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The New Jersey Turfgrass Association

In Cooperation with
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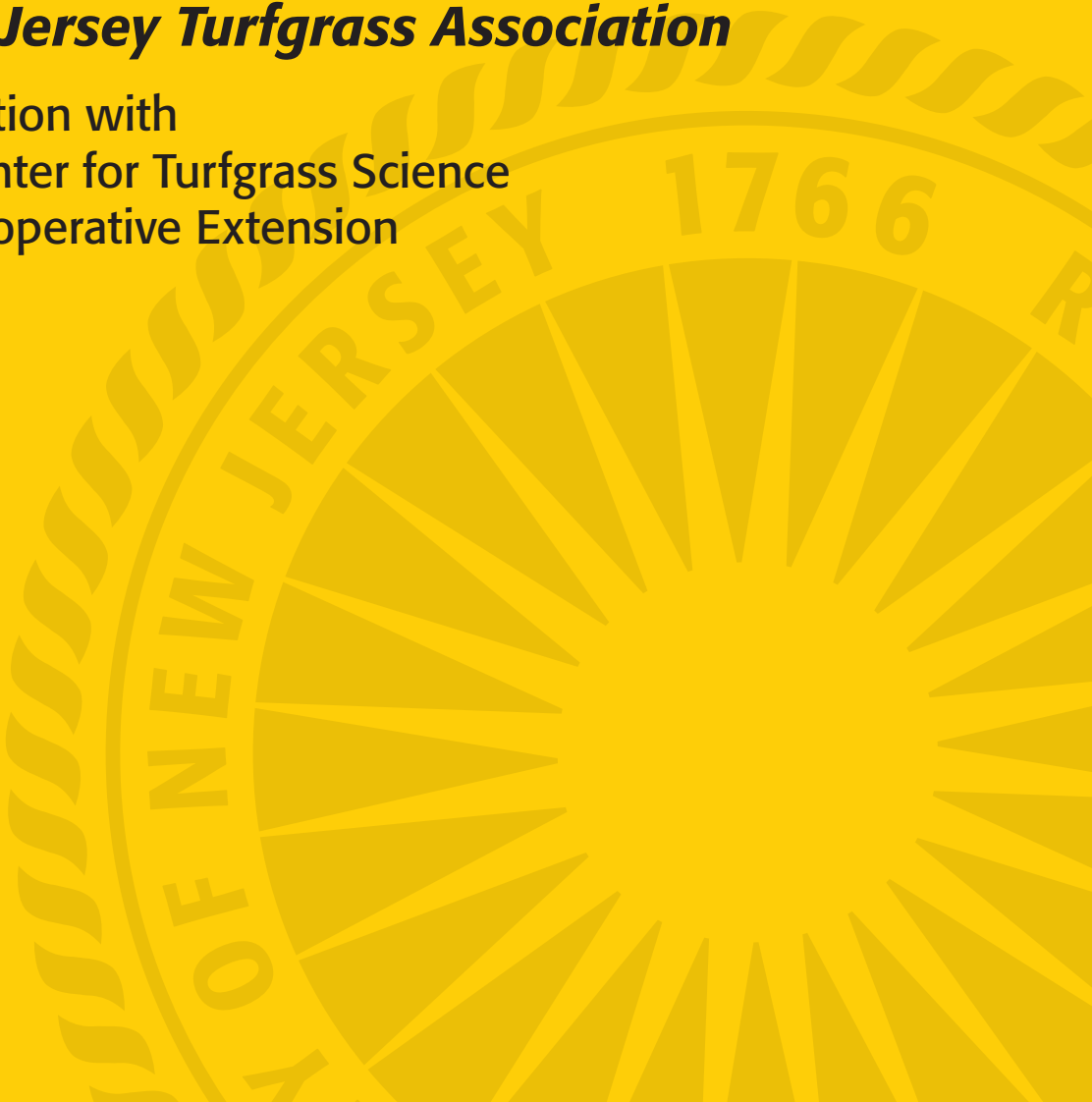

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of the

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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 2013 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.

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

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

SUPPRESSING SUMMER PATCH WITH SELECTED FUNGICIDES AND BIOCONTROL PRODUCTS ON KENTUCKY BLUEGRASS, 2013

Bruce B. Clarke, Pradip R. Majumdar, Samantha Flatley, Gerard Rappa, Michael Mus, Mark Peacos, Tracy J. Lawson, Charles Schmid, James Hempfling, and Joseph B. Clark[1]

Fungicides were evaluated in 2013 for their ability to control summer patch (caused by *Magnaporthe poae*) on Kentucky bluegrass (*Poa pratensis* cv. Baron) at the Rutgers Turf Research Farm in North Brunswick, NJ. Turf was established in September 2002 on a Norton loam soil with a pH of 6.6. Mowing was performed two times weekly at a height of 1.5 inches with clippings returned. The site was irrigated as needed to prevent drought stress and to encourage disease. Turf was inoculated on 15 May 2004 by removing 3-inch diameter x 3-inch deep circular sod cores with a cup cutter, placing 25 cc of oat grains infested with *M. poae* isolate OAK A-5 into each hole, replacing the cores, and irrigating the site to encourage rooting. Three inoculations (1.5 ft apart) were made per plot. Plots were 3 x 9 ft and treatments were arranged in a randomized complete block with four replications.

Fertilizer was applied as 16-0-8 (0.69 lb nitrogen (N) per 1000 ft^2) on 12 May and 16-0-8 (0.66 lb N per 1000 ft^2) on 24 June, 28 August, and 31 October. Dimension 2EW (13.1 fl oz per acre) was sprayed on 19 April for pre-emergence weed control. Broadleaf weeds were controlled with Trimec Classic 1.3L (1.5 fl oz per 1000 ft^2) on 11 April and Turflon Ester 4EC (1.4 fl oz per 1000 ft^2) on 23 July, crabgrass (*Digitaria sanguinalis*) was suppressed with Acclaim Extra 0.57EC (1.4 fl oz per 1000 ft^2) on 9 July and Drive 75DF (0.367 fl oz per 1000 ft^2) + methylated seed oil (0.55 fl oz per 1000 ft^2) on 29 August, and yellow nutsedge (*Cyperus esculentus*) was eliminated from the site on 23 July with Dismiss 4L (7 fl oz per acre). Insect pests were suppressed with Merit 75WP (0.17 oz per 1000 ft^2) on 12 June. Curalan 50EG (1.0 fl oz per 1000 ft^2) and Emerald 70WG (0.18 fl oz per 1000 ft^2) were applied to the entire test area on 7 July and 27 August, respectively, to control dollar spot (caused by *Sclerotinia homoeocarpa*).

Fungicides were applied in water equivalent to 4 gal per 1000 ft^2 with a CO_2 powered sprayer at 30 psi using 85025 air induction nozzles. Treatments (trt) were initiated on 30 May when the maximum soil temperature at a 2-inch depth exceeded 65°F for five consecutive days. Fungicides were reapplied at the predetermined intervals as indicated in Tables 1A, 1B and 1C. Turf area exhibiting foliar symptoms of summer patch was assessed as a disease severity index (DSI) on 10, 20, and 30 July, 9, 19, and 29 August, and 8 and 18 September. The DSI was calculated by multiplying the patch diameter of each infection center by the disease intensity of that patch. Disease intensity was assessed on a 0 to 3 scale, where 0 = no visual foliar necrosis, 1 = 1 to 33% necrotic foliage, 2 = 34 to 66% necrotic foliage, and 3 = 67 to 100% necrotic foliage within each patch. Patch diameter was recorded as the mean of two perpendicular measurements per infection center. Disease severity values were averaged for each plot. Turf quality was rated on 27 June, 25 July, and 22 August using a 1 to 9 scale, where 9 = best turf quality and 5 = acceptable quality. Color of foliage was visually estimated on 27 June, 25 July, and 22 August using a 1 to 5 scale, where 1 = very chlorotic turf, 2 = slight reduction in green color, 3 = normal green color of healthy turf, 4 = slight dark green color, 5 = very dark green color. Data were subjected to analysis of variance and means were separated by Waller-Duncan *k*-ratio *t*-test (*k* = 100).

Summer patch symptoms were first noticed on 1 July but did not become uniformly distributed throughout the study area until 10 July (Table 1A).

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The epidemic peaked at a DSI of 118 for untreated turf (trt 29) on 18 September, which was extremely severe and the most destructive summer patch infestation observed on this site since the turf was inoculated in 2004. A DSI of less than 20 was considered an acceptable level of disease control. Only three of the 25 products in this study (A20744A 50WG + Heritage 50WG [trt 1], Briskway 2.7SC @ 0.5 fl oz every 21 days [trt 13], and Tourney 50WG @ 0.37 oz every 14 days [trt 16]) provided acceptable, season-long control (30 May to 18 September) of summer patch. These products contained either a DMI and/or a QoI fungicide. Another three treatments (QP Enclave 5.3F @ 3 fl oz + QP Fosetyl-Al 80WDG @ 4.0 oz + Foursome 100SL @ 0.4 fl oz every 14 days [trt 11], 3336 4F [trt 23], and Ammonium Sulfate + Banner Maxx [trt 28]) afforded good to excellent disease control throughout the application period (30 May to 8 August; Tables 1A and 1B). Ammonium sulfate applied once on 11 July (trt 26) and the same product applied every 14 days (trt 27) reduced disease severity ~ 33% and 40%, respectively, during the summer compared to the untreated control (trt 29).

Turf quality was acceptable (greater or equal to 5.0) for all of the entries in June, except the untreated control (trt 29), but quickly declined for most treatments as the disease outbreak intensified in July and August (Table 1C). Only A20744A 50WG + Heritage 50WG (trt 1), QP Enclave 5.3F @ 4.0 fl oz + Foursome 100SL @ 0.4 fl oz every 21 days (trt 10), Briskway 2.7SC @ 0.5 fl oz every 21 days (trt 13), Briskway 2.7SC @ 0.5 fl oz every 28 days (trt 14), Tourney 50WG @ 0.37 oz every 14 days (trt 16), Banner Maxx 1.3ME @ 2.0 fl oz every 14 days (trt 19), Banner Maxx 1.3ME @ 4.0 fl oz every 28 days (trt 21), 3336 4F (trt 23), and Ammonium Sulfate + Banner Maxx (trt 28) provided acceptable turf quality throughout the study.

Several treatments resulted in visually darker green foliage on at least one rating date compared to untreated turf (i.e., RU-2125-13H SC [trts 4, 5], QP Enclave 5.3F + Foursome 100SL [trts 9, 10], QP Enclave 5.3F @ 3 fl oz + QP Fosetyl-Al 80WDG @ 4.0 oz + Foursome 100SL @ 0.4 fl oz every 14 days [trt 11], and the 2013 Syngenta SP Program #3 [trt 15]), presumably because they contained either a pigment and/or a plant growth regulator (Table 1C). No phytotoxicity was observed in this study.

Table 1A. Suppressing summer patch with selected fungicides on Kentucky bluegrass: Rutgers University, 2013.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[3]	Disease Severity Index[1,2] 10 July	20 July	30 July	9 Aug.	19 Aug.
1	A20744A 50WG	0.5 oz	–					
	+ Heritage 50WG	0.4 oz	28	2.8 b	13.4 b	9.0 e	11.0 d	13.5 j
2	Heritage 50WG	0.4 oz	28	12.8 b	37.1 ab	38.9 a-e	32.5 a-d	35.5 f-j
3	A20581A 4.17SC	0.472 fl oz	28	2.9 b	37.4 ab	40.3 a-e	39.5 a-d	54.8 d-j
4	RU-2125-13H SC	3.3 fl oz	14	11.0 b	38.3 ab	43.3 a-e	50.5 a-d	83.0 a-f
5	RU-2125-13H SC	6.6 fl oz	28	10.0 b	56.3 ab	70.5 a-c	86.0 ab	126.0 a
6	BW136N 513G	64.0 oz	–					
	/ BW136N 513WP	2.5 oz	ALT[4,5]	7.7 b	60.3 ab	81.9 a	92.1 a	114.0 ab
7	2013 SP Program #1	–	14[4,6]	23.7 ab	69.5 a	51.8 a-e	86.0 ab	96.0 a-d
8	2013 SP Program #2	–	14[4,7]	7.6 b	33.8 ab	41.5 a-e	40.4 a-d	92.0 a-e
9	QP Enclave 5.3F	3.0 fl oz	–					
	+ Foursome 100SL	0.4 fl oz	14	8.3 b	44.3 ab	51.3 a-e	65.7 a-d	80.5 a-f
10	QP Enclave 5.3F	4.0 fl oz	–					
	+ Foursome 100SL	0.4 fl oz	21	13.2 b	38.5 ab	47.0 a-e	49.2 a-d	62.0 d-j
11	QP Enclave 5.3F	3.0 fl oz	–					
	+ QP Fosetyl-Al 80WDG	4.0 oz	–					
	+ Foursome 100SL	0.4 fl oz	14	0.0 b	14.6 b	19.4 c-e	34.8 a-d	73.4 b-g
12	QP Enclave 5.3F	4.0 fl oz	–					
	+ QP Fosetyl-Al 80WDG	4.0 oz	–					
	+ Foursome 100SL	0.4 fl oz	21	11.0 b	31.6 ab	32.7 a-e	47.3 a-d	61.8 d-j
13	Briskway 2.7SC	0.5 fl oz	21	0.0 b	14.9 b	12.0 e	11.8 d	14.1 ij
14	Briskway 2.7SC	0.5 fl oz	28	3.0 b	25.3 ab	29.3 a-e	24.6 a-d	39.8 f-j
15	2013 SP Program #3	Syngenta	14[8]	11.7 b	35.3 ab	45.8 a-e	57.5 a-d	62.7 c-j
16	Tourney 50WG	0.37 oz	14	0.0 b	8.8 b	17.7 c-e	18.0 b-d	18.8 h-j
17	Tourney 50WG	0.37 oz	28	4.6 b	23.8 ab	36.8 a-e	40.6 a-d	64.4 b-i
18	Heritage 50WG	0.2 oz	14	10.6 b	38.2 ab	39.8 a-e	43.1 a-d	55.3 d-j
19	Banner Maxx 1.3ME	2.0 fl oz	14	0.0 b	20.3 ab	28.3 b-e	35.0 a-d	39.2 f-j
20	2013 SP Program #4	Rutgers	14[9]	5.7 b	48.0 ab	42.3 a-e	34.8 a-d	39.3 f-j
21	Banner Maxx 1.3ME	4.0 fl oz	28	7.9 b	23.0 ab	28.8 b-e	36.0 a-d	42.6 e-j
22	Daconil Ultrex 82.5 WDG	3.2 oz	14	7.8 b	50.5 ab	70.5 a-c	84.8 a-c	112.8 a-c

(Continued)

Table 1A. Summer patch on Kentucky bluegrass trial: Rutgers University, 2013.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[3]	Disease Severity Index[1,2] 10 July	20 July	30 July	9 Aug.	19 Aug.
23	3336 4F	4.0 fl oz	14	1.4 b	8.9 b	15.5 de	14.0 cd	26.8 g-j
24	2013 SP Program #5	Plant-Food	14[10]	19.3 ab	59.8 ab	65.8 a-d	78.5 a-d	102.4 a-d
25	2013 SP Program #6	Plant-Food	14[11]	2.0 b	38.7 ab	48.0 a-e	64.9 a-d	76.9 a-g
26	Ammonium Sulfate	0.2 lb	CUR-Once[12]	19.8 ab	44.7 ab	44.0 a-e	60.4 a-d	69.0 b-h
27	Ammonium Sulfate	0.2 lb	14[12]	8.7 b	37.5 ab	38.1 a-e	56.8 a-d	85.7 a-f
28	Ammonium Sulfate	0.2 lb	–					
	+ Banner Maxx 1.3ME	2.0 fl oz	14[12,13]	0.0 b	21.5 ab	23.1 c-e	21.0 a-d	29.8 g-j
29	Untreated Check	–	–	38.8 a	60.0 ab	81.0 ab	78.8 a-d	96.3 a-d
			INT[14]	DAT[15]	DAT	DAT	DAT	DAT
			14	13	9	5	1	11
			21	20	9	19	8	18
			28	13	26	5	15	25

[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). All fungicides were applied in 4.0 gal H_2O per 1000 sq ft with a CO_2 compressed air sprayer, 85025 air induction nozzle, at 30 psi.

[2] Disease severity index = patch diameter x disease intensity. Disease intensity was rated on a scale of 0 to 3, where 0 = no visual foliar necrosis, 1 = 1 to 33% necrotic foliage, 2 = 34 to 66% necrotic foliage, and 3 = 67 to 100% necrotic foliage. Patch diameter was recorded as the mean of two perpendicular measurements per infection center. Three locations were inoculated per 3 x 9 ft replicate plot with *Magnaporthe poae* isolate OAK A-5 on 15 May 2004. Disease severity values were averaged for each plot.

[3] Fungicides were applied on 30 May (all treatments, except treatment 26), 13 June (14-day treatment), 20 June (21-day treatment), 27 June (14- and 28-day treatments), 11 July (14- and 21-day treatments; initiated treatment 26), 25 July (14- and 28-day treatments), 1 August (21-day treatment), and 8 August (14-day treatment).

[4] Treatments 6, 7, and 8 were irrigated with 0.5 gal of water per plot immediately following application.

[5] Treatment 6 consisted of BW136N 513G (64.0 oz) applied with a shaker bottle on 30 May and 25 July, and BW136N 513WP sprayed on 27 June.

[6] Treatment 7 (2013 Summer Patch Program #1) consisted of BW136N 513G (64.0 oz) applied on 30 May and 25 July, and BW136N 513WP (1.5 oz) on 13 and 27 June, 11 July, and 8 August.

(Continued)

Table 1A. Summer patch on Kentucky bluegrass trial: Rutgers University, 2013.

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[7] Treatment 8 (2013 Summer Patch Program #2) consisted of BW136N 513G (64.0 oz) applied on 30 May and 25 July, and BW136N 513G (32.0 oz) on 13 June, 27 June, 11 July, and 8 August.

[8] Treatment 15 (2013 Syngenta Summer Patch Program #3) consisted of Headway 1.38ME (2.25 fl oz) + Daconil Action 6.1SC (3.5 fl oz) + Appear 4.1SL (4.0 fl oz) applied on 30 May, Daconil Action 6.1SC (3.0 fl oz) + Medallion 1.04SC (1.5 fl oz) + Appear 4.1SL (4.0 fl oz) on 13 June, Headway 1.38ME (2.25 fl oz) + Daconil Action 6.1SC (3.0 fl oz) + Appear 4.1SL (6.0 fl oz) on 27 June, Daconil Action 6.1SC (3.0 fl oz) + Medallion 1.04SC (1.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 11 July, Daconil Action 6.1SC (3.0 fl oz) + Briskway 2.7SC (0.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 25 July, and Daconil Action 6.1SC (3.0 fl oz) + Briskway 2.7SC (0.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 8 August.

[9] Treatment 20 (2013 Rutgers Summer Patch Program #4) consisted of Banner Maxx 1.3ME (2.0 fl oz) applied on 30 May, Insignia Intrinsic 2.1SC (0.4 fl oz) on 13 June, 3336 4F (4.0 fl oz) + Banol 6SC (2.0 fl oz) on 27 June, Chipco Signature 80WG (4.0 oz) + Torque 3.6SC (0.6 fl oz) on 11 July, Heritage TL 0.8ME (1.0 fl oz) on 25 July, and 3336 4F (4.0 fl oz) + Subdue Maxx 2ME (1.0 fl oz) on 8 August.

[10] Treatment 24 (2013 Plant-Food Summer Patch Program #5) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Phosphite 30 0-0-27 LC (2.0 fl oz) + Mn 5% LC (4.0 fl oz) + Phusion Mn 7% LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Omega LC (0.35 fl oz) + Organic Acid LC (3.0 fl oz) applied every 14 days from 30 May to 8 August.

[11] Treatment 25 (2013 Plant-Food Summer Patch Program #6) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Phosphite 30 0-0-27 LC (2.0 fl oz) + Mn 5% LC (4.0 fl oz) + Phusion Mn 7% LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Omega LC (0.35 fl oz) + Organic Acid LC (3.0 fl oz) + Banner Maxx 1.3ME (0.5 fl oz) applied every 14 days from 30 May to 8 August.

[12] Treatments 26 to 28 were applied to dry foliage and then immediately irrigated with 0.5 gal of water per plot. Treatment 26 was initiated upon symptom expression on 11 July and not repeated.

[13] Treatment 28 was sprayed with NH_3SO_4, irrigated with 0.5 gal of water per plot, and then sprayed with Banner Maxx 1.3ME (2.0 fl oz).

[14] INT = Spray interval in days.

[15] DAT = Days after the last treatment.

Table 1B. Suppressing summer patch with selected fungicides on Kentucky bluegrass: Rutgers University, 2013.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[3]	Disease Severity Index[1,2] 29 Aug.	8 Sept.	18 Sept.
1	A20744A 50WG	0.5 oz	–			
	+ Heritage 50WG	0.4 oz	28	9.8 g	3.0 i	0.0 l
2	Heritage 50WG	0.4 oz	28	36.5 e-g	30.8 f-i	14.3 j-l
3	A20581A 4.17SC	0.472 fl oz	28	46.9 c-g	47.2 d-i	41.3 f-k
4	RU-2125-13H SC	3.3 fl oz	14	93.0 a-c	90.2 a-d	76.8 b-g
5	RU-2125-13H SC	6.6 fl oz	28	132.5 a	109.3 a	101.8 ab
6	BW136N 513G	64.0 oz	–			
	/ BW136N 513WP	2.5 oz	ALT[4,5]	120.0 ab	101.0 ab	79.8 b-e
7	2013 SP Program #1	–	14[4,6]	93.7 a-c	87.8 a-e	78.0 b-f
8	2013 SP Program #2	–	14[4,7]	87.0 a-e	58.5 b-h	61.5 c-h
9	QP Enclave 5.3F	3.0 fl oz	–			
	+ Foursome 100SL	0.4 fl oz	14	77.0 b-f	73.5 a-f	73.0 b-h
10	QP Enclave 5.3F	4.0 fl oz	–			
	+ Foursome 100SL	0.4 fl oz	21	57.9 c-g	53.2 c-h	46.8 e-j
11	QP Enclave 5.3F	3.0 fl oz	–			
	+ QP Fosetyl-Al 80WDG	4.0 oz	–			
	+ Foursome 100SL	0.4 fl oz	14	78.5 b-f	52.3 c-h	42.0 f-k
12	QP Enclave 5.3F	4.0 fl oz	–			
	+ QP Fosetyl-Al 80WDG	4.0 oz	–			
	+ Foursome 100SL	0.4 fl oz	21	73.0 b-f	56.6 b-h	66.3 b-h
13	Briskway 2.7SC	0.5 fl oz	21	12.5 g	15.0 hi	8.0 kl
14	Briskway 2.7SC	0.5 fl oz	28	40.8 d-g	18.3 hi	17.3 j-l
15	2013 SP Program #3	Syngenta	14[8]	71.0 b-f	48.3 d-h	22.0 i-l
16	Tourney 50WG	0.37 oz	14	17.8 g	19.3 hi	15.3 j-l
17	Tourney 50WG	0.37 oz	28	72.3 b-f	58.8 b-h	55.8 d-i
18	Heritage 50WG	0.2 oz	14	41.2 d-g	33.3 f-i	15.8 j-l
19	Banner Maxx 1.3ME	2.0 fl oz	14	50.3 c-g	40.5 e-i	40.3 g-k
20	2013 SP Program #4	Rutgers	14[9]	45.5 c-g	25.0 g-i	20.0 i-l
21	Banner Maxx 1.3ME	4.0 fl oz	28	45.9 c-g	34.4 f-i	37.8 h-k
22	Daconil Ultrex 82.5 WDG	3.2 oz	14	118.8 ab	104.0 a	95.8 a-c

(Continued)

Table 1B. Summer patch on Kentucky bluegrass trial: Rutgers University, 2013.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[3]	Disease Severity Index[1,2] 29 Aug.	8 Sept.	18 Sept.
23	3336 4F	4.0 fl oz	14	43.3 c-g	33.9 f-i	41.5 f-k
24	2013 SP Program #5	Plant-Food	14[10]	91.9 a-d	84.7 a-e	86.0 a-d
25	2013 SP Program #6	Plant-Food	14[11]	89.2 a-d	69.6 a-g	61.0 c-h
26	Ammonium Sulfate	0.2 lb	CUR-Once[12]	75.6 b-f	79.3 a-e	67.0 b-h
27	Ammonium Sulfate	0.2 lb	14[12]	77.6 b-f	73.5 a-f	50.0 d-j
28	Ammonium Sulfate	0.2 lb	–			
	+ Banner Maxx 1.3ME	2.0 fl oz	14[12,13]	28.1 fg	18.5 hi	21.3 i-l
29	Untreated check	–	–	111.0 ab	96.8 a-c	118.0 a
			INT[14]	DAT[15]	DAT	DAT
			14	21	31	41
			21	28	38	48
			28	35	45	55

[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). All fungicides were applied in 4.0 gal H_2O per 1000 sq ft with a CO_2 compressed air sprayer, 85025 air induction nozzle, at 30 psi.

[2] Disease severity index = patch diameter x disease intensity. Disease intensity was rated on a scale of 0 to 3, where 0 = no visual foliar necrosis, 1 = 1 to 33% necrotic foliage, 2 = 34 to 66% necrotic foliage, and 3 = 67 to 100% necrotic foliage. Patch diameter was recorded as the mean of two perpendicular measurements per infection center. Three locations were inoculated per 3 x 9 ft replicate plot with *Magnaporthe poae* isolate OAK A-5 on 15 May 2004. Disease severity values were averaged for each plot.

[3] Fungicides were applied on 30 May (all treatments, except treatment 26), 13 June (14-day treatment), 20 June (21-day treatment), 27 June (14- and 28-day treatments), 11 July (14- and 21-day treatments; initiated treatment 26), 25 July (14- and 28-day treatments), 1 August (21-day treatment), and 8 August (14-day treatment).

[4] Treatments 6, 7, and 8 were irrigated with 0.5 gal of water per plot immediately following application.

[5] Treatment 6 consisted of BW136N 513G (64.0 oz) applied with a shaker bottle on 30 May and 25 July, and BW136N 513WP sprayed on 27 June.

[6] Treatment 7 (2013 Summer Patch Program #1) consisted of BW136N 513G (64.0 oz) applied on 30 May and 25 July, and BW136N 513WP (1.5 oz) on 13 and 27 June, 11 July, and 8 August.

(Continued)

Table 1B. Summer patch on Kentucky bluegrass trial: Rutgers University, 2013.

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[7] Treatment 8 (2013 Summer Patch Program #2) consisted of BW136N 513G (64.0 oz) applied on 30 May and 25 July, and BW136N 513G (32.0 oz) on 13 June, 27 June, 11 July, and 8 August.

[8] Treatment 15 (2013 Syngenta Summer Patch Program #3) consisted of Headway 1.38ME (2.25 fl oz) + Daconil Action 6.1SC (3.5 fl oz) + Appear 4.1SL (4.0 fl oz) applied on 30 May, Daconil Action 6.1SC (3.0 fl oz) + Medallion 1.04SC (1.5 fl oz) + Appear 4.1SL (4.0 fl oz) on 13 June, Headway 1.38ME (2.25 fl oz) + Daconil Action 6.1SC (3.0 fl oz) + Appear 4.1SL (6.0 fl oz) on 27 June, Daconil Action 6.1SC (3.0 fl oz) + Medallion 1.04SC (1.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 11 July, Daconil Action 6.1SC (3.0 fl oz) + Briskway 2.7SC (0.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 25 July, and Daconil Action 6.1SC (3.0 fl oz) + Briskway 2.7SC (0.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 8 August.

[9] Treatment 20 (2013 Rutgers Summer Patch Program #4) consisted of Banner Maxx 1.3ME (2.0 fl oz) applied on 30 May, Insignia Intrinsic 2.1SC (0.4 fl oz) on 13 June, 3336 4F (4.0 fl oz) + Banol 6SC (2.0 fl oz) on 27 June, Chipco Signature 80WG (4.0 oz) + Torque 3.6SC (0.6 fl oz) on 11 July, Heritage TL 0.8ME (1.0 fl oz) on 25 July, and 3336 4F (4.0 fl oz) + Subdue Maxx 2ME (1.0 fl oz) on 8 August.

[10] Treatment 24 (2013 Plant-Food Summer Patch Program #5) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Phosphite 30 0-0-27 LC (2.0 fl oz) + Mn 5% LC (4.0 fl oz) + Phusion Mn 7% LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Omega LC (0.35 fl oz) + Organic Acid LC (3.0 fl oz) applied every 14 days from 30 May to 8 August.

[11] Treatment 25 (2013 Plant-Food Summer Patch Program #6) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Phosphite 30 0-0-27 LC (2.0 fl oz) + Mn 5% LC (4.0 fl oz) + Phusion Mn 7% LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Omega LC (0.35 fl oz) + Organic Acid LC (3.0 fl oz) + Banner Maxx 1.3ME (0.5 fl oz) applied every 14 days from 30 May to 8 August.

[12] Treatments 26 to 28 were applied to dry foliage and then immediately irrigated with 0.5 gal of water per plot. Treatment 26 was initiated upon symptom expression on 11 July and not repeated.

[13] Treatment 28 was sprayed with NH_3SO_4, irrigated with 0.5 gal of water per plot, and then sprayed with Banner Maxx 1.3ME (2.0 fl oz).

[14] INT = Spray interval in days.

[15] DAT = Days after the last treatment.

Table 1C. Suppressing summer patch with selected fungicides on Kentucky bluegrass: Rutgers University, 2013.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Turf Quality[1,2]			Color[3]		
				27 June	25 July	22 Aug.	27 June	25 July	22 Aug.
1	A20744A 50WG	0.5 oz	–						
	+ Heritage 50WG	0.4 oz	28	8.2 ab	6.9 a	7.4 a	5.2 de	5.0 c	5.1 a
2	Heritage 50WG	0.4 oz	28	6.1 i	4.8 b-g	5.4 c	5.3 de	4.9 c	5.1 a
3	A20581A 4.17SC	0.472 fl oz	28	7.7 a-f	3.9 d-i	4.7 c-e	5.3 de	5.0 c	5.3 a
4	RU-2125-13H SC	3.3 fl oz	14	7.9 a-c	3.6 f-j	3.5 e-g	5.9 c	5.0 c	5.3 a
5	RU-2125-13H SC	6.6 fl oz	28	7.9 a-c	2.1 j	1.3 i	5.6 cd	5.0 c	5.3 a
6	BW136N 513G	64.0 oz	–						
	/ BW136N 513WP	2.5 oz	ALT[5,6]	6.7 e-i	2.1 j	2.8 fg	5.2 de	4.8 c	5.1 a
7	2013 SP Program #1	–	14[5,7]	6.9 c-i	2.7 ij	3.0 fg	5.4 c-e	4.9 c	5.1 a
8	2013 SP Program #2	–	14[5,8]	6.2 hi	3.8 d-i	3.3 fg	5.0 e	5.0 c	5.1 a
9	QP Enclave 5.3F	3.0 fl oz	–						
	+ Foursome 100SL	0.4 fl oz	14	8.2 ab	3.8 d-i	2.4 g-i	6.6 b	5.9 a	5.5 a
10	QP Enclave 5.3F	4.0 fl oz	–						
	+ Foursome 100SL	0.4 fl oz	21	7.8 a-e	5.4 a-d	5.3 c	5.6 cd	5.3 bc	5.1 a
11	QP Enclave 5.3F	3.0 fl oz	–						
	+ QP Fosetyl-Al 80WDG	4.0 oz	–						
	+ Foursome 100SL	0.4 fl oz	14	8.4 a	5.3 a-e	3.9 d-f	7.3 a	6.0 a	5.1 a
12	QP Enclave 5.3F	4.0 fl oz	–						
	+ QP Fosetyl-Al 80WDG	4.0 oz	–						
	+ Foursome 100SL	0.4 fl oz	21	7.1 b-i	4.6 b-h	3.7 e-g	5.6 c-e	5.0 c	5.0 a
13	Briskway 2.7SC	0.5 fl oz	21	7.7 a-f	6.0 ab	6.8 ab	5.2 de	5.3 bc	5.4 a
14	Briskway 2.7SC	0.5 fl oz	28	7.4 a-g	4.9 b-g	5.7 bc	5.0 e	5.0 c	5.1 a
15	2013 SP Program #3	Syngenta	14[9]	7.3 a-h	3.6 f-j	3.1 fg	6.6 b	5.6 ab	5.1 a
16	Tourney 50WG	0.37 oz	14	6.4 g-i	5.3 b-f	5.8 bc	5.1 de	5.3 bc	5.3 a
17	Tourney 50WG	0.37 oz	28	6.6 f-i	4.0 c-i	3.3 fg	5.3 de	5.1 bc	5.4 a
18	Heritage 50WG	0.2 oz	14	7.2 b-i	4.2 c-i	5.1 cd	5.0 e	5.0 c	5.0 a
19	Banner Maxx 1.3ME	2.0 fl oz	14	7.3 a-h	5.1 b-g	5.0 cd	5.0 e	4.9 c	5.0 a
20	2013 SP Program #4	Rutgers	14[10]	7.7 a-f	4.0 c-i	5.9 bc	5.0 e	4.8 c	5.1 a
21	Banner Maxx 1.3ME	4.0 fl oz	28	7.2 a-i	5.1 b-g	5.7 bc	5.0 e	5.0 c	5.0 a
22	Daconil Ultrex 82.5 WDG	3.2 oz	14	6.4 g-i	2.8 ij	1.5 hi	5.3 de	4.9 c	5.1 a

(Continued)

Table 1C. Summer patch on Kentucky bluegrass trial: Rutgers University, 2013.

	Treatment	Rate per 1000 sq ft	Application Schedule (days)[4]	Turf Quality[1,2]			Color[3]		
				27 June	25 July	22 Aug.	27 June	25 July	22 Aug.
23	3336 4F	4.0 fl oz	14	6.7 d-i	5.1 b-g	5.1cd	5.2 de	4.9 c	5.0 a
24	2013 SP Program #5	Plant-Food	14[11]	6.6 e-i	3.1 h-j	3.0 fg	5.2 de	5.0 c	5.3 a
25	2013 SP Program #6	Plant-Food	14[12]	8.0 a-c	3.9 d-i	3.5 e-g	5.6 c-e	4.9 c	5.1 a
26	Ammonium Sulfate	0.2 lb	CUR-Once[13]	6.5 g-i	4.0 c-i	3.5 e-g	5.1 de	4.8 c	5.1 a
27	Ammonium Sulfate	0.2 lb	14[13]	7.3 a-h	4.0 c-i	3.7 ef	5.2 de	5.0 c	5.1 a
28	Ammonium Sulfate	0.2 lb	–						
	+ Banner Maxx 1.3ME	2.0 fl oz	14[13,14]	6.8 c-i	5.6 a-c	5.7 bc	5.4 c-e	4.9 c	5.4 a
29	Untreated check	–	–	4.5 j	3.1 h-j	2.8 f-h	5.0 e	5.0 c	5.3 a
			INT[15]	DAT[16]	DAT	DAT	DAT	DAT	DAT
			14	14	14	14	14	14	14
			21	7	14	21	7	14	21
			28	14	14	28	14	14	28

[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). All fungicides were applied in 4.0 gal H_2O per 1000 sq ft with a CO_2 compressed air sprayer, 85025 air induction nozzle, at 30 psi.

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

[3] Color of foliage on a scale of 1 to 10, where 5 = color of healthy untreated turf, less than 5 = progressively more chlorotic/necrotic turf, and greater than 5 = progressively darker green turf.

[4] Fungicides were applied on 30 May (all treatments, except treatment 26), 13 June (14-day treatment), 20 June (21-day treatment), 27 June (14- and 28-day treatments), 11 July (14- and 21-day treatments; initiated treatment 26), 25 July (14- and 28-day treatments), 1 August (21-day treatment), and 8 August (14-day treatment).

[5] Treatments 6, 7, and 8 were irrigated with 0.5 gal of water per plot immediately following application.

[6] Treatment 6 consisted of BW136N 513G (64.0 oz) applied with a shaker bottle on 30 May and 25 July, and BW136N 513WP sprayed on 27 June.

[7] Treatment 7 (2013 Summer Patch Program #1) consisted of BW136N 513G (64.0 oz) applied on 30 May and 25 July, and BW136N 513WP (1.5 oz) on 13 and 27 June, 11 July, and 8 August.

(Continued)

Table 1C. Summer patch on Kentucky bluegrass trial: Rutgers University, 2013.

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[8] Treatment 8 (2013 Summer Patch Program #2) consisted of BW136N 513G (64.0 oz) applied on 30 May and 25 July, and BW136N 513G (32.0 oz) on 13 June, 27 June, 11 July, and 8 August.

[9] Treatment 15 (2013 Syngenta Summer Patch Program #3) consisted of Headway 1.38ME (2.25 fl oz) + Daconil Action 6.1SC (3.5 fl oz) + Appear 4.1SL (4.0 fl oz) applied on 30 May, Daconil Action 6.1SC (3.0 fl oz) + Medallion 1.04SC (1.5 fl oz) + Appear 4.1SL (4.0 fl oz) on 13 June, Headway 1.38ME (2.25 fl oz) + Daconil Action 6.1SC (3.0 fl oz) + Appear 4.1SL (6.0 fl oz) on 27 June, Daconil Action 6.1SC (3.0 fl oz) + Medallion 1.04SC (1.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 11 July, Daconil Action 6.1SC (3.0 fl oz) + Briskway 2.7SC (0.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 25 July, and Daconil Action 6.1SC (3.0 fl oz) + Briskway 2.7SC (0.5 fl oz) + Appear 4.1SL (6.0 fl oz) on 8 August.

[10] Treatment 20 (2013 Rutgers Summer Patch Program #4) consisted of Banner Maxx 1.3ME (2.0 fl oz) applied on 30 May, Insignia Intrinsic 2.1SC (0.4 fl oz) on 13 June, 3336 4F (4.0 fl oz) + Banol 6SC (2.0 fl oz) on 27 June, Chipco Signature 80WG (4.0 oz) + Torque 3.6SC (0.6 fl oz) on 11 July, Heritage TL 0.8ME (1.0 fl oz) on 25 July, and 3336 4F (4.0 fl oz) + Subdue Maxx 2ME (1.0 fl oz) on 8 August.

[11] Treatment 24 (2013 Plant-Food Summer Patch Program #5) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Phosphite 30 0-0-27 LC (2.0 fl oz) + Mn 5% LC (4.0 fl oz) + Phusion Mn 7% LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Omega LC (0.35 fl oz) + Organic Acid LC (3.0 fl oz) applied every 14 days from 30 May to 8 August.

[12] Treatment 25 (2013 Plant-Food Summer Patch Program #6) consisted of 16-2-7 25% SRN LC (6.0 fl oz) + Phosphite 30 0-0-27 LC (2.0 fl oz) + Mn 5% LC (4.0 fl oz) + Phusion Mn 7% LC (3.0 fl oz) + Flo Thru 2403 LC (3.0 fl oz) + Omega LC (0.35 fl oz) + Organic Acid LC (3.0 fl oz) + Banner Maxx 1.3ME (0.5 fl oz) applied every 14 days from 30 May to 8 August.

[13] Treatments 26 to 28 were applied to dry foliage and then immediately irrigated with 0.5 gal of water per plot. Treatment 26 was initiated upon symptom expression on 11 July and not repeated.

[14] Treatment 28 was sprayed with NH_3SO_4, irrigated with 0.5 gal of water per plot, and then sprayed with Banner Maxx 1.3ME (2.0 fl oz).

[15] INT = Spray interval in days.

[16] DAT = Days after the last treatment.