The Biology and Management of Spring Dead Spot in Bermudagrass

Kansas State University

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Start Date: 1998
Number of Years:
Total Funding: $65,874

Objectives:

1. *Determine the distribution of the three pathogens (Ophiosphaerella herpotricha, O. korrae, and Leptosphaeria narmari) associated with spring dead spot on bermudagrass.*
2. *Test the aggressiveness of each of the three spring dead spot pathogens in field tests at Manhattan and Wichita, KS, and Stillwater, OK.*
3. *Develop techniques to rapidly screen bermudagrass selections for resistance.*
4. *Monitor development of spring dead spot fungi on bermudagrass roots during the growing season in order to better understand the seasonal colonization and more accurately time fungicide applications.*

Spring dead spot (SDS) is a serious disease of bermudagrass along the northern range of its adaptation in the United States. Three distinct root-rotting fungi called *Ophiosphaerella herpotricha, 0. korrae,* and *0. narmari* (formerly *Leptosphaeria korrae* and *L. narmari)* cause this disease. The purpose of our research is to learn more about the distribution and biology of these SDS pathogens, and based on this understanding, to develop more effective strategies for managing this disease.

Diseased bermudagrass stolons and roots were sampled from golf courses in Kansas, Oklahoma, and Kentucky. Isolates of *0. herpotricha* and *0. korrae* were recovered from samples in all states, with *0. herpotricha* being slightly more abundant. The species *0. narmari,* previously reported only in Australia, was detected for the first time in North America from samples collected in Oklahoma and Kansas.

Little is known about the population structure of SDS pathogens on a local and regional scale. Similarities among isolates of *0. herpotricha* are being analyzed by amplified fragment length polymorphism (AFLP) analysis. Preliminary analysis suggests that on individual fairways, there is a mosaic of clones of *0. herpotricha.* However, on a regional scale there appears to be significant genetic heterogeneity among isolates. Less diversity has been detected among isolates of *0. korrae* and *0. narmari*

Field and greenhouse studies are being conducted to evaluate the resistance of seed and vegetatively propagated bermudagrass selections to spring dead spot. Field trials in Oklahoma indicated that several bermudagrass entries including *GUYMON, SUNDEVIL, MIDLAWN, MIDFIELD, FT. RENO,* and *MIRAGE* were more resistant to spring dead spot. We are currently developing greenhouse and laboratory methods to more rapidly screen bermudagrass selections for disease resistance. Furthermore, we are determining whether there are differences in pathogenicity to bermudagrass selections among the three SDS pathogens.

Various cultural and chemical control strategies have been proposed to control spring dead spot. We established a trial in 1998 to evaluate the effects of some of these control recommendations, alone and in combination, for suppression of SDS. Treatments include summer aerification and verticutting, soil acidification with ammonium sulfate, and fungicide treatments. I

Determining Best Management Practices to Convert a Putting Green from Penncross to a New Variety

North Carolina State University

Dr. Daniel Bowman

Start Date: 1996
Number of Years: 3
Total Funding: $12,000

Objectives:

1. *To develop molecular methods that will allow us to determine for a mixed population of bentgrasses the relative percentages of the component varieties.*
2. *To determine appropriate management practices for converting an existing golf green from Penncross to one of the new varieties, using the method developed in the first objective.*
3. *To compare the competitive ability of the new bentgrass varieties during Penncross conversion.*

For several decades, *PENNCROSS* was the creeping bentgrass of choice for putting greens. This has changed over the past several years with the introduction of new bentgrass varieties with improved stress tolerance or better shoot density, and the trend will continue as more new varieties are released. Many superintendents are interested in replacing *PENNCROSS* with one of the new bentgrasses, but are uncertain of how to accomplish this without resorting to complete renovation. This study is designed to evaluate several methods by which an existing *PENNCROSS* green may be converted to one of the new bentgrass varieties.

One of the challenges in addressing the question of conversion is to develop methods to quantify the success of conversion. Simple visual examination is not possible, since bentgrass varieties are essentially indistinguishable based on morphological characteristics. We are using an existing molecular technology, Restriction Fragment Length

Polymorphism (RFLP) to determine population composition. This method can be used to determine the relative percentages of two (or more) varieties in bulk tissue samples (clippings).

The following fall treatments, applied each September, are being evaluated for their effect on bentgrass conversion:

1. Control, no interseeding
2. Broadcast interseeding with *L93* and *A4*
3. Cultivation with JobSaver tines plus broadcast interseeding
4. Verticutting plus broadcast interseeding
5. Primo plus JobSaver cultivation plus broadcast interseeding
6. Primo plus verticutting plus broadcast interseeding

Primo was applied at a rate of 0.3 ounces per 1000 ft^2 three days before interseeding. Success of the treatments are being evaluated annually for at least three years by sampling clippings from each plot and subjecting them to molecular genetic analysis.

Leaf tissue was sampled from the plots in late August. DNA was extracted and Southern analysis was conducted using a RFLP probe which distinguishes *A4* from *PENNCROSS*.

Computer imagery and data analysis indicates that conversion from *PENNCROSS* to *A4* during the first year occurred to the greatest extent with the JobSaver plus Primo treatments (Table 4). Conversion was approximately 20 percent. The least effective treatments were verticutting and verticutting plus Primo. These results led us to cultivate the plots more aggressively in year two, hoping to open-up the canopy more and provide a more favorable environment for the seedlings.

The data indicate that conversion from *PENNCROSS* is probably feasible, but that it will take a number of years. Further, it seems likely that complete conversion, in which *PENNCROSS* is completely eliminated, may not be possible.

Table 4. Conversion of *PENNCROSS* to *A4* bentgrass.

Treatment	Conversion to A4
	--------- % --------
Control, no interseeding	0.0 c
Broadcast seeding	13.8 abc
JobSaver Tines	16.2 ab
JobSaver Tines + Primo	21.2 a
Verticutting	2.5 bc
Verticutting + Primo	2.5 bc

Values followed by the same letter are not significantly different at P = 0.10.

The Distribution, Characterization and Management of Gray (*Typhula incarnata*), Speckled (*T. ishikariensis* complex) and *T. phacorrhiza* snow molds of Wisconsin Golf Courses

University of Wisconsin

Steve Millett

Start Date: 1998
Number of Years: 1
Total Funding: $18,225

Objectives:

1. *Determine the distribution and population structure of T. incarnata, the T. ishikariensis complex and T. phacorrhiza in Wisconsin golf courses.*
2. *To investigate the genetic variation within the nuclear ribosomal DNA (rDNA) among isolates of T. incarnata, the T. ishikariensis complex and T. phacorrhiza.*
3. *To determine the relative aggressiveness of T. incarnata, the T. ishikariensis complex and T. phacorrhiza on PENNCROSS creeping bentgrass.*
4. *To determine if fungicides and alternative tactics have different efficacies for control of gray (T. incarnata), speckled (T. ishikariensis complex) and T. phacorrhiza snow molds.*
5. *To determine the in vitro sensitivity of Typhula incarnata, the T. ishikariensis complex and T. phaxorrhiza to standard fungicides.*

A systematic random sampling technique was used to estimate the distribution of *Typhula* snow molds in Wisconsin golf courses. The sampling frame divided the State into three climate zones. Within these zones, seven golf courses that are within a 70 kilometer radius of Madison (southern), Stevens Point (central) and Woodruff (northern) were randomly selected to survey. Samples were air dried, crushed and sieved to collect sclerotia. The sclerotia were identified as either *Typhula incarnata* (TIN), *T. ishikariensis* complex (TISH) or *T. phacorrhiza* (TP). TIN was the most frequently collected species in the southern zone and TISH was the most frequent in the central and northern zones. Also, TP was found associated with distinctive patches in the central and northern zones. The DNA sequence of the complete internal transcribed spacer region (CITS) of the nuclear ribosomal DNA (rDNA) was used to genetically characterize the three *Typhula* species. Also, the relative aggressiveness of TIN, TISH and TP on creeping bentgrass was also determined using a growth chamber assay.

Survey Results. In general, the snow mold pressure was mild to moderate in the southern zone and moderate to severe in the central and northern zones. *T. incarnata* was the most frequently collected *Typhula* species in the southern zone. *T.*