

Infection of Selected Turfgrasses by *Labyrinthula terrestris*

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Abstract

A number of turfgrasses were screened in the greenhouse and laboratory for susceptibility to *Labyrinthula terrestris*, a new turfgrass pathogen that causes rapid blight of cool season turfgrasses. Salt tolerant varieties and warm season grasses such as Bermuda grass, tufted hairgrass, inland saltgrass, centipede grass, seashore paspalum and kikuyugrass were not susceptible; cool season grasses such as velvet bentgrass, annual ryegrass, perennial ryegrass, annual bluegrass, Kentucky bluegrass, and rough bluegrass were very susceptible.

Introduction

Labyrinthula terrestris (Bigelow, et al., in press) is the causal organism of rapid blight (Olsen et al., 2003). As golf course managers have become aware of rapid blight symptoms throughout Arizona, confirmed diagnoses of rapid blight have increased. Since the first report of *Labyrinthula* was diagnosed (Olsen et al., 2003), over a dozen golf courses in Arizona have been found to be affected by rapid blight. According to Dr. Larry Stowell and Dr. Wendy Gelernter of PACE Turfgrass Research Institute, (San Diego, CA website PACE Insights Vol. 9 No. 3 www.pace-tri.com), over 100 golf courses in 11 states have reported rapid blight. It is usually associated with poor quality irrigation water and/or saline soil conditions.

Initial symptoms of rapid blight are water-soaked lesions in turf foliage with eventual collapse and browning or bronzing of the leaves. If the disease progresses, small patches of dying turf may coalesce to reach to larger proportions. Although symptoms are especially pronounced on greens, *L. terrestris* has been isolated from turf on fairways and from landscape areas (Olsen et al., 2004). Cool season turfgrasses used as overseeds are most severely affected, but disease also has been found on perennial bentgrass greens. Disease develops as early as the end of October (after first mowing of overseeded turf) and *L. terrestris* has been isolated throughout the winter and spring seasons from cool season grasses until the end of May in Arizona (personal observation). Bermuda appears to be tolerant.

One of the strategies to manage rapid blight will be to find varieties of turfgrass that are resistant to, or have some tolerance to, the pathogen. Field data and greenhouse data showed that of the five grasses tested, *Poa trivialis* 'Laser', colonial bentgrass 'SR7100', perennial ryegrass 'Brightstar SLT', Dawson's slender creeping red fescue, and Seaside II creeping bentgrass, only Seaside II bentgrass and, to a lesser degree, Dawson's creeping red fescue, showed tolerance to rapid blight (Olsen et al., 2004). The focus of this investigation was to screen a larger selection of turfgrasses for susceptibility to rapid blight, including some warm season grass varieties in the greenhouse and laboratory.

Methods

Plants were grown in autoclaved silica sand in the greenhouse or alternatively in the laboratory under gro-lights as previously described (Olsen et al., 2004) (Table 1.). The Karsten Turfgrass Center at The University of Arizona provided cool season grass seed that was planted directly into autoclaved silica sand in 8-cm diameter cups. Warm season grasses were started from sprigs that were either greenhouse propagated (*Distichlis* and *Paspalum*) or from the Karsten Turfgrass Center research plots (Tifway 419, Bermuda grass). Roots of the warm season grasses were rinsed thoroughly to remove soil and/or potting mix before they were transplanted into silica sand in cups.

Plants were grown from 2 weeks to one month, dependent upon germination and plant growth rate, before being inoculated. They were irrigated with either MiracleGro or Hoagland's solution until 3-4 days prior to inoculation. The irrigation water was then adjusted to an EC of 4.0 dS/m, the saline condition that is near optimal for *L. terrestris* growth (M.J. Kohout et al., 2004) using an artificial seawater solution. Plants were clipped (using scissors) to simulate mowing, and inoculated with a suspension of *L. terrestris* cells in serum seawater (EC = 4.0 dS/m, 1% horse serum [Hemasource, Aurora, OR]) at a rate of at least 40,000 cells/ml as previously described (Olsen et al., 2004). Inoculated vs. non-inoculated controls were maintained in separated trays, and plants were sampled as symptoms developed.

Grass leaf blades, roots, rhizomes and/or stolons were sampled and plated on a selective medium (1.5 % agar, 1% horse serum, 250 µg Ampicillin, Streptomycin sulfate and Penicillin G/liter in 4.0 dS/m EC water). Each species was checked for infection at least twice, and non-inoculated controls were also assayed to verify that no *Labyrinthula* was present. The grasses were rated as: 1 = very few isolated *Labyrinthula* colonies on isolation plate and asymptomatic (would be considered tolerant to rapid blight), 2 = a few isolated colonies, slight symptoms, and 3 = many isolated colonies from symptomatic tissues apparent compared to the controls. Plants that were wilting, browning and dying were considered symptomatic.

Results and Discussion

All plants screened in these trials became infected with *L. terrestris* (Table 1). Some grasses did not show symptoms and are considered tolerant to the organism but not resistant. Results of these trials are from greenhouse and laboratory experiments in which high inoculum levels and salinity favor disease development. However, the potential for these grasses to become infected with *L. terrestris* is notable. Further investigations for tolerance in turf varieties will be crucial in controlling rapid blight wherever poor quality irrigation water is used.

Acknowledgement

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Literature Cited

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Table 1. Turfgrass varieties screened for infection by *L. terrestris* and expression of disease symptoms in greenhouse and laboratory trials. Ratings are from observations 3- 6 weeks after initial inoculation.

Common name	Genus, species and variety	Rating ¹
velvet bentgrass	<i>Agrostis canina</i> L. var. SR7200	3
buffalograss	<i>Buchloe dactyloides</i> (Nutt.) Engelm. var. Bison	2
common Bermudagrass	<i>Cynodon dactylon</i> (L.) Pers.	2
Bermudagrass	<i>Cynodon dactylon</i> (L.) x <i>C. transvaalensis</i> Tifway 419	2
tufted hairgrass	<i>Deschampia caespitosa</i> (L.) Beauv. ssp. <i>Caespitosa</i>	1
inland saltgrass	<i>Distichlis spicata</i> (Raf.)	1
centipede grass	<i>Eremochloa ophiuroides</i> (Munro) Hack.	1
tall fescue	<i>Festuca arundinacea</i> (Screb.) var. Southern choice	2
sheeps fescue	<i>Festuca ovina</i> L. var. <i>duriuscula</i>	2
Chewings fine fescue	<i>Festuca rubra</i> L. var. <i>commutata</i> SR5100	2
hard fescue	<i>Festuca trachyphylla</i> (Hack.) Kajina	2
annual ryegrass	<i>Lolium multiflorum</i> Lam.	3
perennial ryegrass	<i>Lolium perenne</i> L. var. Palmer III	3
perennial ryegrass	<i>Lolium perenne</i> L. var. Brightstar SLT	3
Bahiagrass	<i>Paspalum notatum</i> Fluegge var. Pensacola	2
seashore paspalum	<i>Paspalum vaginatum</i> Sw.	1
kikuyugrass	<i>Pennisetum clandestinum</i> Hochst ex Chiov var. AZ-1	1
annual bluegrass	<i>Poa annua</i> L.	3
Kentucky bluegrass	<i>Poa pratensis</i> L. var. Limousine	3
rough bluegrass	<i>Poa trivialis</i> L. var. Laser	3
Korean lawngrass	<i>Zoysia japonica</i> Steud.	2

¹Plants were rated for number of colonies that grew from root samples, stolons, rhizomes and/or symptomatic areas of grass leaves. 1 = one or less colonies formed and plants were non-symptomatic, 2 = two or more colonies formed, symptoms slight (slight yellowing or bronzing of leaves), 3 = many colonies formed, symptoms severe (bronzing with death of leaves), symptoms very distinct