TURFGRASS TRENDS

DISEASE MANAGEMENT

Resistant Cultivars Are Bermuda's Best Battle Vs. Spring Dead Spot

By Dennis Martin, Ned Tisserat, Charles Taliaferro, Nathan Walker and Mike Anderson

Spring dead spot (SDS) is one of the worst diseases a superintendent can face while growing bermudagrass in the transition zone.

SDS injury usually takes the form of circular dead areas that can range from a few inches to several feet in diameter. Patches can coalesce into even larger areas at times. While the fungi that cause SDS may be colonizing the plants in summer, fall or even winter, the injury symptoms occur during green-up in the April-May period. The disease is most common on mature bermudagrass stands that are 2 or more years old.

The management of SDS involves the use of resistant cultivars, coupled with practices that expedite bermuda growth into damaged areas.

Survival of bermudagrass crowns and rhizomes within the infected patches is highly variable, ranging from nearly complete survival to no

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Arguably beautiful to a turf pathologist, these spring dead spot symptoms are ugly from both the golfer's and the superintendent's perspectives, and they reduce playing surface quality.

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In field tests, the outer two holes received inoculum while the center hole was used as a check to assess injury from removal of a plug late in the growing season.

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survival. Often winterkill and SDS interact to cause devastation. Besides being very unsightly, SDS patches are usually sunken, providing a less-than-optimal ball lie for golfers. As the season progresses, weeds often proliferate in the patches, further reducing the quality of the playing surface.

SDS is caused by at least three different species of fungi. *Ophiosphaerella korrae* is the most frequently isolated SDS pathogen in the southeastern United States (Iriarte et al. 2004; Wetzel, Skinner, and Tisserat, 1999) while *O. herpotricha* is the most abundant SDS pathogen in Kansas and Oklahoma (Tisserat et al., 1989; Wetzel, Skinner and Tisserat, 1999). *Ophiosphaerella narmari* has been isolated as a casual agent in California, Kansas, Oklahoma and North Carolina (Iriarte et al. 2004; Wetzel, Hulbert and Tisserat, 1999).

An integrated approach to managing SDS involves the 1.) selection and use of resistant cultivars, coupled with practices that 2.) expedite bermuda growth into damaged areas that 3.) reduce the severity of the disease in the future (Tisserat, 2004; Martin and Hudgins, 2002).

More specifically, the practices shown to reduce severity of the disease include combinations of aeration and vertical mowing performed twice each year to reduce soil compaction and thatch mass (Fry and Tisserat, 1997) as well as the use of acidifying fertilizers (Dernoeden et al, 1991) that may neutralize soil alkalinity. Surprisingly, while SDS has been connected with intense management practices, close mowing alone does not increase the severity of the disease (Martin et al, 2001).

Many practicing turfgrass managers consider any cultural practices that reduce winter-hardiness as initial "suspects" in further increasing severity of SDS until those practices are found "not guilty." This is because the actual mechanism of bermudagrass death with this disease is believed to be low-temperature kill on plant material that was pre-disposed by fungal infection. One such "suspect" practice is late-season nitrogen fertilization.

It is important to note that it has not been established through research that late-season fertilization of bermudagrass increases SDS severity. Furthermore, recent work at other universities has shown that late-season fertilization does not necessarily increase winterkill.

Overall, control of SDS with fungicides has been erratic from state to state and trial to trial. Tredway and Butler (2003) recently provided a review of their initial encouraging fungicidal results on fungicide choice, carrier rate and the importance of timing of applications in the late summer through fall. Biocontrol agents are currently under study by members of our team and control of SDS may be a possibility in the future (Anderson et al., 2003).

Although proper cultural techniques are critical to a successful SDS management program, use of resistant cultivars is arguably the foundation of a successful program in situations where managers can influence the cultivar being installed initially or through renovation. With this in mind, a substantial amount of screening for SDS resistance was conducted in the mid-continent during the 1990s, with work continuing today.

No less than 84 commercially available and experimental bermudagrasses have been screened thus far in trials at Oklahoma State University or Kansas State University. An additional 37 previously untested entries are currently under study at Stillwater, Okla.

Many of the grasses currently under study are NTEP bermudagrass entries. Others are grasses in the final stage of testing in our bermudagrass breeding and development effort. Standards are included in each trial, with these being some of the best and worst performers of the past. These studies have been partially funded through several grantors, including the United States Golf Association

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These are typical dead spot symptoms in the spring, about 2.5 years after initial inoculation. Symptoms are assessed and can be used as relative indices of cultivar susceptibility.

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(USGA), National Turfgrass Evaluation Program (NTEP), the Kansas Turfgrass Foundation (KTF) and the Oklahoma Turfgrass Research Foundation (OTRF).

The method used to screen for SDS under field conditions was developed by Ned Tisserat and the late John Pair of Kansas State University. Minor modifications of the technique have occurred over the years. While efforts are underway to develop a more rapid screening technique by members of our team (Anderson et al. 2003), we still must rely on lengthy field testing.

Briefly, the screening technique involves growing the known causal agent of the disease on oat seed in the lab. In the fall, after cutting several shallow holes with a cup cutter, the colonized oat seed is inserted into the holes and the sod plugs are replaced. Inoculation sites are marked with small pieces of copper wire which can be located using a metal detector. Marking/mapping is necessary to distinguish between an infestation site and possible natural background SDS.

In the spring of subsequent years, the area of symptomatic turf is recorded. Select patches are used to determine if the fungus present is the one originally grown on oat seed. In some studies, the shoot survival within the affected areas is also monitored. The disease progresses over time. A minimum of two but preferably three or more years of symptoms are necessary before any confidence can be gained in bermudagrass cultivar response to an SDS pathogen.

Confidence in findings is further built by comparing findings from different studies conducted with the same pathogen strain over time.

Currently, we use SDS patch area as an index of comparison for resistance. In examining NTEP reports, trade magazines and journals, the reader will find disease area, number of patches, shoot mortality within infected areas or even a 1-9 rating scale used as indices of relative resistance to the disease. Readers are always urged to check the legends or footnotes associated with any disease ratings so that it is clear as to whether "big numbers" mean "more resistant" or "less resistant" to the disease.

It is important to note that bermudagrasses that are termed to be "more resistant" are still susceptible to the disease. However, symptoms are less severe on these cultivars (either less disease area, fewer spots and/or better shoot survival within patches) than on those that are very susceptible.

Variety performance

Based on our research we feel that cultivars which are fairly susceptible to SDS caused by *O. herpotricha* include Arizona Common, Cheyenne, Jackpot, NuMex Sahara, Oasis, Poco Verde, Primavera, Princess 77, Sonesta, Tifton 10, Tifway 419, Tifgreen 328, Tropica, Vamont and Sunturf.

Long-term standards of good SDS resistance include the vegetatively propagated Midlawn, Midfield and Midiron. Yukon and Guymon are two of the most resistant seeded varieties, with Riviera also providing improved resistance over Arizona Common.

The newer vegetative cultivars Patriot and Tifsport show improved resistance over Tifway 419. Not all of the varieties mentioned above would provide ideal performance from teebox to fairway to rough, so consult your local turf specialist for specific input.

We are concerned that contamination of seeded varieties and shifts in genetic identity of these cultivars during seed production over time may mean that test results from earlier trials may not align with those from later trials. Readers are encouraged to use the most recent test results when seeded varieties are of concern.

Despite the seemingly large number of bermudagrass cultivars previously tested and currently under evaluation for SDS resistance, large information gaps in cultivar resistance exist.

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This is because not all economically important cultivars have been tested using a single strain of each known causal agent species, let alone several strains within each of the important causal species. Fortunately, with a few exceptions, bermudagrass cultivars that are more winter-hardy generally have improved resistance to SDS disease where *O. herpotricha* is concerned. It is not known if this general trend holds where the other SDS pathogens are concerned.

Given that different species cause the disease, more than one species can be present within an area, and bermudagrass susceptibility varies depending upon the strain of fungus present (Iriarte et al. 2004).

A "one cultivar fits all" fix is not likely to be the solution for gaining control over SDS. Nevertheless, researchers must be allowed to systematically solve the SDS puzzle one piece at a time.

In the meantime, it is important for the practicing turf manger to use sound cultural management and be cognizant of the identity of the local species of importance so that an informed decision is made about choosing a resistant cultivar and proper fungicide. To better make these informed decisions, one must get to know his or her local turfgrass pathologist for advisement on the SDS agent of importance as well as the local turfgrass specialist regarding whether bermudagrass cultivars that are more resistant can meet the aesthetic and functional features that are desired.

Dennis Martin is a member of Oklahoma State's department of horticulture and landscape architecture, where he holds a 75 percent extension and 25 percent research appointment. He has served OSU in this capacity for 14 years.

Ned Tisserat is a member of the department of bioagricultural sciences and pest management at Colorado State University.

Charles Taliaferro and Mike Anderson are members of the department of plant and soil sciences at Oklahoma State University.

Nathan Walker is a member of the department of entomology and plant pathology at Oklahoma State University.

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Disclosure

Guymon, Patriot, Riviera, and Yukon, are products of the Oklahoma State University.

Midfield and Midlawn are joint products of the Kansas State University and Oklahoma State University programs.

Midiron is a product of Kansas State University.