

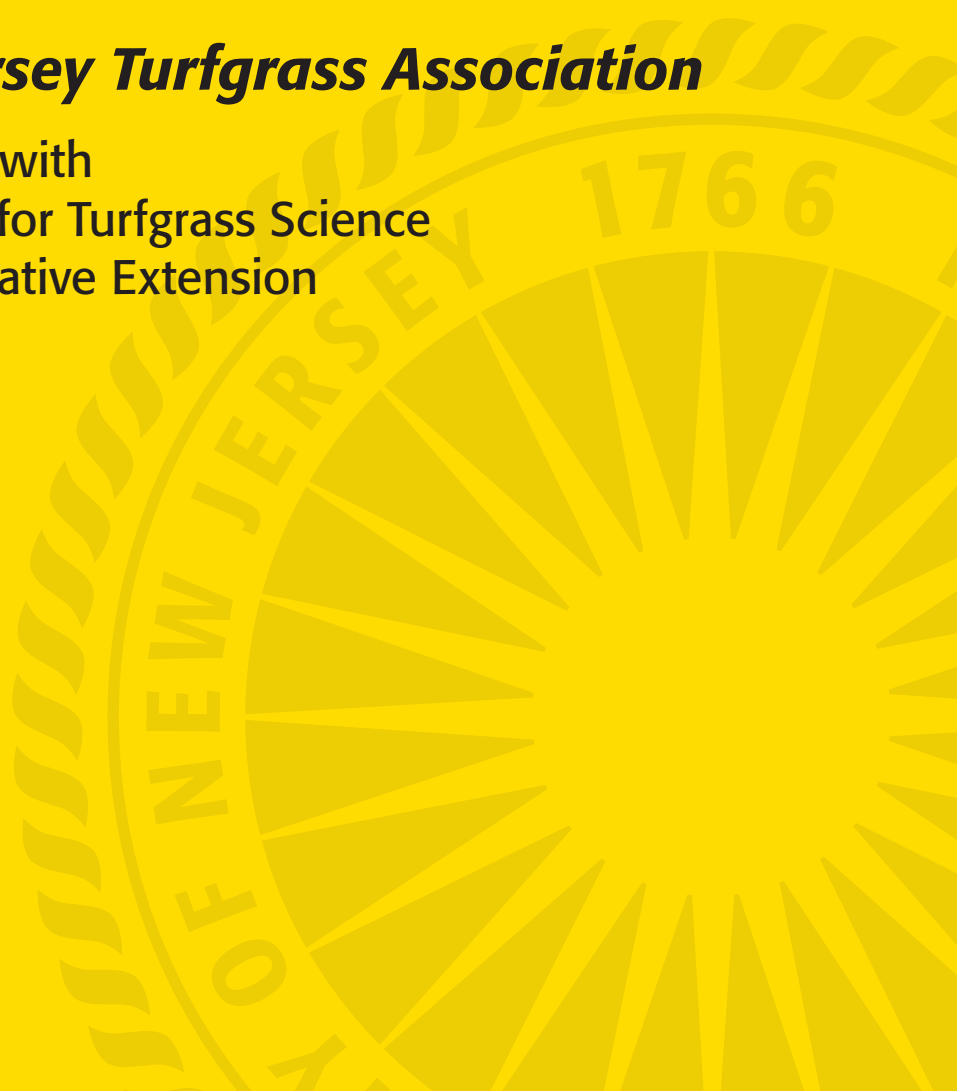
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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State 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 2007 New Jersey Turfgrass Expo. Publication of these lectures provides a readily avail-

able 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

IMPACT OF CHEMICAL AND BIOLOGICAL FUNGICIDES FOR THE PREVENTIVE CONTROL OF ANTHRACNOSE ON AN ANNUAL BLUEGRASS GREEN

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Fungicides were evaluated in 2007 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 Norton loam with a pH of 6.2 by killing the existing stand of creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass with Roundup Pro 3LC (3 qt/acre) and then core aerifying the site in two directions to bring dormant annual bluegrass seed to the soil surface. Mowing was performed daily at a height of 0.125 inch with clippings collected. The site was irrigated as needed to prevent drought stress.

Fertilizer was applied as 34-0-0 (0.2 lb nitrogen (N)/1000 ft²) on 22 April and 1 May, 21-0-0 (0.2 lb N/1000 ft²) on 12 and 26 May, and 34-0-0 (0.2 lb N/1000 ft²) on 24 June. Dimension 0.15G (28 oz/acre) was applied on 10 May for pre-emergence weed control and Fusilade 2L (0.28 fl oz/1000 ft²) was sprayed on 23 August to eliminate creeping bentgrass from the site.

Diseases other than anthracnose (e.g., dollar spot [caused by *Sclerotinia homoeocarpa*] and brown patch [incited by *Rhizoctonia solani*]) were suppressed in the test area with Curalan 50EG (1.0 oz/1000 ft²) on 12 May, Emerald 70WG (0.18 oz/1000 ft²) + ProStar 70W (1.45 oz/1000 ft²) on 24 June and 22 July, Curalan 50EG (1.0 oz/1000 ft²) + ProStar 70W (1.45 oz/1000 ft²) on 7 July and 5 August, and Emerald 70WG (0.18 oz/1000 ft²) on 18 August. Previous research by the authors has shown that Curalan 50EG, ProStar 70W, and Emerald 70WG do not affect anthracnose development on this site at the rates used in this study. The growth regulator Primo MAXX 1ME (0.125 fl oz/1000 ft²) was applied to

the trial every 14 days from 12 May to 18 August, but seedhead suppressants were not used. Insect pests were controlled with Talstar GC 0.67F (0.5 oz/1000 ft²) on 3 May and 19 June. Turf was topdressed with a sand root zone mix on 3 June. Plots were 3 x 5 ft and were arranged in a randomized complete block with four replications.

Fungicides were applied in water equivalent to 1.9 gal/1000 ft² with a CO₂ powered sprayer at 30 psi using Tee Jet 8003E nozzles. Treatments (trt) were initiated on 18 May, prior to the development of anthracnose. Fungicides were reapplied at the appropriate intervals until 3 August as indicated in Table 1. Turf was visually evaluated for percent turf area infested with anthracnose on 13 and 20 July and 3, 16, and 26 August. Phytotoxicity was assessed on 13 June using a 1 to 5 scale, where 1 = no foliar discoloration, 2 = slight chlorosis or necrosis, 3 = moderate chlorosis or necrosis, 4 = severe chlorosis or necrosis and 5 = all turf dead. Turf quality was evaluated on 23 August using a 1 to 9 scale, where 9 = best turf quality and 6 = acceptable quality. Algal cover was assessed as the percentage of the turf/soil surface covered with blue green algae (cyanobacteria) on 27 August. Data were subjected to analysis of variance and means were separated by Waller-Duncan *k*-ratio *t*-test (*k* = 100).

Anthracoise developed on 7 July as a natural infection and became uniformly distributed throughout the green by 13 July. Disease severity peaked on 26 August (82% turfgrass area infested on non-fungicide treated turf). Due to the extreme severity of this natural epidemic, only the following treatments provided season-long control of anthracnose (i.e., less than 10% turf area infested from 18 May through 26

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August): RU2125-07A SC (trts 1 to 3), RU2125-07C SC (trt 5), RU2125-07A SC + RU2125-07D WG (trt 6), Tourney 50WDG @ 0.37 oz (trt 30), PK Plus 3-6-18 + Daconil Ultrex 82.5WDG (trt 44), LBG-31G (trt 48), Spectator Ultra 1.3 EC + Manicure Ultra 82.5WDG (trt 49), Disarm 480 SC + Manicure Ultra 82.5WDG (trt 51), Autograph 70WG + Kestrel 1.3ME (trts 53, 54), Autograph 70WG 9.14 oz + PEX 60015 82.5DF @ 3.6 oz (trt 56), Chipco Signature 80WG + Banner MAXX 1.3 (trts 57, 58), Chipco Signature 80WG @ 8.0 oz + Daconil Ultrex 82.5WDG @ 3.6 oz (trt 60), CL EXP-9 WG (trt 73), Lynx 2SC + Chipco Signature 80WG (trt 94), RU Program #1 (trt 98), and RU Program #2 (trt 99). Several additional products and product combinations applied at 14-day intervals including A7402 2.1EC (trts 11, 12), Autograph 70WG 4.57 oz + PEX 60015 82.5DF @ 1.8 oz (trt 55), and Chipco Signature 80WG @ 4.0 oz + Daconil Ultrex 82.5WDG @ 1.8 oz (trt 59) also provided good residual control (20 days after the last fungicide application on 27 July).

Only 32% of the treatments afforded adequate protection during the application period (18 May to 3 August) and most of these entries contained chlorothalonil, fosetyl-Al, metaconazole (a recently released DMI fungicide), or an experimental fungicide. It is interesting to note that fungicides in the QoI, benzimidazole, dicarboximide, DMI (except for Tourney 50WDG [trts 29, 30]), antibiotic (e.g., Endorse), and phenylpyrrole (e.g., Medallion) groups did not adequately control anthracnose during the severe epidemic in 2007, even though they typically provided acceptable levels of protection on this site prior to 2006. In fact, on 20 July, only 13 days after the disease was first detected, the QoI and benzimidazole fungicides in this study did not control the disease unless tank mixed with another fungicide chemistry. However, the phosphonates Chipco Signature 80WG (trt 8) and Alude 46L (trt 93) did afford adequate protection on this date. Tank mixtures often controlled anthracnose better than the individual components used alone (e.g., Disarm 480 SC + Daconil Ultrex 82.5WDG (trt 28), Rhapsody AS + Daconil Ultrex 82.5WDG (trt 36), Chipco Signature 80WG + Banner MAXX 1.3 (trts 57, 58), and Chipco Signature 80WG + Daconil Ultrex 82.5WDG (trts 59, 60).

Slight to moderate foliar chlorosis was noted on 13 June for turf treated with the experimental fungicides RU2125-07E SC (trt 7), CL EXP-16 F (trt 69), and CL EXP-9 WG (trt 73), as well as products containing the following DMIs: Banner MAXX 1.3ME (trts 13 to 15), Tourney 50WDG (trts 29, 30), Spectator Ultra 1.3 EC + Manicure Ultra 82.5WDG (trt 49), Disarm 480 SC + Spectator Ultra 1.3 EC (trt 50), Insignia 20WG + Trinity 1.67SC (trt 62), Trinity 1.67SC (trt 64), and Instrata 3.6SE (trt 87). Phytotoxicity was not significant for any other treatment.

Turf quality evaluated at the conclusion of the study (23 August) was closely associated with anthracnose control, except for Tourney 50WDG @ 0.37 oz (trt 30) and Trinity 1.67SC @ 1.5 fl oz (trt 64) which afforded good disease protection but caused moderate foliar chlorosis.

No treatments increased algal cover in this study compared to untreated turf. The following entries provided good to excellent control of blue green algae (< 15% algal cover): RU2125-07A SC (trts 1 to 3), RU2125-07B WG (trt 4), RU2125-07C SC (trt 5), RU2125-07A SC + RU2125-07D WG (trt 6), RU2125-07E SC (trt 7), Chipco Signature 80WG (trt 8), Daconil Ultrex 82.5WDG (trts 35, 37), PK Plus 3-6-18 + Daconil Ultrex 82.5WDG (trt 44), LBG-31G (trt 48), Spectator Ultra 1.3 EC + Manicure Ultra 82.5WDG (trt 49), Disarm 480 SC + Manicure Ultra 82.5WDG (trt 51), Autograph 70WG + Kestrel 1.3ME (trts 53, 54), Autograph 70WG + PEX 60015 82.5DF (trts 55, 56), Chipco Signature 80WG + Banner MAXX 1.3ME (trts 57, 58), Chipco Signature 80WG + Daconil Ultrex 82.5WDG (trts 59, 60), 3336 Plus 19.4F + Alude 46L (trt 65), CL EXP-16 F @ 1.2 fl oz (trt 69), CL EXP-18 (trt 70), CL EXP-9 WG (trt 73), 3336 Plus 19.4F + Daconil Ultrex 82.5WDG (trt 74), CL EXP-9 WG + Daconil Ultrex 82.5WDG (trt 75), Endorse 2.5W + Daconil Ultrex 82.5WDG (trt 77), Spectro 90WDG (trt 79), LEM17 50WDG @ 0.3 oz (trt 82) and 0.4 oz (trt 83), Instrata 3.6SE (trt 87), Concert 4.3SE (trt 88), Lynx 2SC + Chipco Signature 80WG (trt 94), and RU Programs #1 (trt 98) and #2 (trt 99). Except for experimental treatments, all of these products contained chlorothalonil or a phosphonate fungicide.

Table 1. Impact of chemical and biological fungicides for the preventive control of anthracnose on an annual bluegrass green: Rutgers University, 2007.

Treatment	Rate per 1000 sq ft	Spray Interval (days) ⁵	Turf Area Infested (%) per Plot ¹					Algae ^{1,2} (%)	Phyto-toxicity ³	Turf Quality ⁴
			13 July	20 July	3 Aug.	16 Aug.	26 Aug.			
1 RU2125-07A SC	3.8 fl oz	14	1.8 q-s	1.3 z'i-k'	0.8 z'e'f'	0.0 z'j'	1.0 z'd'	1.0 z'j'k'	1.0 g	8.8 ab
2 RU2125-07A SC	5.7 fl oz	14	0.3 s	0.5 z'j'k'	0.3 z'f'	0.0 z'j'	0.5 z'd'	0.0 z'k'	1.0 g	8.8 ab
3 RU2125-07A SC	7.5 fl oz	14	0.0 s	0.0 z'k'	0.8 z'e'f'	0.0 z'j'	0.0 z'd'	0.3 z'k'	1.0 g	8.5 a-c
4 RU2125-07B WG	2.4 oz	14	7.5 o-s	10.0 v-z'k'	23.8 n-u	16.3 z'a'-i'	17.8 z-z'b'	4.0 z'g'-k'	1.0 g	6.5 f-k
5 RU2125-07C SC	1.0 fl oz	14	1.5 q-s	1.0 z'j'k'	2.0 z'c'-f'	0.0 z'j'	4.5 z'a'-d'	11.0 z'd'-k'	1.0 g	7.0 d-i
6 RU2125-07A SC	3.8 fl oz	14	0.0 s	0.3 z'k'	0.0 z'f'	0.0 z'j'	0.3 z'd'	0.0 z'k'	1.0 g	9.0 a
+ RU2125-07D WG.....	4.0 oz			0.3 z'k'	0.0 z'f'	0.0 z'j'	0.3 z'd'	0.0 z'k'	1.0 g	9.0 a
7 RU2125-07E SC	5.0 fl oz	14	2.8 p-s	10.0 v-z'k'	12.0 s-z'f'	3.8 z'g'-j'	8.0 z-z'd'	0.0 z'k'	1.8 de	8.0 a-e
8 Chipco Signature 80WG	4.0 oz	14	2.0 q-s	6.5 z'a'-k'	16.8 p-z'b'	21.5 w-z'e'	40.5 p-u	15.3 z'b'-k'	1.0 g	5.0 l-q
9 A7402 2.1EC.....	0.16 fl oz	14	9.5 n-s	15.0 t-z'h'	27.5 m-r	38.8 n-v	52.5 l-q	47.5 m-s	1.0 g	5.3 k-p
10 A7402 2.1EC.....	0.31 fl oz	14	6.3 o-s	12.3 v-z'k'	22.8 n-v	33.8 q-y	51.3 l-q	50.5 l-q	1.0 g	4.0 p-u
11 A7402 2.1EC.....	0.62 fl oz	14	2.0 q-s	4.0 z'd'-k'	6.3 w-z'f'	10.0 z'd'-j'	15.8 x-z'd'	20.0 z-z'f'	1.0 g	6.8 e-j
12 A7402 2.1EC.....	0.941 fl oz	14	0.5 rs	3.5 z'e'-k'	5.8 x-z'f'	3.8 z'g'-j'	11.0 y-z'd'	16.5 z-z'i'	1.0 g	7.0 d-i
13 Banner MAXX 1.3ME	0.5 fl oz	14	17.8 k-n	31.5 l-q	48.3 jk	55.0 d-m	74.0 b-j	35.3 r-x	1.8 de	4.0 p-u
14 Banner MAXX 1.3ME	1.0 fl oz	14	8.0 n-s	13.8 u-z'k'	29.5 m-q	46.3 j-s	58.3 k-o	30.8 t-z	1.8 de	4.8 m-r
15 Banner MAXX 1.3ME	1.5 fl oz	14	4.5 o-s	8.0 y-z'k'	17.0 p-z'a'	32.5 r-z	26.3 u-y	37.3 q-w	2.0 cd	5.0 l-q
16 A6780 1.3ME	0.5 fl oz	14	12.0 m-q	19.0 q-z'a'	40.8 k-m	42.5 l-u	64.8 f-l	51.3 l-q	1.0 g	4.5 n-s
17 A6780 1.3ME	1.0 fl oz	14	10.5 n-s	16.8 r-z'f'	26.3 n-s	36.3 p-w	48.0 m-r	37.3 q-w	1.0 g	5.0 l-q
18 EcoGuard L.....	20.0 fl oz	7	10.5 n-s	26.5 o-u	41.0 k-m	41.3 m-u	63.0 h-m	39.5 p-v	1.0 g	4.3 o-t
19 EcoGuard Program #1	—	VAR ⁶	6.8 o-s	21.8 p-x	40.5 k-m	31.3 s-z'a'	54.0 l-p	43.5 o-u	1.0 g	4.5 n-s
20 EcoGuard L.....	20.0 fl oz	7	9.8 n-s	20.8 p-y	29.0 m-q	38.8 n-v	49.8 l-r	53.5 j-p	1.0 g	5.3 k-p
+ NoburN.....	3.0 fl oz			20.8 p-y	29.0 m-q	38.8 n-v	49.8 l-r	53.5 j-p	1.0 g	5.3 k-p
21 SARS-346 40WP	0.5 oz	14	7.0 o-s	14.8 t-z'i'	18.3 o-z	27.5 u-z'c'	40.3 p-u	37.5 q-w	1.0 g	6.0 h-m
22 SARS-346 40WP	0.75 oz	14	6.5 o-s	4.0 z'd'-k'	9.8 u-z'f'	15.0 z'b'-j'	18.3 w-z'a'	17.5 z-z'h'	1.0 g	6.3 g-l
23 SARS-346 40WP	0.4 oz	14	7.0 o-s	20.3 p-z	34.5 l-n	38.8 n-v	58.0 k-o	45.0 n-t	1.0 g	4.8 m-r
+ 3336 50W	1.44 oz			20.3 p-z	34.5 l-n	38.8 n-v	58.0 k-o	45.0 n-t	1.0 g	4.8 m-r
24 SARS-346 40WP	0.4 oz	14	5.3 o-s	8.5 x-z'k'	16.3 q-z'c'	23.8 v-z'd'	37.5 q-v	34.5 s-y	1.0 g	5.3 k-p
+ 3336 50W	2.0 oz			8.5 x-z'k'	16.3 q-z'c'	23.8 v-z'd'	37.5 q-v	34.5 s-y	1.0 g	5.3 k-p

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ⁵	Turf Area Infested (%) per Plot ¹					Algae ^{1,2} (%) 27 Aug.	Phyto- toxicity ³ 13 June	Turf Quality ⁴ 23 Aug.
			13 July	20 July	3 Aug.	16 Aug.	26 Aug.			
25 3336 4F	2.0 fl oz	14	32.8 e-h	46.0 f-j	66.3 d-i	60.0 a-k	78.0 a-h	66.0 c-k	1.0 g	3.3 s-v
26 Disarm 480SC.....	0.36 fl oz	14	30.0 f-j	36.0 j-o	65.0 e-i	57.5 b-l	81.3 a-e	86.3 a	1.0 g	3.0 t-v
27 ARY 0534001 SC	0.35 fl oz									
+ Disarm 480 SC.....	0.1 fl oz	14	2.5 q-s	5.8 z'a'-k'	5.8 x-z'f'	12.5 z'c'-j'	15.8 x-z'd'	30.3 u-z'a'	1.0 g	6.3 g-l
28 Disarm 480 SC.....	0.18 fl oz									
+ Daconil Ultrex 82.5WDG.....	1.8 oz	14	0.5 rs	3.8 z'e'-k'	10.8 t-z'f'	13.8 z'c'-j'	28.5 t-x	20.3 y-z'f'	1.0 g	7.0 d-i
29 Tourney 50WDG	0.18 oz	14	6.5 o-s	5.0 z'b'-k'	10.0 u-z'f'	7.5 z'e'-j'	10.5 z-z'd'	19.8 z-z'f'	2.5 b	6.8 e-j
30 Tourney 50WDG	0.37 oz	14	4.5 o-s	6.3 z'a'-k'	6.8 w-z'f'	3.8 z'g'-j'	6.5 z'a'-d'	18.8 z-z'g'	3.0 a	5.5 j-o
31 EX 190 2.5SC	0.26 fl oz	14	30.8 f-i	37.3 j-o	63.0 f-i	47.5 i-r	82.0 a-e	71.0 b-g	1.0 g	3.8 q-v
32 EX 190 2.5SC	0.52 fl oz	14	39.0 d-f	58.3 b-f	67.3 c-h	62.5 a-i	79.8 a-f	76.0 a-e	1.0 g	3.0 t-v
33 EX 190 2.5SC	0.76 fl oz	14	30.8 f-i	48.8 e-j	70.0 c-h	58.8 b-k	77.3 a-i	80.3 a-c	1.0 g	3.0 t-v
34 Rhapsody AS	5.0 fl oz	14	26.8 h-k	29.0 m-r	63.0 f-i	50.0 g-p	80.8 a-e	86.3 a	1.0 g	3.5 r-v
35 Daconil Ultrex 82.5WDG.....	3.2 oz	14	0.0 s	4.8 z'b'-k'	12.8 s-z'f'	3.8 z'g'-j'	6.8 z'a'-d'	4.5 z'g'-k'	1.0 g	8.0 a-e
36 Rhapsody AS	5.0 fl oz									
+ Daconil Ultrex 82.5WDG.....	1.8 oz	14	0.0 s	2.3 z'g'-k'	12.0 s-z'f'	16.3 z'a'-i'	28.5 t-x	15.5 z'a'-k'	1.0 g	6.8 e-j
37 Daconil Ultrex 82.5WDG.....	1.8 oz	14	4.0 o-s	13.3 u-z'k'	31.3 l-p	36.3 p-w	55.0 l-p	10.3 z'd'-k'	1.0 g	4.8 m-r
38 Ammonium Nitrite 34-0-0	4.7 oz	14 ⁷	21.0 i-m	28.5 m-s	45.0 kl	35.0 p-x	64.0 g-l	54.5 h-o	1.0 g	4.3 o-t
39 3336 50W.....	1.44 oz	14	22.8 i-l	27.5 n-t	59.3 g-j	52.5 f-o	70.8 d-k	60.0 f-m	1.0 g	4.0 p-u
40 3336 50W.....	2.0 oz	14	39.3 d-f	43.3 h-l	69.0 c-h	75.0 a	84.0 a-e	81.0 a-c	1.0 g	3.0 t-v
41 PK Plus 3-6-18.....	6.0 fl oz	14	2.0 q-s	15.5 s-z'g'	18.0 o-z	37.5 o-v	62.0 j-m	23.8 w-z'd'	1.0 g	4.3 o-t
42 Gary's Green Ultra 13-2-3.....	9.0 fl oz									
+ Mg Chelate 5%	1.0 fl oz	14	43.0 cd	53.8 c-h	67.8 c-h	65.0 a-g	82.8 a-e	76.3 a-e	1.0 g	2.5 v
43 Gary's Green Program #1.....	—	VAR ⁸	2.8 p-s	10.5 v-z'k'	19.0 o-y	42.5 l-u	40.8 p-u	22.8 x-z'e'	1.0 g	5.0 l-q
44 PK Plus 3-6-18.....	6.0 fl oz									
+ Daconil Ultrex 82.5WDG.....	1.8 oz	14	0.3 s	2.8 z'g'-k'	6.8 w-z'f'	3.8 z'g'-j'	9.0 z'z'd'	1.8 z'j'k'	1.0 g	7.5 b-g
45 Gary's Green Program #2.....	—	VAR ⁹	0.3 s	4.3 z'c'-k'	7.0 w-z'f'	18.8 y-z'g'	34.5 r-v	21.0 x-z'f'	1.0 g	5.5 j-o
46 Acclaim Extra Program #1	—	VAR ¹⁰	26.5 h-k	57.0 b-g	75.3 b-f	70.0 a-d	87.0 a-c	71.3 a-g	1.0 g	3.3 s-v
47 Curalan 50EG	1.0 oz									
+ Prostar 70WG	2.2 oz	21	28.5 g-j	41.0 i-m	69.5 c-h	63.8 a-h	80.3 a-e	48.8 m-s	1.0 g	3.5 r-v
48 LBG-31G.....	7.0 fl oz	14	0.0 s	1.5 z'h'-k'	5.5 y-z'f'	1.3 z'i'j'	6.5 z'a'-d'	1.3 z'j'k'	1.3 fg	8.0 a-e

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft	Spray Interval (days) ⁵	Turf Area Infested (%) per Plot ¹					Algae ^{1,2} (%) 27 Aug.	Phyto- toxicity ³ 13 June	Turf Quality ⁴ 23 Aug.
			13 July	20 July	3 Aug.	16 Aug.	26 Aug.			
49 Spectator Ultra 1.3EC 2.0 fl oz + Manicure Ultra 82.5WDG..... 5.0 oz		14	0.3 s	3.5 z'e'-k'	4.0 z-z'f'	0.0 z'j'	2.0 z'b'-d'	0.0 z'k'	1.8 de	9.0 a
50 Disarm 480 SC..... 0.18 fl oz + Spectator Ultra 1.3EC 1.0 fl oz		14	6.0 o-s	17.0 r-z'e'	26.5 n-s	48.8 h-q	58.5 k-o	62.0 e-m	1.5 ef	3.8 q-v
51 Disarm 480 SC..... 0.18 fl oz + Manicure Ultra 82.5WDG..... 3.25 oz		14	1.0 rs	1.5 z'h'-k'	9.5 u-z'f'	1.3 z'i'j'	6.0 z'a'-d'	0.0 z'k'	1.0 g	8.0 a-e
52 Twosome 3.74F 4.0 fl oz		14	9.8 n-s	10.3 v-z'k'	24.8 n-t	35.0 p-x	53.8 l-p	51.8 k-q	1.0 g	5.0 l-q
53 Autograph 70WG 4.57 oz + Kestrel 1.3ME 2.0 fl oz		14	0.0 s	0.5 z'j'k'	1.5 z'c'-f'	0.0 z'j'	3.8 z'a'-d'	0.5 z'j'k'	1.0 g	8.8 ab
54 Autograph 70WG 9.14 oz + Kestrel 1.3ME 2.0 fl oz		14	0.0 s	0.3 z'k'	2.0 z'c'-f'	0.0 z'j'	1.8 z'b'-d'	0.0 z'k'	1.0 g	8.8 ab
55 Autograph 70WG 4.57 oz + PEX 60015 82.5DF 1.8 oz		14	1.3 rs	0.8 z'j'k'	2.5 z'a'-f'	3.8 z'g'-j'	14.0 x-z'd'	0.8 z'j'k'	1.0 g	7.3 c-h
56 Autograph 70WG 9.14 oz + PEX 60015 82.5DF 3.6 oz		14	0.0 s	0.0 z'k'	2.3 z'b'-f'	0.0 z'j'	0.0 z'd'	0.0 z'k'	1.0 g	9.0 a
57 Chipco Signature 80WG 4.0 oz + Banner MAXX 1.3ME..... 2.0 fl oz		14	0.5 rs	4.0 z'd'-k'	1.0 z'd'-f'	0.5 z'i'j'	3.0 z'a'-d'	2.0 z'i'-k'	1.0 g	8.8 ab
58 Chipco Signature 80WG 8.0 oz + Banner MAXX 1.3ME..... 2.0 fl oz		14	0.0 s	1.5 z'h'-k'	1.3 z'd'-f'	0.0 z'j'	2.3 z'a'-d'	0.0 z'k'	1.0 g	8.8 ab
59 Chipco Signature 80WG 4.0 oz + Daconil Ultrex 82.5WDG..... 1.8 oz		14	1.5 q-s	6.0 z'a'-k'	8.8 v-z'f'	5.5 z'f'-j'	11.5 y-z'd'	0.0 z'k'	1.0 g	8.0 a-e
60 Chipco Signature 80WG 8.0 oz + Daconil Ultrex 82.5WDG..... 3.6 oz		14	0.3 s	0.3 z'k'	1.8 z'c'-f'	0.0 z'j'	0.8 z'd'	0.0 z'k'	1.0 g	8.8 ab
61 Insignia 20WG 0.9 oz		14	38.5 d-f	46.8 f-j	65.8 d-i	61.3 a-j	80.3 a-e	59.0 g-n	1.0 g	3.3 s-v
62 Insignia 20WG 0.5 oz + Trinity 1.67SC 1.0 fl oz		14	7.0 o-s	16.8 r-z'f'	20.5 n-x	33.8 q-y	35.5 r-v	37.5 q-w	1.5 ef	5.8 i-n
63 Trinity 1.67SC 1.0 fl oz		14	6.5 o-s	20.3 p-z	26.0 n-s	27.5 u-z'c'	44.0 o-s	41.3 o-u	1.0 g	5.5 j-o
64 Trinity 1.67SC 1.5 fl oz		14	7.3 o-s	21.3 p-y	19.0 o-y	21.3 w-z'e'	22.8 v-z	21.3 x-z'f'	3.0 a	7.3 c-h
65 3336 Plus 19.4F 6.0 fl oz + Alude 46L 5.5 fl oz		14	3.0 p-s	9.0 w-z'k'	22.0 n-v	30.0 t-z'b'	48.3 m-r	7.5 z'f'-k'	1.0 g	5.0 l-q

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ⁵	Turf Area Infested (%) per Plot ¹					Algae ^{1,2} (%) 27 Aug.	Phyto- toxicity ³ 13 June	Turf Quality ⁴ 23 Aug.
			13 July	20 July	3 Aug.	16 Aug.	26 Aug.			
66 3336 Plus 19.4F.....	6.0 fl oz	14	7.0 o-s	10.3 v-z'k'	41.5 k-m	48.8 h-q	70.3 e-k	49.5 l-r	1.0 g	4.3 o-t
67 3336 4F.....	3.0 fl oz	14	27.3 h-j	39.3 i-n	66.0 d-i	53.8 e-n	72.8 c-k	72.8 a-g	1.0 g	3.8 q-v
68 CL EXP – 16 F.....	0.6 fl oz	14	8.5 n-s	12.3 v-z'k'	12.3 s-z'f'	6.3 z'e'-j'	12.0 y-z'd'	22.0 x-z'f'	1.3 fg	6.5 f-k
69 CL EXP – 16 F.....	1.2 fl oz	14	3.5 o-s	18.3 r-z'b'	15.5 q-z'e'	5.0 z'f'-j'	4.8 z'a'-d'	14.5 z'c'-k'	2.3 bc	7.8 a-f
70 CL EXP – 18.....	4.0 oz	14	0.3 s	2.0 z'g'-k'	10.5 t-z'f'	17.5 z-z'h'	34.8 r-v	3.5 z'h'-k'	1.0 g	6.0 h-m
71 CL EXP – 8 50WP.....	2.0 oz	14 ¹¹	29.5 f-j	38.3 i-o	58.0 h-j	61.3 a-j	81.8 a-e	70.0 b-g	1.0 g	4.0 p-u
72 CL EXP – 8 50WP.....	4.0 oz	14 ¹¹	44.8 cd	60.0 a-e	70.5 c-h	71.3 a-c	79.3 a-f	63.8 d-l	1.0 g	3.5 r-v
73 CL EXP – 9 WG.....	0.6 oz	14	0.0 s	2.5 z'g'-k'	1.5 z'c'-f'	2.5 z'h'-j'	2.3 z'a'-d'	9.3 z'd'-k'	2.3 bc	8.3 a-d
74 3336 Plus 19.4F.....	3.0 fl oz									
+ Daconil Ultrex 82.5WDG.....	3.2 oz	14	1.5 q-s	14.0 u-z'j'	30.0 m-q	16.3 z'a'-i'	17.3 x-z'd'	1.0 z'j'k'	1.0 g	7.0 d-i
75 CL EXP – 9 WG.....	0.6 oz									
+ Daconil Ultrex 82.5WDG.....	3.2 oz	14	1.8 q-s	17.8 r-z'c'	13.8 r-z'f'	2.5 z'h'-j'	3.5 z'a'-d'	0.0 z'k'	2.0 cd	8.3 a-d
76 Endorse 2.5W.....	4.0 oz	14	9.8 n-s	11.5 v-z'k'	17.0 p-z'a'	31.3 s-z'a'	46.0 n-s	40.5 o-v	1.0 g	5.3 k-p
77 Endorse 2.5W.....	4.0 oz									
+ Daconil Ultrex 82.5WDG.....	3.2 oz	14	1.3 rs	3.3 z'f'-k'	13.3 r-z'f'	6.3 z'e'-j'	5.5 z'a'-d'	0.5 z'j'k'	1.0 g	8.8 ab
78 3336 Plus 19.4F.....	4.0 fl oz									
+ CL EXP – 8 50WP.....	2.0 oz	14 ¹¹	13.0 m-p	23.0 p-v	34.8 l-n	45.0 k-t	74.5 b-j	54.0 i-p	1.0 g	4.3 o-t
79 Spectro 90WDG.....	4.0 oz	14	4.0 o-s	8.8 x-z'k'	25.5 n-s	12.5 z'c'-j'	22.8 v-z	1.5 z'j'k'	1.0 g	5.8 i-n
80 LEM17 20SC.....	0.47 fl oz	14	1.5 q-s	1.0 z'j'k'	5.8 x-z'f'	11.3 z'd'-j'	15.0 x-z'd'	29.8 u-z'b'	1.0 g	7.3 c-h
81 LEM17 50WDG.....	0.2 oz	14	20.5 j-m	22.3 p-w	33.5 l-n	27.5 u-z'c'	41.5 p-u	26.5 v-z'c'	1.0 g	5.3 k-p
82 LEM17 50WDG.....	0.3 oz	14	13.8 l-o	21.0 p-y	31.3 l-p	20.0 x-z'f'	37.5 q-v	12.0 z'c'-k'	1.0 g	6.5 f-k
83 LEM17 50WDG.....	0.4 oz	14	0.5 rs	6.0 z'a'-k'	13.8 r-z'f'	10.0 z'd'-j'	17.3 x-z'c'	8.3 z'e'-k'	1.0 g	7.3 c-h
84 LEM17 50WDG.....	0.2 oz									
+ DPX-YT669 22.5SC.....	0.28 fl oz	14	2.0 q-s	7.0 z-z'k'	20.8 n-w	17.5 z-z'h'	32.5 s-w	18.0 z-z'h'	1.0 g	6.8 e-j
85 DPX-YT669 22.5SC.....	0.28 fl oz	14	37.5 d-g	46.3 f-j	67.8 c-h	60.0 a-k	80.8 a-e	68.5 b-h	1.0 g	3.8 q-v
86 Heritage TL 0.8MC.....	1.0 fl oz	14	28.5 g-j	32.8 k-p	53.3 i-k	53.8 e-n	78.8 a-g	69.0 b-g	1.0 g	4.3 o-t
87 Instrata 3.6SE.....	4.0 fl oz	14	1.0 rs	8.5 x-z'k'	10.8 t-z'f'	3.8 z'g'-j'	13.8 x-z'd'	1.0 z'j'k'	2.0 cd	8.0 a-e
88 Concert 4.3SE.....	5.4 fl oz	14	3.5 o-s	7.0 z-z'k'	18.0 o-z	5.0 z'f'-j'	6.3 z'a'-d'	0.0 z'k'	1.3 fg	8.0 a-e
89 Essar 204G.....	12 lb	Twice ¹²	43.5 cd	42.3 h-l	66.3 d-i	57.5 b-l	62.5 i-m	67.3 b-j	1.0 g	3.3 s-v
90 Aerification check.....	—	Twice ¹²	59.8 a	50.5 d-i	76.5 a-f	72.5 ab	89.8 ab	68.3 b-i	1.0 g	3.3 s-v

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft	Spray Interval (days) ⁵	Turf Area Infested (%) per Plot ¹					Algae ^{1,2} (%) 27 Aug.	Phyto-toxicity ³ 13 June	Turf Quality ⁴ 23 Aug.	
			13 July	20 July	3 Aug.	16 Aug.	26 Aug.				
91 3336 Plus 19.4F	4.0 fl oz	14	8.8 n-s	20.0 p-z	32.3 l-o	52.5 f-o	70.8 d-k	60.0 f-m	1.0 g	4.5 n-s	
92 Medallion 50W	0.33 oz	14	6.3 o-s	16.5 r-z'f'	18.5 o-z	27.5 u-z'c'	43.8 o-t	35.0 r-x	1.0 g	6.0 h-m	
93 Alude 46L	5.5 fl oz	14	2.0 q-s	5.0 z'b'-k'	15.8 q-z'd'	33.8 q-y	41.8 p-t	18.3 z-z'h'	1.0 g	5.3 k-p	
94 Lynx 2SC	1.0 fl oz										
+ Chipco Signature 80WG	4.0 oz	14	0.0 s	0.3 z'k'	0.3 z'f'	0.0 z'j'	1.3 z'c'd'	1.0 z'j'k'	1.0 g	9.0 a	
95 Curalan 50EG	1.0 oz	14	38.3 d-f	41.0 i-m	68.0 c-h	60.0 a-k	85.0 a-e	82.0 ab	1.0 g	3.3 s-v	
96 Chipco 26GT 2SC	4.0 fl oz	14	11.0 n-r	17.5 r-z'd'	29.8 m-q	38.8 n-v	60.3 j-n	62.0 e-m	1.0 g	4.8 m-r	
97 ProStar 70W	2.2 oz	14	38.5 d-f	45.0 g-k	73.5 b-g	65.0 a-g	85.0 a-e	82.0 ab	1.0 g	3.0 t-v	
98 RU Program #1	—	VAR ¹³	0.3 s	0.5 z'j'k'	1.8 z'c'-f'	2.5 z'h'-j'	6.5 z'a'-d'	1.5 z'j'k'	1.0 g	8.5 a-c	
99 RU Program #2	—	VAR ¹⁴	0.0 s	0.8 z'j'k'	5.5 y-z'f'	1.3 z'i'j'	5.8 z'a'-d'	0.3 z'k'	1.3 fg	8.5 a-c	
100 Untreated check	—	—	43.8 b-d	57.5 b-g	73.3 b-g	57.5 b-l	82.3 a-e	72.5 a-g	1.0 g	3.8 q-v	
			INT ¹⁵ Twice	DAT ¹⁶ 5	DAT 12	DAT 26	DAT 39	DAT 49	DAT 80	DAT 5	DAT 76
			7	7	7	7	13	23	24	5	20
			14	14	7	7	20	30	31	13	27
			21	14	21	14	27	37	38	5	34

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

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.

⁴ Turf quality on a 1 to 9 scale where 9 = best turf quality and 6 = commercially acceptable quality.

⁵ Fungicides were applied on 18 May (all treatments, except treatments 52, 71, 72, and 78), 25 May (7-day treatment), 1 June (7- and 14-day treatments, and treatments 71, 72, and 78 initiated), 8 June (7- and 21-day treatments, and treatment 52 initiated), 15 June (7- and 14-day treatments), 22 June (7-day treatment), 29 June (7-, 14-, and 21-day treatments), 6 July (7-day treatment), 13 July (7- and 14-day treatments), 20 July (7- and 21-day treatments), 27 July (7- and 14-day treatments), and 3 August (7-day treatment).

(Continued)

Table 1 (continued).

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- ⁶ Variable spray schedule, where treatment 19 (EcoGuard Program #1) consisted of EcoGuard L (20.0 fl oz/1,000 sq ft) + Bio B Plus (1.5 fl oz/1,000 sq ft) + NoburN (3.0 fl oz/1,000 sq ft) applied every 7 days from 18 May to 3 August.
- ⁷ Treatment 38 was applied and irrigated immediately with 0.5 gal water per plot every 14 days from 18 May to 27 July.
- ⁸ Variable spray schedule, where treatment 43 (Gary's Green Program #1) consisted of Gary's Green Ultra 13-2-3 (9.0 fl oz/1,000 sq ft) + Mg Chelate 5% (1.0 fl oz/1,000 sq ft) + PK Plus 3-6-18 (6.0 fl oz/1,000 sq ft) applied every 14 days from 18 May to 27 July.
- ⁹ Variable spray schedule, where treatment 45 (Gary's Green Program #2) consisted of Gary's Green Ultra 13-2-3 (9.0 fl oz/1,000 sq ft) + Mg Chelate 5% (1.0 fl oz/1,000 sq ft) + Daconil Ultrex 82.5 WDG (1.8 oz/1,000 sq ft) applied every 14 days from 18 May to 27 July.
- ¹⁰ Variable spray schedule, where treatment 46 (Acclaim Program #1) consisted of Acclaim Extra 0.57SC (0.115 fl oz/1,000 sq ft) applied on 18 May, 1, 15, and 29 June, and Curalan 50EG (1.0 oz/1,000 sq ft) + ProStar 70WG (2.2 oz/1,000 sq ft) applied every 21 days from 18 May to 20 July.
- ¹¹ CL EXP – 8 (treatments 71, 72, and 78) was applied as a 25WP on 1 June and as a 50WP from 15 June to 27 July.
- ¹² Turf (treatments 89 and 90) was aerified to a depth of 3.25 inches on 18 May and 8 June with 0.5-inch solid tines on a 2 x 2-inch spacing. Treatment 89 was applied after each aerification in 3,000 cc of sand which was brushed into aerification holes. An equivalent amount of sand was brushed into aerification holes for treatment 90 (sand check).
- ¹³ Variable spray schedule, where treatment 98 (Rutgers Program #1) consisted of Lynx 2SC (1.0 fl oz/1,000 sq ft) on 18 May, Daconil Ultrex 82.5WDG (3.2 oz/1,000 sq ft) on 1 June, Chipco Signature 80WG (4.0 oz/1,000 sq ft) + Daconil Ultrex 82.5WDG (2.75 oz/1,000 sq ft) on 15 June, Endorse 2.5W (4.0 oz/1,000 sq ft) + Daconil Ultrex 82.5WDG (2.75 oz/1,000 sq ft) on 29 June, Chipco Signature 80WG (4.0 oz/1,000 sq ft) + Lynx 2SC (1.0 fl oz/1,000 sq ft) on 13 July, Insignia 20WG (0.9 oz/1,000 sq ft) + Daconil Ultrex 82.5WDG (2.75 oz/1,000 sq ft) on 27 July, Lynx 2SC (1.0 fl oz/1,000 sq ft) + Daconil Ultrex 82.5WDG (2.75 oz/1,000 sq ft) on 10 August, and Chipco Signature 80WG (4.0 oz/1,000 sq ft) + Medallion 50W (0.33 oz/1,000 sq ft) on 24 August. Ammonium nitrate (34-0-0) was applied (4.7 oz/1,000 sq ft) and was irrigated with 0.5 gal water per 1,000 sq ft prior to all fungicide applications.
- ¹⁴ Variable spray schedule, where treatment 99 (Rutgers Program #2) consisted of the same fungicide regime as treatment 98 but without the ammonium nitrate applications.
- ¹⁵ Spray intervals in days.
- ¹⁶ Days after treatment (DAT) for each spray interval.



Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Chosen Freeholders. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.