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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 University 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. Articles appearing in these proceedings are divided into two sections.

The first section (white pages) includes lecture notes of papers presented at the 1997 New Jersey Turfgrass Expo. Publication of the New Jersey Turfgrass Expo Notes provides a readily

available source of information covering a wide range of topics. The Expo Notes include technical and popular presentations of importance to the turfgrass industry.

The second section (green pages) includes technical research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of these papers is to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann B. Gould, Editor
Dr. Bruce B. Clarke, Coordinator

CONTROL OF BROWN PATCH ON COLONIAL BENTGRASS WITH CHEMICALS AND BIOLOGICAL FUNGICIDES

L. P. Tredway, B. B. Clarke, S. S. Vaiciunas, and P. R. Majumdar¹

Fungicides were evaluated in 1997 for their ability to control brown patch (caused by the fungus *Rhizoctonia solani*) on colonial bentgrass (*Agrostis tenuis* cv. SR7100) maintained under golf course fairway conditions at the Rutgers Turf Research Farm in North Brunswick, NJ. The turf was established September 1995 on a Norton loam with a pH of 6.1. Mowing was performed three times weekly at a height of 0.4 inches with clippings collected, and the site was irrigated to prevent drought stress. Fertilizer was applied as 20-0-20 on 23 May (0.5 lb N/1000 ft²), 46-0-0 on 20 June (0.5 lb N/1000 ft²), 15-0-0 on 31 July (0.5 lb N/1000 ft²), and 46-0-0 on 5 August (0.8 lb N/1000 ft²). Weeds were controlled with Betasan 4-E (7 fl oz/1000 ft²) on 28 April and MCPP-4 amine (1 fl oz/1000 ft²) plus Banvel (0.18 fl oz/1000 ft²) on 10 July. Insect pests were suppressed with Turcam (1 oz/1000 ft²) on 17 June and Dursban (2 fl oz/1000 ft²) on 1 August. Aquaduct wetting agent (8 fl oz/1000 ft²) was applied on 9 June, 24 June, 1 July, 8 July, and 27 July to control localized dry spots. Hollow tine aerification was performed on 7 July with 0.375 inch tines on 2 inch centers. 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 (trt) 1, 2, 3A, 4A, 5A, and 6A were initiated on 10 June, whereas all other treatments were initiated on 26 June. Fungicides were re-applied at the appropriate intervals as indicated in Table 1. Percent turf area infected with *R.*

solani was assessed on 13 July (data not shown), 27 July, 29 July, 14 August, 20 August, and 3 September. Data were subjected to analysis of variance and means separation by Waller-Duncan *k*-ratio *t* test (*k* = 100) following arcsine transformation.

Brown patch infection was first observed on 13 July. Disease pressure was intermittent in July and early August, but intensified through August and peaked in early September. Excellent brown patch control was provided throughout the season with Heritage 50WG (trt 15, 24), Sentinel 40WG (trt 25), Prostar 50W (trt 40, 41), Prostar 50W + Bayleton 50W (trt 42), WAC 71 90WG (trt 37, 38), Cleary 3336 50W (trt 35), Daconil Ultrex 82.5WDG (trt 7), Procymidone 50W (trt 11, 12), S-7222 WG + S-7221 W (trt 32, 33), S-7225 W + S-7221 W (trt 30, 31), and the high rates of RU041523S (trt 22, 23), RU200112W (trt 14), IB 10351 WG (trt 17), and AE B066752 (trt 58) (Table 1). Extended residual control was observed on 3 September for many treatments, including Heritage 50WG (trt 15, 24), Sentinel 40WG (trt 25), Prostar 50W (trt 40, 41), Prostar 50W + Bayleton 50W (trt 42), WAC 71 90WG (trt 38), RU041523S (trt 22, 23), S-7225 W + S-7221 W (trt 30, 31), S-7222 WG + S-7221 W (trt 32, 33).

Companion I and Companion II (*Bacillus subtilis*) provided little control of brown patch when applied alone (trt 1, 2); however, the addition of Companion II to the 3.8 oz rate of Daconil Ultrex 82.5WDG (trt 5) enhanced disease control on 29 July and 3 September compared to

¹ Graduate Research Assistant, Extension Specialist in Turfgrass Pathology, Graduate Research Assistant, and Senior Laboratory Technician, respectively, New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University of New Jersey, New Brunswick, NJ 08901.

either fungicide alone. A single application of Heritage 50WG (trt 10) was more effective and lasted longer than a single application of Sentinel 40WG (trt 9) applied on the same date, but the fungicides were equally effective when applied on 21 day intervals (trt 24, 25). Combining Eagle 40W with Heritage 50WG (trt 44) did not extend or enhance disease control afforded by Heritage 50WG alone (trt 15). Treatments containing Prostar 50W alone (trt 40, 41) or in combination with Bayleton 50W (trt 42) provided similar levels of disease suppression throughout the season. Continued application of Sentinel 40WG (trt 25), Prostar 50W (trt 40, 41), Prostar 50W + Bayleton 50W (trt 42), Heritage 50WG (trt 15, 24), and S-7225 W + S-7221 W (trt 30, 31) resulted in improved disease control and extended

residual efficacy, even though disease pressure intensified throughout the study.

Under high disease pressure late in the season, CGA-371367 (*Pseudomonas fluorescens*, trt 48) provided some disease suppression compared to untreated turf. When combined with fungicide applications (trt 52, 53, 54), CGA-371367 did not enhance disease control compared to the fungicides alone (trt 49, 50, 51). Phytotoxicity was observed as foliar necrosis on 14 August and 20 August for plots treated with the 5.04 fl oz rate of RU041523S (trt 23). Slight reductions in stand density were observed on 15 September for all plots treated with triazole fungicides (data not shown).

Table 1. Impact of fungicides on the severity of brown patch on colonial bentgrass in North Brunswick, NJ.

	Treatment and rate/1000 sq ft	Spray interval (days) ²	Turf area infected (%)/plot ¹				
			27 July	29 July	14 Aug.	20 Aug.	3 Sept.
1	Companion I 4.0 fl oz	14	11.5 k-o	14.5 t-y	36.5 uvw	61.8 wx	65.5 u-y
2	Companion II 4.0 fl oz	14	15.2 op	19.2 xyz	31.8 stu	36.8 qrs	27.2 lmn
3A	Companion I 4.0 fl oz	—	—	—	—	—	—
B	+ Daconil Ultrex 82.5WDG 3.8 oz	14	5.8 b-j	9.0 p-t	1.8 b-h	2.0 c-g	24.0 klm
4A	Companion I 4.0 fl oz	—	—	—	—	—	—
B	+ Daconil Ultrex 82.5WDG 1.9 oz	14	11.0 j-o	15.2 u-y	3.2 g-m	8.0 jk	60.2 uvw
5A	Companion II 4.0 fl oz	—	—	—	—	—	—
B	+ Daconil Ultrex 82.5WDG 3.8 oz	14	5.2 a-h	2.2 c-i	1.8 b-h	1.2 c-f	11.2 j
6A	Companion II 4.0 fl oz	—	—	—	—	—	—
B	+ Daconil Ultrex 82.5WDG 1.9 oz	14	8.0 c-m	13.0 s-x	3.2 g-m	13.0 lm	66.5 v-y
7	Daconil Ultrex 82.5WDG 3.8 oz	14	6.8 b-l	7.5 m-r	1.8 b-h	0.5 a-d	21.5 kl
8	Daconil Ultrex 82.5WDG 1.9 oz	14	11.8 k-o	17.2 w-z	1.0 a-e	16.2 mn	66.5 v-y
9	Sentinel 40WG 0.33 oz	Once	9.5 f-o	6.2 l-r	33.8 tuv	42.5 st	61.2 u-x
10	Heritage 50WG 0.4 oz	Once	5.2 a-h	0.0 a	25.8 rst	33.5 pqr	72.2 yzz'
11	Procymidone 50W 3.0 oz	14	5.5 b-j	2.8 d-k	4.5 h-n	2.8 e-h	7.2 hij
12	Procymidone 50W 5.0 oz	14	5.0 a-g	2.8 d-k	4.0 g-m	2.2 e-h	5.0 ghi
13	RU200112W 0.49 oz	14	5.2 a-h	9.0 p-t	1.0 a-e	3.0 f-i	64.2 u-x
14	RU200112W 0.98 oz	14	4.0 a-d	2.5 c-j	0.5 a-d	0.5 a-d	7.0 hi
15	Heritage 50WG 0.2 oz	14	7.2 c-m	2.5 c-j	0.8 a-d	0.2 ab	1.0 a-d
16	IB 10351 WG 0.74 oz	7	9.5 f-o	16.2 v-y	6.8 k-n	3.0 f-i	75.0 zz'
17	IB 10351 WG 1.47 oz	7	6.2 b-l	6.2 l-r	0.2 ab	0.2 ab	9.0 ij
18	Daconil Ultrex 82.5WDG 2.94 oz	14	8.0 c-m	8.2 o-s	1.8 b-h	1.5 c-f	39.2 p
19A	RU041523S 0.31 fl oz	—	—	—	—	—	—
B	+ Atplus 435 0.1% v/v	21	14.5 nop	16.0 v-y	13.5 op	30.5 pq	73.0 yzz'

Table 1 (continued).

	Treatment and rate/1000 sq ft	Spray interval (days) ²	Turf area infected (%)/plot ¹				
			27 July	29 July	14 Aug.	20 Aug.	3 Sept.
20A	RU041523S 0.63 fl oz	—	—	—	—	—	—
B	+ Atplus 435 0.1% v/v	21	6.5 b-l	7.0 m-r	9.5 nop	16.2 mn	58.2 tuv
21A	RU041523S 1.26 fl oz	—	—	—	—	—	—
B	+ Atplus 435 0.1% v/v	21	7.2 c-m	5.5 j-p	3.0 e-k	9.5 kl	18.5 k
22A	RU041523S 2.52 fl oz	—	—	—	—	—	—
B	+ Atplus 435 0.1% v/v	21	2.8 ab	1.8 b-h	1.5 b-g	1.0 b-e	2.8 d-g
23A	RU041523S 5.04 fl oz	—	—	—	—	—	—
B	+ Atplus 435 0.1% v/v	21	6.0 b-k	1.5 b-h	7.8 mno	5.5 h-k	2.5 d-g
24	Heritage 50WG 0.26 oz	21	5.0 a-g	1.8 b-h	1.2 a-f	0.0 a	0.0 a
25	Sentinel 40WG 0.25 oz	21	9.8 g-o	0.8 a-d	1.5 b-g	0.2 ab	0.2 ab
26	ConSyst 67WDG 4.0 oz	14	6.2 b-l	5.8 k-q	1.8 b-h	4.2 ghi	38.5 p
27	Chipco Aliette Signature 80WG 4.0 oz	14	10.0 h-o	30.0 z'z''	45.2 wx	53.2 uv	64.2 u-x
28	Aliette 80WG 4.0 oz	14	9.8 g-o	20.5 yz	33.2 tu	49.2 tu	77.8 z'
29	Chipco 26019 FLO 2SC 4.0 fl oz	14	4.8 a-e	8.8 p-t	1.0 a-e	1.2 c-f	40.2 pq
30A	S-7225 W 2.0 oz	—	—	—	—	—	—
B	+ S-7221 W 0.6 oz	14	7.2 b-l	0.5 abc	4.0 g-m	0.8 a-d	1.0 a-d
31A	S-7225 W 3.0 oz	—	—	—	—	—	—
B	+ S-7221 W 1.2 oz	14	4.8 a-e	1.0 a-e	2.2 b-i	0.2 ab	0.0 a
32A	S-7222 WG 3.7 oz	—	—	—	—	—	—
B	+ S-7221 W 0.6 oz	14	6.2 b-l	3.0 f-n	3.0 e-k	1.2 c-f	2.5 d-g
33A	S-7222 WG 7.35 oz	—	—	—	—	—	—
B	+ S-7221 W 1.2 oz	14	2.2 a	0.2 ab	3.0 e-k	1.5 c-f	2.2 d-g
34	S-7247 MC 4.0 fl oz	14	10.8 i-o	3.0 f-n	2.5 c-i	1.2 c-f	8.5 ij
35	Cleary 3336 50W 4.0 oz	14	10.0 h-o	2.5 c-j	1.0 a-e	0.2 ab	11.0 j

Table 1 (continued).

	Treatment and rate/1000 sq ft	Spray interval (days) ²	Turf area infected (%)/plot ¹				
			27 July	29 July	14 Aug.	20 Aug.	3 Sept.
36A	Chipco 26GT 2SC 2.0 fl oz	—	—	—	—	—	—
B	+ Cleary 3336 4.5F 2.0 fl oz	14	9.2 e-o	6.5 l-r	1.2 a-g	1.2 c-f	24.8 klm
37	WAC 71 90WG 4.0 oz	14	3.5 abc	2.8 d-k	0.5 a-d	0.8 a-d	21.5 kl
38	WAC 71 90WG 8.0 oz	14	1.8 a	1.0 a-e	0.0 a	0.0 a	2.8 efg
39	Spotrete 75WDG 5.0 oz	7	9.2 e-o	11.5 r-w	15.8 pq	8.8 kl	67.8 w-z
40	Prostar 50W 2.0 oz	14	7.0 b-l	2.8 d-k	0.8 a-d	0.0 a	3.8 fgh
41	Prostar 50W 3.0 oz	21	7.2 c-m	3.8 h-o	0.5 a-d	0.0 a	1.8 def
42A	Bayleton 50W 0.5 oz	—	—	—	—	—	—
B	+ Prostar 50W 2.0 oz	28	6.2 b-l	5.0 i-p	2.5 c-i	0.2 ab	0.8 abc
43A	Eagle 40W 0.6 oz	—	—	—	—	—	—
B	/or Fore 80W 6.0 oz	14 ³	8.5 d-n	14.5 t-y	6.0 j-n	15.0 mn	68.0 w-z
44A	Eagle 40W 0.6 oz	—	—	—	—	—	—
B	+ Heritage 50WG 0.25 oz	14	6.0 b-k	0.8 a-d	1.2 a-f	0.0 a	0.0 a
45	RH0611F 8.0 oz	14	5.0 a-g	10.8 q-v	1.2 a-f	5.8 ijk	29.8 mno
46	Fore 80W 6.0 oz	14	13.2 m-p	24.0 zz'	13.5 op	32.2 pqr	68.8 xyz
47	Eagle 40W 0.6 oz	14	10.8 i-o	4.0 h-o	7.5 lmn	8.0 jk	33.0 nop
48	CGA-371367 31.3 fl oz	Daily ⁴	26.0 q	36.5 z''	49.2 x	58.2 vw	57.8 stu
49	Banner Maxx 1.24MC 2.0 fl oz	14	4.5 a-e	5.0 i-p	3.5 g-m	7.5 jk	18.5 k
50	CGA-173506 50W 0.2 oz	14	12.2 l-o	14.0 t-y	21.8 qr	39.2 rs	66.8 wxy
51	CGA-BMP 46.5W 0.5 oz	14	9.8 g-o	6.5 l-r	5.2 i-n	8.8 kl	49.8 rs
52A	CGA-371367 31.3 fl oz	Daily ⁴	—	—	—	—	—
B	/+ Banner Maxx 1.24MC 2.0 fl oz	14	7.5 c-m	7.5 m-r	14.0 p	15.0 mn	49.5 rs
53A	CGA-371367 31.3 fl oz	Daily ⁴	—	—	—	—	—
B	/+ CGA-173506 50W 0.2 oz	14	11.5 k-o	8.5 p-t	23.0 rs	26.2 op	36.2 op

Table 1 (continued).

Treatment and rate/1000 sq ft		Spray interval (days) ²	Turf area infected (%) / plot ¹				
			27 July	29 July	14 Aug.	20 Aug.	3 Sept.
54A	CGA-371367 31.3 fl oz	Daily ⁴	—	—	—	—	—
B	/+ CGA-BMP 46.5W 0.5 oz	14	11.8 l-o	9.2 p-u	6.0 j-n	6.0 ijk	51.5 rst
55	AE B066752 3.8 oz	14	5.5 b-i	16.8 v-z	2.5 c-i	15.8 mn	36.2 op
56	AE B066752 5.8 oz	14	8.0 c-m	10.5 q-v	2.8 d-j	1.5 c-f	48.2 qr
57	AE B066752 3.8 oz	21	8.0 c-m	6.0 k-q	1.8 b-h	20.2 no	78.0 z'
58	AE B066752 5.8 oz	21	9.0 e-o	2.0 b-i	1.8 b-h	2.2 e-h	39.2 p
59	Untreated Check	—	20.0 pq	20.8 yz	42.8 vwx	68.5 x	74.2 zz'

INT ⁵	DAT ⁶	DAT	DAT	DAT	DAT
7	10	1	7	6	19
14	17	1	7	13	26
21	10	12	7	13	26
28	31	1	17	23	36

¹ Values are means of four replicates. Means followed by the same letter are not significantly different according to Waller-Duncan *k*-ratio *t* test ($k = 100$).

² Fungicides were applied 10 June (treatments 1, 2, 3A, 4A, 5A, 6A), 26 June (all treatments), 3 July (7 day treatment only), 10 July (7 and 14 day treatments), 17 July (7 and 21 day treatments), 28 July (7, 14, and 28 day treatments), 4 Aug. (7 day treatment only), 7 Aug. (7, 14, and 21 day treatments), and 14 Aug. (7 day treatment only).

³ Treatment 43A was applied on 26 June and 28 July. Treatment 43B was applied on 10 July and 7 Aug.

⁴ Treatments 48, 52A, 53A, and 54A were applied daily (Monday to Saturday) at 5 PM from 7 July to 29 Aug.; treatments 52B, 53B, and 54B were applied separately on 14 day intervals.

⁵ Spray interval in days.

⁶ Days after treatment (DAT) for each spray interval.