

CREEPING BENTGRASS (*Agrostis palustris* 'Crenshaw')

Dollar spot; *Sclerotinia homoeocarpa*

Brown patch; *Rhizoctonia solani*

Algae; Cyanobacteria

Yellow spot; Unknown

Visual quality

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### Evaluation of fungicides for control of dollar spot in creeping bentgrass, 2003.

Fungicides were evaluated for their effect on dollar spot, brown patch, algae invasion, turfgrass quality, and 'yellow spot', an unknown condition for which a causal agent has not yet been identified. This trial was conducted at North Carolina State University Turfgrass Field Laboratory in Raleigh, NC on 'Crenshaw' creeping bentgrass maintained under golf course putting green conditions. Mowing was performed three times weekly at a height of 0.156 in. with clippings collected, and the site was irrigated to prevent drought stress. Fertilizer was applied as 24-5-11 on 9 Apr (0.5 lb N/1000 sq ft), 18-3-18 on 5 May (0.5 lb N/1000 sq ft), and 18-4-10 on 15 May (0.5 lbN/1000 sq ft). Insect pests were suppressed with Dursban Pro (1.5 oz/1000 sq ft) on 16 May, 27 Jun, and 25 Jul. Canteen wetting agent (6 fl oz/1000 sq ft) was applied on 24 Apr, 12 May, 24 Jun, and 1 Aug for suppression of localized dry spots. Plots were 3.33 ft x 5 ft and were arranged in a randomized complete block with four replications. The experimental area was inoculated on 14 Apr using rye grain infested with *S. homoeocarpa* isolates S4 and S8 to encourage dollar spot development. Fungicides were applied in water equivalent to 2 gal per 1000 sq ft with a CO<sub>2</sub> powered sprayer at 40 psi using TeeJet 8004 nozzles. All treatments were initiated on 17 Apr. Fungicides were reapplied at the appropriate intervals as indicated in the table. Dollar spot incidence was assessed by counting the total number of infection centers in each plot on 5 May, 21 May, 26 May, 2 Jun, 11 Jun, 17 Jun, 24 Jun, 30 Jun, 7 Jul, and 15 Jul. Percent turf area exhibiting brown patch symptoms was assessed on 7 Jul and 15 Jul, and percent turf area invaded by algae was assessed on 30 Jun. Turfgrass quality was evaluated on 7 Jul, using a 1 to 9 scale (9=best, 5=acceptable) based on color, density, and uniformity. Yellow spot incidence was assessed by counting the total number of infection centers in each plot on 15 Jul. All data were subjected to analysis of variance and means separation by Waller-Duncan k-ratio t test (k=100).

Dollar spot symptoms were first observed in the experimental area on 26 Apr. All fungicide treatments provided excellent control of the disease on 5 May and 21 May. A severe dollar spot epidemic occurred during several consecutive days of wet and overcast weather from 23 May to 26 May, which was near the end of the application interval for 14 and 21 day treatments. Propiconazole Pro (1 fl oz, 14 day), Triton (0.6 oz, 28 day), Banner Maxx (1 fl oz, 28 day), 3336 (all rates), Spectro (all rates), and ConSyst (all rates) continued to provide excellent dollar spot control on 26 May. Several treatments, which are typically effective for dollar spot control, were severely affected by dollar spot during this epidemic, including Emerald (0.13 oz, 14 day and 0.18 oz, 21 day), Triton (0.3 oz, 21 day), Lynx (0.28 oz, 21 day), and Chipco 26GT (4 fl oz, 21 day). Rapid recovery occurred in these treatments following the scheduled re-application on 28 May, and by 11 Jun, these treatments were not significantly different from the best treatments in the trial. From 11 June to 15 Jul, excellent dollar spot control was provided by Emerald (0.13 oz, 14 day; 0.18 oz, 21 day), Propiconazole Pro (1 fl oz, 14 day), Triton (0.3 oz, 14 day; 0.6 oz, 28 day), Eagle (1.2 oz, 28 day), Chipco 26GT (3 fl oz, 14 day), 3336 (all rates), Spectro (all rates), and ConSyst 67WDG (all rates). Applications of Compass (0.2 oz, 14day) resulted in significant reduction of dollar spot incidence only on 5 May, 21 May, 17 Jun, and 30 Jun, but applications of Insignia (0.9 oz, 14 day) reduced dollar spot incidence on all evaluation dates except 26 May.

Brown patch activity was first observed in the experimental area in early July. Insignia, Insignia alternated with Emerald, Lynx (0.28 oz, 21 day; 0.56 oz, 28 day), Compass (0.2 oz, 14 day), 3336 (all rates), Spectro (4.0 oz and 5.76 oz, 14 day), and ConSyst (4.0 oz, 14 day) afforded excellent brown patch control on both 7 Jul and 15 Jul. The pressure from algae invasion was severe throughout 2003 due to prolonged periods of wet, overcast weather. Applications of Triton (0.6 oz, 28 day), Lynx (0.28 oz, 21 day; 0.56 oz, 28 day), Bayleton (0.5 oz, 28 day), and Eagle (1.2 oz, 28 day) resulted in elevated levels of algae invasion compared to the Untreated Control. Overall, treatments containing Spectro (all rates) and ConSyst (4.0 oz, 14 day) resulted in the highest turfgrass quality due to excellent control of dollar spot, brown patch, and algae invasion.

In early July, symptoms of an unknown disease were observed in the experimental area, producing spots of chlorotic, yellow foliage that were 1 to 3 inches in diameter. Incidence of the symptoms increased steadily over time, but the symptoms did not become more severe, and necrosis of the turf foliage was not observed. This condition is tentatively being referred to as "yellow spot", although it is also sometimes referred to as "*Curvularia*" due to the presence of this fungus in samples from affected areas. Few significant differences in yellow spot incidence were detected among treatments. No fungicide treatments significantly increased or decreased the incidence of yellow spot compared to the Untreated Control.

**Table 1.** Effect of fungicide treatments on dollar spot incidence in ‘Crenshaw’ creeping bentgrass in Raleigh, NC.

Treatment and rate / 1000 sq ft	Spray Interval (days)	Dollar spot incidence (infection centers per plot)				
		5 May	21 May	26 May	2 Jun	11 Jun
Emerald 70WG 0.13 oz .....	14 <sup>z</sup>	0 d <sup>y</sup>	0 b	25 cd	16 b-g	2 fg
Emerald 70WG 0.18 oz .....	21	1 d	1 b	29 bc	24 bcd	2 fg
Insignia 20WG 0.9 oz.....	14	1 d	1 b	28 bcd	20 b-e	46 b
Emerald 70WG 0.13 oz alt Insignia 20WG 0.9 oz.....	14	1 d	0 b	25 cd	20 b-f	27 cd
Propiconazole Pro 1.3EC 1.0 fl oz .....	14	2 bcd	2 b	8 fgh	7 f-j	0 g
Triton 70WG 0.3 oz.....	21	1 cd	0 b	18 c-f	15 c-h	3 fg
Triton 70WG 0.6 oz.....	28	1 cd	2 b	8 fgh	5 g-j	9 fg
Lynx 45WP 0.28 oz.....	21	4 bcd	3 b	25 cd	19 b-f	8 fg
Lynx 45WP 0.56 oz.....	28	0 d	0 b	21 cde	20 b-e	24 de
Bayleton 50DF 0.5 oz.....	28	2 bcd	5 b	22 cd	28 b	38 bc
Banner MAXX 1.3EC 1 fl oz .....	28	0 d	2 b	10 e-h	14 d-i	6 fg
Eagle 40WP 1.2 oz .....	28	2 bcd	3 b	18 d-g	15 b-h	10 fg
Chipco 26GT 2SC 3.0 fl oz .....	14	0 d	1 b	23 cd	22 b-e	13 ef
Chipco 26GT 2SC 4.0 fl oz .....	21	1 d	2 b	28 bcd	27 bc	4 fg
Compass 50WG 0.2 oz.....	14	6 b	5 b	43 a	43 a	69 a
Daconil Ultrex 82.5 WDG 1.8oz.....	14	6 bc	3 b	21 cde	11 e-j	24 de
3336 50WP 2.0 oz .....	14	1 cd	0 b	6 gh	3 hij	0 g
3336 50WP 4.0 oz .....	14	1 cd	1 b	0 h	0 j	2 fg
Spectro 90WDG 2.0 oz.....	14	1 d	0 b	1 h	1 j	0 g
Spectro 90WDG 4.0 oz.....	14	0 d	0 b	3 h	1 ij	0 g
Spectro 90WDG 5.76oz.....	14	0 d	0 b	1 h	1 j	2 fg
ConSyst 67WDG 2.0 oz.....	14	2 cd	1 b	8 fgh	4 g-j	3 fg
ConSyst 67WDG 4.0 oz.....	14	0 d	1 b	2 h	1 ij	1 fg
Untreated Control .....	--	23 a	16 a	39 ab	43 a	60 a

<sup>z</sup>Fungicides were applied on 17 Apr (all treatments), 1 May (14 day treatments), 7 May (21 day treatments), 14 May (14 and 28 day treatments), 28 May (14 and 21 day treatments), 12 Jun (14 and 28 day treatments), and 18 Jun (21 day treatments).

<sup>y</sup>Values are means of four replicates. Means within columns followed by the same letter are not significantly different according to Waller-Duncan k-ratio t-test (k=100).

**Table 2.** Effect of fungicide treatments on dollar spot incidence in ‘Crenshaw’ creeping bentgrass in Raleigh, NC.

Treatment and rate / 1000 sq ft	Spray Interval (days)	Dollar spot incidence (infection centers per plot)				
		17 Jun	24 Jun	30 Jun	7 Jul	15 Jul
Emerald 70WG 0.13 oz .....	14 <sup>z</sup>	2 gh <sup>y</sup>	4 d	0 de	1 hi	0 i
Emerald 70WG 0.18 oz .....	21	6 fgh	1 d	0 de	1 hi	1 i
Insignia 20WG 0.9 oz.....	14	23 d	82 b	34 c	86 b	78 b
Emerald 70WG 0.13 oz alt Insignia 20WG 0.9 oz.....	14	7 e-h	9 d	1 de	17 d-g	21 def
Propiconazole Pro 1.3EC 1.0 fl oz .....	14	0 gh	1 d	1 de	1 hi	1 i
Triton 70WG 0.3 oz.....	21	3 fgh	2 d	2 de	6 e-i	8 f-i
Triton 70WG 0.6 oz.....	28	13 d-g	5 d	3 de	8 d-i	9 f-i
Lynx 45WP 0.28 oz.....	21	21 de	5 d	3 de	23 cd	31 d
Lynx 45WP 0.56 oz.....	28	40 bc	11 d	11 de	14 d-h	6 ghi
Bayleton 50DF 0.5 oz.....	28	49 b	5 d	2 de	21 cde	17 efg
Banner MAXX 1.3EC 1 fl oz .....	28	23 d	2 d	0 de	4 ghi	3 hi
Eagle 40WP 1.2 oz .....	28	16 def	3 d	2 de	3 ghi	2 i
Chipco 26GT 2SC 3.0 fl oz .....	14	5 fgh	14 d	7 de	6 f-i	16 e-h
Chipco 26GT 2SC 4.0 fl oz .....	21	26 cd	5 d	2 de	20 c-f	25 de
Compass 50WG 0.2 oz.....	14	49 b	105 a	69 b	110 a	116 a
Daconil Ultrex 82.5 WDG 1.8oz.....	14	8 e-h	29 c	12 d	33 c	63 c
3336 50WP 2.0 oz .....	14	1 gh	5 d	4 de	4 ghi	5 ghi
3336 50WP 4.0 oz .....	14	4 fgh	9 d	9 de	7 e-i	7 f-i
Spectro 90WDG 2.0 oz.....	14	0 h	0 d	0 e	0 i	0 i
Spectro 90WDG 4.0 oz.....	14	0 gh	0 d	0 de	0 hi	1 i
Spectro 90WDG 5.76 oz.....	14	1 gh	3 d	0 de	1 hi	8 f-i
ConSyst 67WDG 2.0 oz .....	14	4 fgh	6 d	5 de	9 d-i	12 e-i
ConSyst 67WDG 4.0 oz .....	14	1 gh	1 d	1 de	2 hi	3 hi
Untreated Control .....	--	84 a	113 a	99 a	122 a	122 a

<sup>z</sup> Fungicides were applied on 17 Apr (all treatments), 1 May (14 day treatments), 7 May (21 day treatments), 14 May (14 and 28 day treatments), 28 May (14 and 21 day treatments), 12 Jun (14 and 28 day treatments), 18 Jun (21 day treatments), and 26 Jun (14 day treatments).

<sup>y</sup>Values are means of four replicates. Means within columns followed by the same letter are not significantly different according to Waller-Duncan k-ratio t-test (k=100).

**Table 3.** Effect of fungicide treatments on brown patch incidence, algae invasion, turfgrass quality, and yellow spot incidence in ‘Crenshaw’ creeping bentgrass in Raleigh, NC.

Treatment and rate / 1000 sq ft	Spray Interval (days)	Brown patch incidence (%)		Algae invasion (%)	Turf quality <sup>z</sup>	Yellow spot incidence (#)
		7 Jul	15 Jul			
Emerald 70WG 0.13 oz .....	14 <sup>y</sup>	13 def <sup>x</sup>	16 bcd	5 d-i	5.5 c-f	1 ab
Emerald 70WG 0.18 oz .....	21	28 ab	13 b-e	7 c-f	5.0 d-g	2 ab
Insignia 20WG 0.9 oz.....	14	0 gh	0 g	5 e-i	3.3 hi	3 ab
Emerald 70WG 0.13 oz alt Insignia 20WG 0.9 oz.....	14	0 gh	0 g	3 f-i	5.5 c-f	5 a
Propiconazole Pro 1.3EC 1.0 fl oz .....	14	19 bcd	14 b-e	6 d-g	5.3 c-g	2 ab
Triton 70WG 0.3 oz.....	21	3 gh	11 c-f	5 d-h	5.0 d-g	0 b
Triton 70WG 0.6 oz.....	28	6 fgh	12 c-f	15 ab	4.8 efg	0 b
Lynx 45WP 0.28 oz.....	21	1 gh	6 efg	10 bcd	4.8 efg	0 b
Lynx 45WP 0.56 oz.....	28	5 fgh	6 efg	18 a	4.0 ghi	0 b
Bayleton 50DF 0.5 oz.....	28	21 a-d	12 b-e	10 b-e	4.5 fgh	1 b
Banner MAXX 1.3EC 1 fl oz .....	28	29 a	15 b-e	4 f-i	5.3 c-g	0 b
Eagle 40WP 1.2 oz .....	28	16 cde	9 c-g	11 bc	4.5 fgh	0 b
Chipco 26GT 2SC 3.0 fl oz .....	14	2 gh	18 bc	1 ghi	6.0 b-e	0 b
Chipco 26GT 2SC 4.0 fl oz .....	21	24 abc	36 a	0 i	5.0 d-g	2 ab
Compass 50WG 0.2 oz.....	14	0 gh	0 g	3 f-i	3.3 hi	2 ab
Daconil Ultrex 82.5 WDG 1.8oz.....	14	2 gh	13 b-e	0 hi	4.8 efg	0 b
3336 50WP 2.0 oz .....	14	2 gh	3 fg	0 hi	5.5 c-f	0 b
3336 50WP 4.0 oz .....	14	0 gh	3 fg	1 ghi	6.1 bcd	2 ab
Spectro 90WDG 2.0 oz.....	14	0 gh	21 b	0 hi	7.5 a	0 b
Spectro 90WDG 4.0 oz.....	14	0 gh	1 g	0 hi	7.5 a	0 b
Spectro 90WDG 5.76oz.....	14	0 h	0 g	0 i	7.0 ab	0 b
ConSyst 67WDG 2.0 oz .....	14	9 efg	31 a	3 f-i	4.3 fgh	0 b
ConSyst 67WDG 4.0 oz .....	14	0 gh	8 d-g	0 i	6.5 abc	0 b
Untreated Control .....	--	27 ab	14 b-e	1 ghi	2.8 i	2 ab

<sup>z</sup>Turfgrass quality on a 1 to 9 scale, where 9=highest quality and 5=acceptable quality.

<sup>y</sup> Fungicides were applied on 17 Apr (all treatments), 1 May (14 day treatments), 7 May (21 day treatments), 14 May (14 and 28 day treatments), 28 May (14 and 21 day treatments), 12 Jun (14 and 28 day treatments), and 18 Jun (21 day treatments).

<sup>x</sup>Values are means of four replicates. Means within columns followed by the same letter are not significantly different according to Waller-Duncan k-ratio t-test (k=100).