Leaf Blight and Crown Rot on Creeping Bentgrass, a New Disease Caused by *Drechslera catenaria*

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ABSTRACT

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A new disease on cv. Toronto creeping bentgrass in Ohio was named leaf blight and crown rot. The disease is caused by *Drechslera catenaria*, a fungus not previously reported on *Agrostis palustris*. The disease is characterized by reddish leaf lesions in early spring followed by gradual necrosis of the foliage and ultimately crown rot that leads to death of the plant. Two spring applications of the fungicide iprodione at 56.8 g (a.i.)/93 m^2 effectively controlled the disease on golf putting greens.

Additional key words: *Drechslera erythrospila*, *Helminthosporium catenarium*, *H. erythrospilum*, red leaf spot, turfgrass

Creeping bentgrass (*Agrostis palustris* Huds. 'Toronto') is a stolon-propagated turfgrass that is commonly used on golf course putting greens in Ohio and other north central states. In 1977, Toronto bentgrass greens on two Ohio golf courses had symptoms suggesting red leaf spot caused by *Drechslera erythrospila* (Drechs.) Shoem., a disease previously reported to be severe on this species (4).

Symptoms on bentgrass plants from these greens first appeared in early spring as red leaf lesions and leaf tip dieback. Eventually, entire leaves became necrotic and the plants were blighted to the crown. Several small groups of adjacent plants were infected, forming reddish brown, sunken infection areas 2–3 cm in diameter on the golf putting green. These infection centers often coalesced to involve areas several meters square, and from a distance, the entire diseased area appeared reddish brown.

The objectives of our research were to determine the cause of the disease and to develop effective control.

MATERIALS AND METHODS

Fungus isolation. Diseased plants were taken from cv. Toronto creeping bentgrass putting greens in May 1977. Individual plants were thoroughly washed under running tap water, surface-disinfested by soaking them for 3 min in 0.5% sodium hypochlorite, and aseptically plated on lactose casein hydrolysate (LCH) medium (6). Plates were incubated at 21 C under continuous fluorescent light at 5.5 klux.

Induction of sporulation. LCH agar plugs with mycelium were transferred onto autoclaved leaves that had been placed on the surface of 2% water agar-filled petri plates. These plates were incubated at 21 C in continuous fluorescent light at 5.5 klux. After 14 days, conidia growing on the leaf tissue were harvested and used to inoculate greenhouse-grown Toronto bentgrass plants. The fungus was reisolated from these plants on LCH medium. Conidia produced were stored on silica gel crystals at 4 C as described by Perkins (10) to provide a genetically uniform source of inoculum.

Artificial inoculation of greenhouse plants. *A. palustris* 'Toronto,' 'Penncross,' and 'Seaside'; *Festuca arundinacea* Schreb. 'Kentucky 31'; and *Poa pratensis* L. 'Delta' were evaluated for susceptibility to the isolated fungus. All plants were 2–3 mo old when inoculated. The plants were grown in 8.8-cm diameter Styrofoam cups in a soil, peat, and perlite medium (1:1:1, v/v) in full sun in a greenhouse and fertilized at each watering with a water-soluble 20-20-20 fertilizer containing 150 μg/ml N.

Conidia were washed with double distilled water from 12-day-old fungus cultures grown on either autoclaved Toronto bentgrass leaves or LCH medium and filtered through two layers of cheesecloth. The concentration of the filtrate was adjusted to 5,000 conidia per milliliter by using a Sedgwick-Rafter counting chamber (VWR Scientific, Columbus, OH 43215) and a Howard

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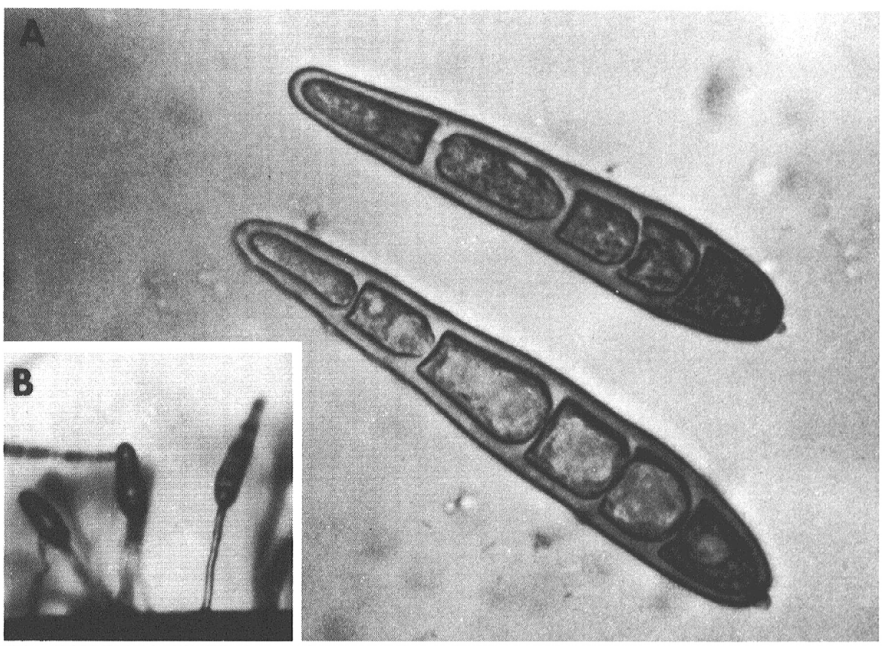

Fig. 1. *Drechslera catenaria* recovered from cv. Toronto bentgrass leaf: **(A)** conidia (×700). **(B)** Conidia and conidiophores (×130).

micrometer disk. A drop of Tween 20 (Emulsion Engineering, Inc., Elk Grove, IL 60007) was added per 100 ml of conidial suspension to reduce surface tension on leaves.

An artist's airbrush (Badger Air Brush Co., Franklin Park, IL 60131) was used to inoculate four pots of plants by spraying the foliage to runoff with 1 ml of the conidial suspension. Four control pots were sprayed with a solution of Tween 20 and distilled water. The plants were then enclosed in polyethylene bags for 48 hr, placed under fluorescent lamps at 6.5 klux for 14 hr daily at 24 C, and examined for symptoms periodically for 18 days after inoculation, at which time fungal isolation attempts were made. Artificial inoculation and isolation experiments were repeated twice.

Field tests. Chlorothalonil and iprodione were applied to a naturally infected Toronto bentgrass putting green in northern Ohio. Treated areas were 1.5 m^2 replicated four times in a randomized complete block design. Fungicides were applied with a CO_2-powered, handheld sprayer at 19 L of water per 93 m^2 (5 gal/1,000 ft^2). Each fungicide was applied as a spring treatment (12 April and 24 April 1978) or as a fall/spring (7 October 1977, 12 April and 24 April 1978) treatment.

Disease severity was assessed 24 April, 24 July, and 13 September by estimating the percentage of diseased area in the plots on a scale of 1 = 0–10% to 10 = 91–100% of the area diseased. The data were statistically analyzed according to Duncan's new multiple range test at the 5% level of probability.

RESULTS

The fungus isolated from naturally infested Toronto bentgrass grew vegetatively but did not sporulate on LCH medium. It also did not sporulate when transferred to 20% V-8 juice agar (2) or potato-dextrose agar. When LCH agar plugs with mycelium were transferred onto autoclaved Toronto bentgrass leaves, the fungus sporulated sufficiently within 14 days to provide adequate conidia for inoculation of greenhouse-grown Toronto bentgrass plants. The fungus that was reisolated from these plants sporulated profusely on LCH medium and continued to sporulate on subsequent tranfers.

Microscopic examination of conidia from diseased Toronto bentgrass tissue and from fungal isolates on LCH medium showed the isolated fungus to be *Drechslera catenaria* (Drechs.) Ito (= *Helminthosporium catenarium* Drechs.) (Fig. 1), a species described by Drechsler in 1923 (3). On LCH medium at 21 C under continuous fluorescent light, conidia were hyaline and glistening and tapered from base to apex. Based on 50 observations, conidia ranged from 40–170 μm long (mean, 103.9 μm). Mean widths of basal and apical cell wall septa were 15.5 and 7.1 μm, respectively. The number of cells per conidium ranged from 3 to 9 (mean, 5.6). The basal cell was hemiellipsoidal, and the second cell from the base was commonly widest. One to three secondary conidia often formed in chainlike fashion at the apical ends of primary conidia.

When the fungus was cultured on 2% water agar containing autoclaved Toronto bentgrass leaves, black bodies resembling sclerotia were observed in the medium. No sporulation could be detected when the fungus was incubated in the dark. On LCH medium the mycelium was initially white to tan and later turned olive-gray.

Artificial inoculations. When pot-grown creeping bentgrass cultivars Toronto, Penncross, and Seaside were inoculated with conidial suspensions of *D. catenaria*, the symptoms were similar to those on diseased Toronto bentgrass greens. The fungus was easily reisolated from these artificially inoculated plants, and by microscopic examination, the fungus was again determined to be *D. catenaria*. Inoculation of tall fescue resulted in restricted lesions on which sporulation was very sparse.

No symptoms were observed on cv. Delta Kentucky bluegrass plants, and the fungus could not be isolated from these plants. No disease symptoms were observed on any uninoculated control plants of any species or cultivar studied. Based on disease symptoms in the field and on artificially inoculated greenhouse-grown turfgrass, the disease has been named leaf blight and crown rot.

Field fungicide tests. Marked differences in disease severity among fungicide treatments were not observed until 24 July 1978 (Table 1). Disease levels in all iprodione-treated plots were then significantly lower than in control plots and remained so through 13 September 1978. However, no significant differences were observed between spring only and spring/fall treatments. Disease control with iprodione decreased significantly at 14.2 and 28.4 g (a.i.)/93 m^2 from 24 July to 13 September, whereas iprodione at 56.8 g (a.i.)/93 m^2 provided excellent disease control throughout the period.

The test plots were evaluated again on 24 April 1979, and the disease ratings were similar to those recorded on 9 September 1978. Chlorothalonil failed to control the disease at the rate and application frequency we tested.

Table 1. Effect of spring only and fall/spring applications[y] of iprodione and chlorothalonil on leaf blight and crown rot of cv. Toronto creeping bentgrass

Fungicide	Rate (g[a.i.]/93 m^2)	Mean disease severity (1978)[z]		
		Apr. 24	July 24	Sept. 13
Chlorothalonil	119.0 spring	4.0 ab	6.2 c	8.2 d
Chlorothalonil	119.0 fall/spring	5.0 b	6.6 c	8.6 d
Iprodione	14.2 spring	3.2 ab	3.0 b	5.2 c
Iprodione	14.2 fall/spring	3.6 ab	2.4 ab	5.2 c
Iprodione	28.4 spring	4.6 ab	1.8 ab	3.4 b
Iprodione	28.4 fall/spring	2.0 a	1.2 a	2.2 ab
Iprodione	56.8 spring	4.6 ab	1.2 a	1.6 a
Iprodione	56.8 fall/spring	4.0 ab	1.2 a	1.8 a
Control	···	3.6 ab	6.2 c	7.4 d

[y] Spring only applications were on 12 April and 24 April 1978. Fall/spring applications were on 7 October 1977 and 12 April and 24 April 1978.

[z] Disease was rated on a 1–10 scale based on percentage of plot area diseased; 1 = 0–10% to 10 = 91–100%. Means in columns followed by the same letter are not statistically different ($P = 0.05$ by Duncan's new multiple range test).

DISCUSSION

D. catenaria was first observed on wood reedgrass (*Cinna arundinacea* L.) in 1923 (3), but it has since been reported causing leaf diseases of several forage grasses in the United States (5,13,15), Canada (13), and the United Kingdom (14), as well as leaf blights of barley (7) and wheat (8) in India. *D. catenaria* has also been commonly observed on incubated seeds of forage grasses in Denmark (1,9). Although *D. catenaria* has not been reported causing disease on creeping bentgrass, it has been reported to be associated with other *Agrostis* spp. Shoemaker (12) reported a disease of red top (*A. alba* L.) caused by *D. catenaria*, and Andersen (1) recovered *D. catenaria* from seed of colonial bentgrass (*A. vulgaris* With.).

The symptoms of this disease suggest the name leaf blight and crown rot. This disease is distinct from red leaf spot, caused by *D. erythrospila*, even though some of the symptoms of the two diseases may appear similar. *D. catenaria* is easily distinguished from *D. erythrospila* by conidium morphology.

Excellent control of leaf blight and crown rot throughout the season was achieved by using two spring applications of iprodione fungicide (11) at 56.8 g (a.i.)/93 m^2.

LITERATURE CITED

1. ANDERSEN, H. 1959. *Helminthosporium catenarium* Drechs. pa graeser i Danmark. Tidsskr. Planteavl. 43:710-736.
2. DIENER, U. L. 1955. Sporulation in pure culture by *Stemphyllium solani*. Phytopathology 45:141-145.
3. DRECHSLER, C. 1923. Some graminicolous

species of Helminthosporium: I. J. Agric. Res. 24:641-740.
4. DRECHSLER, C. 1935. A leaf spot of bentgrasses caused by *Helminthosporium erythrospilum*, n. sp. Phytopathology 25:344-361.
5. LEFEBVRE, C. L., and H. W. JOHNSON. 1941. Collections of fungi, bacteria and nematodes of grasses. Plant Dis. Rep. 25:556-579.
6. MALCA, I., and A. J. ULLSTRUP. 1962. Effects of carbon and nitrogen nutrition on growth and sporulation of two species of *Helminthosporium*. Bull. Torrey Bot. Club 89:240-249.
7. MISRA, A. P., O. M. PRAKASH, and R. A. SINGH. 1972. *Helminthosporium catenarium* incitant of a new leaf blight disease of barley in India. Indian Phytopathol. 24:582-583.
8. MISRA, A. P., and R. A. SINGH. 1972. Hitherto an unrecorded disease of wheat incited by *Helminthosporium catenarium* in India. Indian Phytopathol. 24:803-804.
9. NEERGAARD, P. 1958. 8, 9 Arsberetning vedrorende Fropatologish Kontrol. 1 Juni 1955-31 Mai 1956, 1 Juni 1956-31 Mai 1957. Statens Plantetilsyn Kobenhavn.
10. PERKINS, D. D. 1962. Preservation of *Neurospora* stock cultures with anhydrous silica gel. Can. J. Microbiol. 8:591-594.
11. SANDERS, P. L., L. L. BURPEE, H. COLE, Jr., and J. M. DUICH. 1978. Control of fungal pathogens of turfgrass with the experimental iprodione fungicide, RP26019. Plant Dis. Rep. 62:549-553.
12. SHOEMAKER, R. A. 1962. *Drechslera* Ito. Can. J. Bot. 40:809-843.
13. U.S. DEPARTMENT OF AGRICULTURE. 1960. Index of Plant Diseases in the United States. Agric. Handb. 165. 531 pp.
14. WILKINS, P. W. 1973. Infection of *Lolium* and *Festuca* spp. by *D. siccans* and *D. catenaria*. Euphytica 22:106-113.
15. ZEIDERS, K. E. 1976. A new disease of reed canarygrass caused by *Helminthosporium catenarium*. Plant Dis. Rep. 60:556-560.