



## **ETIOLOGY AND CONTROL OF SUMMER DECLINE OF BENTGRASS PUTTING GREENS**

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### **IMPACT STATEMENT**

Fungicides were evaluated for control of bentgrass summer decline in Arkansas, and the etiology of the disease was investigated. Registered and experimental chemicals in the strobilurin class of fungicides were the only effective treatments. Rate and timing of these fungicides did not appear critical because even one application of a low rate gave effective control and worked well as both preventive and curative treatments. *Idriella bolleyi* was the most commonly isolated fungus from diseased plants and is likely the pathogen responsible for the decline. Additional experiments are required to prove that *I. bolleyi* is the cause of the disease.

### **BACKGROUND**

Maintaining the quality of bentgrass putting greens in the transition zone has been a perennial problem. Temperature and relative humidity are often too high during the summer in Arkansas for optimum growth of bentgrass which is used on putting greens of many golf courses. Various pathogens have been shown or are suspected to contribute to the summer decline syndrome. In Arkansas, the decline has often been attributed to “root Pythium” even though there has never been definitive data showing that *Pythium* sp. contributed to decline, and fungicides selective for this group of fungi were often applied as preventive and curative control measures. The objectives of this study were to identify the cause of summer decline and to determine which fungicides, rates, and timings are effective control measures.

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## RESEARCH DESCRIPTION

This study was conducted at Fianna Hills Country Club in Fort Smith, on a 'Penncross' creeping bentgrass green with a history of summer decline. The grass was maintained at 5/32-in. mowing height and standard practices used at Fianna Hills were carried out including irrigation, fertilization, and weed control. The design was a randomized complete block with 26 fungicide treatments and four replications. Individual plots were 4 ft x 5 ft and were isolated using a rectangular spray shield during applications. Treatments were applied at 4 gal/1000 sq ft of water using a hand-held carbon dioxide (CO<sub>2</sub>)-powered sprayer at 20 psi with a Tee-jet 800 2VS spray tip. Treatments were applied on approximate 14- or 28-day schedules as indicated in Table 1.

Disease severity ratings (percentage of plot diseased: 0, 2, 7, 15, 30, 50, 70, 85, 93, or 98%) and turf quality ratings (0 = no grass to 9 = perfect putting surface) were made on 30 June, 6 July, 23 July, and 21 August 1998, except that no turf quality ratings were taken on 23 July. Two 1-in. diameter by 3 in. long plugs were taken from each plot on 6 July and 21 August to determine the effect of treatments on root length. The average length of the largest three roots was considered to be the root length, and the root lengths in the two plugs per plot were averaged before statistical analysis. All statistical analyses were done using the SAS ANOVA procedure.

Samples of diseased turf were taken on several dates beginning 30 June. Samples were examined microscopically for symptoms and evidence of pathogens. Individual plants were thoroughly washed, disinfested using 10% bleach for 0.5 to 1.5 min, and plated on water agar and a medium selective for *Pythium* sp. Individual fungal colonies growing from plants were transferred to potato dextrose agar and allowed to sporulate so that the fungi could be identified.

## FINDINGS

Disease first became evident on 26 June as small (1- to 4-in. diameter) spots of yellow, sunken turf with irregular and diffuse margins. On closer examination, the leaves and crowns had a water-soaked appearance. Leaves were yellow except for a dark-gray streak in the center from the base to about two-thirds of the length, and leaf sheaths were covered with a dark brown to black "crust". The spots quickly coalesced into larger areas of diseased turf that had a matted appearance, but plants remained alive. The most commonly isolated fungus was identified as *Idriella bolleyi* (synonyms *Microdochium bolleyi*, *Aureobasidium bolleyi*, and *Gloeosporium bolleyi*) commonly found on roots of grasses and has been identified as a minor root pathogen on bentgrass in Iowa (Hodges and Campbell, 1996). Additional experiments are required to prove that *I. bolleyi* is the cause of the disease.

By 6 July it was clear that only treatments of Heritage, BAS 500, BAS 505, or CGA 279202 controlled the disease (Table 1), and this pattern was maintained for subsequent ratings. All these chemicals are in the strobilurin group of fungicides. Of these, only Heritage is registered for use on bentgrass. Even treatments that contained a single application of Heritage at a low rate (0.2 oz/1000 sq ft) gave significant control. Heri-

tage appeared to work both as preventive and curative applications, so timing did not appear critical. By 21 August, treatments with Daconil Zn, Spectro, and Bayleton + Daconil Ultrex had significantly more disease and significantly lower turf quality ratings than the non-treated checks. These treatments may have suppressed other microorganisms in the turf that naturally suppress the pathogen.

Treatments that controlled the disease generally had excellent turf quality (Table 1). Turf quality ratings were negatively correlated with disease severity ratings. Correlation coefficients ranged from -0.79 to -0.93 indicating that, in general, disease control played a major role in maintaining turf quality. Maximum treatment showed some efficacy against the disease, but turf quality was lower than expected for that level of control because the turf had a coarse appearance.

There were no differences in root length on 6 July (data not shown, overall mean = 7.7 cm) and only small differences significant at  $P = 0.10$  on 21 August (Table 1). Two treatments (Daconil Zn and Bayleton + Daconil Ultrex) had roots significantly shorter than the non-treated checks, and no treatments had roots significantly longer than the non-treated checks.

#### LITERATURE CITED

Hodges, C.F. and D.A. Campbell. 1996. Infection of adventitious roots of *Agrostis palustris* by *Idriella bolleyi*. J. Phytopathology 144:265-271.

#### ACKNOWLEDGMENTS

We wish to thank Rodger Pevehouse, superintendent at Fianna Hills, for providing the green to conduct this research, and his grounds crew for maintaining the plots during the course of the study. We thank Bayer Garden and Professional Care, BASF Corporation, Cleary Company, Novartis Turf and Ornamental Products, Rohm and Haas Company, and Zeneca Professional Products for financial support.

**Table 1. Results of turf fungicide test at Fianna Hills Country Club, Fort Smith, Arkansas, 1998.**

Treatment (rate of product/1000 ft <sup>2</sup> )	Disease severity					Turf quality			Root length
	Spray	30	6	23	21	30	6	21	21
	interval <sup>z</sup> (days)	June	July	July	Aug.	June	July	Aug.	Aug.
		%				(0-9)			(cm)
BAS 500F, 0.28 fl. oz.	14	14	2	0	1	6.5	7.3	7.3	7.0
BAS 500F, 0.42 fl. oz.	14	12	9	0	1	6.5	6.8	7.5	7.6
BAS 500F, 0.52 fl. oz.	28	1	2	0	1	7.5	7.3	7.8	7.5
BAS 505 50DF, 0.14 oz.	14	10	2	1	2	6.5	7.0	7.5	7.6
BAS 505 50DF, 0.21 oz.	14	24	8	15	1	5.8	6.3	7.5	6.6
BAS 505 50DF, 0.28 oz.	28	3	0	0	1	7.3	7.8	7.5	7.3
CGA 279202 50WP, 0.15 oz.									
+Subdue Maxx 2E, 0.5 fl.oz.	14	12	2	1	1	6.3	5.5	7.5	7.3
CGA 279202 50WP, 0.3 oz									
+Subdue Maxx 2E, 0.5 fl.oz.	14	8	1	1	8	6.3	7.3	6.5	7.7
Heritage 50WG, 0.2 oz.	14	10	1	0	1	6.5	7.8	8.0	6.9
Heritage 50WG, 0.2 oz. / alternated with Daconil									
Zn 4.17F, 6.0 fl. oz.	14	0	2	9	15	8.0	7.0	6.3	6.0
Daconil Zn 4.17F, 6.0 fl. oz.	14	2	14	90	98	7.0	6.0	1.0	5.8
Daconil Zn 4.17F, 6.0 fl. oz. + Aliette 80WDG, 4.0 oz.	14	38	48	91	93	5.8	5.0	2.0	6.8
Heritage 50WG, 0.4 oz.	28	5	1	0	1	7.0	7.5	7.5	7.4
Maximum 63WP, 10.0 oz.	14	4	23	73	17	6.5	4.0	5.5	6.8
Eagle 40WP, 1.2 oz. / alternated with Heritage									
50WG, 0.4 oz.	14	9	14	14	2	6.5	6.3	6.5	6.7
Spectro 90WP, 8.0 oz.	14	2	6	75	90	7.0	6.7	3.0	6.4
Lynx 45WP, 0.28 oz. + Daconil									
Ultrex 82.5WP, 1.8 oz.	14	12	3	70	38	6.3	6.8	4.5	7.9
Lynx 45WP, 0.28 oz. + Heritage 50WG, 0.2 oz.	14	5	1	0	6	7.0	7.3	7.3	7.5
Bayleton 50DF, 0.25 oz. + Daconil Ultrex 82.5WP, 1.8 oz.	14	16	29	81	76	5.5	5.0	3.3	5.8
Bayleton 50DF, 0.25 oz. + Heritage 50WG, 0.2 oz.	14	9	2	0	3	7.0	6.8	6.8	7.2
Eagle 40WP, 1.2 oz (13 May); Terrazole 35WP 5.0 oz. (26 May); Heritage 50WG, 0.4 oz (9 June); Subdue Maxx 2E, 1.0 fl. oz. (6 July)	N/A	4	1	1	7	6.8	7.0	6.8	7.2
Chipco 26019 50WP, 2.0 oz. (13 May, 26 May, 9 June, 30 June, 6 July); Subdue Maxx 2E, 1.0 fl. oz. (23 July)	N/A	39	21	71	26	5.5	5.3	5.5	7.3
Prostar 50WP, 2.0 oz. (26 May, 9 June); Heritage 50WG, 0.2 oz. (6 July)	N/A	31	31	0	3	5.8	5.3	7.3	7.4

continued

**Table 1. Results of turf fungicide test at Fianna Hills Country Club, Fort Smith, Arkansas, 1998. Continued.**

Treatment (rate of product/1000 ft <sup>2</sup> )	Spray interval (days)	Disease severity				Turf quality			Root length
		30 June	6 July	23 July	21 Aug.	30 June	6 July	21 Aug.	21 Aug.
		- - - - -	% - - - - -	- - - - -	- - - - -	- - - - -	(0-9) - - -	- - -	(cm)
Prostar 50WP, 2.0 oz. (26 May); Prostar 50WP, 2.0 oz. + Terrazole 35WP, 5.0 oz. (9 June); Heritage 50 WG, 0.2 oz. (6 July)	N/A	36	21	1	2	5.5	5.5	7.0	6.8
Nontreated check #1	—	23	29	81	46	5.5	5.3	4.8	7.0
Nontreated check #2	—	32	16	80	49	5.3	5.0	4.3	7.1
Prob. > F		- - - - -	- - - - -	0.0001 - - -	- - -	- - -	0.0001 - - -	- - -	0.1
CV (%)		89	103	29	59	11.0	16.0	13.0	13.0
LSD (P = 0.05)		18	17	12	19	1.0	1.5	1.2	—
LSD (P = 0.10)		—	—	—	—	—	—	—	1.1

<sup>z</sup> N/A = not applicable