Stress

Abiotic factors that Cause Stress
- Shade
- Lack of Water
- Soil Compaction
- Overwatering
- Cold temperatures

Grasses succeed in spite of all these stresses
Problems are Inevitable

Disease

Diseases

Insects

Disease Development

Disease Development
Identification - Signs

Identification – Symptoms

Pathogen thought to reside mostly in dead plant material

Environment

Disease Development

Bermudagrass

Large Patch

Large Patch
Environment – Large Patch

- Cool to mild temperatures (50-80°F)
- When soil temps drop to or below ~70°F
- High relative humidity (> 85%)
- Frequent rain events
- Cloud cover

- Disease subsides during summer
- Disease shuts down when the plant shuts down (first freeze / heavy frost)
Disease Development

Pathogen
Host
Time
Environment

Optimal conditions for disease development over an extended time period

Disease Management

Cultural control
Biological control
Chemical control

Large Patch

Irrigation management during spring and fall
Do not fertilize or aerify when disease is active

Fertilize prior to mid-September

Biological Control

- Published research is limited
- Biofungicide research development is increasing
General guidelines:
- Treatments initiated in Fall when soil temperatures are ~ 72°F
- Spring application initiated when turf has reached ~ 60% green-up

Fungicides:
- 1 – 2 gallons of water carrier volume
- Strobilurins, DMIs, SDHIs, others

**Chemical Control**

**Mapping**

**Fungicides**
- Strobilurin class (Heritage, Insignia, others)
- flutolanil (ProStar)
- tebuconazole (Torque)
- triadimefon (Bayleton)
- others

**Large Patch**

**2 Fall + 1 Spring Applications**
13 May

**2 Fall Applications**
13 May

**Table 1. - Application Rates and Intervals for Insignia**

<table>
<thead>
<tr>
<th>Disease (Pathogen)</th>
<th>Use Rate (oz Product per 1000 sq ft)</th>
<th>Use Rate (oz Product per Acre)</th>
<th>Application Interval (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Patch (Brown Patch of warm season turf (grasses) (Rhizoctonia solani))</td>
<td>0.5 to 0.9</td>
<td>22 to 40</td>
<td>14 to 28</td>
</tr>
</tbody>
</table>
Take-all Patch

Identification - Symptoms

Host - St. Augustine

Gaeumannomyces graminis var. graminis

Environment

- Active at same time as large patch
- Not as much research on Take-all patch as large patch

Irrigation management during spring and fall

Do not fertilize when disease is active

Favored by alkaline soil

Choose acidifying fertilizers

- Ammonium sulfate
- Ammonium nitrate
- Urea (poly, sulfur-coated)
- Organic (Milorganite, others)
**Take-all Patch**

### Mapping

**Fungicides**
- azoxystrobin
- flutolanil
- propiconazole
- thiophanate-methyl
- triadimefon
- others

### propiconazole

<table>
<thead>
<tr>
<th>Take-All Patch (Gaeumannomyces graminis)</th>
<th>2-4</th>
<th>88-176</th>
<th>Spring and Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructions:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply Banner MAXX to reduce the severity of take-all patch.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make 1-2 fall applications in September and October or when night temperatures drop to 55°F, and 1-2 spring applications in April and May, depending on local recommendations.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### pyraclostrobin

**Lightly water fungicides into rootzone**

Use preventively. Begin applications when conditions are favorable for fungal infection, prior to disease symptom development. Make 2 applications, 28 days apart, in the fall, and 2 applications, 28 days apart, in the spring.

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**Spring dead spot**

- Destructive disease of bermudagrass
  - Hybrid or seeded
  - Intensively managed
    - Low mowing height
    - Soil compaction
    - High soil pH
    - Heavy thatch accumulation
- May occur on buffalograss or zoysiagrass
Spring dead spot

- Infection of roots
  - Occurs in fall
  - Soil temperatures from 50°-77°F
- Infection process
  - Overwinters as mycelium in thatch
  - Mycelium grows along stolons and roots
  - Forms infection mats
  - Progress from primary to secondary roots

Host selection

<table>
<thead>
<tr>
<th>Relative tolerance</th>
<th>Cultivars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most</td>
<td>Midfield, Midiron, Midlawn, Patriot, Riviera,</td>
</tr>
<tr>
<td></td>
<td>Tifport, and Yukon</td>
</tr>
<tr>
<td>Moderate</td>
<td>Cheyenne, Mirage, Sundevil II, Tifway (Tifton 419)</td>
</tr>
<tr>
<td>Least</td>
<td>Arizona Common, Tifton 10, Numex Sahara,</td>
</tr>
<tr>
<td></td>
<td>Princess 77, Pyramid, Sunbird, Savannah,</td>
</tr>
<tr>
<td></td>
<td>Transcontinental, Tifgreen (Tifton 328)</td>
</tr>
</tbody>
</table>

Information from University of Arkansas Extension Publication FSA7551. Available online at: www.uaex.edu

Thatch management

- Vertical mowing
  - Perform in late spring to summer
  - Deep and aggressive
  - Remove material
- Benefits
  - Removing large amounts of inoculum
  - Oxygen helps produce healthy roots
  - Thicker, denser turf stand
Improving thatch and soil compaction

• Aerification
  – Perform in late spring to summer
  – Apply up to 3 times per year in severe locations
  – Remove cores from premise
• Aerification following symptom expression
  – Speed up recovery of patches
  – Penetrates the thatch layer increasing oxygen

Fertility and pH

• Critical aspects to manage
• Soil test every 1-2 years
• pH
  – Neutral to high pH (≥7) favors spring dead spot
  – Best for pH to be nearer 6
  – Bermudagrass is hearty at low pH’s
  – Lowering pH is a slow process
  – Apply acidifying fertilizers
    • Ammonium sulfate
    • Sulfur coated urea

Fertility application

• Follow soil test recommendations
  – Specifically for potassium (K)
    • Apply 1 lb K₂O/1,000 ft² toward end of summer
    • Raise mowing height toward end of summer
  – Nitrogen source based on soil pH
• Avoid late season nitrogen applications

Recapping fertility from NC State

• Calcium nitrate suppressed O. korrae
  – Increased pH
  – Increased calcium availability
• Ammonium sulfate suppressed O. herpotricha
• Urea and sulfur coated urea had little to no effect
Labeled fungicides

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Products</th>
<th>Appr.</th>
<th>Efficacy</th>
<th>Res. Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fenarimol</td>
<td>Rubigan</td>
<td>1-2x’s</td>
<td>+++</td>
<td>2</td>
</tr>
<tr>
<td>Tebuconazole</td>
<td>Torque</td>
<td>1-2x’s</td>
<td>+++</td>
<td>2</td>
</tr>
<tr>
<td>Azoxystrobin + propiconazole</td>
<td>Headway</td>
<td>1-2x’s</td>
<td>+++</td>
<td>3</td>
</tr>
<tr>
<td>Fludioxonil + propiconazole</td>
<td>Concert</td>
<td>1-2x’s</td>
<td>++</td>
<td>2</td>
</tr>
<tr>
<td>Chlorothalonil + propiconazole</td>
<td>Instrata</td>
<td>1-2x’s</td>
<td>+</td>
<td>2</td>
</tr>
<tr>
<td>Azoxystrobin</td>
<td>Heritage</td>
<td>1-2x’s</td>
<td>+</td>
<td>2</td>
</tr>
<tr>
<td>Thiophanate + methyl</td>
<td>Systar</td>
<td>1-2x’s</td>
<td>+</td>
<td>3</td>
</tr>
<tr>
<td>Chlorothalonil + thiophanate + methyl</td>
<td>26/36, Dovetail, Fluid fungicide</td>
<td>1-2x’s</td>
<td>+</td>
<td>3</td>
</tr>
</tbody>
</table>

+++ good control when disease pressure is high, or excellent control when disease pressure is moderate
++ good control when disease pressure is moderate, or excellent control when disease pressure is low
+ good control when disease pressure is low

Information available online at: http://www.turffiles.ncsu.edu/Diseases/Spring_Dead_Spot.aspx

**Must** Water In Fungicide

- Not talked about that often. A few thoughts...
  - Targeting a root infecting pathogen with a systemic fungicide = YES!!!
    - Most systemic fungicides only move apoplastically in the xylem. Meaning they go UP!
    - Notable exceptions: Fosetyl Al (Signature) and phosphites.
  - Contact fungicides: Not if targeting a foliar disease
  - Targeting a foliar disease with a systemic: No, but...
  - How much? Depends on percolation rate: 1/10th - 1/4th an inch

Ronstar a Good Pre-Emergent Option

Gray Leaf Spot

- Warm temperatures – 80-90 F
- Host - St. Augustine

Gray Leaf Spot

- Nitrogen management
- Irrigation management

GLS - Management

- Fungicides Usually not necessary

Gray Leaf Spot

Ronstar a Good Pre-Emergent Option

Gray Leaf Spot

Gray Leaf Spot

Host - St. Augustine
<table>
<thead>
<tr>
<th>Water management</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image of grassy area with irrigation system]</td>
</tr>
</tbody>
</table>

4/7/2016