The Other Turfgrass Diseases

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Dollar Spot

- Important disease of creeping bentgrass putting greens, tall fescue, bermudagrass, and other warm- and cool-season grasses in Oklahoma
- Pathogen: *Sclerotinia homoeocarpa*
- Occurrence: Warm humid weather with cool night – Dew events
- Spring and fall problem in Oklahoma
- More severe in nitrogen deficient turf
Dollar Spot of Turfgrass

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Dollar spot is a common foliar disease that occurs on most types of turfgrasses (bentgrass, Bermuda grass, bluegrass, buffalo grass, fescue, ryegrass, and zoysia) throughout Oklahoma. However, this disease is often most severe on turfgrass in residential landscapes maintained under a low nitrogen fertilizer program and on bentgrass golf greens. In Oklahoma, dollar spot is most prevalent in late spring to early fall when high humidity and cool nights favor the formation of dew on turfgrass for extended periods and temperature is most conducive for growth of the fungus.

Symptoms and Signs
Symptoms of dollar spot vary with turfgrass species and management practices. On closely mowed turfgrass, such as bentgrass golf greens, the characteristic symptoms of dollar spot are small, circular, straw-colored, sunken patches that rarely exceed two to three inches in diameter (Figure 1). If the disease becomes severe or is left unmanaged, individual spots may coalesce forming larger, irregular patches of blighted turfgrass that can die back to the soil surface. On residential lawns and taller turfgrasses, symptoms appear in irregularly shaped, bleached patches ranging from four to six inches or more in diameter (Figure 2). Patches may coalesce to cover large areas.

Individual inflicted leaves exhibit lesions (spots) that are first chlorotic (pale green or yellow), then water-soaked, and finally a bleached straw color (Figure 3). Dollar spot lesions are characteristically bordered by a tan to reddish-brown margin (Figure 4). However, these borders do not usually occur on annual bluegrass. Leaf lesions can expand extending across the entire leaf, resulting in gridling of blades and discoloration from leaf tips. Individual leaf blades may have a single lesion, many small lesions, or be entirely blighted. Leaf symptoms can be confused with those caused by Pythium blight and Rhizoctonia brown patch.

In the early morning when dew is present on grass blades and the pathogen is active, a white, cottony, growth (mycelium) may be seen in the infected patches. The white, cottony growth resembles that of other fungi such as Pythium and Rhizoctonia or can be confused with windborne seeds of various trees (e.g., cottonwood). The growth rapidly disappears as leaves dry.

Figure 1. Symptoms of dollar spot on a creeping bentgrass putting green.

Figure 2. Symptoms of dollar spot on a residential lawn planted with bermudagrass.

Figure 3. Leaf spot symptoms bleached leaves characteristic of dollar spot on bermudagrass.
Dollar Spot

- Closely mowed grasses
  - Small sunken circular patches (≤ 2 inches)
- Taller grasses
  - Larger, irregularly-shaped, bleached patches (≤ 6 inches)
- Leaf symptoms
  - Tan lesions with reddish-brown/purple margins
  - Water soaked lesions
  - Yellow or straw colored after death
  - Cottony growth present when dew is heavy
Dollar Spot

Control

- Minimize leaf wetness period
- Maintain adequate soil fertility – esp. Nitrogen
- Reduce thatch and soil compaction
- Fungicides (Eagle, Banner, Curalan, Trinity, Emerald etc.; DO NOT USE HERITAGE)
Objective: To evaluate season-long fungicide programs for control of dollar spot and brown patch on creeping bentgrass putting greens
Methods

- Location: OSU Turfgrass Research Center
- Host: Creeping bentgrass ‘Penncross’
- Fungicide programs evaluated were developed by BASF Crop Protection, Cleary Chemical, and Oklahoma State University
<table>
<thead>
<tr>
<th>Treatment and Rate/1000 ft²</th>
<th>Timing²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-treated Check</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**OSU 1**
- Banner Maxx 1.3ME 1.00 oz
- Emerald 70WG 0.13 oz + Trinity 1.67SC 1.00 oz
- Curnalan 50EG 1.00 oz
- Honor 28 WG 1.10 oz
- Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Fore 80WP 4.00 oz + Heritage 50WDG 0.30 oz
- Curnalan 50EG 1.00 oz + Triton FLO 367SC 0.50 oz
- 3336 Plus 19.4F 4.00 oz

**BASF 1**
- Emerald 70WG 0.13 oz
- Trinity 1.67SC 1.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Insignia 20WG 0.90 oz
- Chipco Signature Ultra 80WG 4.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Emerald 70WG 0.13 oz + Iprodione Pro 2SE 4.00 oz

**OSU 2**
- Emerald 70WG 0.13 oz + Trinity 1.67SC 1.00 oz
- Banner Maxx 1.3ME 1.00 oz + Daconil Ultrex 82.5WG 3.20oz
- 3336 Plus 19.4F 4.00 oz
- Spectro 90WDG 5.80 oz
- Fore 80WP 4.00 oz + Heritage 50WDG 0.30 oz
- Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Endorse 2.5WP 4.00 oz
- Trinity 1.67SC 1.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Emerald 70WG 0.13 oz
- Curnalan 50EG 1.00 oz

**ADVISORY**
- Emerald 70WG 0.13 oz + Trinity 1.67SC 1.00 oz
- 3336 Plus 19.4F 4.00 oz
- Emerald 70WG 0.13 oz + Daconil Ultrex 82.5WG 3.20oz

**BASF 2**
- Honor 28 WG 1.10 oz
- Trinity 1.67SC 1.00 oz + Daconil Ultrex 82.5 WG 3.20oz
- Emerald 70WG 0.13 oz + Iprodione Pro 2SE 4.00 oz
- Chipco Signature Ultra 80WG 4.00 oz + Daconil Ultrex 82.5WG 3.20oz
- Spectro 90WDG 5.80 oz
- Iprodione Pro 2SE 4.00 oz + Daconil Ultrex 82.5 WG 3.20oz

**CLEARY**
- Curnalan 50EG 1.00 oz
- Strider 1.3MEC 2.00 oz + Legend 54F 3.60 oz
- 3336 Plus 19.4F 3.00 oz + Legend 54F 3.60 oz + Alude 5F 6.00 oz
- 26/36 4F 3.00 oz + Alude 5F 6.00 oz
- Heritage 50WDG 0.40 oz + Protect 75DF 4.00 oz + Alude 5F 6.00 oz
- Spectro 90WDG 5.00 oz + Alude 5F 6.00 oz
- Strider 1.3MEC 1.00 oz + Legend 54F 3.60 oz + Alude 5F 6.00 oz
- 26/36 4F 3.00 oz
- Spectro 90WDG 4.00 oz
Methods

- First applications applied 1-May
- Subsequent applications applied at 14-day intervals (except ADVISORY treatment)
- ADVISORY treatments were applied according to the new dollar spot advisory
- Infested with *Sclerotinia homoeocarpa* 16-May
- Ratings conducted at 7-day intervals
- Ratings for dollar spot initiated 1-May
Results – Dollar Spot

Season-Long Dollar Spot Intensity

Non-Treated  OSU_1  BASF_1  OSU_2  ADVISORY  BASF_2  CLEARY

A  B  BC  BC  BCD  CD  D
Results – Final Turf Quality

Final Turf Quality – 11. Sep

- Non-Treated: C
- OSU 1: A
- BASF 1: B
- OSU 2: B
- Advisory: B
- BASF 2: A
- Cleary: A
Conclusions

- All fungicide programs resulted in highly acceptable turfgrass quality
- CLEARY program controlled dollar spot and brown patch to the highest degree throughout the season
- All other fungicide programs resulted in acceptable control of dollar spot
- ADVISORY program saved 2 sprays
Disease Advisories

• Advisories can help anticipate onset or increase of disease
• Can improve fungicide application timing
• Can help save fungicide applications
Dollar Spot Advisory

• Location: OSU Turfgrass Research Center, OK (Fall, Spring 2008; Spring 2009); OJ Noer Turfgrass Center, WI (3 locations – 2009 growing season)
• Host: Creeping bentgrass
• Treatments: Non-treated, Preventative, Curative
• New dollar spot foci counted daily
• Hourly weather data recorded
## Predictive Risk Advisory

<table>
<thead>
<tr>
<th>Moving Average</th>
<th>Best Model</th>
<th>Max-Rescaled $R^2$</th>
<th>Concordant (%)</th>
<th>Area Under ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-day</td>
<td>-11.63 - 2.43 (FUNG) – 0.12 (MINAT) + 0.178(MEANRH)</td>
<td>0.46</td>
<td>88</td>
<td>0.88</td>
</tr>
</tbody>
</table>

- $n=423$ (2,538 obs averaged across rep)
- Oklahoma and Wisconsin data
Dramatization - 2009

Oklahoma

- Advised Fungicide Application
- Actual number of dollar spot foci
- 14-day fungicide protection interval

Wisconsin
Results – Earlier Version

Season-Long Dollar Spot Intensity

Non-Treated | OSU1 | BASF1 | OSU2 | ADVISORY | BASF2 | CLEARY

A
B
BC
BC
BCD
CD
D
Fungus has a wide temperature range that it can grow → 50°F to 86°F (lab data not shown)

Increasing Humidity = Increased Likelihood of dollar spot

5-day average humidity of 70% or more is sufficient for dollar spot

Doesn’t necessarily need to rain

Dew events are sufficient
Large Patch
Large Patch

Pathogen: *Rhizoctonia solani* (AG 2-2 IV)

*R. solani* (AG 2-2 IIIB) is the pathogen that causes brown patch of cool-season grasses

- **Hosts (warm-season [C4] grasses):** bermudagrass, zoysiagrass, St. Augustinegrass
- **Occurrence:** primarily in the spring and fall

Property of Oklahoma State University
Large patch (Zoysia Patch) of Warm-Season Turfgrasses

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Large patch is an occasional disease of warm-season turfgrasses (bermudagrass, zoysia grass, and St. Augustinegrass). In Oklahoma, the disease can occur in residential, landscape, and recreational warm-season turfgrasses. In Oklahoma, the disease is most noticeable in early spring when turfgrasses are breaking dormancy and weather conditions are wet and mild. In some years, the disease is also evident in the fall. However, infection by the pathogen during this time of year may not always result in visible symptoms.

Symptoms and Signs
Affected areas may range from inches to many yards in length or diameter (Figures 1 and 2). The turf in affected areas will thin and grass leaves may appear bleached or yellow (Figure 3). Large circular, semi-circular, or arcs of damaged turf will be apparent. When the disease is active, the interface between healthy and diseased turf may appear orange or bronze in color (Figure 4). Orange-brown borders of the patches are most apparent on zoysia grass. Symptoms associated with other turf diseases including leaf blight, a white, cottony growth (mycelium), and "smoke rings" at the edge of the diseased areas will be absent. Patches are panicle, typically expand in size and often can reach several yards in diameter. Affected shoots can easily be pulled from points of attachment (rhizome) and the base of the shoot may appear water soaked. As plant stand density is reduced, weed encroachment is common both during and after disease development (Figures 3 and 4).

Causal Agent and Disease Cycle
The fungus, Rhizoctonia solani is the causal agent of large patch. This fungus and several related species are responsible for numerous turfgrass diseases (including brown patch and yellow patch) that can occur at anytime on all grasses, except during very cold winters. The fungus overwinters as dormant threads-like fungal strands (mycelium) in infected plants or as special snow-like structures (sclerotia). The production of true spores does not occur. Therefore, spread of this fungus can occur through movement of infected plant parts or soil by equipment, people, animals, water, or wind. Epidemics are typically initiated when temperatures are mild and prolonged periods of high humidity exist. In Oklahoma, infected of susceptible grasses begins in late September when soil temperatures are above 50°F. Moisture is adequate, and may continue until dormancy. Fungal activity can resume in early spring but is suppressed by soil temperatures that exceed 85°F. Turfgrass grown under high nitrogen fertility that is applied too late in the year or very early in the spring is more prone to the development of large patch. Turfgrass that is also excessively irrigated, has abundant thatch, or poor air circulation

Figure 1. Symptoms of large patch on a mixed stand of St. Augustinegrass and bermudagrass in Southeastern Oklahoma.

Figure 2. Symptoms of large patch on bermudagrass.
Environmental Conditions

- Pathogen active when soil temperature falls below 21°C (70 °F)
- Symptoms don’t typically appear in fall
- Symptoms noticed in the spring after green-up
- Extended wet periods and saturated soils favor disease development
- Excessive nitrogen exacerbates disease
- Zoysiagrass most susceptible, followed by St. Augustine, and Bermudagrass
Large Patch

Symptoms

- Appear as turf breaks or approaches dormancy
- “smoke ring” absent
- “Orange halo” present
Large Patch

Symptoms

– A reduction in the number of live tillers present in spring
– Weed encroachment common
– Lesions are generally absent
– Shoots may be pulled easily from sheath

Photo Credit: Lane Tredway, NCSU
Management

Cultural control

- Fertility, refrain from fertilizer applications until turf is actively growing
  - Avoid too much nitrogen when turf is actively growing
- Reduce thatch and soil compaction
- Reduce soil water saturation
Management

Fungicides

• Applied in the fall
• First application when soil temperatures @ 21°C (70 °F)
• Second application 28 days later
• Mapping of areas for spot treatment
Large Patch

Fungicide Trials 2008 – 2009

- Zoysiagrass – ‘Meyer’
- First application – 26 Sep.
- Inoculated – 6 Oct.
- Second application – 24 Oct.
- Heavily irrigated until dormancy
- Rated Spring 2009 – Percentage of plot diseased
Results – Large Patch

Disease Intensity

Fungicide Treatments (2 applications 28 days apart)
Turf Quality – 22 May

Turfgrass Quality (0=dead grass; 9=completely healthy grass)

Fungicide Treatments (2 applications 28 days apart)
2009 - 2010 Trials

Spray Interval Study

- Zoysiagrass – ‘Meyer’
- First application – 17 Sep.
- Inoculated – 21 Sep.
- 14-day interval – 1 Oct.
- 21-day interval – 9 Oct.
- Rated Spring 5 May
Severity – 3 May

Fisher’s LSD = 11.4 %
Fisher’s LSD = 1.1
Bipolaris Diseases

Photo Credit: Steve Vann, University of Arkansas
Bipolaris Diseases

- Pathogens: *Bipolaris spp.*
- Can cause a leaf spot (spring and fall) and crown rot (heat of the summer)
- Generally favored by cool, wet weather
- Can be common in spring and fall or periods of stress
- Excessive nitrogen can make disease worse
- Nitrogen deficient turfgrass also favors disease
Bipolaris Diseases

Symptoms

- Leaves can appear yellow to tan (leaf spots)
- Distinct, irregularly shaped lesions on leaves with brownish green or purple to black edge
- Extensive rot of stems, crowns, and roots may occur

Photo Credit: Steve Vann, University of Arkansas
Bipolaris Diseases

Control

- Plant Resistance – Some “common” types are very susceptible
- Avoid excessive or deficient soil fertility and excessive herbicide applications
- Fungicides – numerous, sometimes not needed
- Avoid extended periods of leaf wetness
  - Promote air movement and reduce shade, if possible
- Reduce thatch in spring or fall for cool season grasses and in summer for warm season grasses
- Reduce soil compaction
- Raise mowing heights
Fairy Ring
Fairy Ring

- Pathogen: Various basidiomycete (mushroom/puffball) fungi
Fairy Ring

- The symptoms are a result of a fungus decomposing organic matter (thatch) in the soil
- The fungus can grow less than an inch up to 18 inches per year
- Depth of growth is usually limited to 6 inches
- The lush growth is caused by release of nitrogen into the soil due to decomposition
- Decomposing wood material is thought to contribute to problems with fairy ring
- New fairy rings are:
  - Often initiated from spores produced by the mushrooms
  - Moving any soil/thatch will move the fungus
Fairy Ring

Control

• Frequent aerification (even a pitchfork will work!), combined with deep watering

• Soil removal or mixing

• Fungicides
  azoxystrobin (Heritage), flutolanil (Prostar), fluoxastrobin (Disarm), pyraclostrobin (Insignia), azoxystrobin + propiconazole (Headway)

• Mask symptoms with light nitrogen applications, aerification, and deep watering
Questions