

2005 RUTGERS Turfgrass Proceedings



THE NEW JERSEY TURFGRASS ASSOCIATION

In Cooperation With

RUTGERS COOPERATIVE RESEARCH & EXTENSION
NEW JERSEY AGRICULTURAL EXPERIMENT STATION
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY
NEW BRUNSWICK

Distributed in cooperation with U.S. Department of Agriculture in furtherance of the Acts of Congress on May 8 and June 30, 1914. Rutgers Cooperative Research & Extension works in agriculture, family and community health sciences, and 4-H youth development. Dr. Karyn Malinowski, Director of Extension. Rutgers Cooperative Research & Extension provides education and educational services to all people without regard to race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs). Rutgers Cooperative Research & Extension is an Equal Opportunity Program Provider and Employer.

2005 RUTGERS TURFGRASS PROCEEDINGS

of the

**New Jersey Turfgrass Expo
December 6-8, 2005
Trump Taj Mahal
Atlantic City, New Jersey**

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 2005 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.

Special thanks are given to those who have submitted papers for this proceedings, to the New Jersey Turfgrass Association for financial assistance, and to Barbara Fitzgerald and Marlene Karasik for administrative and secretarial support.

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

EFFICACY OF FUNGICIDES AND BIORATIONAL PRODUCTS FOR THE CONTROL OF DOLLAR SPOT ON A CREEPING BENTGRASS FAIRWAY

Bruce B. Clarke, Pradip R. Majumdar, Dennis Fitzgerald, Mark Peacos, Paul Goldberg, Kyle Gaugler, Lindsay Jepsen, and John Inguagiato¹

Biological and chemical fungicides were evaluated in 2005 for their ability to control dollar spot (caused by *Sclerotinia homoeocarpa*) at the Rutgers Turf Research Farm in North Brunswick, NJ on creeping bentgrass (*Agrostis stolonifera*) maintained under golf course fairway conditions. Turf was established September 1996 on a Norton loam with a pH of 6.5. Mowing was performed three times weekly at a height of 0.375 inches with clippings collected. The site was irrigated as needed to prevent drought stress. Fertilizer was applied as 16-4-8 on 1 April (0.55 lb nitrogen (N)/1000 ft²) and 19 April (0.43 lb N/1000 ft²), urea (0.46 lb N/1000 ft²) on 17 May, and ammonium nitrate (0.5 lb N/1000 ft²) on 20 June. Localized dry spots were controlled with Primer wetting agent (4 oz/1000 ft²) on 22 June. Dimension 1E (24 fl oz/A) was applied on 11 May for pre-emergence weed control. Prostar 70W (2.5 oz/1000 ft²) was applied to the entire test area on 16 August to suppress brown patch. Insect pests were controlled with Turcam 7.6W (1.0 oz/1000 ft²) on 15 June and 29 July. On 15 July, Merit 75WSP (0.17 oz/1000 ft²) was applied for additional control of insects. The site was aerified with 0.5-inch hollow tines on 4-inch centers on 18 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 1.9 gal per 1000 ft² with a CO₂ powered sprayer at 30 psi using TeeJet 8003VS flat fan nozzles. Treatments (trt) were initiated on 27 May when environmental conditions were conducive to dollar spot development. Fungicides were reapplied at the appropriate intervals as indicated in Tables 1A and 1B. Turf was visually evaluated for number of dollar spot infection centers per plot on 3, 13, and 23 June, 1, 13, and 25

July, 4, 17, and 30 August, 12 and 22 September, and 10 October, and for percent turf area infested with brown patch (caused by *Rhizoctonia solani*) on 1 July and number of copper spot infection centers per plot (caused by *Gloeocercospora sorghi*) on 17 August. Data were subjected to analysis of variance and means were separated using the Waller-Duncan *k*-ratio *t*-test (*k* = 100).

Dollar spot was first observed on 1 June. Disease pressure increased rapidly and became uniform throughout the study by 13 June (Table 1A). Disease incidence peaked by 10 October (Table 1B) with more than 150 infection centers per plot (a very high level of disease) on the untreated control (trt 60). The products that provided good to excellent control of dollar spot throughout the treatment period (i.e., 27 May to 15 September) included 26/36 39.3F (trts 1-2), Headway 1.39EC (trt 25), Heritage TL 0.8ME + Banner Maxx 1.3ME (trt 27), rotational program #1 (trt 30), Banner Maxx 1.3ME (trts 37 and 45), A14472 32.5WG (trt 39), Concert 4.3SE (trt 41), PX056 (=Sync) + either Banner Maxx 1.3ME (trts 42 and 44) or Concert 4.3SE (trts 50-51), Emerald 70WG (trts 52-53), and Chipco 26GT 2SC (trt 54). The remaining fungicides and biorational materials afforded acceptable (i.e., less than 10 lesion centers/plot) on at least half of the rating dates, except RU 20189-05 L alone (trts 13-14) or alternated with Daconil Ultrex 82.5WDG (trt 11), Daconil Ultrex 82.5WDG (trts 21, 24, 47 and 49), CGA 245704 50W (trt 22), CGA 245704 50W + Daconil Ultrex 82.5WDG (trt 23), Heritage TL 0.8ME (trts 33 and 55-56), Heritage TL 0.8ME + Banner Maxx 1.3ME (trt 36), PX056 + Daconil Ultrex 82.5WDG (trts 46-48), and Plant Food Tank Mixture (trt 58).

¹Extension Specialist in Turfgrass Pathology, Senior Laboratory Technician, Research Assistant, Senior Greenhouse and Field Technician, Research Assistant, Research Assistant, Research Assistant, and Graduate Assistant, respectively, New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University of New Jersey, New Brunswick, NJ 08901-8520.

The addition of Heritage TL 0.8ME to Banner Maxx 1.3ME (trts 27-29 and 36) generally did not affect fungicide efficacy, compared to Banner alone, except on 13 and 23 June, 25 July, and 4 August where the tank mixture provided less control of dollar spot (trt 36) and on 22 September when it improved disease control (trt 27). RU 20189-05 L occasionally enhanced efficacy when added to Daconil Ultrex 82.5WDG (i.e., 17 August, trt 12, and 30 August, trts 10 and 12). Similarly, PX056 (Sync) improved control when combined with Banner Maxx 1.3ME (17 August, trt 42) or with Daconil Ultrex 82.5WDG (25 July, trts 46 and 48; 4 August, trt 46; and 30 August, trt 48).

Excellent residual control of dollar spot was observed on 22 September (Table 1B) for turf treated with Heritage TL 0.8ME + Banner Maxx 1.3ME (trt 27), Headway 1.39EC (trt 35), and A14472 32.5WG (trt 40), and on 22 September and 10 October for the rotational program #1 (trt 30) and Emerald 70WG (trts 52-53). Gallonage (i.e., 1 vs. 2 gal water/1000 ft²) generally did not affect disease response. Since brown patch severity was relatively low (i.e., 8 to 12%) during the study, most products provided adequate control (less than 10% turf area infested) when this disease was evaluated on 1 July (Table 1B). No phytotoxicity was observed.

Table 1A. Part 1: Efficacy of fungicides and biorational products for the control of dollar spot on fairways, New Brunswick, NJ, 2005.

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ²	Number of Lesions per plot ¹											
			3 June	13 June	23 June	1 July	13 July	25 July	4 Aug.	17 Aug.	30 Aug.			
1	26/36 39.3F	5.0 fl oz	21	0.8 a-c	0.0 a	0.0 a	0.0 a	0.0 a	0.5 a	1.5 a-c	0.5 ab	1.0 a		
2	26/36 39.3F	3.75 fl oz	21	1.3 a-d	0.0 a	0.0 a	0.0 a	0.0 a	2.3 ab	2.3 a-d	0.0 a	0.5 a		
3	Cleary 3336 4F	4 fl oz	14	2.5 a-d	0.8 ab	2.5 a-c	6.3 a-g	10.5 a-i	19.0 c-g	25.8 i-n	24.8 qr	74.3 h		
4	Cleary 3336 Plus 19.4F	4 fl oz	21	2.0 a-d	1.0 ab	3.5 a-e	6.0 a-g	13.8 a-i	33.8 hi	32.5 k-o	26.3 qr	120.5 k		
5	Cleary 3336 Plus 19.4F	2 fl oz	21	3.3 a-e	3.0 a-d	7.3 a-i	10.3 a-g	18.5 f-k	52.3 jk	34.5 m-p	30.8 r	136.5 l		
6	RU20189-05L	1.5 fl oz	14 ³	4.3 b-e	8.3 b-f	5.3 a-g	15.3 g-j	15.8 c-i	19.5 c-g	12	a-h	1.3 a-c	0.8 a	
7	/Banner MAXX 1.3ME	0.5 fl oz	21 ³	4.5 b-e	7.5 a-f	10.3 e-l	15.5 g-k	35.5 m-p	103.5 qr	59.5 r-t	3.8 a-f	0.8 a		
8	RU20189-05L	2.0 fl oz	14 ³	3.0 a-e	0.8 ab	0.5 a	12.0 d-h	13.0 a-i	24.8 f-h	23.3 h-m	2.5 a-d	0.8 a		
9	/Banner MAXX 1.3ME	0.5 fl oz	21 ³	2.3 a-d	1.3 a-c	10.3 e-l	10.8 b-h	9.3 a-i	95.0 pq	41.3 o-q	4.5 a-g	2.8 a		
10	RU20189-05L	1.5 fl oz	14 ³	3.0 a-e	6.3 a-f	8.5 b-j	8.8 a-g	10.0 a-i	95.3 pq	64.5 s-u	6.8 b-h	8.3 ab		
11	+ Daconil Ultrex 82.5WDG	1.8 oz	14	3.5 a-e	19.5 hi	16.0 k-m	35.0 n	14.3 b-i	77.5 mn	46.3 pq	14.3 i-n	21.0 c		
12	/Daconil Ultrex 82.5WDG	1.5 fl oz	14 ³	3.0 a-e	3.3 a-d	2.0 a-c	13.8 f-j	18.0 e-k	109.8 rs	72.0 uv	9.0 e-j	11.3 a-c		
13	RU20189-05L	1.5 fl oz	14	2.8 a-e	6.3 a-f	11.5 f-l	23.3 j-l	18.5 f-k	63.5 kl	46.0 pq	12.0 h-m	63.8 g		
14	RU20189-05L	2 fl oz	14	3.5 a-e	7.0 a-f	13.8 j-l	20.8 h-l	32.3 l-o	89.3 n-p	48.0 qr	7.8 d-h	37.8 de		
15	Banner MAXX 1.3ME	0.5 fl oz	21	4.0 a-e	4.0 a-e	4.5 a-f	11.3 c-h	9.8 a-i	9.5 a-e	5.0 a-e	3.3 a-e	3.0 a		
16	Banner MAXX 1.3ME	0.5 fl oz	28	3.5 a-e	8.8 c-f	12.3 g-l	11.3 c-h	29.5 j-n	34.8 hi	10.0 a-g	1.3 a-c	0.3 a		
17	Untreated Check	--	3.8 a-e	47.0 l	21.0 mn	50.5 op	46.5 pq	80.3 m-o	48.5 qr	21.5 o-q	102.5 j		
18	Untreated Check	--	4.0 a-e	46.3 m	17.0 lm	55.8 op	43.5 o-q	73.8 lm	58.0 rs	17.3 m-p	87.3 i		
19	Fairway SQ 6-0-2	3 fl oz	14	1.5 a-d	0.0 a	0.0 a	4.3 a-f	7.8 a-h	41.8 ij	11.5 a-h	6.3 a-h	15.5 bc		
20	+ Daconil Ultrex 82.5WDG	1.8 oz	14	0.0 a	0.0 a	0.0 a	3.3 a-f	5.8 a-f	26.8 gh	15.5 e-i	7.0 c-h	52.8 f		
21	+ Daconil Ultrex 82.5WDG	1.8 oz	14	2.0 a-d	0.0 a	0.8 a	10.3 a-g	11.3 a-i	80.8 m-o	21.5 g-k	5.0 a-g	47.5 ef		

(Continued)

Table 1A (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ²	Number of Lesions per plot ¹								
			3 June	13 June	23 June	1 July	13 July	25 July	4 Aug.	17 Aug.	30 Aug.
22 CGA 245704 50W	0.012 oz	21	4.8 c-e	38.0 jk	21.5 mn	47.0 o	32.5 l-o	63.3 kl	42.5 o-q	9.3 e-k	55.3 fg
23 Daconil Ultrex 82.5WDG	1.8 oz										
+ CGA 245704 50W	0.012 oz	21	3.5 a-e	10.0 d-f	12.3 g-l	22.8 j-l	11.5 a-i	24.8 f-h	14.3 c-i	15.0 j-n	36.5 d
24 Daconil Ultrex 82.5WDG	1.8 oz	21	2.8 a-e	7.3 a-f	12.5 g-l	47.8 o	20.0 g-l	56.0 k	22.3 g-l	16.3 l-o	82.3 hi
25 Headway 1.39EC	0.75 fl oz	14	1.8 a-d	0.5 a	1.3 ab	0.8 a-c	5.0 a-f	26.0 gh	3.8 a-e	4.5 a-g	5.0 ab
26 Heritage TL 0.8ME	1.0 fl oz	14	3.3 a-e	4.3 a-e	9.3 c-k	33.0 mn	30.5 k-n	118.5 st	50.3 qr	8.0 d-i	64.5 g
27 Heritage TL 0.8ME	1.0 fl oz										
+ Banner MAXX 1.3ME	0.5 fl oz	14	1.3 a-d	0.0 a	0.0 a	0.0 a	5.8 a-f	16.8 b-g	1.0 a	0.5 ab	0.3 a
28 Heritage TL 0.8ME	1.0 fl oz										
+ Banner MAXX 1.3ME	1.0 fl oz	21	1.8 a-d	0.8 ab	2.5 a-c	8.3 a-g	4.3 a-e	9.5 a-e	2.3 a-d	12.0 h-m	5.3 ab
29 Heritage TL 0.8ME	0.5 fl oz										
+ Banner MAXX 1.3ME	0.5 fl oz	14	2.8 a-e	0.0 a	0.0 a	1.0 a-c	4.3 a-e	23.5 e-h	5.0 a-e	0.0 a	0.0 a
30 Rotational program #1	--	21 ⁴	1.8 a-d	0.8 ab	1.8 a-c	3.8 a-f	6.0 a-f	3.0 ab	2.3 a-d	0.5 ab	0.5 a
31 Banner MAXX 1.3ME	0.5 fl oz	14	0.8 a-c	0.8 ab	0.0 a	0.0 a	2.5 a-d	11.0 a-f	1.3 ab	0.0 a	1.3 a
32 RU 20189-05L	2.0 fl oz	7 ⁵	1.8 a-d	0.0 a	7.5 a-i	56.3 op	35.5 m-p	74.5 lm	33.8 l-o	12.5 h-m	47.8 ef
33 Heritage TL 0.8ME	1.0 fl oz	21	3.8 a-e	32.0 j	15.8 j-m	76.3 r	23.0 i-m	71.3 lm	29.0 j-n	98.0 s	0.3 a
34 Headway 1.39EC	1.5 fl oz	21	1.0 a-d	0.0 a	2.0 a-c	8.8 a-g	8.5 a-h	17.5 c-g	4.8 a-e	10.0 f-l	0.5 a
35 Headway 1.39EC	3.0 fl oz	28	0.5 ab	0.0 a	4.3 a-f	0.0 a	11.3 a-i	84.3 m-p	20.0 f-j	0.0 a	0.5 a
36 Heritage TL 0.8ME	2.0 fl oz										
+ Banner MAXX1.3ME	2.0 fl oz	28	2.0 a-d	24.8 i	28.5 o	3.3 a-f	20.5 h-l	91.3 o-q	32.0 j-o	0.0 a	0.3 a
37 Banner MAXX 1.3ME	1.0 fl oz	21	1.5 a-d	3.5 a-d	4.8 a-f	11.3 c-h	14.8 c-i	9.5 a-e	6.5 a-e	0.0 a	0.3 a
38 Banner MAXX 1.3ME	2.0 fl oz	28	2.5 a-d	1.0 ab	2.8 a-d	0.5 ab	13.8 a-i	63.0 kl	5.3 a-e	0.0 a	0.0 a
39 A14472 32.5WG	0.5 oz	21	2.8 a-e	7.0 a-f	6.0 a-h	13.0 e-i	6.5 a-g	2.8 ab	8.3 a-f	2.5 a-d	0.8 a
40 A14472 32.5WG	1.0 oz	28	4.0 a-e	1.0 ab	6.8 a-i	1.3 a-c	16.3 d-i	62.0 kl	5.0 a-e	0.0 a	0.3 a
41 Concert 4.3SE	4.2 fl oz	21	2.8 a-e	0.0 a	0.5 a	4.3 a-f	6.5 a-g	7.0 a-c	0.8 a	4.0 a-g	0.5 a
42 PX056	0.32 fl oz										
+ Banner MAXX 1.3ME	1.0 fl oz	21 ⁶	1.5 a-d	3.0 a-d	3.0 a-e	8.5 a-g	6.5 a-g	2.3 ab	0.5 a	3.0 a-e	1.5 a
43 Banner MAXX 1.3ME	1.0 fl oz	21 ⁶	1.8 a-d	8.8 c-f	3.8 a-e	10.3 a-g	9.0 a-h	14.3 a-g	6.3 a-e	10.3 g-l	5.5 ab
44 PX056	0.32 fl oz										
+ Banner MAXX 1.3ME	1.0 fl oz	21	2.3 a-d	4.3 a-e	2.3 a-c	10.5 a-g	12.3 a-i	9.0 a-d	1.5 a-c	0.8 a-c	0.0 a

(Continued)

Table 1A (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ²	Number of Lesions per plot ¹									
			3 June	13 June	23 June	1 July	13 July	25 July	4 Aug.	17 Aug.	30 Aug.	
45 Banner MAXX 1.3ME	1.0 fl oz	21	2.5 a-d	0.0 a	2.0 a-c	8.8 a-g	6.0 a-f	5.8 a-c	1.8 a-c	0.5 ab	0.3 a	
46 PX056	0.32 fl oz											
+ Daconil Ultrex 82.5WDG	1.8 oz	21 ⁶	1.5 a-d	9.5 d-f	7.3 a-i	22.5 i-l	18.5 f-k	21.5 d-h	14.8 d-i	25.8 qr	45.0 d-f	
47 Daconil Ultrex 82.5WDG	1.8 oz	21 ⁶	3.5 a-e	9.0 d-f	10.0 d-i	25.0 k-m	16.0 d-i	73.0 lm	35.3 m-p	23.8 q	36.8 d	
48 PX056	0.32 fl oz											
+ Daconil Ultrex 82.5WDG	1.8 oz	21	3.3 a-e	12.0 f-g	12.8 h-i	25.3 lm	17.0 e-j	21.5 d-h	22.3 g-l	20.0 n-q	34.8 d	
49 Daconil Ultrex 82.5WDG	1.8 oz	21	1.8 a-d	11.3 ef	13.0 h-i	33.0 mn	15.8 c-i	52.0 jk	32.5 k-o	15.5 k-o	78.0 hi	
50 PX056	0.32 fl oz											
+ Concert 4.3SE	4.2 fl oz	21 ⁶	2.0 a-d	3.3 a-d	0.8 a	1.8 a-d	2.0 a-c	0.3 a	1.5 a-c	1.3 a-c	0.3 a	
51 PX056	0.32 fl oz											
+ Concert 4.3SE	4.2 fl oz	21	1.5 a-d	0.0 a	0.8 a	3.0 a-e	5.0 a-f	2.5 ab	0.8 a	3.5 a-e	0.0 a	
52 Emerald 70WG	0.13 oz	14	4.3 b-e	0.0 a	0.0 a	0.0 a	0.0 a	1.3 a	3.0 a-e	0.0 a	0.3 a	
53 Emerald 70WG	0.18 oz	21	2.3 a-d	1.3 a-c	1.0 ab	0.8 a-c	0.5 ab	7.3 a-d	14.0 b-i	4.0 a-g	0.0 a	
54 Chipco 26GT 2SC	4.0 fl oz	14	0.8 a-c	0.0 a	0.0 a	0.0 a	4.5 a-e	13.0 a-g	2.8 a-e	3.0 a-e	1.0 a	
55 HeritageTL 0.8ME	2.0 fl oz	28	4.0 a-e	39.5 kl	25.0 no	51.5 op	95.5 r	129.8 t	70.5 tu	8.5 d-i	21.0 c	
56 HeritageTL 0.8ME	0.5 fl oz	14	6.5 e	3.8 a-e	15.5 j-m	47.5 o	52.0 q	113.3 rs	81.5 v	23.0 pq	116.5 k	
57 Concert 4.3SE	4.2 fl oz	21 ⁶	2.8 a-e	0.0 a	2.5 a-c	5.5 a-g	10.0 a-i	6.0 a-c	4.5 a-e	3.8 a-f	8.0 ab	
58 Plant Food Tank Mix	--	14 ⁷	3.8 a-e	18.0 gh	17.0 lm	34.0 mn	13.3 a-i	74.3 lm	36.3 n-p	10.0 fl	54.3 fg	
59 Untreated Check	--	--	2.8 a-e	44.8 l	38.8 p	65.5 q	44.3 o-q	80.3 m-o	51.3 qr	23.8 q	125.8 k	
60 Untreated Check	--	--	5.0 de	51.0 m	35.5 p	58.8 pq	42.0 n-q	84.8 m-p	62.8 s-u	25.5 qr	102.8 j	

INT ⁸	DAT ⁹	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT	DAT
7	1	4	7	1	1	4	7	1	4	7	5
14	7	4	14	8	6	4	14	14	13	12	12
21	7	17	7	15	6	18	7	20	20	12	12
28	7	17	27	7	20	4	14	14	27	12	12

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).

(Continued)

Table 1A (continued).

- ² Fungicides were applied on 27 May (all treatments, except treatment 58), 9 June (14 day treatment and treatment 58), 16 June (21 day treatment), 23 June (14 and 28 day treatments), 7 July (14 and 21 day treatments), 21 July (7, 14, and 28 July treatments), 28 July (7 and 21 day treatments), 4 August (7 and 14 day treatments), 11 August (7 day treatment), 18 August (7, 14, 21, and 28 day treatments), 25 August (7 day treatment), 1 September (7 and 14 day treatments), and 15 September (treatment 30 only).
- ³ For treatments 6 to 9, 11, and 12, RU20189-05L was applied every 14 days from 27 May to 1 September, whereas Banner MAXX 1.3MC was applied every 21 days (treatments 6 and 8) or every 28 days (treatments 7 and 9), and Daconil Ultrex 82.5WDG was sprayed on turf every 21 days (treatments 11 and 12) from 27 May to 1 September.
- ⁴ Rotational program 1 was applied as follows: Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (2.4 oz) on 27 May, Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) on 16 June, Chipco 26GT 2SC (3 fl oz) + Cleary 3336 4F (2 fl oz) on 7 July, Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) on 28 July, Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) on 18 August, and Chipco 26GT 2SC (3 fl oz) + Cleary 3336 4F (2 fl oz) on 15 September.
- ⁵ For treatment 32, Daconil Ultrex 82.5 WDG (3.8 oz) was applied on 7 July followed by RU20189-05L (2 fl oz) every 7 days from 21 July to 1 September.
- ⁶ Treatments 42, 43, 46, 47, 50, and 57 were applied in 1 gal water/1000 sq ft. All other other treatments in this study were applied in 2 gal water/1000 sq ft.
- ⁷ Treatment 58 consisted of a tank mixture containing Thio-Sul 12-0-0 S (6 fl oz) + Green T 12-3-12 50% SRN (6 fl oz) + Tecmangam 32% (3.2 oz) + Sugar Cal 10% Ca (2 fl oz) + Adams Earth (2 fl oz) + Flo Thru (2 fl oz) + 12-3-12 Organic (24 oz).
- ⁸ Spray intervals in days.
- ⁹ Days after treatment (DAT) for each spray interval.

Table 1B. Part 2: Efficacy of fungicides and biorational products for the control of dollar spot on fairways, New Brunswick, NJ, 2005.

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ²	Brown Patch (%) 1 July	Number of Lesion Centers per Plot ¹			Copper Spot ¹⁰ 17 Aug.
				12 Sept.	22 Sept.	10 Oct.	
1 26/36 39.3F	5.0 fl oz	21	0.0 a	1.3 ab	27.0 b-h	90.0 k-s	0.0 a
2 26/36 39.3F	3.75 fl oz	21	3.8 a-d	2.0 ab	23.0 a-h	77.0 g-o	0.8 a-c
3 Cleary 3336 4F	4 fl oz	14	5.0 a-e	47.5 j-l	95.0 m-o	120.5 wx	3.3 a-f
4 Cleary 3336 Plus 19.4F	4 fl oz	21	3.0 a-c	72.0 n-p	131.3 q-s	122.5 wx	1.5 a-d
5 Cleary 3336 Plus 19.4F	2 fl oz	21	8.8 c-g	90.5 qr	186.3 wx	127.7 x	0.8 a-c
6 RU20189-05L	1.5 fl oz	14 ³	10.0 d-h	7.5 a-c	38.8 f-i	79.0 h-p	1.5 a-d
7 /Banner MAXX 1.3ME	0.5 fl oz	21 ³	6.3 a-f	0.0 a	21.5 a-h	43.8 b-d	4.8 c-f
8 /Banner MAXX 1.3ME	0.5 fl oz	28 ³	11.3 e-h	3.0 ab	28.0 b-h	55.5 d-f	1.0 a-d
9 /Banner MAXX 1.3ME	2.0 fl oz	14 ³	6.0 a-f	0.5 a	21.3 a-h	92.0 l-t	1.5 a-d
10 /Banner MAXX 1.3ME	0.5 fl oz	28 ³	0.0 a	41.8 h-l	53.0 i-k	63.3 d-j	2.3 a-e
11 + Daconil Ultrex 82.5WDG	1.8 oz	14	10.0 d-h	48.0 j-l	97.5 m-o	80.5 j-p	2.5 a-e
12 /Daconil Ultrex 82.5WDG	1.5 fl oz	14 ³	16.3 h	26.5 c-h	88.8 l-o	103.0 q-w	4.3 b-f
13 /Daconil Ultrex 82.5WDG	1.8 oz	21 ³	15.0 gh	53.3 k-m	121.8 p-s	86.3 k-r	4.0 a-f
14 /Daconil Ultrex 82.5WDG	1.5 fl oz	14	11.3 e-h	46.3 i-l	152.5 t-v	86.8 k-r	5.0 d-f
15 Banner MAXX 1.3ME	0.5 fl oz	21	7.5 b-f	11.5 a-e	39.8 f-i	83.3 j-q	2.5 a-e
16 Banner MAXX 1.3ME	0.5 fl oz	28	3.8 a-d	8.3 a-d	30.3 c-i	71.3 e-k	0.5 ab
17 Untreated Check	--	--	12.5 f-h	80.8 o-r	101.3 n-p	158.8 y	12.3 h
18 Untreated Check	--	--	8.0 b-f	80.5 o-r	100.0 n-p	160.0 y	10.5 gh
19 Fairway SQ 6-0-2	3 fl oz	14	3.0 a-c	6.0 ab	83.5 k-m	118.8 v-x	0.5 ab
20 + Daconil Ultrex 82.5WDG	1.8 oz	14	0.0 a	18.3 a-f	110.0 o-r	95.3 n-u	0.0 a
21 + Daconil Ultrex 82.5WDG	1.8 oz	14	3.8 a-d	19.3 a-g	103.8 n-q	111.8 t-x	1.0 a-d

(Continued)

Table 1B (continued).

Treatment	Rate per 1000 sq ft	Spray Interval (days) ²	Brown Patch (%) 1 July	Number of Lesion Centers per Plot ¹			Copper Spot ¹⁰ 17 Aug.
				12 Sept.	22 Sept.	10 Oct.	
22 CGA 245704 50W	0.012 oz	21	0.0 a	52.5 k-m	68.8 kl	81.5 j-p	6.8 fg
23 Daconil Ultrex 82.5WDG	1.8 oz	21	1.3 ab	56.8 l-n	70.5 kl	82.5 j-q	2.3 a-e
+ CGA 245704 50W	0.012 oz	21	3.8 a-d	96.3 rs	125.5 q-s	73.3 f-l	2.3 a-e
24 Daconil Ultrex 82.5WDG	1.8 oz	14	1.3 ab	7.0 a-c	33.5 d-i	76.3 g-n	0.0 a
25 Headway 1.39EC	0.75 fl oz	14	1.3 ab	33.3 f-j	173.8 vw	200.0 z	2.3 a-e
26 Heritage TL 0.8ME	1.0 fl oz	14	1.3 ab	0.0 a	7.5 a-c	32.5 bc	0.0 a
27 Heritage TL 0.8ME	1.0 fl oz	14	1.3 ab	28.8 e-i	65.8 i-l	114.3 u-x	0.0 a
+ Banner MAXX 1.3ME	0.5 fl oz	14	1.3 ab	0.0 a	16.3 a-f	52.0 c-e	0.0 a
28 Heritage TL 0.8ME	1.0 fl oz	21	1.3 ab	0.0 a	4.3 ab	0.0 a	0.5 ab
+ Banner MAXX 1.3ME	0.5 fl oz	14	0.0 a	16.3 a-f	34.5 e-i	82.8 j-q	0.0 a
29 Heritage TL 0.8ME	0.5 fl oz	14	0.0 a	37.5 g-k	100.0 n-p	30.5 b	2.5 a-e
+ Banner MAXX 1.3ME	0.5 fl oz	21 ⁴	0.0 a	8.0 a-c	34.5 e-i	97.5 o-u	6.0 ef
30 Rotational program #1	--	14	0.0 a	27.5 d-h	74.5 k-m	122.5 wx	0.0 a
31 Banner MAXX 1.3ME	0.5 fl oz	14	5.0 a-e	0.0 a	6.0 ab	57.8 d-g	0.8 a-c
32 RU 20189-05L	2.0 fl oz	7 ⁵	11.3 e-h	2.3 ab	25.5 b-h	108.8 s-x	0.5 ab
33 Heritage TL 0.8ME	1.0 fl oz	21	2.5 a-c	9.5 a-e	33.0 d-i	65.0 e-j	0.0 a
34 Headway 1.39EC	1.5 fl oz	21	0.0 a	7.5 a-c	13.3 a-e	59.5 d-h	0.0 a
35 Headway 1.39EC	3.0 fl oz	28	0.0 a	7.8 a-c	32.0 d-i	90.8 k-s	0.0 a
36 Heritage TL 0.8ME	2.0 fl oz	28	0.0 a	0.5 a	10.0 a-d	80.8 i-p	0.0 a
+ Banner MAXX1.3ME	2.0 fl oz	21	0.0 a	6.8 a-c	27.3 b-h	70.8 e-k	0.0 a
37 Banner MAXX 1.3ME	1.0 fl oz	21	0.0 a	9.5 a-e	42.8 gj	74.5 f-m	0.0 a
38 Banner MAXX 1.3ME	2.0 fl oz	28	1.3 ab	14.3 a-e	44.3 hj	91.3 k-t	1.3 a-d
39 A14472 32.5WG	0.5 oz	21	2.5 a-c	6.8 a-c	32.8 d-i	75.8 f-n	0.8 a-c
40 A14472 32.5WG	1.0 oz	28	0.0 a	9.5 a-e	42.8 gj	74.5 f-m	0.0 a
41 Concert 4.3SE	4.2 fl oz	21	0.0 a	14.3 a-e	44.3 hj	91.3 k-t	1.3 a-d
42 PX056	0.32 fl oz	21 ⁶	5.0 a-e	6.8 a-c	32.8 d-i	75.8 f-n	0.8 a-c
+ Banner MAXX 1.3ME	1.0 fl oz	21 ⁶	1.3 ab	9.5 a-e	42.8 gj	74.5 f-m	0.0 a
43 Banner MAXX 1.3ME	1.0 fl oz	21 ⁶	1.3 ab	14.3 a-e	44.3 hj	91.3 k-t	1.3 a-d
44 PX056	0.32 fl oz	21	5.0 a-e	6.8 a-c	32.8 d-i	75.8 f-n	0.8 a-c
+ Banner MAXX 1.3ME	1.0 fl oz	21	5.0 a-e	6.8 a-c	32.8 d-i	75.8 f-n	0.8 a-c

(Continued)

Table 1B (continued).

Treatment	Rate per 1000 sq ft	Spray Interval (days) ²	Brown Patch (%) 1 July	Number of Lesion Centers per Plot ¹			Copper Spot ¹⁰ 17 Aug.
				12 Sept.	22 Sept.	10 Oct.	
45 Banner MAXX 1.3ME	1.0 fl oz	21	1.3 ab	10.8 a-e	32.5 d-i	77.5 g-o	0.0 a
46 PX056	0.32 fl oz						
+ Daconil Ultrex 82.5WDG	1.8 oz	21 ⁶	1.3 ab	88.0 p-r	111.3 o-r	106.3 r-w	1.8 a-d
47 Daconil Ultrex 82.5WDG	1.8 oz	21 ⁶	3.8 a-d	85.0 o-r	143.3 f-t	127.5 x	2.0 a-e
48 PX056	0.32 fl oz						
+ Daconil Ultrex 82.5WDG	1.8 oz	21	1.3 ab	68.8 m-o	131.0 q-s	73.8 f-l	3.0 a-f
49 Daconil Ultrex 82.5WDG	1.8 oz	21	2.5 a-c	97.5 rs	168.8 vw	83.8 j-q	1.8 a-d
50 PX056	0.32 fl oz						
+ Concert 4.3SE	4.2 fl oz	21 ⁶	0.5 a	2.0 ab	19.5 a-g	98.8 p-v	0.0 a
51 PX056	0.32 fl oz						
+ Concert 4.3SE	4.2 fl oz	21	0.0 a	2.5 ab	27.8 b-h	75.8 f-n	0.0 a
52 Emerald 70WG	0.13 oz	14	8.8 c-g	0.0 a	0.0 a	0.0 a	0.0 a
53 Emerald 70WG	0.18 oz	21	12.5 f-h	0.0 a	0.5 a	9.5 a	4.5 b-f
54 Chipco 26GT 2SC	4.0 fl oz	14	0.0 a	1.5 ab	16.0 a-f	60.8 d-i	0.8 a-c
55 HeritageTL 0.8ME	2.0 fl oz	28	0.0 a	75.3 o-q	165.0 u-w	212.5 z	0.5 ab
56 HeritageTL 0.8ME	0.5 fl oz	14	0.0 a	97.5 rs	200.0 x	233.3 z'	2.3 a-e
57 Concert 4.3SE	4.2 fl oz	21 ⁶	0.0 a	21.0 b-g	27.3 a-c	63.8 d-j	1.0 a-d
58 Plant Food Tank Mix	--	14 ⁷	5.0 a-e	56.8 l-n	103.8 n-q	94.5 m-u	3.0 a-f
59 Untreated Check	--	--	12.5 f-h	93.0 q-s	107.5 n-r	155.0 y	13.8 h
60 Untreated Check	--	--	10.0 d-h	110.0 s	100.0 n-p	158.8 y	10.5 gh

INT ⁸	DAT ⁹	DAT	DAT	DAT	DAT
7	1	11	21	38	6
14	8	11	21	38	13
21	15	25	36	53	20
28	7	25	36	53	27

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).

(Continued)

Table 1B (continued).

- ² Fungicides were applied on 27 May (all treatments, except treatment 58), 9 June (14 day treatment and treatment 58), 16 June (21 day treatment), 23 June (14 and 28 day treatments), 7 July (14 and 21 day treatments), 21 July (7, 14, and 28 July treatments), 28 July (7 and 21 day treatments), 4 August (7 and 14 day treatments), 11 August (7 day treatment), 18 August (7, 14, 21, and 28 day treatments), 25 August (7 day treatment), 1 September (7 and 14 day treatments), and 15 September (treatment 30 only).
- ³ For treatments 6 to 9, 11, and 12, RU20189-05L was applied every 14 days from 27 May to 1 September, whereas Banner MAXX 1.3MC was applied every 21 days (treatments 6 and 8) or every 28 days (treatments 7 and 9), and Daconil Ultrex 82.5WDG was sprayed on turf every 21 days (treatments 11 and 12) from 27 May to 1 September.
- ⁴ Rotational program 1 was applied as follows: Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (2.4 oz) on 27 May, Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) on 16 June, Chipco 26GT 2SC (3 fl oz) + Cleary 3336 4F (2 fl oz) on 7 July, Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) on 28 July, Banner MAXX 1.3ME (1 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) on 18 August, and Chipco 26GT 2SC (3 fl oz) + Cleary 3336 4F (2 fl oz) on 15 September.
- ⁵ For treatment 32, Daconil Ultrex 82.5 WDG (3.8 oz) was applied on 7 July followed by RU20189-05L (2 fl oz) every 7 days from 21 July to 1 September.
- ⁶ Treatments 42, 43, 46, 47, 50, and 57 were applied in 1 gal water/1000 sq ft. All other other treatments in this study were applied in 2 gal water/1000 sq ft.
- ⁷ Treatment 58 consisted of a tank mixture containing Thio-Sul 12-0-0 S (6 fl oz) + Green T 12-3-12 50% SRN (6 fl oz) + Tecmangam 32% (3.2 oz) + Sugar Cal 10% Ca (2 fl oz) + Adams Earth (2 fl oz) + Flo Thru (2 fl oz) + 12-3-12 Organic (24 oz).
- ⁸ Spray intervals in days.
- ⁹ Days after treatment (DAT) for each spray interval.
- ¹⁰ Number of lesion centers per plot.