Research *You Can Use*

Rapid Blight Disease of Cool-Season Grasses

Research reveals that certain cultivars tolerate rapid blight and may be suitable for overseeding.

BY PAUL PETERSON, BRUCE MARTIN, AND JIM CAMBERATO

Since 1995, the golf course industry has confronted a new disease enemy. Rapid blight disease has caused extensive and costly damage to annual and rough bluegrass, perennial ryegrass, and occasionally to creeping bentgrass in the southeastern and western United States. First diagnosed nine years ago in California on annual bluegrass putting greens,[2] the destructive disease has been identified on more than 100 golf courses in 11 states.

Recently, rapid blight disease has been shown to be caused by a relatively obscure microorganism known as *Labyrinthula*, also referred to as a net slime mold.[5] *Labyrinthula* is a single-cell organism that occurs in net-like aggregations when growing in culture. This organism's ability to survive in plants that live in saline environments is one of its defining characteristics. Traditionally, *Labyrinthula spp.* is known mostly to inhabit coastal environments, and some species have been shown to cause diseases in aquatic grasses. For instance, *Labyrinthula zosterae* is a pathogen associated with eelgrass, an important marine plant that serves as a nursery bed for larval shrimp, oysters, and scallops. Catastrophic declines in eelgrass in North America and Europe during the 1930s and 1940s were probably caused by *L. zosterae*.[3,4,6] Even though the occurrence of rapid blight on various cool-season turfgrasses has been associated with increased soil and/or irrigation water salinity (Martin, Peterson, and Camberato, unpublished), the discovery of *Labyrinthula* affecting grasses grown on land was unexpected.

When it emerges on golf courses, rapid blight symptoms appear as irregularly shaped patches of yellow (chlorotic) or brown (necrotic) turf ranging from 6 inches to 6 feet in diameter. Sometimes these patches have a darkened edge where the turf is water-soaked. Rapid blight can affect juvenile as well as mature turf. Overseeded grasses in the seedling stage at first mowing are particularly vulnerable to infection. Extensive damage can result and stands may be eliminated within a week if disease occurs at establishment. However, rapid blight also can be severe on putting greens of mature annual bluegrass and creeping bentgrass.

Rapid blight outbreaks appear to be associated with dry periods in the fall and spring. Dry weather increases soluble salts in the soil and plants, increasing the susceptibility of cool-season turfgrasses to infection and symptom expression. The major source of the soluble salts appears to be irrigation water, which typically has salinity levels ranging from 1.0 to 3.5 dS/m.

Although rapid blight can result in extensive damage at establishment, it also can be severe on putting greens of mature annual bluegrass and creeping bentgrass.

Over the past year research was initiated to investigate the biology, epidemiology, and management of this emerging threat to the turf industry. Identifying specific cultivars with tolerance to the rapid blight pathogen would provide useful, timely information for turfgrass professionals. The objective of this study was to evaluate 49 different cool-season turfgrass species for their relative tolerance to rapid blight disease.

SCREENING FOR SUSCEPTIBILITY

Forty-nine different grass cultivars representing a range of cool-season grass species were selected for this study. Seed of each cultivar was planted on sterilized sand/peat (85:15) in three-inch square plastic pots. The soil mixture was amended with ground triple super phosphate at 0.1 g/kg soil and dolomitic limestone at 0.25 g/kg soil. Soluble fertilizer (24-12-12) was applied in two separate applications (just after establishment and prior to inoculation) at the rate of 1.5 mg/kg soil. Pots were placed in trays on the greenhouse bench and watered daily with deionized water for approximately three weeks to establish the grasses. Three days before inoculation, the watering regime was changed to artificial seawater at a concentration of 3.5 dS/m, and pots were irrigated each day to field capacity.

Bulk inoculum of five *Labyrinthula* isolates was prepared by growing equal numbers of petri plates of each isolate in serum seawater agar (SSA) for approximately four days. Equal numbers of agar plugs containing each isolate were transferred into serum seawater broth (SSB) and quantified to 140,000 cells per ml.

All plants were wounded prior to inoculation by trimming with scissors. Inoculum was applied to the treated plants at the rate of 1 ml per pot. A control solution containing SSB and Tween (0.25% v/v) was applied at the same rate as the inoculum to an equivalent set of cultivars (non-inocu-

Table 1
Species, cultivar, and source of 49 different cool-season turfgrasses selected for this study

Species	Cultivar	Source
Weeping Alkaligrass	Fults	Seed Research of Oregon
	Salty	Pennington Seed
Colonial Bentgrass	Alister	Turf-Seed, Inc.
	Glory	Turf-Seed, Inc.
	SR 7100	Seed Research of Oregon
Creeping Bentgrass	Brighton	Seed Research of Oregon
	Penn A-1	Turf-Seed, Inc.
	Penncross	Turf-Seed, Inc.
	Providence	Seed Research of Oregon
	Seaside II	Turf-Seed, Inc.
	SR 1119	Seed Research of Oregon
	Sandhill	Seed Research of Oregon
	SRX 1GPD	Seed Research of Oregon
Idaho Bentgrass	GolfStar	Jacklin Seeds
Redtop	Barracuda	Turf Merchants, Inc.
Velvet Bentgrass	Greenwich	Pickseed West Inc.
	SR 7200	Seed Research of Oregon
	Vesper	Pickseed West Inc.
Annual Bluegrass	Annual Bluegrass	Valley Seed Service
Canada Bluegrass	Reubens	J. R. Simplot Company
Kentucky Bluegrass	Arcadia	Seed Research of Oregon
	North Star	Turf-Seed, Inc.
	Kingfisher	Seed Research of Oregon
	SR 2284	Seed Research of Oregon
	SR 2100	Seed Research of Oregon
Rough Bluegrass	Laser	Seed Research of Oregon
	Sabre II	Seed Research of Oregon
	Winterstar	Turf-Seed, Inc.
Crested Dogstail	Shade Star	Turf-Seed, Inc.
Blue Hard Fescue	Bighorn	Turf-Seed, Inc.
Hard Fescue	SR 3100	Seed Research of Oregon
Chewings Fescue	SR 5100	Seed Research of Oregon
Sheep Fescue	Quatro	DLF International Seeds
Slender Creeping Red Fescue	Dawson	Seed Research of Oregon
	Seabreeze	Turf-Seed, Inc.
	SRX 55	Seed Research of Oregon
Strong Creeping Red Fescue	SR 5210	Seed Research of Oregon
Tall Fescue	Tomcat	Clemson University
Tufted Hairgrass	Barcampsia	Barenbrug
Annual Ryegrass	Acella	DLF International Seeds
Intermediate Ryegrass Lolium x hybridum	Transeze	Seed Research of Oregon
Perennial Ryegrass	Experimental	Blue Moon Farms
	Brightstar SLT	Turf-Seed, Inc.
	Hawkeye	Seed Research of Oregon
	Peregrine	Seed Research of Oregon
	Penguin	Seed Research of Oregon
	SR 4420	Seed Research of Oregon
Crested Wheatgrass	Ephriam	Arkansas Valley Seed Solutions
Slender Wheatgrass	San Luis	Arkansas Valley Seed Solutions

Rapid blight symptoms appear as irregularly shaped patches of yellow or brown turf ranging from six inches to six feet in diameter. At times these patches have a darkened edge where the turf is water-soaked.

In research trials, Transeze intermediate ryegrass showed a relatively high level of susceptibility to rapid blight disease (right = inoculated).

lated controls). All plants (inoculated and non-inoculated) were covered with a clear plastic lid for 48 hours after inoculation, after which time the lids were removed and the plants continued to be watered daily with saline water. Plants were checked daily for disease symptoms. Plants were rated for percent of diseased foliage when the level of disease on the known susceptible perennial ryegrass check ("Transeze") reached more than 50% infection symptoms.

HOW DIFFERENT SPECIES AND CULTIVARS STACKED UP

All of the grasses tested were susceptible to rapid blight, but there was a large variation in the level of susceptibility. Mean percent disease ranged from 0.63% in the slender creeping red fescue "Dawson" to 95% in the crested wheatgrass "Ephriam." The grass species most tolerant to rapid blight were the fescues, creeping bentgrasses, and alkaligrasses. With the exception of the creeping bentgrasses, the other bentgrass species (colonial, Idaho, redtop, and velvet) were all highly susceptible to rapid blight.

Similar to bentgrasses, bluegrasses showed a wide variation in levels of tolerance among species. Canada and Kentucky bluegrasses were moderately tolerant to rapid blight (with the exception of the Kentucky bluegrass "North Star," which was highly tolerant), whereas the annual and rough bluegrass species were highly susceptible. Annual ryegrass and some cultivars of perennial ryegrass were moderately susceptible, but other perennial ryegrass cultivars and the intermediate ryegrass "Transeze" were highly susceptible. Of the less commonly utilized grasses, hairgrass and slender wheatgrass were moderately susceptible to rapid blight. Crested dogtail and crested wheatgrass were highly susceptible.

Since epidemics of rapid blight have been associated with high-salinity irrigation water and soils, it was hypothesized that grasses with high salt tolerance are also highly tolerant. Based on these experiments, for many grass types this proved to be true. Alkaligrass, creeping bentgrass (many cultivars), and the fescues are considered moderately tolerant to tolerant of salinity and highly tolerant of rapid blight.[1] Several of the grasses considered very sensitive to salinity, such as colonial and velvet bentgrass, as well as annual and rough bluegrass, were also highly susceptible to rapid blight. However, there were some notable exceptions in the correlation of salt tolerance and rapid blight susceptibility. Crested wheatgrass, rated tolerant to salinity, was the grass most susceptible to rapid blight. Several perennial ryegrasses also showed high susceptibility to rapid blight, although they rate

moderately tolerant to tolerant to salinity.[1]

The most tolerant grass tested in these experiments was "Dawson" slender creeping red fescue. This finding confirmed a field experiment conducted in 2001 on a South Carolina golf course with severe rapid blight, where "Dawson" was the only grass not affected by the disease. Three cultivars of rough bluegrass, a colonial bentgrass, a velvet bentgrass, and a chewings fescue were killed by the disease (Martin, unpublished).

These experiments have shown several cool-season turfgrasses to be tolerant of rapid blight under conditions of moderately high salinity stress. Some of these grasses may be suitable for overseeding where rapid blight is a chronic problem. In South Carolina some golf courses are using seed blends of rough bluegrass and alkaligrass with acceptable results. Potential exists for the use of certain creeping bentgrass cultivars or slender creeping red fescues for overseeding as well, although rates of germination and establishment may be complicating factors to consider. In short, blending rapid-establishing susceptible grasses (rough bluegrass or moderately susceptible grasses like perennial ryegrass) with tolerant grasses (alkaligrass, creeping bentgrass, and slender creeping red fescue) is a promising strategy to reduce the risk of devastating epidemics of rapid blight. Field experiments and further screening of species and cultivars for tolerance to rapid blight and for overseeding suitability will be important now and in the future, especially under reduced-quality irrigation water.

Editor's Note: A more detailed edition of this article and many others in the USGA's Turfgrass and Environmental Research Online at: *http://usgatero.msu.edu*.

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Figure 1

Rapid blight tolerance of 49 grass cultivars selected from different grass types and species evaluated in greenhouse inoculation studies, graphed by percent disease within each grass