Dollar spot is the most common and important turf disease worldwide.

Dollar spot leaves depressions in the putting surface. Recovery from this damage can be very slow.

White mycelium is evident on infected turf early in the morning.

On creeping bentgrass, plant symptoms are a white dieback from the leaf tip.
Infection centers can become much large on landscape turfgrasses.

Foliar lesions are also evident on landscape turfgrasses.

Dollar spot can appear as chocolate-brown spots on bermudagrass and zoysiagrass.

Lesions have a prominent dark brown border on bermudagrass and zoysiagrass.

**Conditions Favoring Dollar Spot**

- low temperatures >50°F
- high temperatures <95°F
- 10 consecutive hours of leaf wetness
- low nitrogen and other nutrients
- low mowing height
- excessive thatch accumulations

Morning dew removal reduces dollar spot by 50%.
Dollar spot is most severe in under-fertilized turf.

Selecting a variety with some resistance is critical.

Preventative fungicide applications provide effective control of dollar spot.

Nozzle Type and Carrier Volume Impact Dollar Spot Control

<table>
<thead>
<tr>
<th>Nozzle Type</th>
<th>Carrier Volume</th>
<th>Dollar Spot Incidence (spots/plot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Induction</td>
<td>1 gal/M</td>
<td>10</td>
</tr>
<tr>
<td>Turbo TJ</td>
<td>2 gal/M</td>
<td>15</td>
</tr>
<tr>
<td>XR Flat Fan</td>
<td>1 gal/M</td>
<td>20</td>
</tr>
<tr>
<td>Delvan</td>
<td>2 gal/M</td>
<td>25</td>
</tr>
<tr>
<td>Untreated</td>
<td>1 gal/M</td>
<td>30</td>
</tr>
</tbody>
</table>

Daconil Ultrex applied at 3.2 oz/1000 ft²
Courtesy M.A. Fidanza, Penn State University

The dollar spot fungus develops resistance to fungicides quickly.
Anthracnose

Pathogen
- Colletotrichum cereale

Hosts
- annual bluegrass
- certain creeping bentgrass varieties
  - Penncross
  - Pennlinks
  - Penneagle
  - Crenshaw
  - L-93
  - Dominant Plus

Two Anthracnose Diseases Are Common in Turfgrasses

Anthracnose Foliar Blight
Anthracnose Basal Rot

Anthracnose foliar blight of annual bluegrass

Anthracnose basal rot of annual bluegrass (Courtesy L.L. Burpee)

Acervuli and setae on a creeping bentgrass stolon

Conidia of Colletotrichum cereale are easily spread by mowers and cultivation equipment
Conditions Favoring Anthracnose Development

**Annual Bluegrass**
- Foliar blight most active during warm or hot weather
- Extended periods of wet, cloudy weather favor basal rot development

**Creeping Bentgrass**
- Basal rot most active during warm or hot weather
- Extended periods of wet, cloudy weather favor foliar blight development

Avoid topdressing, verticutting, aerifying, or spiking while anthracnose diseases are active

These practices spread the spores and create wounds in the leaf for rapid infection

Mowing and Rolling Influence Anthracnose Development**
- Most severe at 0.110" mowing height, less severe at 0.125", and least severe at 0.142"
- No difference between mowing once or twice per day
- Daily rolling slightly reduced disease in both years
  - Improved mowing and less scalping due to smoother surface

Fungicides for Anthracnose Control

**Contacts:**
- Chlorothalonil (Daconil, Chlorostar, Manicure)
- Fludioxonil (Medallion)
- Thiophanate-methyl (3336, Systec)
- Fenarimol (Rubigan)
- Myclobutanil (Eagle)
- Propiconazole (Banner MAXX)
- Tebuconazole (Lynx)
- Triadimefon (Bayleton)
- Triticonazole (Trinity)

**QoIs:**
- Azoxystrobin (Heritage)
- Fluoxastrobin (Disarm)
- Pyraclostrobin (Insignia)
- Trifloxystrobin (Compass)

**Phosphonates:**
- Fosetyl-Al (Signature)
- Phosphorous acid (Alude, Resyst, Vital)

**Polyoxins:**
- Polyoxin D (Endorse)

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Maximizing Anthracnose Control

- Preventative control is most effective, especially with anthracnose basal rot.
- Rotations and tank-mixtures are typically superior to single products.
- Apply fungicides in at least 2 gallons water per 1000 ft².
- Contacts, phosphonates, and polyoxins provide good preventative control but are not effective curatives.
- Resistance to benzimidazoles and QoIs is widespread; resistance to DMIs is developing slowly.

Carrier Volume Impacts Anthracnose Control

Anthracnose Control in Annual Bluegrass
Blowing Rock Country Club, Blowing Rock NC

- Anthracnose Incidence (%)
- Treatments applied 5/23, 6/6, 6/20, 7/11, and 7/25
- Data collected 8/15

Brown Patch

Pathogen

- *Rhizoctonia solani*

Hosts

- All cool-season turfgrasses
Brown patch in creeping bentgrass putting green

No distinct lesions are evident on creeping bentgrass

Brown patch in tall fescue landscape

Lesions are tan, irregular, with a dark brown border

Smoke rings are not formed on tall fescue, but mycelium may be evident early in the morning

Rhizoctonia solani spreads only by hyphae
Brown Patch: Conditions Favoring Disease
- low temperatures >60°F
- high temperatures >90°F
- 12 consecutive hours of leaf wetness
- excessive nitrogen
- restricted air movement
- poor soil drainage
- frequent or excessive irrigation
- high mowing heights

Why is the brown patch only attacking the tall fescue?
The QoI and benzamide fungicides are highly effective for brown patch control.

Brown Patch Control with Fungicides
- preventative application is critical, since infected turf will not recover quickly
- disease becomes active when night temperatures are consistently >60°F
- repeat applications on 14 to 28 day interval, depending on product and rate selected
- uniform coverage is critical - spray in 1 to 2 gallons H₂O per 1000 ft²

Daily Low Air Temperature, Raleigh NC

Fungicides for Brown Patch Control
<table>
<thead>
<tr>
<th>QoI</th>
<th>Benzamides</th>
</tr>
</thead>
<tbody>
<tr>
<td>azoxystrobin (Heritage)</td>
<td>flutolanil (Prostar)</td>
</tr>
<tr>
<td>fluoxastrobin (Disarm)</td>
<td></td>
</tr>
<tr>
<td>pyraclostrobin (Insignia)</td>
<td>chlorothalonil (Daconil)***</td>
</tr>
<tr>
<td>trifloxystrobin (Compass)</td>
<td>fludioxonil (Medallion)</td>
</tr>
<tr>
<td>DMIs</td>
<td>mancozeb (Fore)***</td>
</tr>
<tr>
<td>fenarimol (Rubigan)</td>
<td>polyoxin D (Endorse)</td>
</tr>
<tr>
<td>myclobutanil (Eagle)</td>
<td></td>
</tr>
<tr>
<td>propiconazole (Banner)</td>
<td>iprodione (Chipco 26GT)***</td>
</tr>
<tr>
<td>triadimefon (Bayleton)</td>
<td>vinclozolin (Curalan)***</td>
</tr>
<tr>
<td>triticonazole (Trinity, Triton)</td>
<td>Benzimidazoles</td>
</tr>
<tr>
<td></td>
<td>thiophanate-methyl (3336)</td>
</tr>
</tbody>
</table>

***Not labeled for use on residential lawns
Brown patch control in tall fescue, 2006

Treatments applied on 13 Jun, 11 Jul, and 7 Aug.
Data collected on 8 Sep.

Fungicides for Brown Patch Control in Landscapes

<table>
<thead>
<tr>
<th>A.I.</th>
<th>Trade Name</th>
<th>Rate/1000 ft²</th>
<th>Interval</th>
<th>$/acre/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>fluoxastrobin</td>
<td>Disarm</td>
<td>0.18 oz</td>
<td>28 day</td>
<td>$5</td>
</tr>
<tr>
<td>azoxystrobin</td>
<td>Heritage</td>
<td>0.2 oz</td>
<td>28 day</td>
<td>$7</td>
</tr>
<tr>
<td>pyraclostrobin</td>
<td>Insignia</td>
<td>0.7 oz</td>
<td>28 day</td>
<td>$10</td>
</tr>
<tr>
<td>trifloxystrobin</td>
<td>Compass</td>
<td>0.2 oz</td>
<td>21 day</td>
<td>$10</td>
</tr>
<tr>
<td>flutolanil</td>
<td>ProStar</td>
<td>2.2 oz</td>
<td>28 day</td>
<td>$10</td>
</tr>
</tbody>
</table>

Pre-mix Products for Brown Patch Control in Landscapes

<table>
<thead>
<tr>
<th>A.I.s</th>
<th>Trade Name</th>
<th>Rate/1000 ft²</th>
<th>Interval</th>
<th>$/acre/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>trifloxystrobin + triadimefon</td>
<td>Armada</td>
<td>1.2</td>
<td>21 day</td>
<td>$9</td>
</tr>
<tr>
<td>flutolanil + thiophanate</td>
<td>SysStar</td>
<td>2.2</td>
<td>28 day</td>
<td>$9</td>
</tr>
<tr>
<td>azoxystrobin + propiconazole</td>
<td>Headway</td>
<td>1.5</td>
<td>28 day</td>
<td>$14</td>
</tr>
</tbody>
</table>

Pythium Blight

Pathogen

- *Pythium aphanidermatum* and other species

Hosts

- all turfgrasses
- annual bluegrass, perennial ryegrass, Kentucky bluegrass, and tall fescue particularly susceptible
- not a common problem on creeping bentgrass

Pythium blight in annual bluegrass fairway

Pythium diseases spread in drainage patterns
Pythium blight may spread quickly

Pythium blight in tall fescue landscape

*Pythium aphanidermatum* mycelium in tall fescue

Lesions caused by Pythium blight on tall fescue

The Pythium Blight Disease Cycle is Complex

**Pythium Blight: Conditions Favoring Disease**

- night temperatures >65°F
- 14 hours of continuous leaf wetness
- excessive nitrogen
- poor soil drainage
- frequent or excessive irrigation
- restricted air movement
Pythium Blight: Chemical Control

- most fungicides have no *Pythium* activity
- *Pythium* fungicides have little to no activity against other diseases
- should be controlled preventatively based on weather conditions

Copper Spot

Pathogen

- *Gloeocercospora sorghii*

Hosts

- bentgrasses

Copper Spot: Conditions Favoring Disease

- temperatures in 70's or 80's
- humid or wet weather
- excessive nitrogen
- low soil pH
Copper Spot: Chemical Control

• very little research has been conducted on copper spot management
• chlorothalonil, mancozeb, and DMI fungicides have good to excellent activity
• cases of DMI resistance have been reported

Yellow Tuft

Pathogen
• Sclerophthora macrospora

Hosts
• all cool-season turfgrasses
• annual bluegrass is most susceptible
• zoysiagrass

Yellow Tuft: Conditions Favoring Disease

• cool, wet weather
• poor soil drainage
• excessive nitrogen
• infected turf dies during hot or dry weather

Yellow Tuft: Chemical Control

• pathogen is closely related to Pythium
• systemic fungicide is needed to reach pathogen in crown
• mefanoxam (Subdue) is regarded as most effective
Yellow Spot

Pathogen
- Unknown
- Cyanobacteria suspected

Hosts
- creeping bentgrass

Symptoms of yellow spot are very similar to yellow tuft.

Affected turf turns chlorotic, but never necrotic.

No witches broom symptom is observed with yellow spot.

Conditions Favoring Yellow Spot
- warm, humid weather
- low nitrogen fertility
- drought stress
- close mowing
- ‘Crenshaw’ creeping bentgrass seems to be particularly susceptible

Even though the turf is never killed, severe cases are quite unsightly.
Yellow Spot Management

- maintain adequate nitrogen level and avoid severe drought stress
- QoI fungicides enhance expression of yellow spot symptoms
- chlorothalonil provides effective control
  - 3.2 oz Daconil Ultrex or equivalent every 14 days
  - for curative applications, apply 5.5 oz then repeat 14 days later

Plot treated with 3.2 oz Daconil Ultrex every 14 days

Slime Mold

Pathogen
- *Mucilago* and *Physarum* species

Hosts
- all turfgrasses

Signs of slime mold on creeping bentgrass leaves

Slime molds come in a variety of colors.
Slime mold can be unsightly on putting greens.

Conditions Favoring Slime Mold

- heavy rains preceded by dry conditions
- poor soil drainage
- heavy thatch accumulations

Management of Slime Mold

- signs of slime mold typically go away after 3 to 5 days
- pustules can be removed by mowing, brushing, or washing
- fungicides are labeled for slime mold control, but are usually not necessary or beneficial