Gray Leaf Spot

Pathogen
- *Pyricularia grisea*

Hosts
- perennial ryegrass
- tall fescue
- St. Augustinegrass

Lesions turn gray and fuzzy during periods of leaf wetness.

Perennial ryegrass and tall fescue initially show signs of thinning and wilt.

Severe blighting can occur after days to weeks of disease activity on tall fescue and perennial ryegrass.

St. Augustinegrass is rarely severely injured by gray leaf spot.
Conditions Favoring Gray Leaf Spot

- temperatures >75°F
- 14 consecutive hours of leaf wetness
- heat and/or drought stress
- high mowing heights
- irregular mowing frequency
- excessive nitrogen / deficient nitrogen

The infection process is complex - at least 14 hours of continuous leaf wetness is needed.

Mowing impacts turf health and pathogen growth

- height
- frequency
- sharp blades
- clippings
- spread

Fungicides for Gray Leaf Spot Control

**QoIs**
- azoxystrobin – Heritage
- fluoxastrobin - Disarm
- pyraclostrobin – Insignia
- trifloxystrobin – Compass

**DMIs**
- propiconazole – Banner
- triadimefon – Bayleton
- triticonazole - Trinity

**Benzimidazoles**
- thiophanate-methyl – Cleary
- chlorothalonil – Daconil, Chlorostar, Manicure***
- mancozeb – Fore, Dithane, Mancozeb***

***Not labeled for use on residential lawns

Caution: Fungicide Resistance in Gray Leaf Spot

- *P. grisea* can develop resistance to fungicides quickly
- must rotate or tank mix different chemical classes to prevent resistance buildup

Red Thread

**Pathogen**
- *Laetisaria fuciformis*

**Hosts**
- all cool-season turfgrasses
Red thread develops in spots and patches. Patches can become quite large over time.

Red, branching sclerotia can be seen growing from infected leaves. Mycelium may also be present during wet weather.

**Conditions Favoring Red Thread**

- SLOWLY GROWING TURF
  - low nitrogen
  - other nutrient deficiencies
  - shade
  - cool or cloudy weather
  - collecting clippings may help to slow spread while disease is active
  - fungicides are rarely necessary

**Summer Patch**

**Pathogen**
- *Magnaporthe poae*

**Hosts**
- bluegrasses
- fine fescues
- creeping bentgrass (southern climates)
Symptoms of summer patch initially appear as wilt, chlorosis, or stunted growth. During summer, infected turf collapses to the ground in spots, patches, or rings.

The summer patch pathogen infects the roots, crowns, stolons, and rhizomes. Summer patch can attack creeping bentgrass under certain conditions.

**Conditions Favoring Summer Patch**

- root infection at soil temperatures ≥65°F
- disease development continues between 65°F and 82°F
- foliar symptoms appear during heat or drought stress
- high soil pH
- any factor that reduces root growth in fall and spring

**Effect of mowing height and irrigation scheduling on summer patch in Kentucky bluegrass**

Davis and Dernoeden, 1991
Managing Soil pH in Sand-Based Putting Greens

- calcareous vs. silica sand
- organic matter source
- irrigation water pH
- acidifying fertilizers - ammonium forms of N
- elemental sulfur: Use with caution!

Chemical Control of Summer Patch

- fungicides most effective when applied preventatively
- 21 to 28 day intervals, beginning when soil temps reach 65°F (3-4 applications)
- QoI or DMI fungicides provide excellent preventative control
- azoxystrobin or thiophanate-methyl best for curative applications
- applications should be watered-in immediately with 1/8" to 1/4" of irrigation

Take-all Patch

Pathogen
- *Gaeumannomyces graminis var. avenae*

Hosts
- bentgrasses

Symptoms of take-all patch begin to appear in late spring.

Symptoms become more severe as heat and drought stress continues.

The take-all pathogen infects and rots roots and stolons during the fall and spring.
Conditions Favoring Take-all Patch
- infection occurs in fall and spring when soil temperatures are between 40°F and 60°F
- take-all patch is most severe in newly established turf
- high soil pH
- Mn deficiency
- poor drainage
- excessive thatch accumulation
- nitrogen deficiency and drought stress in spring or summer

High soil pH limits the availability of manganese (Mn)

Management and Control of Take-all Patch
- use acidifying nitrogen sources
- must be applied preventatively in fall and spring when soil temperatures are between 40°F and 60°F
- fall applications are most important
- treatments should be watered-in immediately with 1/8” to 1/4” irrigation
- apply 2 lbs Mn per acre per year, tank-mixed with preventative fungicide applications

Pythium Root Dysfunction
Pathogen
- *P. volutum, P. arrhenomanes, and P. aristospoum*

Hosts
- creeping bentgrass

Pythium root dysfunction caused by *Pythium volutum*
Pythium root dysfunction reduces the plant’s ability to absorb water and nutrients.

**Conditions Favoring Pythium Root Dysfunction**

- most severe in newly constructed greens
- root infection occurs during fall and spring
  - 50°F to 75°F soil temperatures
- roots die back rapidly during heat, causing summer symptoms

**Other conducive conditions**
- low fertility, especially nitrogen
- drought stress
- low mowing heights
- infrequent aerification

**Current Model for Pythium Root Dysfunction**

![Graph showing the correlation between pathogen activity, symptom expression, and creeping bentgrass root depth over time.](image)
Pythium root dysfunction 3 months after seeding

Fall and spring symptoms of Pythium root dysfunction

Aggressive aerification helps to control PRD

Maintaining soil oxygen enables roots to survive hot weather.

Chemical control of Pythium root dysfunction

Rotation
- Insignia (0.9 oz, watered-in)
- Segway (0.9 fl oz, watered-in)
- Signature + Banol (4 + 2 oz)
- or Signature + Subdue Maxx (4 + 1 oz)

Preventative Schedule
- 21 to 28 days between applications when mean daily soil temperatures are between 50°F and 70°F

Curative Schedule
- 14 to 28 days between applications as needed based on symptom expression
Pythium Root Rot

Pathogen
- several species of *Pythium*

Hosts
- all turfgrasses
- putting green turf is most susceptible

Pythium root rot usually develops in irregular patterns

Pythium root rot may also develop in spots or patches

Greasy rotting of stolons and roots indicative of Pythium root rot

Pythium root rot is induced by wet soil conditions
Pythium Root Rot: Chemical Control

Curative
- ethazole (Koban, Terrazole), followed 2 to 3 days later with mefanoxam (Subdue Maxx, Fenox, Mefanoxam)
- both watered-in with 1/8” of irrigation

Preventative
- applications of ethazole or mefanoxam during periods of wet weather
- fosetyl-Al (Signature) may also have preventative activity

Fairy Ring

Pathogen
- >60 species of basidiomycete fungi

Hosts
- all turfgrasses

Symptoms Induced by Fairy Ring Fungi

Type I
- kills grass or badly damages it

Type II
- rings of dark green or quickly growing turf

Type III
- mushrooms produced in a ring pattern
Initial Type I fairy ring symptoms

Type I fairy ring symptoms

Type III fairy ring symptoms

Puffball species are most common on greens in the Southeastern United States.

Fairy ring fungi do not infect turf, they grow on thatch and soil.

Fairy ring fungi leave a hydrophobic coating on thatch and soil.
Conditions Favoring Fairy Ring

• sandy soils, newly constructed greens
• excessive thatch and organic matter accumulation
• extremes in soil moisture
• nutrient deficiency, especially nitrogen

Fairy ring symptoms are most evident in under-fertilized turf.

Excessive thatch accumulations enhance fairy ring.

Curative Suppression of Fairy Ring Symptoms

Type I
• cultivate and/or use wetting agents to re-wet soil profile

Type II
• mask ring symptoms with nitrogen or iron

Type III
• remove mushrooms

Depth is important!
Apply management practices to the infested zone.

Control of Fairy Ring with Fungicides

• fungicide performance is highly variable from location to location
• fungicides alone will not provide curative suppression of symptoms
  • must be applied in conjunction with cultural practices for curative suppression
• fungicides should be considered a long-term preventative approach
Fungicides Labeled for Fairy Ring Control

- azoxystrobin (Heritage)
- flutolanil (ProStar)
- polyoxin D (Endorse)
- pyraclostrobin (Insignia)
- triadimefon (Bayleton, 2ee)

Curative Control of Type II Fairy Rings

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fairy Ring Incidence (%)</th>
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<tbody>
<tr>
<td>Prostar (4.5 oz)</td>
<td>50</td>
</tr>
<tr>
<td>Heritage (0.4 oz)</td>
<td>30</td>
</tr>
<tr>
<td>Endorse (4 oz)</td>
<td>60</td>
</tr>
<tr>
<td>Revolution (6 fl oz)</td>
<td>70</td>
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<tr>
<td>Prostar + Rev</td>
<td>90</td>
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<tr>
<td>Heritage + Rev</td>
<td>80</td>
</tr>
<tr>
<td>Endorse + Rev</td>
<td>85</td>
</tr>
<tr>
<td>Untreated</td>
<td>95</td>
</tr>
</tbody>
</table>

Prevention of fairy ring caused by *Lycoperdon perlatum* in creeping bentgrass (July 11, 2006)

All treatments applied twice in March and April. Treatments were watered in immediately with 0.25" of irrigation. Revolution applied at 6 fl oz/M.

Current Recommendations for Fairy Ring Prevention

- Initiate applications when 5-day average soil temperatures reach 55ºF
- Make two applications of triadimefon (Bayleton) at 1 oz/1000 ft² on a 21 to 30 day interval
- Water in the application immediately with 0.25" of irrigation
- Mixing Bayleton with a soil surfactant is not recommended
- If using Heritage TL, make 4 applications on a 14 day interval at the 1 fl oz rate; Mixing with a soil surfactant is recommended

Comparison of Heritage Application Schedules for Fairy Ring Prevention

- 2 fl oz rate of Heritage TL applied on 22 Mar and 19 Apr
- 1 fl oz rate of Heritage TL applied on 22 Mar, 5 Apr, 19 Apr, and 3 May
- Revolution (6 fl oz) tank-mixed with Heritage applications on 22 Mar and 19 Apr
- Treatments were watered in immediately with 0.25" of irrigation