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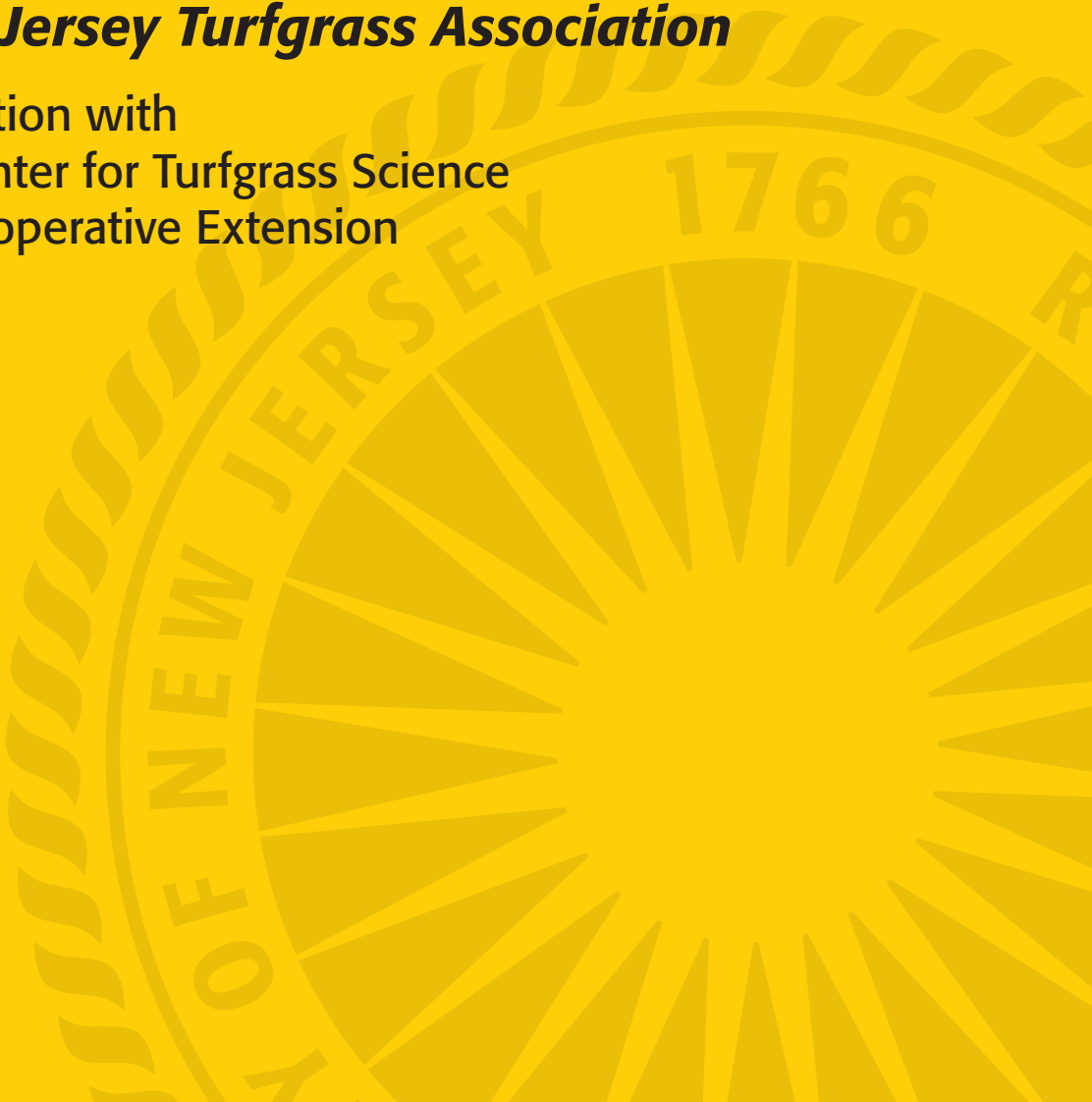

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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State 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 2012 GREEN EXPO Turf and Landscape Conference. 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
Dr. Bruce B. Clarke, Coordinator

ANTHRACNOSE CONTROL WITH FUNGICIDES AND BIORATIONAL PRODUCTS ON ANNUAL BLUEGRASS PUTTING GREEN TURF – TEST 2, 2012

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Fungicides were evaluated in 2012 for their ability to control anthracnose basal rot (caused by *Colletotrichum cereale*) on an annual bluegrass (*Poa annua*) putting green at the Rutgers Turf Research Farm in North Brunswick, NJ. The green was established October 2004 on a Nixon loam with a pH of 6.3 by killing the existing stand of creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass with Roundup Pro 3LC (3 qt per acre) and then core aerifying the site in two directions to bring dormant annual bluegrass seed to the soil surface. The site was inoculated with *C. cereale* isolate ValP-04 on 17 July 2005 using a 2 gal per 1,000 ft^2 water spore suspension (4 x 10^5 conidia per ml); the disease developed naturally on the site each year thereafter. Plots were 3 x 5 ft and were arranged in a randomized complete block with four replications. Mowing was performed daily at a height of 0.110-inch with clippings collected. The site was irrigated as needed to prevent drought stress.

Fertilizer was applied as 30-0-0 (0.4 lb nitrogen (N) per 1000 ft^2) on 19 March; 46-0-0 (0.1 lb N per 1000 ft^2) on 19 March, 11 and 24 April, 9 and 22 May, 5, 18, and 25 June, 2, 16, and 29 July, and 13 and 28 August; 13.7-0-46 (0.1 lb N per 1000 ft^2) on 11 June; 0-30-0 (0.1 lb N per 1000 ft^2) on 11 and 28 June, 24 July, 6 and 23 August, and 6 September; 0-0-62 (0.05 lb N per 1000 ft^2) on 1, 15, and 24 July, 8 and 28 August, and 9 September; and Microgreen (micronutrient mixture; 0.4 fl oz N per 1000 ft^2) on 25 June, 5 July, 2 August, and 1 September. The growth regulators Primo MAXX 1ME (0.125 fl oz per 1000 ft^2) + Proxy 2SL (5.0 fl oz per 1000 ft^2) were sprayed over the trial on 15 March and 6 and 19 April to suppress seed heads, and Primo MAXX 1ME (0.125 fl oz per 1000 ft^2) was continued every 14 days from 5 May to 5 October.

Dollar spot (caused by *Sclerotinia homoeocarpa*) was suppressed with Emerald 70WG (0.18 oz per 1000 ft^2) on 21 April, 23 May, 22 June, 22 July, and 15 August and Curalan 50EG (1.0 oz per 1000 ft^2) on 12 May, 10 June, 9 July, 3 August, and 1 September. Brown ring patch (incited by *Rhizoctonia circinata*) was controlled with ProStar 70W (3.0 oz per 1000 ft^2) on 21 and 29 March, 9 May, and 2 June and Heritage TL 0.8ME (2.0 fl oz per 1000 ft^2) on 21 April and 19 May. Brown patch (caused by *Rhizoctonia solani*) was prevented with ProStar 70W (3.0 oz per 1000 ft^2) on 29 June, 26 July, and 24 August, and summer patch (*Magnaporthe poae*) was suppressed with Heritage TL 0.8ME (2.0 fl oz per 1000 ft^2) on 15 June, 15 July, and 11 August. Previous research by the authors has shown that Curalan 50EG, Heritage TL 0.8ME, ProStar 70W, and Emerald 70WG did not affect anthracnose development on the study site at the rates used in this study. Insect pests were controlled with Acelypryn 1.67SC (0.184 fl oz per acre) on 18 March and Provant 30WDG (0.275 fl oz per 1000 ft^2) on 23 June. Turf was topdressed with sand (2 ft^3 per 1,000 ft^2) on 30 March, 27 April, 10 May, 22 June, 9 July, and 7 August.

Fungicides were applied in water equivalent to 1.9 gal per 1000 ft^2 with a $C0_2$ powered sprayer at 30 psi using Tee Jet 8003E nozzles. Treatments (trt) were initiated on 17 May, prior to the development of anthracnose. Fungicides were reapplied at the appropriate intervals until 23 August as indicated in Tables 1A to 1D. Turf was visually evaluated for percent turf area infested with anthracnose on 8, 18, and 30 June, 10, 20, and 30 July, 10, 20, and 30 August, and 9 September. Phytotoxicity was determined on 14 June and 14 July using a 1 to 5 scale, where 1 = no foliar discoloration, 2 = slight chlorosis or necrosis,

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3 = moderate chlorosis or necrosis, 4 = severe chlorosis or necrosis, and 5 = all turf dead. Turf quality was evaluated on 14 June, 14 July, 11 August, and 9 September using a 1 to 9 scale, where 9 = best turf quality and 5 = acceptable quality. Color of foliage was visually estimated on 14 June and 20 July using a 1 to 5 scale, where 1 = very chlorotic turf, 2 = slight reduction in green color, 3 = normal color of untreated turf, 4 = slight increase in dark green color, and 5 = very dark green color. Percent soil surface covered with blue-green algae (cyanobacteria) was assessed on 20 July. Data were subjected to analysis of variance and means were separated by Waller-Duncan *k*-ratio *t*-test (*k* =100).

Anthracnose developed on 5 June as a natural infection and became uniformly distributed throughout the green by 8 June. Disease severity peaked on 30 August (73% turfgrass area infested on non-fungicide treated turf). Due to the severity of this natural epidemic, only 34% of the treatments provided season-long control of anthracnose (i.e., less than 15% turf area infested from 15 May through 9 September; Tables 1A and 1B). These treatments included products containing chlorothalonil, phosphonates, phenylpyrroles, and/or DMI fungicides [i.e., Daconil Action 6.1SC (trt 9), Cleary 2012 Anth Programs #5 (trt 16) and #6 (trt 17), Plant Food 2012 Anth Programs #7 (trt 18), #8 (trt 19), and #10 (trt 21), Petro-Canada 2012 Anth Programs #11 (trt 22), #12 (trt 23), #13 (trt 24), #14 (trt 25), #16 (trt 27), and #17 (trt 28), Rutgers 2012 Anth Program #21 (trt 32), Medallion 50WP (trt 34), and the experimental fungicides NB37904 1.8SC @ 0.66 fl oz every 14 days (trt 2), and NB37904 1.8SC every 21 days (trts 4, 5)]. Several other products adequately suppressed anthracnose throughout the treatment period (17 May to 15 August; see 20 August evaluation date, Table 1B) [i.e., NB37904 1.8SC @ 0.75 fl oz every 14 days (trt 3) and FPS20115 LC 1.4 fl oz (trt 43)].

Turf quality evaluated on 14 June, 14 July, 11 August, and 9 Sept was closely associated with the degree of anthracnose control; treatments affording acceptable protection from this disease typically had good turf quality (Table 1C). The following treatments had less than acceptable turf quality (less than 5.0 on a scale of 1 to 9, where 9 = best quality) on at least 50% of the evaluation dates: Segway 3.3SC (trt 7), Clearys 26/36 SC (trt 10), IKF-5411 3.3SC (trts 11 to 13), Chipco Signature 80WG (trt 33), F9110 LC (trts 36 to 38), F9881-1 LC + F9110 LC (trts 39 to 41), FPS20115 LC @ 0.71 fl oz (trt 42), FPS20115 LC + Pentathlon 4F (trt 44), and F9881-1 LC (trts 46, 48). Slight phytotoxicity was observed in June and July (Table 1C) for Cleary 2012 Anth Programs #4 (trt 15), #5 (trt 16), and #6 (trt 17), Tourney 50WG (trt 35), FPS20115 LC @ 1.4 fl oz (trt 43), and F9881-1 LC @ 1.125 fl oz (trt 48; Table 1C).

Several treatments resulted in visually darker green foliage (statistically greater than the untreated controls, trts 77, 78) on at least 50% of the evaluation dates [i.e., Cleary 2012 Anth Programs #4 (trt 15), #5 (trt 16), and #6 (trt 17), Plant Food 2012 Anth Programs #7 (trt 18), #8 (trt 19), #9 (trt 20), and #10 (trt 21), Petro-Canada 2012 Anth Programs #11 (trt 22), #12 (trt 23), #13 (trt 24), #14 (trt 25), #15 (trt 26), #16 (trt 27), #17 (trt 28), and #18 (trt 29), and Tourney 50WG (trt 35)] because they contained either a pigment, a plant growth regulator, and/or a fertilizer (Table 1D).

Treatment 49, as well as several products containing chlorothalonil, mancozeb, and/or a phosphonate (i.e., trts 9, 14 to 23, 25, 26, 28 to 33, and 45), reduced algae compared to the untreated control; whereas a few products and product combinations increased the percentage of the soil surface covered with blue green algae presumably because these products reduced stand density (i.e., trts 10, 39 and 43; Table 1D).

Table 1A. Anthracnose control with fungicides and biorational products on annual bluegrass putting green turf, Test 2: Rutgers University, 2012.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[2]	Turf Area Infested (%) per Plot[1]					
				8 June	18 June	30 June	10 July	20 July	30 July
1	NB37904 1.8SC	0.5 fl oz	14	18.0 d-j	17.0 c-h	12.8 g-s	12.3 l-s	3.0 s-v	7.3 l-r
2	NB37904 1.8SC	0.66 fl oz	14[3]	14.0 i-p	15.3 d-j	10.0 l-s	11.8 l-s	2.8 s-v	3.8 o-r
3	NB37904 1.8SC	0.75 fl oz	14[4]	10.3 i-t	10.0 e-k	10.0 l-s	8.0 o-s	0.5 v	2.8 p-r
4	NB37904 1.8SC	0.75 fl oz	21	11.5 i-s	12.5 d-k	12.3 i-s	9.3 n-s	6.0 p-v	4.5 n-r
5	NB37904 1.8SC	1.0 fl oz	21	12.3 i-s	10.8 e-k	9.0 m-s	7.5 o-s	4.5 q-v	3.8 o-r
6	NB37908 28WP	1.1 oz	14	8.8 m-t	12.5 d-k	18.5 e-n	22.3 g-k	13.8 l-p	17.0 g-k
7	Segway 3.3SC	0.45 fl oz	14	24.0 b-g	30.0 b	58.8 a	48.0 b	52.8 ab	75.3 a
8	Affirm 11.3WG	0.87 oz	14	14.8 i-o	14.3 d-k	13.5 g-r	17.3 i-n	15.0 j-o	10.3 k-q
9	Daconil Action 6.1SC	3.5 fl oz	14	13.3 i-r	7.0 jk	14.5 g-q	12.0 l-s	5.3 q-v	3.5 o-r
10	Clearys 26/36	3.0 fl oz	14	7.0 o-t	10.0 e-k	11.5 k-s	7.8 o-s	2.5 s-v	14.3 i-m
11	IKF-5411 3.3SC	0.4 fl oz	14	17.3 f-l	14.3 d-k	28.3 b-f	31.0 d-f	28.8 f-h	43.8 c
12	IKF-5411 3.3SC	0.5 fl oz	14	16.8 g-m	18.3 c-f	30.3 b-d	54.5 ab	47.5 bc	59.8 b
13	IKF-5411 3.3SC	0.5 fl oz	21	18.0 d-j	17.0 c-h	33.0 bc	60.8 a	36.5 d-f	45.5 c
14	2012 Anth Program #3	Cleary	14–ALT[5]	11.8 i-s	16.3 c-i	18.3 e-n	23.5 f-j	12.3 m-q	10.8 k-p
15	2012 Anth Program #4	Cleary	14–ALT[6]	13.8 i-q	18.8 c-e	22.5 c-j	26.8 f-h	11.3 n-r	7.3 l-r
16	2012 Anth Program #5	Cleary	ALT–14[7]	7.5 n-t	7.5 i-k	6.0 p-s	9.3 n-s	3.8 r-v	2.3 p-r
17	2012 Anth Program #6	Cleary	ALT–14[8]	4.0 st	6.5 jk	2.3 s	7.0 p-s	2.5 s-v	3.0 p-r
18	2012 Anth Program #7	Plant Food	7[9]	5.5 q-t	6.5 jk	9.3 m-s	15.8 j-o	14.0 k-p	6.0 m-r
19	2012 Anth Program #8	Plant Food	7[10]	5.3 r-t	8.3 h-k	5.0 q-s	7.8 o-s	8.0 o-v	1.5 qr
20	2012 Anth Program #9	Plant Food	7[11]	7.5 n-t	7.8 i-k	16.3 g-p	24.5 f-i	30.3 e-g	18.5 g-k
21	2012 Anth Program #10	Plant Food	7[12]	5.5 q-t	9.3 f-k	11.5 k-s	11.5 m-s	9.5 n-u	1.8 qr
22	2012 Anth Program #11	Petro-Canada	14[13]	12.0 i-s	11.3 e-k	7.0 o-s	5.3 rs	1.5 uv	1.8 qr
23	2012 Anth Program #12	Petro-Canada	14[14]	9.5 k-t	7.0 jk	10.3 l-s	9.8 n-s	7.8 o-v	2.8 p-r
24	2012 Anth Program #13	Petro-Canada	14[15]	2.5 t	7.8 i-k	6.0 p-s	12.8 l-r	12.0 m-q	3.0 p-r
25	2012 Anth Program #14	Petro-Canada	14[16]	2.5 t	6.8 jk	3.3 rs	6.5 q-s	1.8 uv	1.0 r
26	2012 Anth Program #15	Petro-Canada	ALT–14[17]	10.0 i-t	10.3 e-k	11.8 j-s	10.8 m-s	5.3 q-v	8.0 l-r
27	2012 Anth Program #16	Petro-Canada	14[18]	6.0 p-t	6.5 jk	10.0 l-s	6.5 q-s	1.3 v	1.5 qr
28	2012 Anth Program #17	Petro-Canada	14[19]	9.0 l-t	6.0 k	12.5 h-s	6.3 q-s	3.0 s-v	4.3 n-r
29	2012 Anth Program #18	Petro-Canada	14[20]	8.3 n-t	9.8 e-k	15.5 g-q	15.3 j-p	4.8 q-v	7.3 l-r
30	2012 Anth Program #19	Rutgers	VAR–14[21]	23.8 b-g	24.5 bc	23.0 c-i	35.5 c-e	22.3 g-j	21.5 f-i

(Continued)

Table 1A (continued).

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[2]	Turf Area Infested (%) per Plot[1]					
				8 June	18 June	30 June	10 July	20 July	30 July
31	2012 Anth Program #20 .....Petro-Canada		14[22]	7.8 n-t	8.5 h-k	15.3 g-q	19.0 h-m	10.5 n-s	7.5 l-r
32	2012 Anth Program #21 .....Rutgers		VAR–14[23]	6.3 p-t	9.3 f-k	9.5 m-s	14.0 k-q	10.0 n-t	8.0 l-r
33	Chipco Signature 80WG	4.0 oz	14	13.0 i-r	12.5 d-k	23.5 c-g	28.0 d-g	37.8 de	31.5 de
34	Medallion 50WP.....	0.33 oz	14	7.3 n-t	9.0 g-k	6.8 o-s	8.8 o-s	6.8 p-v	5.8 m-r
35	Tourney 50WG.....	0.28 oz	14	18.3 c-i	15.5 c-g	16.5 g-p	18.8 h-m	16.5 i-n	16.0 h-l
36	F9110 LC .....0.34 fl oz		14	17.5 e-k	14.5 d-k	37.0 b	53.3 ab	42.5 cd	69.0 a
37	F9110 LC .....0.71 fl oz		14	13.3 i-r	11.3 e-k	18.5 e-n	39.5 c	28.8 f-h	45.8 c
38	F9110 LC .....1.0 fl oz		14	10.8 i-s	8.8 h-k	17.3 g-o	36.3 cd	22.8 g-j	40.0 cd
39	F9881–1 LC .....0.55 fl oz		–						
	+ F9110 LC .....0.34 fl oz		14	9.8 j-t	10.8 e-k	16.3 g-p	26.3 f-h	22.0 h-k	31.0 e
40	F9881–1 LC .....0.55 fl oz		–						
	+ F9110 LC .....0.71 fl oz		14	10.5 i-t	10.0 e-k	16.8 g-p	24.3 f-i	15.5 j-o	28.0 ef
41	F9881–1 LC .....0.55 fl oz		–						
	+ F9110 LC .....1.0 fl oz		14	12.0 i-s	13.5 d-k	23.3 c-h	15.3 j-p	3.5 r-v	20.8 f-j
42	FPS20115 LC.....0.71 fl oz		14	8.0 n-t	8.8 h-k	8.0 n-s	11.8 l-s	6.8 p-v	12.3 j-o
43	FPS20115 LC.....1.4 fl oz		14	5.8 p-t	6.3 jk	2.3 s	4.0 s	2.3 t-v	6.3 m-r
44	FPS20115 LC.....0.71 fl oz		–						
	+ Pentathlon 4F .....5.9 fl oz		14	6.3 p-t	9.5 f-k	22.3 c-k	26.3 f-h	19.8 i-m	21.3 f-i
45	FPS20115 LC.....1.4 fl oz		–						
	+ Pentathlon 4F .....5.9 fl oz		14	7.3 n-t	8.5 h-k	19.8 d-m	25.0 f-i	14.0 k-p	17.0 g-k
46	F9881–1 LC .....0.55 fl oz		14	11.0 i-s	15.0 d-k	20.5 d-l	27.8 e-g	22.8 g-j	30.5 e
47	F9881–1 LC .....0.55 fl oz		–						
	+ Pentathlon 4F .....5.9 fl oz		14	12.5 i-r	14.0 d-k	28.8 b-e	30.8 d-f	24.0 g-i	25.5 e-g
48	F9881–1 LC .....1.125 fl oz		14	17.3 f-l	14.3 d-k	19.5 d-m	13.5 l-r	20.8 h-l	24.0 e-h
49	CCP38D LC .....8.0 fl oz		14	15.5 h-n	21.0 b-d	17.5 f-o	20.0 g-l	14.0 k-p	12.8 i-n
50	Untreated check.....	–	–	27.8 ab	45.3 a	53.8 a	59.8 a	57.0 a	70.3 a

(Continued)

Table 1A (continued).

Treatment	Rate per 1000 sq ft	Application Schedule (days)[2]	Turf Area Infested (%) per Plot[1]					
			8 June	18 June	30 June	10 July	20 July	30 July
		INT[24]	DAT[25]	DAT	DAT	DAT	DAT	DAT
		7	2	5	3	6	2	5
		14	8	5	3	13	9	5
		21	2	12	3	13	2	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).

[2] Fungicides were applied on 16 May (all treatments), 23 May (7-day treatment), 30 May (7- and 14-day treatments), 6 June (7- and 21-day treatments), 13 June (7- and 14-day treatments), 20 June (7-day treatment), 27 June (7-, 14-, and 21-day treatments), 4 July (7-day treatment), 11 July (7- and 14-day treatments), 18 July (7- and 21-day treatments), 25 July (7- and 14-day treatments), 1 August (7- day treatment), 8 August (7-, 14-, and 21-day treatments), and 15 August (7-day treatment).

[3] Treatment 2 was applied every 14 days from 16 May to 8 August.

[4] Treatment 3 was applied every 14 days from 16 May to 25 July.

[5] ALT = Alternation treatment, where treatment 14 (Cleary Anth Program #3) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[6] ALT = Alternation treatment, where treatment 15 (Cleary Anth Program #4) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[7] ALT = Alternation treatment, where treatment 16 (Cleary Anth Program #5) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[8] ALT = Alternation treatment, where treatment 17 (Cleary Anth Program #6) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[9] Treatment 18 (Plant Food Anth Program #7) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

(Continued)

Table 1A (continued).

[10] Treatment 19 (Plant Food Anth Program #8) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[11] Treatment 20 (Plant Food Anth Program #9) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

[12] Treatment 21 (Plant Food Anth Program #10) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[13] Treatment 22 (Petro-Canada Anth "Injury Threshold" Program #11, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); and (c) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[14] Treatment 23 (Petro-Canada Anth "Injury Threshold" Program #12, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[15] Treatment 24 (Petro-Canada Anth Program #13, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (5.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 18 July; (b) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) applied on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and then continued with Rutgers Anth Program #21 as follows: (c) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August; and (d) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 8 August.

[16] Treatment 25 (Petro-Canada Anth Program #14, protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (10.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 8 August.

[17] Treatment 26 (Petro-Canada Anth "Injury Threshold" Program #15, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Trinity 1.67SC (0.5 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Trinity 1.67SC (0.25 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, and 25 July; (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[18] Treatment 27 (Petro-Canada Anth "Injury Threshold" Program #16, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Torque 3.6SC (0.4 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #32, due to more than 10% foliar injury); (c) Torque 3.6SC (0.2 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, 25 July, and 8 August.

(Continued)

Table 1A (continued).

[19] Treatment 28 (Petro-Canada Anth “Injury Threshold” Program #17, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[20] Treatment 29 (Petro-Canada Anth “Injury Threshold” Program #18, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June through 28 July; and (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[21] VAR = Variable spray schedule, where treatment 30 (Rutgers “half rate” Anth Program #19) consisted of Banner MAXX 1.3ME (0.5 fl oz) applied on 16 May, Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; Chipco Signature 80WG (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 13 June; Endorse 2.5W (2.0 oz) + Daconil Ultrex (1.6 oz) on 27 June; Chipco Signature 80WG (2.0 oz) + Chipco 26GT 2SC (2.0 fl oz) on 11 July; 3336 Plus 19.4F (1.5 fl oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 25 July’ and Chipco Signature 80WG (2.0 oz) + Medallion 50WP (0.165 oz) on 8 August.

[22] Treatment 31 (Petro-Canada Anth “Injury Threshold” Program #20, where protocol reverts to Rutgers Anth Program #21when more than 10% foliar injury is observed) consisted of (a) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) applied on 16 May; (b) Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; (c) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (d) Endorse 2.5W (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 27 June; (e) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) on 11 July; and (f) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and continued with Rutgers Anth Program #21 as follows: Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[23] VAR = Variable spray schedule, where treatment 32 (Rutgers Anth Program #21) consisted of Banner MAXX 1.3ME (1.0 fl oz) applied on 16 May; Daconil Ultrex 82.5WDG (3.2 oz) on 30 May; Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June; Endorse 2.5W (4.0 oz) + Daconil Ultrex (3.2 oz) on 27 June; Chipco Signature 80WG (4.0 oz) + Chipco 26GT 2SC (4.0 fl oz) on 11 July; 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July; and Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[24] Spray interval in days.

[25] Days after the last treatment.

Table 1B. Anthracnose control with fungicides and biorational products on annual bluegrass putting green turf, Test 2: Rutgers University, 2012.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[2]	Turf Area Infested (%) per Plot[1]			
				10 Aug.	20 Aug.	30 Aug.	9 Sept.
1	NB37904 1.8SC	0.5 fl oz	14	5.5 n-p	11.3 o-t	12.3 n-s	13.5 l-o
2	NB37904 1.8SC	0.66 fl oz	14[3]	1.8 p	10.5 o-t	9.8 n-s	7.0 m-p
3	NB37904 1.8SC	0.75 fl oz	14[4]	2.0 p	7.3 p-t	17.0 l-p	24.3 h-l
4	NB37904 1.8SC	0.75 fl oz	21	1.5 p	11.3 o-t	13.5 n-r	6.3 n-p
5	NB37904 1.8SC	1.0 fl oz	21	1.5 p	11.0 o-t	12.8 n-s	5.5 op
6	NB37908 28WP	1.1 oz	14	12.5 k-o	27.5 j-m	28.5 i-l	25.0 h-k
7	Segway 3.3SC	0.45 fl oz	14	78.5 a	81.0 a	81.0 a	75.0 a
8	Affirm 11.3WG	0.87 oz	14	9.5 l-p	23.0 k-n	25.8 k-m	17.5 k-m
9	Daconil Action 6.1SC	3.5 fl oz	14	1.5 p	6.0 q-t	6.8 o-s	3.8 op
10	Clearys 26/36	3.0 fl oz	14	6.3 n-p	41.0 g-i	38.0 g-j	46.3 de
11	IKF-5411 3.3SC	0.4 fl oz	14	50.3 de	53.0 d-f	54.3 d-f	60.5 bc
12	IKF-5411 3.3SC	0.5 fl oz	14	68.0 b	67.8 bc	62.5 b-d	57.8 bc
13	IKF-5411 3.3SC	0.5 fl oz	21	51.8 de	63.8 bc	62.3 b-d	67.3 ab
14	2012 Anth Program #3	Cleary	14–ALT[5]	5.8 n-p	9.8 p-t	7.8 o-s	5.8 op
15	2012 Anth Program #4	Cleary	14–ALT[6]	4.3 op	17.5 m-p	9.8 n-s	4.3 op
16	2012 Anth Program #5	Cleary	ALT–14[7]	3.3 op	3.8 r-t	2.3 rs	4.0 op
17	2012 Anth Program #6	Cleary	ALT–14[8]	0.5 p	3.5 t	2.0 rs	0.8 p
18	2012 Anth Program #7	Plant Food	7[9]	2.5 p	14.3 n-r	12.8 n-s	6.5 n-p
19	2012 Anth Program #8	Plant Food	7[10]	2.3 p	3.0 t	2.3 rs	2.3 p
20	2012 Anth Program #9	Plant Food	7[11]	17.5 j-m	28.3 j-l	17.3 l-p	9.0 m-p
21	2012 Anth Program #10	Plant Food	7[12]	0.5 p	2.0 t	0.8 s	1.3 p
22	2012 Anth Program #11	Petro-Canada	14[13]	1.8 p	6.3 q-t	4.3 q-s	9.0 m-p
23	2012 Anth Program #12	Petro-Canada	14[14]	1.3 p	10.8 o-t	10.0 n-s	8.0 m-p
24	2012 Anth Program #13	Petro-Canada	14[15]	1.5 p	14.3 n-r	9.3 n-s	8.8 m-p
25	2012 Anth Program #14	Petro-Canada	14[16]	1.8 p	6.0 q-t	10.0 n-s	4.5 op
26	2012 Anth Program #15	Petro-Canada	ALT–14[17]	2.5 p	20.8 l-o	20.8 l-n	17.0 k-n
27	2012 Anth Program #16	Petro-Canada	14[18]	1.0 p	8.5 p-t	11.3 n-s	9.0 m-p
28	2012 Anth Program #17	Petro-Canada	14[19]	1.5 p	9.8 p-t	5.3 p-s	7.0 m-p
29	2012 Anth Program #18	Petro-Canada	14[20]	1.3 p	15.5 n-q	18.3 l-o	17.8 j-m
30	2012 Anth Program #19	Rutgers	VAR–14[21]	14.5 j-n	28.0 j-m	28.0 j-l	21.8 i-l

(Continued)

Table 1B (continued).

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[2]	Turf Area Infested (%) per Plot[1] 10 Aug.	20 Aug.	30 Aug.	9 Sept.
31	2012 Anth Program #20 .....Petro-Canada		14[22]	7.0 n-p	8.5 p-t	13.0 n-r	9.8 m-p
32	2012 Anth Program #21 .....Rutgers		VAR–14[23]	5.8 n-p	9.3 p-t	9.8 n-s	8.8 m-p
33	Chipco Signature 80WG	4.0 oz	14	38.3 f-h	46.3 f-h	40.3 g-i	39.8 ef
34	Medallion 50WP.....	0.33 oz	14	4.0 op	13.8 n-s	9.5 n-s	9.8 m-p
35	Tourney 50WG.....	0.28 oz	14	8.5 m-p	16.5 n-q	11.3 n-s	9.3 m-p
36	F9110 LC .....0.34 fl oz		14	62.5 bc	72.8 ab	72.3 ab	67.0 a-c
37	F9110 LC .....0.71 fl oz		14	54.3 cd	68.5 bc	67.3 bc	61.8 bc
38	F9110 LC .....1.0 fl oz		14	44.0 ef	58.5 c-e	62.3 b-d	62.3 bc
39	F9881–1 LC .....0.55 fl oz		–				
	+ F9110 LC .....0.34 fl oz		14	35.8 f-h	62.3 b-d	55.8 c-e	56.3 cd
40	F9881–1 LC .....0.55 fl oz		–				
	+ F9110 LC .....0.71 fl oz		14	39.8 fg	59.5 c-e	41.5 gh	34.0 f-h
41	F9881–1 LC .....0.55 fl oz		–				
	+ F9110 LC .....1.0 fl oz		14	34.3 gh	62.3 b-d	41.0 gh	38.3 e-g
42	FPS20115 LC.....0.71 fl oz		14	14.5 j-n	46.0 f-h	33.3 h-k	35.0 f-h
43	FPS20115 LC.....1.4 fl oz		14	7.3 n-p	9.5 p-t	17.0 l-p	28.5 g-j
44	FPS20115 LC.....0.71 fl oz		–				
	+ Pentathlon 4F .....5.9 fl oz		14	29.5 hi	37.8 h-j	42.0 gh	40.0 ef
45	FPS20115 LC.....1.4 fl oz		–				
	+ Pentathlon 4F .....5.9 fl oz		14	18.0 j-l	35.0 ij	34.0 h-k	24.3 h-l
46	F9881–1 LC .....0.55 fl oz		14	39.8 fg	49.3 e-g	48.8 e-g	31.5 f-i
47	F9881–1 LC .....0.55 fl oz		–		-		
	+ Pentathlon 4F .....5.9 fl oz		14	23.8 ij	33.0 i-k	43.5 f-h	30.5 f-i
48	F9881–1 LC .....1.125 fl oz		14	20.0 jk	52.0 d-f	40.8 gh	27.8 g-k
49	CCP38D LC .....8.0 fl oz		14	9.5 l-p	17.5 m-p	14.5 m-q	9.8 m-p
50	Untreated check.....	–	–	63.5 bc	68.5 bc	73.3 ab	62.0 bc

(Continued)

Table 1B (continued).

Treatment	Rate per 1000 sq ft	Application Schedule (days)[2]	Turf Area Infested (%) per Plot[1]			
			10 Aug.	20 Aug.	30 Aug.	9 Sept.
		INT[24]	DAT[25]	DAT	DAT	DAT
		7	2	5	15	25
		14	2	12	22	32
		21	2	12	22	32

[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 on 16 May (all treatments), 23 May (7-day treatment), 30 May (7- and 14-day treatments), 6 June (7- and 21-day treatments), 13 June (7- and 14-day treatments), 20 June (7-day treatment), 27 June (7-, 14-, and 21-day treatments), 4 July (7-day treatment), 11 July (7- and 14-day treatments), 18 July (7- and 21-day treatments), 25 July (7- and 14-day treatments), 1 August (7- day treatment), 8 August (7-, 14-, and 21-day treatments), and 15 August (7-day treatment).

[3] Treatment 2 was applied every 14 days from 16 May to 8 August.

[4] Treatment 3 was applied every 14 days from 16 May to 25 July.

[5] ALT = Alternation treatment, where treatment 14 (Cleary Anth Program #3) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[6] ALT = Alternation treatment, where treatment 15 (Cleary Anth Program #4) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[7] ALT = Alternation treatment, where treatment 16 (Cleary Anth Program #5) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[8] ALT = Alternation treatment, where treatment 17 (Cleary Anth Program #6) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[9] Treatment 18 (Plant Food Anth Program #7) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

(Continued)

Table 1B (continued).

[10] Treatment 19 (Plant Food Anth Program #8) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[11] Treatment 20 (Plant Food Anth Program #9) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

[12] Treatment 21 (Plant Food Anth Program #10) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[13] Treatment 22 (Petro-Canada Anth "Injury Threshold" Program #11, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); and (c) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[14] Treatment 23 (Petro-Canada Anth "Injury Threshold" Program #12, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[15] Treatment 24 (Petro-Canada Anth Program #13, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (5.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 18 July; (b) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) applied on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and then continued with Rutgers Anth Program #21 as follows: (c) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August; and (d) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 8 August.

[16] Treatment 25 (Petro-Canada Anth Program #14, protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (10.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 8 August.

[17] Treatment 26 (Petro-Canada Anth "Injury Threshold" Program #15, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Trinity 1.67SC (0.5 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Trinity 1.67SC (0.25 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, and 25 July; (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[18] Treatment 27 (Petro-Canada Anth "Injury Threshold" Program #16, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Torque 3.6SC (0.4 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #32, due to more than 10% foliar injury); (c) Torque 3.6SC (0.2 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, 25 July, and 8 August.

(Continued)

Table 1B (continued).

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[19] Treatment 28 (Petro-Canada Anth “Injury Threshold” Program #17, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[20] Treatment 29 (Petro-Canada Anth “Injury Threshold” Program #18, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June through 28 July; and (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[21] VAR = Variable spray schedule, where treatment 30 (Rutgers “half rate” Anth Program #19) consisted of Banner MAXX 1.3ME (0.5 fl oz) applied on 16 May, Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; Chipco Signature 80WG (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 13 June; Endorse 2.5W (2.0 oz) + Daconil Ultrex (1.6 oz) on 27 June; Chipco Signature 80WG (2.0 oz) + Chipco 26GT 2SC (2.0 fl oz) on 11 July; 3336 Plus 19.4F (1.5 fl oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 25 July’ and Chipco Signature 80WG (2.0 oz) + Medallion 50WP (0.165 oz) on 8 August.

[22] Treatment 31 (Petro-Canada Anth “Injury Threshold” Program #20, where protocol reverts to Rutgers Anth Program #21when more than 10% foliar injury is observed) consisted of (a) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) applied on 16 May; (b) Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; (c) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (d) Endorse 2.5W (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 27 June; (e) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) on 11 July; and (f) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and continued with Rutgers Anth Program #21 as follows: Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[23] VAR = Variable spray schedule, where treatment 32 (Rutgers Anth Program #21) consisted of Banner MAXX 1.3ME (1.0 fl oz) applied on 16 May; Daconil Ultrex 82.5WDG (3.2 oz) on 30 May; Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June; Endorse 2.5W (4.0 oz) + Daconil Ultrex (3.2 oz) on 27 June; Chipco Signature 80WG (4.0 oz) + Chipco 26GT 2SC (4.0 fl oz) on 11 July; 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July; and Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[24] Spray interval in days.

[25] Days after the last treatment.

Table 1C. Anthracnose control with fungicides and biorational products on annual bluegrass putting green turf, Test 2: Rutgers University, 2012.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Turf Quality[1,2]				Phytotoxicity[3]	
				14 June	14 July	11 Aug.	9 Sept.	14 June	14 July
1	NB37904 1.8SC	0.5 fl oz	14	6.1 d-i	6.6 e-j	6.4 c-e	6.6 f-j	1.0 c	1.0 e
2	NB37904 1.8SC	0.66 fl oz	14[5]	5.8 e-j	7.4 b-f	6.6 c-e	6.4 h-k	1.0 c	1.0 e
3	NB37904 1.8SC	0.75 fl oz	14[6]	6.1 d-i	7.4 b-f	6.6 c-e	5.8 j-l	1.0 c	1.0 e
4	NB37904 1.8SC	0.75 fl oz	21	6.4 c-h	7.4 b-f	6.0 d-g	6.8 e-i	1.0 c	1.0 e
5	NB37904 1.8SC	1.0 fl oz	21	6.1 d-i	7.1 c-h	5.8 e-g	6.3 h-k	1.0 c	1.0 e
6	NB37908 28WP	1.1 oz	14	5.8 e-j	6.0 i-m	5.1 g-j	5.0 l-o	1.0 c	1.0 e
7	Segway 3.3SC	0.45 fl oz	14	5.1 i-o	2.9 s	2.4 p	2.9 u	1.0 c	1.0 e
8	Affirm 11.3WG	0.87 oz	14	5.9 e-j	6.4 f-j	5.8 e-g	5.9 i-l	1.0 c	1.0 e
9	Daconil Action 6.1SC	3.5 fl oz	14	5.8 e-j	7.5 a-e	6.9 b-d	7.6 a-e	1.0 c	1.0 e
10	Clearys 26/36	3.0 fl oz	14	5.9 e-j	6.3 g-k	4.5 h-l	4.3 n-s	1.0 c	1.0 e
11	IKF-5411 3.3SC	0.4 fl oz	14	6.1 d-i	4.8 n-q	3.9 k-o	3.6 r-u	1.0 c	1.0 e
12	IKF-5411 3.3SC	0.5 fl oz	14	5.6 f-k	3.9 p-s	3.5 m-o	3.8 q-u	1.0 c	1.0 e
13	IKF-5411 3.3SC	0.5 fl oz	21	5.1 i-o	3.8 q-s	3.4 no	3.5 s-u	1.0 c	1.0 e
14	2012 Anth Program #3	Cleary	14–ALT[7]	6.0 d-i	7.6 a-e	6.4 c-e	7.6 a-e	1.0 c	1.0 e
15	2012 Anth Program #4	Cleary	14–ALT[8]	5.8 e-j	7.3 c-g	6.5 c-e	7.8 a-d	1.0 c	1.3 cd
16	2012 Anth Program #5	Cleary	ALT–14[9]	6.8 b-e	7.9 a-c	7.3 a-c	8.1 a-c	1.0 c	1.5 c
17	2012 Anth Program #6	Cleary	ALT–14[10]	7.0 a-d	8.4 ab	7.9 a	8.5 a	2.0 a	1.7 b
18	2012 Anth Program #7	Plant Food	7[11]	7.9 a	7.8 a-d	6.9 b-d	7.9 a-d	1.0 c	1.0 e
19	2012 Anth Program #8	Plant Food	7[12]	7.6 ab	8.5 a	7.8 ab	8.4 ab	1.0 c	1.0 e
20	2012 Anth Program #9	Plant Food	7[13]	7.3 a-c	6.0 i-m	5.1 g-j	7.5 b-f	1.0 c	1.0 e
21	2012 Anth Program #10	Plant Food	7[14]	7.4 a-c	8.4 ab	8.1 a	8.4 ab	1.0 c	1.0 e
22	2012 Anth Program #11	Petro-Canada	14[15]	5.5 g-l	7.5 a-e	6.4 c-e	6.3 h-k	1.0 c	1.0 e
23	2012 Anth Program #12	Petro-Canada	14[16]	5.3 i-n	7.0 c-i	6.4 c-e	7.1 d-h	1.0 c	1.0 e
24	2012 Anth Program #13	Petro-Canada	14[17]	6.1 d-i	6.4 f-j	6.3 d-f	7.5 b-f	1.0 c	1.0 e
25	2012 Anth Program #14	Petro-Canada	14[18]	6.0 d-i	7.5 a-e	6.9 b-d	6.8 e-i	1.0 c	1.0 e
26	2012 Anth Program #15	Petro-Canada	ALT–14[19]	6.0 d-i	6.0 i-m	5.4 f-h	6.1 i-k	1.0 c	1.0 e
27	2012 Anth Program #16	Petro-Canada	14[20]	6.4 c-h	7.3 c-g	6.4 c-e	6.3 h-k	1.0 c	1.0 e
28	2012 Anth Program #17	Petro-Canada	14[21]	6.1 d-i	7.3 c-g	6.4 c-e	6.5 g-k	1.0 c	1.0 e
29	2012 Anth Program #18	Petro-Canada	14[22]	5.6 f-k	6.4 f-j	5.8 e-g	5.1 l-n	1.0 c	1.0 e
30	2012 Anth Program #19	Rutgers	VAR–14[23]	4.9 j-p	5.3 k-o	5.4 f-h	5.0 l-o	1.0 c	1.0 e

(Continued)

Table 1C (continued).

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Turf Quality[1,2]				Phytotoxicity[3]	
				14 June	14 July	11 Aug.	9 Sept.	14 June	14 July
31	2012 Anth Program #20 .....Petro-Canada		14[24]	6.5 c-g	6.1 h-l	6.4 c-e	6.3 h-k	1.0 c	1.0 e
32	2012 Anth Program #21 .....Rutgers		VAR–14[25]	6.5 c-g	6.9 c-i	6.9 b-d	6.4 h-k	1.0 c	1.0 e
33	Chipco Signature 80WG	4.0 oz	14	5.3 i-n	4.4 o-r	4.6 h-k	4.1 o-t	1.0 c	1.0 e
34	Medallion 50WP.....	0.33 oz	14	6.0 d-i	6.8 d-i	6.4 c-e	7.4 c-g	1.0 c	1.0 e
35	Tourney 50WG.....	0.28 oz	14	5.9 e-j	6.0 i-m	6.3 d-f	7.5 b-f	1.3 b	2.0 a
36	F9110 LC .....0.34 fl oz		14	5.8 e-j	3.8 q-s	3.3 op	3.3 tu	1.0 c	1.0 e
37	F9110 LC .....0.71 fl oz		14	6.1 d-i	3.9 p-s	3.3 op	3.8 q-u	1.0 c	1.0 e
38	F9110 LC .....1.0 fl oz		14	6.8 b-e	4.6 n-r	3.9 k-o	3.9 p-t	1.0 c	1.0 e
39	F9881–1 LC .....0.55 fl oz		–						
	+ F9110 LC .....0.34 fl oz		14	5.9 e-j	4.4 o-r	4.3 j-n	3.6 r-u	1.0 c	1.0 e
40	F9881–1 LC .....0.55 fl oz		–						
	+ F9110 LC .....0.71 fl oz		14	5.6 f-k	4.8 n-q	4.1 k-o	5.0 l-o	1.0 c	1.0 e
41	F9881–1 LC .....0.55 fl oz		–						
	+ F9110 LC .....1.0 fl oz		14	5.9 e-j	5.1 l-o	3.6 l-o	4.5 n-r	1.0 c	1.0 e
42	FPS20115 LC.....0.71 fl oz		14	6.4 c-h	6.0 i-m	4.8 h-k	4.3 n-s	1.0 c	1.0 e
43	FPS20115 LC.....1.4 fl oz		14	6.5 c-g	6.6 e-j	5.8 e-g	4.8 m-p	1.0 c	1.4 cd
44	FPS20115 LC.....0.71 fl oz		–						
	+ Pentathlon 4F .....5.9 fl oz		14	6.4 c-h	5.6 j-n	4.8 h-k	4.5 n-r	1.0 c	1.0 e
45	FPS20115 LC.....1.4 fl oz		–						
	+ Pentathlon 4F .....5.9 fl oz		14	6.6 b-f	6.3 g-k	5.3 g-i	5.0 l-o	1.0 c	1.0 e
46	F9881–1 LC .....0.55 fl oz		14	5.4 h-m	4.6 n-r	4.0 k-o	4.6 n-q	1.0 c	1.0 e
47	F9881–1 LC .....0.55 fl oz		–						
	+ Pentathlon 4F .....5.9 fl oz		14	5.1 i-o	5.0 m-o	4.6 h-k	5.1 l-n	1.0 c	1.0 e
48	F9881–1 LC .....1.125 fl oz		14	5.3 i-n	4.9 n-p	4.4 i-m	5.6 k-m	1.0 c	1.3 d
49	CCP38D LC .....8.0 fl oz		14	5.9 e-j	6.3 g-k	5.8 e-g	6.3 h-k	1.0 c	1.0 e
50	Untreated check.....	–	–	4.3 n-p	3.6 rs	3.3 op	3.6 r-u	1.0 c	1.0 e

(Continued)

Table 1C (continued).

Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Turf Quality[1,2]				Phytotoxicity[3]	
			14 June	14 July	11 Aug.	9 Sept.	14 June	14 July
		INT[26]	DAT[27]	DAT	DAT	DAT	DAT	DAT
		7	1	3	1	3	1	3
		14	1	3	1	3	1	3
		21	8	17	8	17	8	17

[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] Turf quality on a scale of 1 to 9, where 1 = best turf quality and 5 = commercial acceptable quality.

[3] Phytotoxicity on a 1 to 5 scale, where 1 = no discoloration; 2 = slight foliar chlorosis or necrosis, 3 = moderate chlorosis or necrosis, 4 = severe chlorosis or necrosis, and 5 = all turf dead. No phytotoxicity was observed on 11 August or 2 September.

[4] Fungicides were applied on 16 May (all treatments), 23 May (7-day treatment), 30 May (7- and 14-day treatments), 6 June (7- and 21-day treatments), 13 June (7- and 14-day treatments), 20 June (7-day treatment), 27 June (7-, 14-, and 21-day treatments), 4 July (7-day treatment), 11 July (7- and 14-day treatments), 18 July (7- and 21-day treatments), 25 July (7- and 14-day treatments), 1 August (7- day treatment), 8 August (7-, 14-, and 21-day treatments), and 15 August (7-day treatment).

[5] Treatment 2 was applied every 14 days from 16 May to 8 August.

[6] Treatment 3 was applied every 14 days from 16 May to 25 July.

[7] ALT = Alternation treatment, where treatment 14 (Cleary Anth Program #3) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[8] ALT = Alternation treatment, where treatment 15 (Cleary Anth Program #4) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[9] ALT = Alternation treatment, where treatment 16 (Cleary Anth Program #5) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[10] ALT = Alternation treatment, where treatment 17 (Cleary Anth Program #6) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 30 May, 27 June, 25 July, and 8 August.

(Continued)

Table 1C (continued).

[11] Treatment 18 (Plant Food Anth Program #7) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

[12] Treatment 19 (Plant Food Anth Program #8) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[13] Treatment 20 (Plant Food Anth Program #9) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

[14] Treatment 21 (Plant Food Anth Program #10) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[15] Treatment 22 (Petro-Canada Anth “Injury Threshold” Program #11, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); and (c) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[16] Treatment 23 (Petro-Canada Anth “Injury Threshold” Program #12, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[17] Treatment 24 (Petro-Canada Anth Program #13, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (5.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 18 July; (b) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) applied on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and then continued with Rutgers Anth Program #21 as follows: (c) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August; and (d) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 8 August.

[18] Treatment 25 (Petro-Canada Anth Program #14, protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (10.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 8 August.

[19] Treatment 26 (Petro-Canada Anth “Injury Threshold” Program #15, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Trinity 1.67SC (0.5 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Trinity 1.67SC (0.25 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, and 25 July; (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[20] Treatment 27 (Petro-Canada Anth “Injury Threshold” Program #16, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Torque 3.6SC (0.4 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July,

(Continued)

Table 1C (continued).

and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #32, due to more than 10% foliar injury); (c) Torque 3.6SC (0.2 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, 25 July, and 8 August.

[21] Treatment 28 (Petro-Canada Anth "Injury Threshold" Program #17, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[22] Treatment 29 (Petro-Canada Anth "Injury Threshold" Program #18, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June through 28 July; and (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[23] VAR = Variable spray schedule, where treatment 30 (Rutgers "half rate" Anth Program #19) consisted of Banner MAXX 1.3ME (0.5 fl oz) applied on 16 May, Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; Chipco Signature 80WG (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 13 June; Endorse 2.5W (2.0 oz) + Daconil Ultrex (1.6 oz) on 27 June; Chipco Signature 80WG (2.0 oz) + Chipco 26GT 2SC (2.0 fl oz) on 11 July; 3336 Plus 19.4F (1.5 fl oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 25 July' and Chipco Signature 80WG (2.0 oz) + Medallion 50WP (0.165 oz) on 8 August.

[24] Treatment 31 (Petro-Canada Anth "Injury Threshold" Program #20, where protocol reverts to Rutgers Anth Program #21when more than 10% foliar injury is observed) consisted of (a) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) applied on 16 May; (b) Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; (c) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (d) Endorse 2.5W (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 27 June; (e) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) on 11 July; and (f) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and continued with Rutgers Anth Program #21 as follows: Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[25] VAR = Variable spray schedule, where treatment 32 (Rutgers Anth Program #21) consisted of Banner MAXX 1.3ME (1.0 fl oz) applied on 16 May; Daconil Ultrex 82.5WDG (3.2 oz) on 30 May; Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June; Endorse 2.5W (4.0 oz) + Daconil Ultrex (3.2 oz) on 27 June; Chipco Signature 80WG (4.0 oz) + Chipco 26GT 2SC (4.0 fl oz) on 11 July; 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July; and Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[26] Spray interval in days.

[27] Days after the last treatment.

Table 1D. Anthracnose control with fungicides and biorational products on annual bluegrass putting green turf, Test 2: Rutgers University, 2012.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Color[2] 14 June	Color[2] 20 July	Algae[1,3] (%) 20 July
1	NB37904 1.8SC	0.5 fl oz	14	3.0 l	3.5 fg	19.3 e-i
2	NB37904 1.8SC	0.66 fl oz	14[5]	3.1 kl	3.1 g-i	16.3 f-k
3	NB37904 1.8SC	0.75 fl oz	14[6]	3.1 kl	3.0 hi	16.3 f-k
4	NB37904 1.8SC	0.75 fl oz	21	3.0 l	3.5 fg	21.3 e-h
5	NB37904 1.8SC	1.0 fl oz	21	3.0 l	2.8 ij	10.0 h-k
6	NB37908 28WP	1.1 oz	14	3.0 l	3.0 hi	21.3 e-h
7	Segway 3.3SC	0.45 fl oz	14	3.0 l	2.5 jk	21.3 e-h
8	Affirm 11.3WG	0.87 oz	14	3.1 kl	3.1 g-i	13.5 g-k
9	Daconil Action 6.1SC	3.5 fl oz	14	3.4 j	3.0 hi	0.0 k
10	Clearys 26/36	3.0 fl oz	14	3.0 l	3.3 gh	51.3 a
11	IKF-5411 3.3SC	0.4 fl oz	14	3.0 l	2.9 h-j	32.5 b-f
12	IKF-5411 3.3SC	0.5 fl oz	14	3.0 l	3.1 g-i	12.5 g-k
13	IKF-5411 3.3SC	0.5 fl oz	21	3.0 l	3.0 hi	32.5 b-f
14	2012 Anth Program #3	Cleary	ALT–14[7]	3.1 kl	3.9 e-f	0.0 k
15	2012 Anth Program #4	Cleary	ALT–14[8]	3.6 i	3.9 e-f	0.0 k
16	2012 Anth Program #5	Cleary	ALT–14[9]	3.8 hi	4.1 c-e	0.0 k
17	2012 Anth Program #6	Cleary	ALT–14[10]	3.6 i	4.9 a	0.0 k
18	2012 Anth Program #7	Plant Food	7[11]	4.5 d	4.5 a-c	0.0 k
19	2012 Anth Program #8	Plant Food	7[12]	4.6 cd	4.6 ab	0.0 k
20	2012 Anth Program #9	Plant Food	7[13]	4.9 ab	4.3 b-d	0.0 k
21	2012 Anth Program # 10	Plant Food	7[14]	4.8 bc	4.5 a-c	0.0 k
22	2012 Anth Program #11	Petro-Canada	14[15]	4.0 fg	4.5 a-c	0.0 k
23	2012 Anth Program #12	Petro-Canada	14[16]	4.3 e	4.0 de	9.3 h-k
24	2012 Anth Program #13	Petro-Canada	14[17]	5.0 a	3.9 d-f	12.5 g-k
25	2012 Anth Program #14	Petro-Canada	14[18]	5.0 a	4.5 a-c	2.5 i-k
26	2012 Anth Program #15	Petro-Canada	ALT–14[19]	3.9 gh	4.6 ab	1.3 jk
27	2012 Anth Program #16	Petro-Canada	14[20]	4.3 e	4.0 de	22.5 e-h
28	2012 Anth Program #17	Petro-Canada	14[21]	4.1 ef	4.6 ab	10.0 h-k
29	2012 Anth Program #18	Petro-Canada	14[22]	4.1 ef	4.6 ab	10.0 h-k
30	2012 Anth Program #19	Rutgers	VAR–14[23]	3.0 l	2.9 h-j	0.0 k

(Continued)

Table 1D (continued).

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Color[2] 14 June	Color[2] 20 July	Algae[1,3] (%) 20 July
31	2012 Anth Program #20 .....Petro-Canada		14[24]	3.3 jk	3.1 g-i	0.0 k
32	RU 2012 Anth Program #21.....Rutgers		VAR-14[25]	3.0 l	3.3 gh	0.0 k
33	Chipco Signature 80WG	4.0 oz	14	3.4 j	2.4 k	1.3 jk
34	Medallion 50WG	0.33 oz	14	3.0 l	3.0 hi	21.3 e-h
35	Tourney 50WG.....	0.28 oz	14	3.1 kl	3.8 ef	15.0 f-k
36	F9110 LC	0.34 fl oz	14	3.0 l	2.8 i-k	28.8 d-g
37	F9110 LC	0.71 fl oz	14	3.0 l	3.0 hi	25.0 e-h
38	F9110 LC	1.0 fl oz	14	3.0 l	2.9 h-j	36.3 a-e
39	F9881–1 LC	0.55 fl oz	–			
	+ F9110 LC	0.34 fl oz	14	3.0 l	3.0 hi	53.8 a
40	F9881–1 LC	0.55 fl oz	–			
	+ F9110 LC	0.71 fl oz	14	3.0 l	3.0 hi	43.8 a-d
41	F9881–1 LC	0.55 fl oz	–			
	+ F9110 LC	1.0 fl oz	14	3.0 l	2.8 i-k	13.8 g-k
42	FPS20115 LC.....	0.71 fl oz	14	3.0 l	3.0 hi	47.5 a-c
43	FPS20115 LC.....	1.4 fl oz	14	3.0 l	3.3 gh	48.8 ab
44	FPS20115 LC.....	0.71 fl oz	–			
	+ Pentathlon 4F	5.9 fl oz	14	3.0 l	3.3 gh	18.8 e-j
45	FPS20115 LC.....	1.4 fl oz	–			
	+ Pentathlon 4F	5.9 fl oz	14	3.0 l	2.9 h-j	8.8 h-k
46	F9881–1 LC	0.55 fl oz	14	3.0 l	2.9 h-j	20.0 e-i
47	F9881–1 LC	0.55 fl oz	–			
	+ Pentathlon 4F	5.9 fl oz	14	3.0 l	2.9 h-j	23.0 e-h
48	F9881–1 LC	1.125 fl oz	14	3.0 l	2.8 i-k	18.0 f-j
49	CCP38D LC	8.0 fl oz	14	3.0 l	3.1 g-i	0.0 k
50	Untreated check-.....	–	–	3.0 l	2.9 h-j	30.0 c-g

(Continued)

Table 1D (continued).

Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Color[2]		Algae[1,3] (%)
			14 June	20 July	20 July
		INT[26]	DAT[27]	DAT	DAT
		7	1	2	2
		14	1	9	9
		21	8	2	2

[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] Color of foliage on a scale of 1 to 5, where 1 = very chlorotic turf, 2 = slightly chlorotic, 3 = normal green color, 4 = slight dark green color, and 5 = very dark green color.

[3] Percent soil surface covered with blue-green algae (cyanobacteria).

[4] Fungicides were applied on 16 May (all treatments), 23 May (7-day treatment), 30 May (7- and 14-day treatments), 6 June (7- and 21-day treatments), 13 June (7- and 14-day treatments), 20 June (7-day treatment), 27 June (7-, 14-, and 21-day treatments), 4 July (7-day treatment), 11 July (7- and 14-day treatments), 18 July (7- and 21-day treatments), 25 July (7- and 14-day treatments), 1 August (7- day treatment), 8 August (7-, 14-, and 21-day treatments), and 15 August (7-day treatment).

[5] Treatment 2 was applied every 14 days from 16 May to 8 August.

[6] Treatment 3 was applied every 14 days from 16 May to 25 July.

[7] ALT = Alternation treatment, where treatment 14 (Cleary Anth Program #3) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[8] ALT = Alternation treatment, where treatment 15 (Cleary Anth Program #4) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.041 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[9] ALT = Alternation treatment, where treatment 16 (Cleary Anth Program #5) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.083 oz) applied on 30 May, 27 June, 25 July, and 8 August.

[10] ALT = Alternation treatment, where treatment 17 (Cleary Anth Program #6) consisted of Torque 3.6SC (0.6 fl oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 16 May, 13 June, 11 July, and 8 August; and Affirm 11.3WDG (0.9 oz) + Spectro 90WDG (3.75 oz) + CX52 F (0.166 oz) applied on 30 May, 27 June, 25 July, and 8 August.

(Continued)

Table 1D (continued).

[11] Treatment 18 (Plant Food Anth Program #7) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

[12] Treatment 19 (Plant Food Anth Program #8) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + 10-34-0 LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[13] Treatment 20 (Plant Food Anth Program #9) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) applied every 7 days for 16 May through 15 August.

[14] Treatment 21 (Plant Food Anth Program #10) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Sugar Cal LC (3.0 fl oz) + Impulse LC (3.0 fl oz) + Phosphite 30 0-0-27 LC (3.0 fl oz) + Adams Earth LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Manganese 5% LC (3.0 fl oz) + Organic Acid LC (3.0 fl oz) + Daconil Weather Stik 6F (0.9 fl oz) applied every 7 days for 16 May through 15 August.

[15] Treatment 22 (Petro-Canada Anth “Injury Threshold” Program #11, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); and (c) Reserve 4.8SC (1.6 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[16] Treatment 23 (Petro-Canada Anth “Injury Threshold” Program #12, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Tourney 50WG (0.1 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[17] Treatment 24 (Petro-Canada Anth Program #13, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (5.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 18 July; (b) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) applied on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and then continued with Rutgers Anth Program #21 as follows: (c) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August; and (d) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 8 August.

[18] Treatment 25 (Petro-Canada Anth Program #14, protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Alude 46LC (10.0 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days for 16 May to 8 August.

[19] Treatment 26 (Petro-Canada Anth “Injury Threshold” Program #15, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Trinity 1.67SC (0.5 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Trinity 1.67SC (0.25 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, and 25 July; (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

(Continued)

Table 1D (continued).

[20] Treatment 27 (Petro-Canada Anth “Injury Threshold” Program #16, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Torque 3.6SC (0.4 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May, 11 July, and 8 August; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #32, due to more than 10% foliar injury); (c) Torque 3.6SC (0.2 fl oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 30 May, 27 June, 25 July, and 8 August.

[21] Treatment 28 (Petro-Canada Anth “Injury Threshold” Program #17, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) Endorse 2.5W (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June until 8 August.

[22] Treatment 29 (Petro-Canada Anth “Injury Threshold” Program #18, where protocol reverts to Rutgers Anth Program #21 when more than 10% foliar injury is observed) consisted of (a) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied on 16 May and 30 May; (b) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (c) QP Fosetyl Al 80WDG (4.0 oz) + Harmonizer LC (0.5 fl oz) + 651-0350 LC (8.0 fl oz) applied every 14 days from 27 June through 28 July; and (d) Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[23] VAR = Variable spray schedule, where treatment 30 (Rutgers “half rate” Anth Program #19) consisted of Banner MAXX 1.3ME (0.5 fl oz) applied on 16 May, Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; Chipco Signature 80WG (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 13 June; Endorse 2.5W (2.0 oz) + Daconil Ultrex (1.6 oz) on 27 June; Chipco Signature 80WG (2.0 oz) + Chipco 26GT 2SC (2.0 fl oz) on 11 July; 3336 Plus 19.4F (1.5 fl oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 25 July’ and Chipco Signature 80WG (2.0 oz) + Medallion 50WP (0.165 oz) on 8 August.

[24] Treatment 31 (Petro-Canada Anth “Injury Threshold” Program #20, where protocol reverts to Rutgers Anth Program #21when more than 10% foliar injury is observed) consisted of (a) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) applied on 16 May; (b) Daconil Ultrex 82.5WDG (1.6 oz) on 30 May; (c) Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June (Rutgers Anth Program #21, due to more than 10% foliar injury); (d) Endorse 2.5W (2.0 oz) + Daconil Ultrex 82.5WDG (1.6 oz) on 27 June; (e) 651-0350 (8.0 fl oz) + Harmonizer LC (0.5 fl oz) on 11 July; and (f) 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July (Rutgers Anth Program #21, due to more than 10% foliar injury) and continued with Rutgers Anth Program #21 as follows: Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[25] VAR = Variable spray schedule, where treatment 32 (Rutgers Anth Program #21) consisted of Banner MAXX 1.3ME (1.0 fl oz) applied on 16 May; Daconil Ultrex 82.5WDG (3.2 oz) on 30 May; Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 13 June; Endorse 2.5W (4.0 oz) + Daconil Ultrex (3.2 oz) on 27 June; Chipco Signature 80WG (4.0 oz) + Chipco 26GT 2SC (4.0 fl oz) on 11 July; 3336 Plus 19.4F (3.0 fl oz) + Daconil Ultrex 82.5WDG (3.2 oz) on 25 July; and Chipco Signature 80WG (4.0 oz) + Medallion 50WP (0.33 oz) on 8 August.

[26] Spray interval in days.

[27] Days after the last treatment.