Hunter Perry

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PERMANENT:
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EDUCATION:

Master of Science in Plant Pathology, June 2005 - Present
Mississippi State University, Mississippi State, MS
Projected Graduation – Fall 2007

Courses to date:

Statistical Methods	Plant Tissue Culture
Plant Disease Mgt.	Plant Bacteriology
Environmental Plant Phys.	

Bachelor of Science in Agronomy (Golf and Sports Turf Mgt.), May 2005
Mississippi State University, Mississippi State, MS

Courses:

Turfgrass Mgt.	Soil Fertility
Turf Weed Mgt.	Soils
Turf Diseases	Plant Materials I and II
Botany	Arboriculture
Golf Course Operations	Athletic Field Mgt.
Weed Science	Plant Physiology

EXPERIENCE:

Graduate Research Assistant, Mississippi State University, 2005-present

- Thesis: Disease Management Strategies for Controlling Spring Dead Spot and Isolation Frequency of the Causal Organism *Ophiosphaerella korrae* on 'Tifway' Bermudagrass (*Cynodon dactylon* X *C. transvaalensis*)
- Molecular identification of fungi through PCR
- DNA sequencing
- Traditional turf disease diagnosis
- Leaf blight of cogongrass, fertility effects on Bipolaris leaf spot, fungal survey associated with Bipolaris leaf spot
- Evaluate chemical and biological fungicides on warm-season turfgrass diseases

USGA Green Section Summer Intern, 2004

- Consulted with golf course superintendents in North Carolina
- Mentored by Chris Hartwiger (USGA Regional Agronomist) and Patrick O'Brien (Regional Director of USGA Green Section)

Turfgrass Management Co-op, Farmlinks Golf Club, Sylacauga, AL, 2004

- Sprayer calibration and operation
- Applied herbicides, fungicides, insecticides, and fertilizers
- Drainage and irrigation installation
- Bunker and fairway renovation
- Crew management

Turfgrass Management Co-op, Limestone Springs Golf Club, Oneonta, AL, 2003

- Same as above

Summer Intern, BASF, Greenville, MS, 2000-2001

- Applied experimental pesticides with backpack and hooded plot sprayers
- Prepared and applied inoculum

Summer Intern, Delta and Pine Land Cotton Company, Scott, MS, 1997-1999

- Plant mapping
- Basic row crop management practices

Talks/Presentations

- MSU Turf Field Day, Mississippi State, MS (June, 2005)
- MSU Turfgrass Short Course, Mississippi State, MS (January, 2006)
- GCSAA Education Conference, Atlanta, GA (February 2006)
- Mississippi Association of Plant Pathologists and Nematologists Conference, Stoneville, MS (March, 2006)
- Departmental Seminar (Spring, 2006)
- Memphis Area Golf Course Superintendents Assoc., Tupelo, MS (May, 2006)
- Golf course superintendent's workshop, Choctaw, MS (June, 2006)
- Frequency of occurrence of *Ophiosphaerella korrae* on 'Tifway' bermudagrass roots in Mississippi. Abstract submitted and accepted for poster presentation at American Phytopathological Society meeting (Quebec City, Canada, July/August, 2006)
- Frequency of occurrence of *Ophiosphaerella korrae* on 'Tifway' bermudagrass roots in Mississippi. Abstract submitted and accepted for oral presentation at American Society of Agronomy meeting (Indianapolis, IN, November 2006)

Publications

- Control of leaf spot in bermudagrass using Endorse™ fungicide, 2005. Fungicide and Nematicide Tests. 2006. Vol 61: T026.

Professional Organizations

- American Phytopathological Society
- American Society of Agronomy
- Golf Course Superintendent's Association of America
- Mississippi Association of Plant Pathologists and Nematologists (MAPPAN)
- Mississippi Turfgrass Association

Honors/Awards

- Gerald O. Mott Meritorious Award in Crop Science, 2006
- Mississippi State University Agronomy Student of the Year, 2004-2005
- Frank Killebrew Scholarship Award, 2005
- Trans-Mississippi Golf Association Scholarship, 2004
- Mississippi Seniors Golf Association Scholarship, 2004, 2005
- Second place in MAPPAN graduate student research presentations, 2006
- Phi Kappa Phi
- Alpha Theta Chi
- Gamma Sigma Delta

D. Hunter Perry – Research Summary

Disease Management Strategies for Controlling Spring Dead Spot and Isolation Frequency of the Causal Organism *Ophiosphaerella korrae* on 'Tifway' Bermudagrass (*Cynodon dactylon* x *C. transvaalensis*)

Spring dead spot (SDS) is referred to as the most destructive disease of bermudagrass and its hybrids in the United States and Australia (Smiley et al., 2005). Spring dead spot is a disease which occurs on bermudagrass where temperatures are cold enough to promote winter dormancy (Crahay et al., 1988). The turfgrass may be free of symptoms in the fall, but as the turf breaks dormancy necrotic patches are present in the turf. These straw-colored patches may range from several centimeters to greater than 0.5 meter in diameter. The recovery period for the spots may differ depending on size of the spots as well as turf management practices. Very large spots may not recover during the growing season, and weeds may inhabit the necrotic patches.

The disease is caused by three species of ectotrophic root-infecting fungi: *Ophiosphaerella herpotricha* (Fr:Fr) J. Walker, *O. narmari* (J. Walker & A. M. Smith) Wetzel, Hulbert, & Tisserat (= L. *O. narmari* J. Walker & A. M. Smith), and *O. korrae* (J. Walker & A. M. Smith) R. A. Shoemaker & C. E. Babcock (=*Leptosphaeria korrae* J. Walker & A. M. Smith). *Ophiospaerella korrae* is the fungus most commonly associated with SDS in the southeastern U.S. (Iriarte et al., 2004; Wetzel et al., 1999b).

In 2004, *O. korrae* was isolated from bermudagrass roots symptomatic of SDS in Mississippi (Tomaso-Peterson and Lu, personal communication). Confirmation was achieved through polymerase chain reaction (PCR) diagnosis using species specific primers (Tisserat et al., 1994). Based on the *O. korrae* confirmation, the proposed research objectives include:

1. Determine the frequency of occurrence of *O. korrae* in roots of Tifway bermudagrass in Mississippi with a history of spring dead spot.
2. Determine the effect of cultural management techniques on spring dead spot incidence and severity.

Methods

This study is currently being conducted at Old Waverly Golf Club in West Point, MS. All treatments will be investigated on the Tifway bermudagrass fairway of hole #9. Field plot and greenhouse data will be collected from 2005 through 2007.

Turf-soil samples

Turf cores are taken once per month from individual plots (12 ft x 15 ft). Three samples will be taken at random from within each plot. Turf cores are extracted by using a 3.8 cm dia. PVC pipe. Each soil core is approximately 10 cm in length. Monthly sampling has allowed for the constant monitoring of thatch depth and root health throughout the study as well as frequency of *O. korrae* occurrence. Each soil core has the thatch/mat layer depth measured in centimeters. Shoot tissue (stems and leaves) is removed from samples at the leaf-thatch interface. Shoots are oven dried for 24 hours at 65˚C, followed by dry weight (g) determination. Comparison of dry shoot weights is one method plant health will be measured for each treatment.

Soil is removed from root samples, rated for root health using a visual scale of 0 to 5 where 0 = no discoloration, 1 = white roots with minor discoloration, 2 = white with light tanning, 3 = light to dark tan, 4 = dark brown with minor rotting, and 5 = black brittle roots Tisserat et al. (1989). Roots are removed at the mat layer-soil interface. The two root samples with the best root health are selected for dry root weight determination. Roots are handled as previously described for shoot dry weight determination. Root weights will be an indicator of plant health. The remaining root sample is used to isolate *O. korrae*.

***Ophiosphaerella korrae* isolation**

Bermudagrass roots are used as source material for determining isolation and frequency of occurrence of *O. korrae*. Individual root pieces from each treatment are chosen at random for plating. The top 1 cm of each root (closest to the mat layer) is removed, surface disinfested, dried, and plated on ¼ PDA containing 6 g PDA, 15 g agar/L, 100 mg streptomycin sulfate, and 100 mg chloramphenicol. Roots incubate at 25°C for 5 to 7 days or until hyphal growth is observed around the roots. Hyphal growth characteristic of *O. korrae* mycelium are transferred to PDA. Cultures are incubated at 25˚C until colonies mature. All colonies that resemble morphological characteristics of *O. korrae* previously described by Walker and Smith (1972) are used for identification through polymerase chain reaction (PCR) using species-specific oligonucleotide primers (Tisserat et al., 1994; Wetzel et al., 1999a). Sum totals of the number of *O. korrae* isolates positively identified by PCR and colony morphology are recorded for each collection date, treatment, and replication. Resultant data indicates the frequency of *O. korrae* occurrence in bermudagrass roots.

DNA extraction and PCR

The first phase of PCR confirmation includes extracting DNA from the suspected *O. korrae* isolates. Fresh mycelium (approximately 50 mg) is removed from pure cultures growing on PDA. Following DNA extraction, the PCR protocol previously described by Tisserat et al. (1994) is followed. Species-specific oligonucleotide primers (OKITS 1 and OKITS 2) are added to amplify a 454-bp DNA fragment of *O. korrae*.

Monitoring soil temperature

Watchdog data loggers (Spectrum, Plainfield, IL) were installed in the untreated control plots to monitor soil temperatures at a depth of 5 to 7.5 cm. Optimum growth temperatures for *Ophiosphaerella* spp. range from 20 to 25˚C (Worf et al., 1986; Crahay et al., 1988). The data loggers are used to evaluate the relationship between the frequency of *O. korrae* isolations and soil temperatures.

Cultural and chemical treatments

Treatments include various cultural practices, and nutrient and fungicide applications. An untreated control is included.

Core aerification is performed using a Toro® (The Toro Company, Bloomington, MN) pto-driven aerifier. Aerification holes made by the tines are approximately 5 cm in depth to sufficiently break through the mat layer and the underlying soil. Plots will be aerified in one direction and cores are removed from the fairway. Aerification plus topdressing is similar to the above aerification treatment. However, once all soil cores are removed, each plot is topdressed using a mixture of medium grade sand and reed sedge peat (6:1 v/v). The aerified plots are topdressed with enough material to fill the holes. Manganese applications are made based on foliar analysis results to achieve manganese levels up to $\geq$ 275 ppm. A vertical mowing cultivation practice using a Graden® (Graden Industries, Victoria, Australia) vertical mower is performed in one direction. Thatch, partially decomposed plant material, and sand brought to the surface as a result of vertical mowing are removed. Elemental sulfur applications are made to maintain low levels of soil pH. Sulfur is applied based on soil pH analyses. A soil pH range between 5.0 and 5.5 is maintained throughout the duration of this research. Myclobutanil fungicide applications are made according to label instructions. Myclobutanil is applied at 34g/93 sq m in a volume equivalent to 7.5 L H_2O/93 sq m using a CO_2 pressurized (40 psi) backpack sprayer during the first week of November approximately 30 days before dormancy.

Fairway ratings

In the spring when the Tifway bermudagrass breaks dormancy, SDS disease severity becomes evident. A disease severity rating is assigned to each replicated treatment based on the National Turfgrass Evaluation Program (NTEP) ratings. Ratings will be given on a 1 to 9 scale where 1 is severe symptoms of SDS and 9 is no disease (Morris).

Bermudagrass color, density, and turf quality is rated according to NTEP rating methods. Turf color is rated on a 1 to 9 scale with 1 being light green and 9 being dark green. Turf density is rated on a 1 to 9 scale with 9 equaling maximum density. Turf quality is rated on a 1 to 9 scale with 9 being ideal turf and 1 being poor turf. Ratings are taken in late spring/early summer, mid-summer, and late summer/early fall throughout the duration of this research (Morris).

Statistical analysis

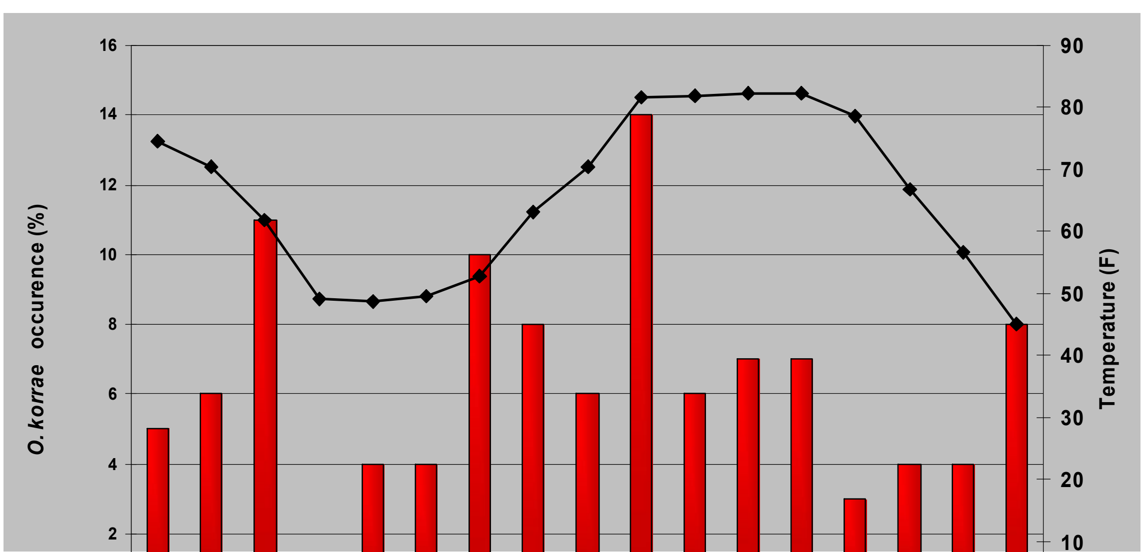
The field plots and greenhouse studies are organized in a randomized complete block design. The data is subjected to analysis of variance. Mean separation is based on Fisher's protected least significant difference test. Pearson's correlation coefficient is being used to compare *O. korrae* occurrence with soil temperatures. Seven treatments, replicated four times are being utilized in this study. Treatments include, aerification with no topdressing, aerification with a topdressing of sand and reed-sedge peat, manganese application, vertical mowing, elemental sulfur application, myclobutanil fungicide applications, and an untreated control.

<u>Results</u>

Over the years, it has been believed that *O. korrae* infects bermudagrass roots prior to winter dormancy. The occurrence of *O. korrae* in roots of Tifway bermudagrass and the influence of soil temperature on fungal activity over the 2004-2005 growing season have provided insight into the host-pathogen relationship. In this study, *O. korrae* has been isolated throughout the year from living bermudagrass roots. The activity of *O. korrae* was reduced when soil temperatures were less than 50° F, but increased as soil temperatures increased above 55° F (Figure 1). Occurrence of *O. korrae* was the highest when bermudagrass growth is the most vigorous (June). It has been reported that ectotrophic root-infecting fungi such as *O. korrae* infect new, developing roots that grow through the thatch/mat layer where the fungus exists saprophytically on dead plant debris.

Pearson's correlation coefficient analysis indicated no correlation between soil temperature and *O. korrae* occurrence. Based on this information, we conclude that *O. korrae* is either actively infecting bermudagrass roots or is present as dormant mycelium when temperatures are above or below the optimal range for *O. korrae* growth. Also, the temperature data suggests that *O. korrae* is actively infected bermudagrass roots nine months out of the year (March-November) in Mississippi. Root health was similar for all treatments, however root health was significantly greater in the vertical mowing treatment during the winter months.

Figure 1. *O. korrae* isolation and soil temperature data for September 2004 – December 2005.



Benefits to the pest management industry

Although there has been over 50 years of research regarding SDS, numerous questions remain regarding *O. korrae* and its influences on SDS. The data collected from 2004-05 establishes a base-line of information that will be used to compare 2005-07 data. Management of SDS using fungicides prior to winter dormancy has been commonplace for years. Based on the data collected from 2004-05, turf managers may need to rethink their approach to SDS management. Instead of treating for SDS in the fall of the year, management may need to be a year-round occurrence. We will determine if cultivation and fertility treatments influence the reduction of SDS severity in a bermudagrass fairway as well as the time of year *O. korrae* is actively infecting bermudagrass roots and what influence soil temperature may have on *O. korrae* activity. This information will lead to a more accurate timing of fungicide applications and new approaches to disease management strategies for controlling SDS of bermudagrass.