, 9, and 17

September. Turf was aerified on 6 and 19 March with 0.375 inch solid tines on 2 inch centers, vertidraind on 14 April with 0.75 inch solid tines on a 3 X 6 inch spacing, aerified on 14 April with 0.625 inch hollow tines on 2 inch centers, and cultivated using a Graden verticutter at a 0.078 inch depth and a 1 inch spacing on 15 April. Plots were 3 X 9 ft and were arranged in a randomized complete block with four replications.

Fungicides were applied in water equivalent to 2 gal per 1000 ft² with a CO₂ powered sprayer at 30 psi using TeeJet 8003E nozzles. Treatments were initiated on 16 May, prior to the development of anthracnose. Fungicides were reapplied every 14 days until 19 August. Turf was visually evaluated for percent turf area infested with anthracnose on 8 and 18 July, 2, 14, and 26 August, and 10 September. Turf quality was evaluated on 19 August using a 1 to 9 scale, where 9 = best turf quality. Data were subjected to analysis of variance and means separation by Waller-Duncan *k*-ratio *t*-test (*k*=100).

The disease developed naturally on 4 July and became uniformly distributed throughout the green by 18 July. Only annual bluegrass was infested with *C. graminicola*. Disease severity peaked on 10 September (83% turfgrass area infected on non-fungicide treated turf). In general, treatments containing Daconil Ultrex at 3.2 oz or Endorse at 4.0 oz provided excellent control of anthracnose (96 to 100%), compared to non-fungicide treated turf. Of the DMI fungicides, only Banner MAXX at 1.0 fl oz, Lynx at 1.11 oz, or Chipco Triton at 1.0 fl oz adequately controlled the disease (98 to 100% control), whereas Eagle at 1.0 oz provided moderate control (80 to 100% control) and Bayleton at 1.0 oz proved ineffective. The phosphonate Chipco Signature at 4.0 oz, the dicarboximide Chipco 26GT at 4.0 fl oz, and the phenylpyrrole Medallion at 0.25 oz provided good to

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excellent suppression of the disease (78 to 100%). As a group, fungicides within the QoI chemical class, including Insignia at 0.5 oz, Heritage at 0.2 oz, and Compass at 0.25 oz, provided relatively poor control of anthracnose basal rot (3 to 46% control) at this site. The carboximide ProStar at 2.2 oz, the dicarboximide Vorlan at 1.0 oz, the dithiocarbamate Fore Rainshield at 8.0 oz, and the benzimidazole Cleary 3336 at 4.0 or 6.0 oz also did not adequately control this disease. Moreover, on 8 and 18 July,

ProStar enhanced anthracnose basal rot, compared to non-fungicide treated turf. Tank mixtures and rotational programs (i.e., applying products from different chemical classes every two weeks) provided excellent disease control that was typically equivalent to or better than single product entries. Turf quality was closely associated with the severity of anthracnose basal rot. Other than a dark green color induced by the DMI fungicides, no phytotoxicity was observed.

Table 1. Evaluation of fungicides for the control of anthracnose basal rot on annual bluegrass, Paramus, NJ, 2002.

Treatment and Rate per 1000 sq ft	Spray Interval (days) ^x	Class ^w	Turf Area Infested (%) per Plot ^z					Turf Quality ^y 19 Aug.	
			8 July	18 July	2 Aug.	14 Aug.	26 Aug.		10 Sept.
Chipco Signature 80WG 4.0 oz	14	1	0.0 a	1.0 ab	4.0 ab	16.8 c	26.0 e	33.3 j	6.8 e
Heritage 50WG 0.2 oz	14	2	1.8 a-c	18.3 f	61.8 g	62.3 g	73.5 j-l	64.5 lm	4.0 a-c
Compass 50WG 0.25 oz	14	2	2.8 bc	38.0 h	76.0 hi	66.0 gh	70.5 j	72.8 no	3.3 a
Cleary 3336 50W 4.0 oz	14	3	2.8 bc	24.8 g	70.3 h	71.5 hi	78.5 j-l	75.0 no	3.5 a
Cleary 3336 50W 6.0 oz	14	3	2.0 a-c	20.3 fg	61.8 g	65.8 gh	74.8 j-l	83.8 p	3.8 ab
Cleary 3336 50W 6.0 oz	14	3	0.0 a	4.5 a-d	20.3 d	28.0 de	40.0 gh	47.5 k	5.0 cd
+ Alliance 0:28:26 3 fl oz	14	4	3.5 c	51.5 i	76.5 hi	63.8 g	73.0 j-l	85.3 p	4.8 b-d
ProStar 70WG 2.2 oz	14	5	0.0 a	0.8 ab	1.5 ab	3.0 ab	11.5 b-d	15.5 fh	8.0 fj
Endorse 2.5W 4.0 oz	14	6	0.0 a	0.3 ab	0.0 a	0.0 a	0.0 a	0.8 a	9.0 j
Lynx 45W 1.11 oz	14	7	1.0 ab	8.5 c-e	37.0 e	40.0 e	57.0 i	68.5 mn	5.5 d
Insignia 20WG 0.5 oz	14	2	0.3 a	10.3 de	58.8 g	63.5 g	80.3 l	83.3 p	4.3 a-c
Vorlan 50DF 1.0 oz	14	1	0.0 a	0.5 ab	1.5 ab	1.0 a	7.3 a-c	25.8 i	8.5 h-j
Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.0 a	0.8 ab	1.0 ab	1.3 a	4.0 ab	7.5 a-e	8.3 g-j
Banner MAXX 1.3MC 1.0 fl oz	14	7	0.0 a	1.0 ab	0.8 ab	0.8 a	1.3 a	2.3 a	9.0 j
Banner MAXX 1.3MC 1.0 fl oz	14	7	0.0 a	3.3 a-c	9.0 bc	10.0 bc	34.8 fg	32.8 j	7.0 ef
+ Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.5 a	7.3 b-e	31.8 e	60.3 g	79.3 kl	78.5 op	3.5 a
Eagle 40W 1.0 oz	14	7	0.0 a	12.5 e	45.5 f	52.8 f	71.5 jk	75.8 no	3.8 ab
Bayleton 50DF 1.0 oz	14	7	0.0 a	0.5 ab	0.0 a	0.0 a	0.0 a	0.3 a	9.0 j
Bayleton 50DF 1.0 oz	14	7	0.0 a	0.5 ab	0.0 a	0.0 a	0.0 a	0.3 a	9.0 j
+ Compass 50WG 0.25 oz	14	2	0.0 a	0.5 ab	0.0 a	0.0 a	0.0 a	0.3 a	5.5 d
Chipco Triton 1.67SC 1.0 fl oz	14	7	0.0 a	0.5 ab	0.0 a	0.0 a	0.0 a	0.3 a	9.0 j
Chipco Triton 1.67SC 1.0 fl oz	14	7	0.0 a	7.0 a-e	13.5 cd	33.5 de	47.0 h	60.3 l	5.5 d
+ Chipco Signature 80WG 4.0 oz	14	1	0.0 a	11.5 e	1.0 ab	5.0 ab	5.5 ab	10.8 b-g	7.8 e-i
Fore Rainshield 80W 8.0 oz	14	9	0.0 a	1.8 ab	1.8 ab	3.5 ab	14.0 cd	17.5 gh	7.8 e-i
Fore Rainshield 80W 8.0 oz	14	9	0.0 a	1.0 ab	1.8 ab	11.0 bc	30.8 ef	43.3 k	7.5 e-h
+ Chipco Signature 80WG 4.0 oz	14	1	0.0 a	1.8 ab	1.8 ab	3.5 ab	14.0 cd	17.5 gh	7.8 e-i
Chipco 26GT 2SC 4 fl oz	14	12	0.0 a	1.0 ab	1.8 ab	11.0 bc	30.8 ef	43.3 k	7.5 e-h
+ Chipco Signature 80WG 4.0 oz	14	1	0.0 a	1.0 ab	1.8 ab	3.5 ab	14.0 cd	17.5 gh	7.8 e-i
Chipco 26GT 2SC 4 fl oz	14	12	0.0 a	1.0 ab	1.8 ab	11.0 bc	30.8 ef	43.3 k	7.5 e-h

(Continued)

Table 1 (continued).

Treatment and Rate per 1000 sq ft	Spray Interval (days) ^x	Class ^w	Turf Area Infested (%) per Plot ^z							Turf Quality ^y 19 Aug.
			8 July	18 July	2 Aug.	14 Aug.	26 Aug.	10 Sept.		
Daconil Ultrex 82.5SDG 3.2 oz		8		1.3 ab	1.8 ab	3.3 ab	2.5 a	1.8 a	9.0 j	
+ Chipco Signature 80WG 4.0 oz	14	1	0.3 a							
ProStar 70WG 2.2 oz		5		1.3 ab	2.5 ab	1.3 a	3.5 ab	4.5 ab	8.5 h-j	
+ Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.0 a							
Endorse 2.5W 4.0 oz		6		1.5 ab	0.5 ab	0.3 a	0.5 a	2.0 a	9.0 j	
+ Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.0 a	1.0 ab	1.5 ab	4.5 ab	17.0 d	18.5 gh	7.3 e-g	
Medallion 50W 0.25 oz	14	10	0.0 a							
Medallion 50W 0.25 oz		10		0.8 ab	0.3 a	0.0 a	0.8 a	2.8 a	9.0 j	
+ Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.0 a							
Heritage 50WG 0.2 oz		2		5.0 a-d	1.3 ab	2.8 ab	2.3 a	6.5 a-d	8.5 h-j	
+ Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.0 a							
Cleary 3336 50W 4.0 oz		3		3.5 a-c	1.3 ab	0.3 a	2.5 a	15.3 e-h	8.8 ij	
+ Daconil Ultrex 82.5SDG 3.2 oz	14	8	0.0 a	1.5 ab	0.0 a	0.8 a	5.0 ab	13.0 c-h	8.8 ij	
Rotational Program 1 ^v	14	-	0.0 a	2.0 a-c	0.3 a	3.5 ab	6.8 a-c	19.0 hi	8.5 h-j	
Rotational Program 2 ^u	14	-	0.0 a	0.8 ab	0.3 a	1.3 a	5.3 ab	8.3 a-f	8.3 g-j	
Rotational Program 3 ^t	14	-	0.0 a	1.3 ab	0.8 ab	0.8 a	1.3 a	4.5 ab	8.8 ij	
Rotational Program 4 ^s	14	-	0.0 a	0.0 a	0.5 ab	1.0 a	1.0 a	5.5 a-c	8.8 ij	
Rotational Program 5 ^r	14	-	0.0 a	0.5 ab	0.8 ab	2.8 ab	4.8 ab	12.5 c-h	8.3 g-j	
Rotational Program 6 ^q	14	-	0.0 a	1.0 ab	1.5 ab	4.3 ab	4.0 ab	14.3 d-h	8.3 g-j	
Rotational Program 7 ^p	14	-	0.5 a	37.5 h	78.5 i	78.0 i	80.5 l	83.3 p	4.0 a-c	
Untreated Control		-								
		INT ^o	DAT ⁿ	DAT	DAT	DAT	DAT	DAT	DAT	
		14	14	10	11	9	7	22	14	

^z Values are means of four replications. Means followed by the same letter are not significantly different according to Waller-Duncan k-ratio t-test (k = 100).

^y Turf Quality on a 1 to 9 scale, where 9 = best turf quality. Values above 6.0 represent acceptable turf quality.

^x Fungicides were applied 16 and 27 May, 10 and 24 June, 8 and 22 July, and 5 and 19 August.

(Continued)

Table 1 (continued).

- ^w Class=Chemical Class, where 1=Phosphonate, 2=Qol (includes strobilurin fungicides), 3=Benzimidazole, 4=Macro nutrients P and K, 5=Carboximide, 6=Polyoxin-D (antibiotic), 7=Sterol biosynthesis inhibitor/Demethylation inhibitor, 8=Nitrile, 9=Dithiocarbamate, 10=Phenylpyrrole, 11=Phenylamide, and 12=Dicarboximide fungicide class.
- ^v Rotation Program 1 was applied as follows: Heritage 50WG (0.4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 16 May, Chipco Signature 80WG (4 oz) + Fore Rainshield 80W (8 oz) on 27 May, Heritage 50WG (0.4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 10 June, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 24 June, Heritage 50WG (0.4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 8 July, Chipco Signature 80WG (4 oz) + Fore Rainshield 80W (8 oz) on 22 July, Heritage 50WG (0.4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 5 August, and Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 19 August. All rates were per 1000 sq ft.
- ^u Rotation Program 2 was applied as follows: Cleary 3336 50W (4 oz) + Daconil Ultrex 82.5SDG (1.8 oz) on 16 May, Cleary 3336 50W (4 oz) + Daconil Ultrex 82.5SDG (1.8 oz) on 27 May, Heritage 50WG (0.4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 10 June, Daconil Ultrex 82.5SDG (3.2 oz) on 24 June, Heritage 50WG (0.4 oz) + Banner MAXX 1.3MC (1 fl oz) on 8 July, Subdue MAXX 2MC (0.5 fl oz [Classw = 11]) + Daconil Ultrex 82.5SDG (3.2 oz) on 22 July, Heritage 50WG (0.4 oz) + Banner MAXX 1.3MC (1.0 fl oz) on 5 August, and Subdue MAXX 2MC (1 fl oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 19 August. All rates were per 1000 sq ft.
- ^t Rotation Program 3 was applied as follows: Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 16 May, Chipco Signature 80WG (4 oz) + Chipco 26GT 2SC (4 fl oz) on 27 May, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 10 June, Chipco Signature 80WG (4 oz) + Compass 50WG (0.25 oz) on 24 June, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 8 July, Chipco Signature 80WG (4 oz) + Heritage 50WG (0.4 oz) on 22 July, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 5 August, and Chipco Signature 80WG (4 oz) + Chipco 26GT 2SC (4 fl oz) on 19 August. All rates were per 1000 sq ft.
- ^s Rotation Program 4 was applied as follows: Banner MAXX 1.3MC (1 fl oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 16 May, Cleary 3336 50W (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 27 May, Compass 50WG (0.25 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 10 June, Bayleton 50DF (1 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 24 June, Cleary 3336 50W (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 8 July, Heritage 50WG (0.2 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 22 July, Eagle 40W (1 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 5 August, and Cleary 3336 50W (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 19 August. All rates were per 1000 sq ft.
- ^r Rotation Program 5 was applied as follows: Daconil Ultrex 82.5SDG (3.2 oz) on 16 May, Banner MAXX 1.3MC (1 fl oz) on 27 May, Cleary 3336 50W (4 oz) on 10 June, Heritage 50WG (0.2 oz) + Banner MAXX 1.3MC (1 fl oz) on 24 June, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 8 July, Heritage 50WG (0.2 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 22 July, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 5 August, and Heritage 50WG (0.2 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 19 August. All rates were per 1000 sq ft.
- ^q Rotation Program 6 was applied as follows: Cleary 3336 50W (4 oz) on 16 May, Banner MAXX 1.3MC (1 fl oz) on 27 May, Daconil Ultrex 82.5SDG (3.2 oz) on 10 June, Heritage 50WG (0.2 oz) + Fore Rainshield 80W (8 oz) on 24 June, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 8 July, Subdue MAXX 2MC (1 fl oz) + Banner MAXX 1.3MC (1 fl oz) on 22 July, Heritage 50WG (0.2 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 5 August, and Chipco Signature 80WG (4 oz) + Fore Rainshield 80W (8 oz) on 19 August. All rates were per 1000 sq ft.
- ^p Rotation Program 7 was applied as follows: Banner MAXX 1.3MC (2 fl oz) on 16 May, Banner MAXX 1.3MC (2 fl oz) on 27 May, Heritage 50WG (0.4 oz) on 10 June, Chipco Signature 80WG (4 oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 24 June, Banner MAXX 1.3MC (2 fl oz) + Subdue MAXX 2MC (1 fl oz) + Chipco 26GT 2SC (4 fl oz) on 8 July, Banner MAXX 1.3MC (2 fl oz) + Daconil Ultrex 82.5SDG (3.2 oz) on 22 July, Heritage 50WG (0.4 oz) on 5 August, and Chipco Signature 80WG (4 oz) + Fore Rainshield 80W (8 oz) on 19 August. All rates were per 1000 sq ft.
- ^o Spray interval in days.
- ⁿ Days after treatment (DAT) for each spray interval.