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Turfgrass Disease Identification Guide for Golf

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TURFGRASS DISEASE IDENTIFICATION

Syngenta would like to acknowledge the following individuals for their contribution to the development of this turf guide: Pete Dernoeden, PhD, University of Maryland, and Bruce Clarke, PhD, Rutgers University.

Necrotic Ring Spot

Causal Agent:
Ophiosphaerella korrae

Susceptible Turfgrass:
Kentucky bluegrass, annual bluegrass, rough bluegrass, fine-leaf fescue

Symptoms:
Necrotic ring spot first appears as small, light green spots and progresses to thinned, circular patches that are yellow to light-green in color and approximately 3 to 15 inches in diameter. The patches, which can expand up to 3 feet in diameter, eventually turn brown or straw-colored and die. The roots and rhizomes of the affected turfgrass turn brown to black. Grass plants can survive and recolonize the center of the patches, which leads to a ring-like appearance.

Necrotic Ring Spot

Conditions Favoring Disease:
Necrotic ring spot initiates in moist soil, thrives in temperatures of up to 80°F and becomes more severe in higher temperatures and drought conditions. Seeded sites, as well as sodded sites in newly cleared woodlands, are susceptible to this disease. It is also found in areas with compacted soil and that are high in nitrogen during the spring and summer.

Management Tips:
- Raise mower height.
- Reduce soil compaction through aerification and use of lightweight equipment.
- Use moderate to high amounts of phosphorous and potash.
- Maintain adequate nitrogen and a balanced fertility.
- Minimize the amount of shade.
- Lightly irrigate (approximately 1/10 inch) in the mid-afternoon on a daily basis to cool plants.
- Avoid drought stress.
- Top-dress and aerate turf as needed.
- Reduce thatch.
- Overseed with perennial ryegrass or more tolerant bluegrass cultivars.
- Apply systemic fungicides on a preventive basis.

Occasionally occurs in: CA, DE, KS, KY, MD, ME, MO, NC, NE, NH, NV, NY, VA, VT, WV.

Frequently occurs in: CO, CT, ID, IL, IN, MA, MN, NJ, OH, OR, PA, UT, WA, WI, WY.

Labeled products:

BannerMaxx® II Fungicide | Headway® Fungicide | Heritage® Fungicide

Renown®* Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control Necrotic Ring Spot. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Spring Dead Spot

Causal Agent:
Ophiosphaerella korrae, *Ophiosphaerella herpotricha*, and *Ophiosphaerella narmari*

Susceptible Turfgrass:
Bermudagrass and buffalograss

Symptoms:
Infected bermudagrass shows disease symptoms as it emerges from winter dormancy. Spring dead spot appears as bleached, straw-colored, circular patches that measure up to several feet in diameter. The roots of affected plants turn dark brown to black.

Spring Dead Spot

Conditions Favoring Disease:
Spring dead spot favors cool, wet weather in the spring and fall and daily temperatures of less than 60°F in November. This disease is typically found where thatch is more than 1/2-inch thick and in locations with poor drainage and low potash levels. Heavy applications of nitrogen in late summer often increase disease severity the following spring. Spring dead spot is more severe on bermudagrass that is over three years old and in locations with long dormancy and cold temperatures.

Management Tips:
- Avoid late summer or fall applications of nitrogen fertilizers which may enhance disease severity.
- Use ammonium sources of nitrogen combined with potassium for fertilizer from spring through early August.
- Control weeds in affected turf to enhance recovery from spring dead spot.
- Apply moderate to high levels of phosphorous, potash, and minor elements.
- Improve drainage of turf.
- Reduce thatch.
- Convert from common varieties to hybrid bermudagrass with good winter hardiness.
- Use preventive fungicide applications in late September or October.

Occasionally occurs in: AL, AZ, CA, GA, IL, IN, KY, LA, MD, MO, MS, NM, NV, SC, SD, TX.

Frequently occurs in: AK, KS, NC, OK, TN, VA.

Labeled products:

BannerMaxx II Fungicide | Headway Fungicide | Heritage Fungicide

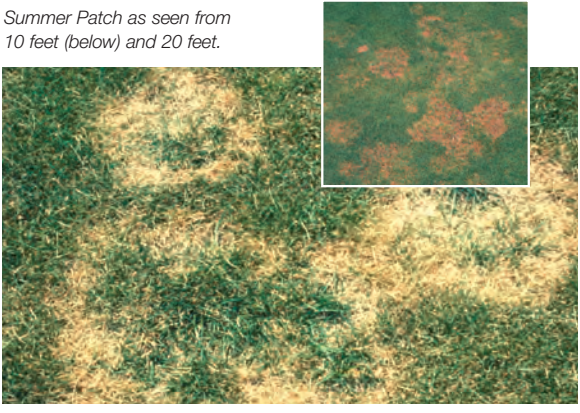
Summer Patch

Causal Agent:
Magnaporthe poae

Susceptible Turfgrass:
Annual bluegrass, Kentucky bluegrass, and fine-leaf fescue

Symptoms:
Summer patch appears as circular or irregularly shaped patches that measure from several inches to several feet in width. Initially, patches appear as slow-growing thinned or wilted turfgrass. Mature patches are bronzish-yellow to straw-colored and can coalesce as they increase in size. The leaves of the plant turn yellow to brown from the tip to the base. The roots turn moderate to dark brown. Summer patch can exhibit a ring-like appearance where a less susceptible grass species survives inside the diseased patch.

Summer Patch as seen from 10 feet (below) and 20 feet.



Conditions Favoring Disease:
Root infection is initiated when soil temperatures exceed 65°F; however, foliar symptoms of summer patch are favored by temperatures over 85°F during the day and over 70°F at night. It is also commonly found in areas that are sunny, exposed, and with high soil moisture, high soil pH, compaction, poor drainage, and low mowing height. This disease is typically more severe in turfgrass that has been fertilized with nitrate-nitrogen.

Management Tips:
- Use acidifying fertilizers.
- Increase the height of cut.
- Reduce soil compaction through aerification and use of lightweight equipment.
- Syringe when the temperature is over 85°F.
- Improve the drainage of the turf.
- Convert to resistant species, such as tall fescue, bentgrass, or perennial rye.
- Apply effective fungicides preventively in early to late spring. Do not expect 100% disease control.

Occasionally occurs in: AK, AL, AZ, CA, GA, KS, LA, MA, MN, MO, MS, NC, NM, NV, NY, OK, OR, SC, SD, TN, TX, WA, WI.

Frequently occurs in: CT, DE, IL, IN, KY, MD, MI, NE, NJ, OH, PA, VA.

Labeled products:

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control Summer Patch. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Take-all Patch

Causal Agent:
Gaeumannomyces graminis var. *avenae*

Susceptible Turfgrass:
Bentgrass

Symptoms:
Take-all patch symptoms initially appear as small, circular reddish-brown spot patches. Symptoms will progress to wilted, circular patches that are brown or bronze-colored and measure up to several feet in diameter. Symptoms are most evident during periods of stress induced by hot, dry weather. Infected plants have dark-brown roots.

Take-all Patch as seen from 10 feet (right) and 20 feet.

Conditions Favoring Disease:
Take-all patch is most common on newly established turf and severity decreases as the turf stand matures. It will occur on sites that have light textured soils, low organic matter content, manganese deficiency, and pH above 6.5. Take-all patch typically occurs in cool, wet conditions and in areas with a high soil pH—most severe at pH 6.5 or above. This disease is more severe on less fertile and sandy soil.

Management Tips:
- Use acidifying fertilizers.
- Apply moderate to high levels of phosphorus, potash, and minor elements where these nutrients are depleted from the soil.
- Improve the drainage of the turf.
- Reduce thatch.
- Apply appropriate systemic fungicides in the early spring after the first mowing and in the late summer or fall.

Occasionally occurs in: AL, AR, AZ, CA, FL, GA, IA, KS, LA, MO, MS, MT, NC, ND, NE, NM, NV, OK, SC, SD, TN, TX, VT.

Frequently occurs in: CO, CT, DE, ID, IL, IN, KY, MA, MD, MI, MN, NJ, OH, OR, PA, RI, WA, WI, WV, WY, VA.

Labeled products:

BannerMaxx® II Fungicide | Headway® Fungicide | Heritage® Fungicide

Renown® * Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control Take-all Patch. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Fairy Ring

Causal Agent:
Basidiomycetes of more than 50 species on native soils can cause fairy ring symptoms; some of the more common agents include: *Agaricus campestris*; *Chorophyllum molybdites*; *Collybis* spp.; *Hygrocybe* spp.; *Lepiota* spp.; *Marasmius oreades*; *Bovista* spp.; *Scleroderma* spp.; *Tricholoma* spp.; *Lycoperdon clitocybe; Agrocybe* spp.; *Corprinus comatus*; and other species. Fungal species occurring on sand-based greens not as diverse, *Lycoperdon* spp., however, is most common

Susceptible Turfgrass:
All species of warm- and cool-season turfgrass

Symptoms:
Fairy ring symptoms vary with causal agents and the environment. Above-ground mushroom and puff ball basidiocarps may or may not occur. Typically, turf symptoms can appear as outer rings that are either dark-green or brown in color. Sometimes the symptoms may be hydrophobic rings or circular areas showing the first signs of wilt. The shape and size of the rings vary depending on the species and environmental conditions. Activity in the turf may subside when the individual rings come in contact with each other. Some causal agents form fruiting bodies (i.e., mushrooms), but do not form rings. Conversely, other causal agents will form rings, but not fruiting bodies. The fungi that result in a fairy ring symptom may be confined to the soil or the thatch area or both. Upon taking a soil profile, an orange discoloration along the root zone may be present with or without a strong mushroom odor.

Fairy Ring

Conditions Favoring Disease:
Fairy rings typically occur when the turfgrass is most actively growing. This disease can also occur on cool-season turfgrass in mild winter climates. In warm climates, fairy ring inhabiting bermudagrass turfgrass can decrease over-seed germination and stands in these areas due to hydrophobic areas limiting water availability for the germinating seed.

Management Tips:
- Avoid using root zone mixes with high levels of undecomposed organic materials.
- Reduce thatch by vertical cutting.
- Core aerify.
- Irrigate deeply.
- Use nitrogen fertilizer to mask symptoms on some types of fairy ring.
- Use soil wetting agents/soil surfactants to help alleviate hydrophobic soil conditions.

Frequently occurs in: All states.

Labeled products:

Headway® Fungicide | Heritage® Fungicide | Renown®* Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control Fairy Ring. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

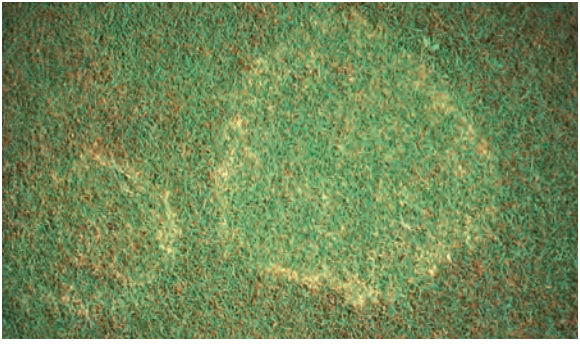
Superficial Fairy Ring

Causal Agent:
Coprinus kubickae, *Melanotus phillipsii*, *Trechispora alnicola*, *Trechispora cohaerens*, *Trechispora farinacea*, other species

Susceptible Turfgrass:
All species of warm- and cool-season turfgrass

Symptoms:
Symptoms vary depending on the type of superficial fairy ring. This disease can cause patches with felted, white mycelium. Sometimes the patch is sunken and has a ring that measures approximately 1-inch wide at the border. Also, the lower leaves on the turfgrass in the affected areas can die.

Superficial Fairy Rings as seen from 10 feet



Conditions Favoring Disease:
Superficial fairy ring is favored by the summer season for cool-season turfgrass. For areas where warm-season turfgrass is the principle turfgrass species and dormancy is sporadic or doesn't occur, superficial fairy ring can be a common problem. While the patches typically disappear in the cool seasons for cool-season turf or in the summer for warm-season turf, they can remain if the turf is not properly managed.

Management Tips:
- Maintain adequate fertilization to minimize symptoms.
- Reduce thatch by vertical cutting and aerifying.
- Topdress and cultivate turf to control mat and thatch.
- Improve soil drainage.
- Increase mowing height.

Frequently occurs in: All states.

Labeled products:

Headway® Fungicide | Heritage® Fungicide

Yellow Tuft (Downy Mildew)

Causal Agent:
Sclerophthora macrospora

Susceptible Turfgrass:
All turf

Symptoms:
Symptoms of yellow tuft vary depending on the grass cultivar. On cool-season turfgrass, yellow tuft causes circular patches that measure 1/4 to 4 inches in diameter. The shoots become dwarfed and turn yellow in color. Infected seedlings form individual clusters of dense shoots that are yellow in color. The tufts of shoots originate from a single node or terminal stem apex that is excessively tillered with shortened roots. Yellow tuft will mimic annual bluegrass plants in creeping bentgrass putting greens. The individual tufted plants can be easily detached from the soil surface using a knife. On St. Augustinegrass, the disease is called downy mildew and causes white streaks that are parallel to the leaf veins. The epidermis over the streaks becomes raised and turns white in color. Excessive tillering, however, does not occur in St. Augustinegrass, but plants may be stunted.

Downy Mildew

Conditions Favoring Disease:
Downy mildew initially occurs in wet, poorly drained areas that are depressed. The disease typically infects cool-season turf in early to late spring and mid- to late fall. It affects St. Augustinegrass primarily during the humid weather of summer and can be more severe in shaded areas.

Management Tips:
- Improve the soil drainage.
- Increase the air circulation.
- Use proper surface contours to minimize water movement and accumulation on the turf's surface.
- Avoid high or excessive levels of nitrogen that result in lush growth.

Occasionally occurs in: AL, FL, GA, LA, MS, TX.

Frequently occurs in: AR, CT, DE, IA, IL, IN, KS, KY, MA, MD, ME, MI, MN, MO, NC, NE, NH, NJ, NY, OH, OK, PA, RI, SC, TN, VA, VT, WI, WV.

Labeled products:

SubdueMaxx® Fungicide

Powdery Mildew

Causal Agent:
Erysiphe graminis

Susceptible Turfgrass:
Kentucky bluegrass, fine-leaf fescue, bentgrass, ryegrass, and bermudagrass

Symptoms:
The disease first appears on the leaves as individual tufts of fine, white mycelium. The tufts enlarge and coalesce, causing the leaves to have a grayish-white or powdery appearance. Severely infected turf turns yellow, then tan and brown in color. Stressed turf that is severely infected can die. Severely infected turf, especially in shaded areas, can become thinned.

Powdery Mildew

Conditions Favoring Disease:
Powdery mildew is favored by humid, cloudy weather with temperatures between 60°F and 72°F. It occurs in areas under stress, with low light, and with high humidity. Powdery mildew is also common in areas with poor air circulation, but does not require a film of water to infect turf.

Management Tips:
- Water as needed to avoid drought stress.
- Avoid levels of nitrogen and irrigation that produce lush leaf growth.
- Raise the mower height.
- Prune tree limbs to improve air circulation and the amount of sunlight.
- Convert to a polystand of shade-adapted turfgrass.

Occasionally occurs in: AL, AR, AZ, FL, GA, KY, LA, MS, NC, NM, OK, SC, TN, TX, VA.

Frequently occurs in: CA, CO, CT, DE, OR, IA, ID, IL, IN, KS, MA, MD, ME, MI, MN, MO, ND, NE, NH, NJ, NV, NY, OH, PA, RI, SD, UT, VT, WA, WI, WV, WY.

Labeled products:

BannerMaxx® II Fungicide | Concert® II Fungicide | Headway® Fungicide

Heritage® Fungicide | Renown® Fungicide

Pythium Blight

Causal Agent:
Pythium aphanidermatum, other *Pythium* species

Susceptible Turfgrass:
All turfgrass species, especially annual bluegrass, perennial ryegrass, bentgrasses, and tall fescue and bermudagrass

Symptoms:
Pythium blight appears suddenly during hot, humid weather. This disease causes greasy, brown circular spots that are initially about 3/4 inch to 2 inches in diameter and then rapidly enlarge in size. The spots are water-soaked and dark-colored early in the morning. They also form fluffy white masses of fungal mycelium (cottony blight) and can coalesce to form large, irregular areas of dead turf. Infected patches may appear bronzish-orange in color.

Pythium *Blight as seen up close in early stages (right) and from 20 feet (below).*

Conditions Favoring Disease:
Pythium blight favors night temperatures of over 68°F. It occurs in areas that experience more than 10 hours a day of foliar wetness for several consecutive days. It is found in the wettest areas of turf and in areas with poor drainage and air circulation. Lush-growing turf growing under nitrogen fertilization is particularly susceptible to the disease.

Management Tips:
- Avoid mowing wet turf when the foliar mycelium is evident to minimize spreading the disease.
- Reduce thatch.
- Apply less than 1/2 pound of nitrogen per 1,000 ft^2 a month during hot weather.
- Increase air circulation to speed the drying process of the turf.
- Minimize the amount of shade.
- Irrigate turf early in the day. Avoid late-day watering.
- Improve soil drainage.
- Irrigate turf deeply and as infrequently as possible.
- Apply contact and systemic fungicides on a preventive basis.

Occasionally occurs in: CA, CO, IA, IL, KS, ME, MI, MN, MO, MT, ND, NE, NH, NV, NY, OR, SD, UT, VT, WA, WI, WY.

Frequently occurs in: AL, AR, AZ, CT, DE, FL, GA, IN, KY, LA, MA, MD, MS, NC, NM, NJ, OH, OK, PA, RI, SC, TN, TX, VA, WV.

Labeled products:

Headway® Fungicide | Heritage® Fungicide | SubdueMaxx® Fungicide

Renown® Fungicide*

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control *Pythium* Blight. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Pythium Root Rot

(Root Dysfunction)

Causal Agent:
Pythium aphanidermatum, Pythium aristosporum, Pythium graminicola, Pythium vanterpooli, other *Pythium* species

Susceptible Turfgrass:
Species grown on putting greens, such as annual bluegrass, bentgrass, and bermudagrass

Symptoms:
Pythium root rot is common on highly maintained turf, such as golf course greens. Although symptoms of *Pythium* root rot are typically nondistinctive, this disease can appear as yellow, irregularly shaped patches. The affected turfgrass is thin, off-color, and slow growing, while the root system is stunted with reduced volume and vigor. Foliar mycelium does not occur.

Pythium *Root Rot*

Conditions Favoring Disease:
Some *Pythium* species favor temperatures between 32°F and 50°F while others thrive in temperatures between 70°F and 90°F. *Pythium* root rot occurs in areas with high soil moisture, poor drainage, and low light. It also infects locations with low mowing height and excessive wear.

Management Tips:
- Increase the height of cut.
- Apply optimum amounts of nitrogen, phosphorous, and potash.
- Reduce mowing frequency and use lightweight mowers.
- Avoid overwatering.
- Apply low amounts of nitrogen in the spring when roots are forming.
- Minimize the amount of shade.
- Improve the drainage of the turf.
- Reduce soil compaction.
- Apply systemic fungicides on a preventive basis.

Occasionally occurs in: CA, CO, IA, ID, IL, KS, ME, MI, MO, MN, MT, ND, NE, NH, NV, NY, OR, SD, UT, VT, WA, WI, WY.

Frequently occurs in: AL, AR, AZ, CT, DE, FL, GA, IN, KY, LA, MA, MD, MS, NC, NJ, NM, OH, OK, PA, RI, SC, TN, TX, VA, WV.

Labeled products:

Headway® Fungicide | Heritage® Fungicide | SubdueMaxx® Fungicide

Renown® Fungicide*

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control *Pythium* Root Rot. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Brown Patch, cool-season turf

Causal Agent:
Brown Patch: *Rhizoctonia solani*

Susceptible Turfgrass:
All species of cool-season turfgrass

Symptoms:
The symptoms of brown patch can vary depending on the turfgrass cultivar, climatic and atmospheric conditions, soil types and textures, and intensity of the turfgrass management. This disease typically appears as rings or patches of blighted turfgrass that measure 5 inches to more than 10 feet in diameter. The pathogen also causes leaf spots and "smoke rings"—thin, brown borders around the diseased patches that appear most frequently in the early morning. After the leaves die in the blighted area, new leaves can emerge from the surviving crowns. On wide-bladed species, leaf lesions develop with tan centers and dark brown to black margins.

Brown Patch as seen up close (right) and from 20 feet.

Conditions Favoring Disease:
Brown patch is favored by high relative humidity as well as temperatures of over 85°F during the day and over 60°F at night. It occurs in areas that experience more than 10 hours a day of foliar wetness for several consecutive days. Brown patch infestation is more severe when the turf is cut to a height less than the optimum for that turfgrass species.

Management Tips:
- Use low to moderate amounts of nitrogen, moderate amounts of phosphorous, and moderate to high amounts of potash.
- Avoid fast-release nitrogen applications when the disease is active.
- Increase the height of cut.
- Increase the air circulation.
- Minimize the amount of shade.
- Irrigate turf early in the day.
- Improve soil drainage.
- Reduce thatch.
- Remove dew from turf early in the day.
- For best results, use contact or systemic fungicides to prevent brown patch.

Frequently occurs in: All states.

Labeled products:

BannerMaxx® II Fungicide	Concert® II Fungicide	Daconil® Fungicide
Headway® Fungicide	Heritage® Fungicide	Instrata® Fungicide
Medallion® Fungicide	Renown® Fungicide	

Large Patch, warm-season turf

Causal Agent:
Rhizoctonia solani

Susceptible Turfgrass:
Zoysiagrass and other warm-season turfgrasses

Symptoms:
Large patch (zoysia patch) appears as rings or patches of blighted turfgrass that measure 5 inches to 10 feet or more in diameter. Patches are brown to yellow in appearance, with a possible "orange firing" at the periphery of the patches. Small reddish-brown colored leaf spots occur on leaf sheaths, stems, and stolons. After the leaves die in the blighted area, new leaves can emerge from the surviving crowns. If the turfgrass is still green, the disease is most apparent down in the canopy, especially around the leaf sheaths as discolored/blackened lesions—when pulled lightly, these leaves detach very easily and are sometimes green above the damaged sheath.

Zoysia Patch as seen from 10 feet (right) and 20 feet.

Conditions Favoring Disease:
The symptoms of large patch can vary depending on the turfgrass cultivar, or climatic and atmospheric conditions, soil type and texture, and intensity of the turfgrass management. This disease is favored by high relative humidity, as well as temperatures of 50°F to 60°F at night in late fall or early spring. Infection is most likely when soil temperatures at a 2–4 inch depth decrease to 65°F. This is the period to apply preventive fungicides. Large patch infestation is more severe when the turf has high levels of thatch or is fertilized with nitrogen late in the season.

Management Tips:
- Maintain balanced fertility.
- Avoid nitrogen applications in the late fall through early spring when the pathogen is active.
- Increase the air circulation.
- Avoid overwatering.
- Improve soil drainage.
- Reduce thatch.
- For best results, apply contact or systemic fungicides at no less than 2 gal/1,000 ft^2 to prevent large patch.

Occasionally occurs in: DE, IN, KS, KY, MO, MD, VA, WV.

Frequently occurs in: AL, AR, AZ, CA, FL, GA, LA, MS, NC, NM, OK, SC, TN, TX.

Labeled products:

BannerMaxx II Fungicide | Concert II Fungicide | Headway Fungicide

Heritage Fungicide | Renown Fungicide

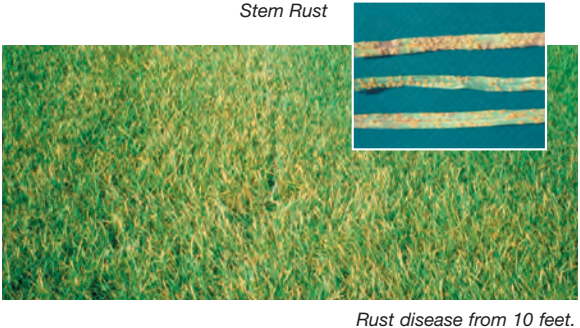
Rusts: Crown, Leaf, Stem, and Stripe

Causal Agent:
Crown—*Puccinia coronata;* Leaf—*Uromyces dactylidis*;
Stem (Black)—*Puccinia graminis;*
Stripe (Yellow)—*Puccinnia striiformis*

Susceptible Turfgrass:
Kentucky bluegrass, annual bluegrass, ryegrass, old bentgrass cultivars, zoysiagrass, bermudagrass, and tall and fine fescue

Symptoms:
Rust diseases cause light yellow flecks initially on the leaf blades and sheaths. The flecks enlarge, elongate, and turn yellow in color. The infected areas rise above the epidermis and then rupture, releasing spores that are yellowish-orange to reddish-brown in color. The leaf blade turns yellow starting at the tip and progressing to the base sheath. A severe disease infection can cause the shoot to turn yellowish to reddish-brown in color and slow in growth. The turf may appear thin as individual shoots die.

Stem Rust



Rust disease from 10 feet.

Conditions Favoring Disease:
Rust diseases typically occur in early spring through fall, depending on the location of the turf. Rusts favor moist, low-light areas. Depending on the species, rusts favor temperatures between 65°F and 86°F. Severe rust infections occur on slow-growing turfgrass, particularly those with low nitrogen levels and/or plant water stress.

Management Tips:
- Convert to a turfgrass species or cultivar (especially for Kentucky bluegrass and perennial ryegrass) that are resistant to rust diseases found in the area.
- Apply adequate levels of nitrogen.
- Remove clippings from turf.
- Reduce thatch.
- Reduce shade and improve air circulation.
- Regulate irrigation to minimize the amount of time moisture remains on the leaf surface. Water deeply and infrequently.
- Use systemic fungicides to control rust diseases on slow-growing grasses and to grasses that are not mowed.

Frequently occurs in: All states.

Labeled products:

BannerMaxx® II Fungicide | Concert® II Fungicide | Daconil® Fungicide
Headway® Fungicide | Heritage® Fungicide | Instrata® Fungicide
Renown® Fungicide

Stripe Smut

Causal Agent:
Ustilago striiformis

Susceptible Turfgrass:
Annual bluegrass and certain varieties of Kentucky bluegrass, perennial ryegrass, and bentgrass

Symptoms:
Plants are stunted and may appear light green or yellow. Leaf blades are stiff, erect and sheaths develop narrow, elongated streaks that are yellowish-green in color. The leaf blade then curls and forms parallel stripes that are gray to black in color and extend the length of the leaf. Infected older leaves will shred, twist, and split, starting at the tips and progressing downward. Infected areas may be concentrated in large areas or scattered across the turf. Eventually, the root growth and tillering of the turf are reduced.

Stripe Smut

Conditions Favoring Disease:
Stripe smut favors temperatures between 50°F and 60°F, typically in the spring and fall. Hot, dry weather and improper fertilization accelerates the disease in older turf.

Management Tips:
- Convert to a turfgrass species or cultivar (especially in Kentucky bluegrass) that is resistant to stripe smut.
- Avoid high levels of nitrogen, especially during the summer.
- Maintain a balanced fertility level.
- Irrigate as needed to prevent drought stress.

Occasionally occurs in: AR, CA, DE, KS, KY, MD, MO, NV, OK, TN, VA.

Frequently occurs in: CO, CT, IA, ID, IL, IN, MA, ME, MI, MN, MT, ND, NE, NH, NJ, NY, OH, OR, PA, RI, SD, UT, VT, WA, WI, WV, WY.

Labeled products:

BannerMaxx II Fungicide | Concert II Fungicide

Gray Snow Mold (*Typhula* Blight)

Causal Agent:
Typhula incarnata, Typhula ishikariensis, Typhula idahoenis, and *Typhula canadensis*

Susceptible Turfgrass:
All species of cool-season turfgrass

Symptoms:
The symptoms of gray snow mold are evident after snow melts. It causes patches that are light brown, gray, or straw-colored and that measure less than 10 inches in diameter. The patches can increase to several feet and coalesce. Rust-, brown-, or black-colored *sclerotia* also appear on the infected leaves.

Gray Snow Mold as seen from 10 feet (right) and 20 feet.

Conditions Favoring Disease:
Snow cover usually is necessary for this disease to cause damage. Gray snow mold is most severe when snow cover lasts more than 90 days.

Management Tips:
- Mow turf regularly until dormancy.
- Avoid heavy applications of water-soluble nitrogen sources in late fall prior to dormancy.
- Prevent excess snow from accumulating by using shrubs, windbreaks, or a snow fence.
- Prevent snow compaction on the turf.
- Remove snow from turf in the spring.
- Lightly fertilize turf in early spring to encourage new growth.
- In the fall, use fungicides prior to snow cover, and in late winter, use them to promote a quick spring recovery if snow cover melts or is removed.

Occasionally occurs in: CA, DE, IL, IN, KS, KY, MD, MO, NC, NV, OR, TN, VA, WV.

Frequently occurs in: CO, CT, IA, ID, MA, ME, MI, MN, MT, ND, NE, NH, NJ, NY, OH, PA, RI, SD, VT, WA, WI, WY.

Labeled products:

Banner Maxx® II Fungicide	Concert® II* Fungicide	Daconil® Fungicide
Headway® Fungicide	Heritage® Fungicide	Instrata® Fungicide
Medallion® Fungicide	Renown®* Fungicide	

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Concert® II and Renown® to control Gray Snow Mold. Please see the specific section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

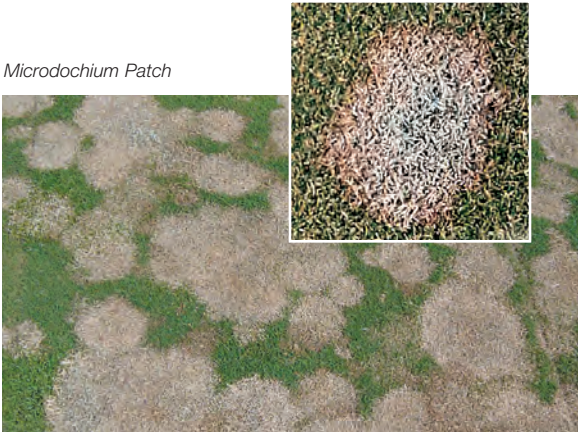
Microdochium Patch
(Pink Snow Mold)

Causal Agent:
Microdochium nivale

Susceptible Turfgrass:
Most species of cool-season turfgrass

Symptoms:
Pink snow mold causes water-soaked patches that are yellow, tan, or salmon-colored and that measure 1 to 8 inches or more in diameter. The patches, which can coalesce, are pale pink around the edges. Spores are produced in white or salmon-colored sporodochia that are found on the dead tissue. Blighting can occur in streaks from spores tracking on the equipment wheels.

Microdochium Patch



Conditions Favoring Disease:
Pink snow mold favors temperatures of less than 60°F. It is more severe where snow has fallen on unfrozen soil or in cold, rainy weather. *Microdochium nivale* is commonly called *Fusarium* patch (see page 46) in the absence of snow cover—but the causal organism is the same.

Management Tips:
- Regularly mow turf until dormancy.
- Avoid heavy applications of water-soluble nitrogen sources in late fall prior to dormancy.
- Maintain balanced fertility.
- Avoid using lime. Alkaline soils enhance disease development.
- Reduce thatch.
- Prevent excess snow from accumulating by using shrubs, windbreaks, or snow fences.
- Apply contact and/or systemic fungicides in the fall and reapply during periods of no snow cover.
- Shade and leaf wetness are also key factors in disease severity.

Occasionally occurs in: AL, AR, AZ, CA, GA, NC, NM, OK, TN, TX, VA.

Frequently occurs in: CO, CT, DE, IA, ID, IL, IN, KS, MA, MD, ME, MN, MO, MT, ND, NE, NH, NJ, NV, NY, OH, OR, PA, RI, SD, UT, VT, WA, WI, WV, WY.

Labeled products:

Banner MAXX II Fungicide | Concert II Fungicide | Daconil Fungicide
Headway Fungicide | Heritage Fungicide | Instrata Fungicide
Medallion Fungicide | Renown* Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control Microdochium Patch. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Brown Ring Patch

Causal Agent:
Waitea circinata var. *circinata/Chrysorhiza circinata* (formerly *Rhizoctonia circinata)*

Susceptible Turfgrass:
Annual bluegrass (*Poa annua)*, Roughstalk Bluegrass (*Poa trivialis*), and creeping Bentgrass

Symptoms:
Yellow regular to irregular rings that may become necrotic from a few inches to a foot or more in diameter. Rings are more often brown versus yellow on creeping Bentgrass. Infection can occur within a temperature range of 60 to 85°F with an optimal range of 75 to 80°F. Continuing infection can degrade thatch resulting in sunken rings. Greenish color can be greater inside the affected yellow rings similar to fairy ring. Can be easily confused with yellow patch (cool weather brown patch), but is more tolerant of higher temperatures. Recovery following curative fungicide applications can be slow. The pathogen can colonize the upper root zone and soil in addition to the thatch similar to fairy ring. Can cause thinning or irregular establishment of creeping Bentgrass and *Poa trivialis* in situations of overseeding of bermudagrass or other warm-season turfgrasses.

Brown Ring Patch

Conditions Favoring Disease:
Moderate temperatures for extended periods within 60 to 85°F range. Use of some fungicides, such as thiophanate-methyl (TM) have no effect on brown ring patch, so disease may persist with slow recovery following fungicide applications of TM. Infection is more common under dry conditions when compared to the brown patch disease which is more prevalent under wet, water-logged conditions. Also, unlike brown patch, elevated nitrogen fertility does not increase brown ring patch severity, but can help alleviate disease symptoms. As such, brown ring patch is more common in low-nitrogen fertility situations.

Management Tips:
- Raise mower height.
- Reduce soil compaction through aerification and use of lightweight equipment.
- Maintain adequate nitrogen and a balanced fertility.
- Avoid drought stress.
- Top-dress and aerate turf, as needed.
- Thatch management—avoid thatch accumulation.
- Avoid use of thiophanate-methyl or other benzimidazoles.
- Apply systemic fungicides on a preventive basis only.

Occurs in: CA, NV, WA, OR, OH, VA, FL, ID, UT, MI, ME, NY, PA, NH, CT, and other states.

Labeled products*:

Banner MAXX II Fungicide | Headway Fungicide | Concert II Fungicide
Heritage Fungicide | Medallion Fungicide | Renown Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of each of these products to control Brown Ring Patch. Please see the specific section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Left photo courtesy Turfgrass Disease Solutions, LLC.
Right photo courtesy S. Kammerer, University of Florida

Leaf & Sheath Spot/Mini Ring

Causal Agent:
Waitea circinata var. *zeae/Chrysorhiza zeae*
(formerly *Rhizoctonia zeae)* and/or
Waitea circinata var. *oryzae/Chrysorhiza oryzae*

Susceptible Turfgrass:
All species of warm- and cool-season turfgrass

Symptoms:
The symptoms of leaf and sheath spot can vary dramatically depending on the grass cultivar, climatic and atmospheric conditions, soil, and intensity of the turfgrass management. This disease typically causes thinned areas resembling scalped areas or semi-circular thinned rings in warm-season turfgrass and can be commonly confused with fairy ring or hydrophobic areas. In cool-season turfgrass, small patches of blighted turfgrass that measure 5 inches or more in diameter may exist in conjunction with brown patch. The disease can often have a darker red/orange hue to the infected turfgrass. Leaf spots may, but oftentimes do not, occur. These thin areas can also be slower to respond to fungicides as the disease is most active at high temperatures which can impede turfgrass re-growth.

Leaf and sheath spot

Conditions Favoring Disease:
Symptoms of leaf and sheath spot do not occur as fast as with brown patch or large patch (*R. solani*), nor do they occur in the same conditions. Infection is most f avored by high canopy temperatures of 83°–97°F. This disease can be quite active in the heat of the summer when temperatures in the turfgrass canopy exceed the 100°F range. Turfgrass that is stressed from drought and over-reliance on irrigation with poor quality water high in carbonates and salinity is more subject to infection. This can be a seemingly hot, dry weather disease as humidity or moisture within the crown is all that is necessary for infection.

Management Tips:
- Maintain or apply nitrogen if levels are low.
- Increase the height of cut on greens, especially during drought conditions.
- Increase the air circulation.
- Irrigate turf early in the day.
- Manage or leach salts periodically with heavy irrigation events.
- Reduce thatch.
- Use fans when practical to improve air flow and lower canopy temperatures.
- For best results, use contact or systemic fungicides to prevent brown patch.
- For curative control, use systemic fungicides at water volumes no less than 2 gal/1,000 ft^2.

Frequently occurs in: All states.

Labeled products:

Daconil® Fungicide | Headway® Fungicide | Heritage® Fungicide | Renown® Fungicide

Instrata® Fungicide | BannerMaxx® II* Fungicide | Medallion®* Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Banner MAXX® II and Medallion® to control Leaf & Sheath Spot/Mini Ring. Please see the specific section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

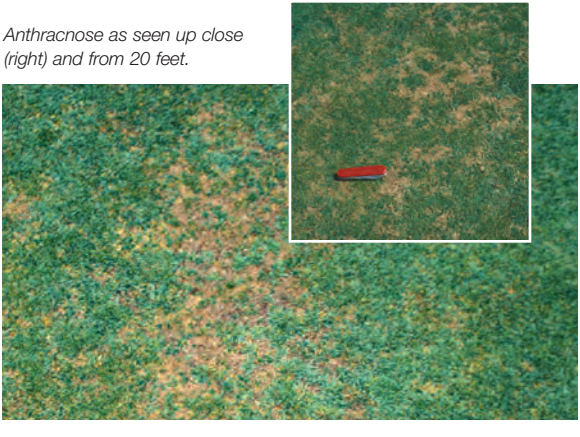
Anthracnose

Causal Agent:
Colletotrichum cereale
(formerly *Colletotrichum graminicola*)

Susceptible Turfgrass:
Annual bluegrass and creeping bentgrass

Symptoms:
Anthracnose is most destructive during warm weather. It causes irregularly shaped patches that are yellow to brown in color. Leaf lesions that are yellow with black centers may also occur. Anthracnose also causes a basal stem rot from late winter to fall. Infected shoots are easily detached. The dead foliage and stems also become covered with acervuli—tiny, spined, black fruiting bodies—that require magnification to identify.

Anthracnose as seen up close (right) and from 20 feet.



Conditions Favoring Disease:
Anthracnose favors temperatures over 78°F. It occurs in areas that experience more than 10 hours a day of leaf wetness for several consecutive days. Conditions that stress turfgrass plants, such as soil compaction, poor drainage, low mowing height, and low amounts of nitrogen fertility also contribute to this disease.

Management Tips:
- Increase the height of cut.
- Minimize stress by using walk-behind mowers.
- Decrease the amount of foot traffic.
- Maintain adequate nitrogen and a balanced fertility level.
- Irrigate the turfgrass just enough to prevent wilting.
- Do not core aerate while disease symptoms are present.
- Core aerate and overseed in the fall.
- Convert from annual bluegrass to less susceptible varieties of turfgrass in the fairways.
- Make preventive fungicide applications where the disease is a chronic problem.

Occasionally occurs in: AL, AR, AZ, CA, CO, FL, GA, IA, ID, LA, ME, MN, MS, MT, NC, ND, NE, NH, NM, NV, NY, OR, SC, SD, TX, UT, VT, WA, WY.

Frequently occurs in: CT, DE, IL, IN, KS, KY, MA, MD, MI, MO, NJ, OK, PA, RI, TN, VA, WV.

Labeled products:

BannerMaxx® II Fungicide	Concert® II Fungicide	Daconil® Fungicide
Headway® Fungicide	Heritage® Fungicide	Instrata® Fungicide
Medallion® Fungicide	Renown® Fungicide	

Bentgrass Dead Spot

Causal Agent:
Ophiosphaerella agrostis

Susceptible Turfgrass:
Creeping bentgrass and bermudagrass

Symptoms:
Bentgrass dead spot begins as small, sunken reddish-brown or orange-rust spots about 1/2 inch in width, growing to about 3–4 inches. Typically, there's some tan tissue in the center and reddish-brown leaves at the edges, possibly developing a green center if left untreated. Distinctive black fruiting bodies of the fungus are readily seen with a hand lens.

Bentgrass Dead Spot

Conditions Favoring Disease:
Open, sunny locations and hot, dry weather favor development. Dead spot most often strikes greens that were newly constructed or renovated and that were built with large amounts of sand. Disease is not known to occur in native soils. The disease naturally declines and it is rarely seen on greens older than six years.

Management Tips:
- Maintain balanced fertility.
- Avoid turf stress and excessive traffic.
- Apply water-soluble fertilizers to stimulate growth of surrounding healthy creeping bentgrass.
- Apply contact and/or systemic fungicides on a preventive basis.

Occasionally occurs in: FL, MO, TX.

Frequently occurs in: CT, DE, IL, IN, KY, MA, MD, MI, NC, NJ, NY, OH, PA, RI, VA, WV.

Labeled products:

Headway® Fungicide | Medallion® Fungicide

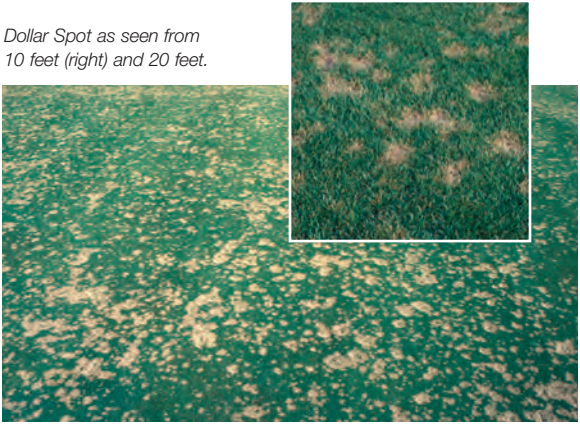
Dollar Spot

Causal Agent:
Sclerotinia homoeocarpa

Susceptible Turfgrass:
All species of warm- and cool-season turfgrass

Symptoms:
Dollar spot causes sunken, circular patches that measure up to 2 inches in diameter on golf greens and several inches on higher mown turf. The patches turn from brown to straw color and may eventually coalesce, forming irregularly shaped areas. Infected leaves may display small lesions that turn from yellow-green to straw color with a reddish-brown border. The lesions can extend the full width of the leaf. Multiple lesions may occur on a single leaf blade.

Dollar Spot as seen from 10 feet (right) and 20 feet.



Conditions Favoring Disease:
Dollar spot is favored by temperatures between 59°F to 86°F and continuous high humidity. This disease is particularly favored by warm days, cool nights, and intense dews. It also infects areas with low levels of nitrogen and becomes more severe in dry soils.

Management Tips:
- Use an adequate level of nitrogen, particularly in the spring and early summer.
- Mow grass at regular intervals.
- Reduce thatch.
- Increase the air circulation.
- Irrigate turf deeply and as infrequently as possible to avoid drought stress.
- Remove dew from the turf early in the day.
- Convert to a turfgrass cultivar (especially for bentgrass) that is more tolerant to dollar spot.
- Apply contact and/or systemic fungicides on a preventive basis.

Occasionally occurs in: CA, OR, WA.

Frequently occurs in: AL, AR, AZ, CO, CT, DE, FL, GA, IA, ID, IL, IN, KS, LA, MA, MD, ME, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, OH, OK, PA, RI, SC, SD, TN, TX, UT, VA, VT, WI, WV, WY.

Labeled products:

BannerMaxx® II Fungicide | Concert® II Fungicide | Daconil® Fungicide
Headway® Fungicide | Instrata® Fungicide | Renown® Fungicide

Fusarium Patch
(Microdochium Patch)

Causal Agent:
Microdochium nivale (same species that causes pink snow mold)

Susceptible Turfgrass:
Most species of cool-season turf

Symptoms:
Fusarium patch causes patches that are yellow or reddish-brown in color and 1 inch to 6 inches in diameter. The periphery of the patches are reddish-brown or pink in color. "Smoke rings"—thin, brown borders around the diseased patches that appear only in the early morning—can occur. The patches occur in cool, wet weather. Blighting in streaks can also occur as a result of spore tracking on equipment wheels.

Fusarium *Patch*

Conditions Favoring Disease:
Fusarium patch thrives in temperatures less than 60°F (but above 32°F) and in locations that experience more than 10 hours a day of foliar wetness for several consecutive days. It also favors areas high in nitrogen fertility and low in phosphorous and potash. *Fusarium* patch also infects areas with slow growing conditions and heavy thatch. *Microdochium nivale* is termed *Fusarium* patch when it occurs in the absence of snow cover.

Management Tips:
- Maintain balanced fertility but avoid urea sources of nitrogen.
- Avoid using lime. Alkaline soils enhance disease development.
- Increase air circulation to speed turf's drying process.
- Minimize the amount of shade.
- Reduce thatch.
- Apply fungicides prior to or at the first signs of disease. Turf recovery is more likely in the fall.
- Make additional fungicide applications as needed during the winter (without snow cover). Turf recovery is slow during the winter so maintain a fungicide program to reduce turf damage.

Occasionally occurs in: AL, AR, AZ, CA, FL, GA, LA, MS, NC, NM, OK, SC, TX.

Frequently occurs in: CO, CT, DE, IA, ID, IL, IN, KS, KY, MA, MD, ME, MI, MN, MO, MT, ND, NE, NH, NJ, NV, NY, OH, OR, PA, RI, SD, TN, UT, VA, VT, WA, WI, WV, WY.

Labeled products:

BannerMaxx II Fungicide | Concert II Fungicide | Daconil Fungicide
Headway Fungicide | Heritage Fungicide | Instrata Fungicide
Medallion Fungicide | Renown Fungicide

Gray Leaf Spot

Causal Agent:
Pyricularia grisea

Susceptible Turfgrass:
St. Augustinegrass, perennial ryegrass, tall fescue, and centipedegrass

Symptoms:
The symptoms of gray leaf spot vary depending on the grass cultivar. On St. Augustinegrass, gray leaf spot first appears as small, brown spots on the leaves and stems. The spots quickly enlarge to approximately 1/4 inch in length and become bluish-gray in color and oval or elongated in shape. The mature lesions are tan to gray in color and have depressed centers with irregular margins that are purple to brown in color. On perennial ryegrass and tall fescue, symptoms first appear as small, water-soaked lesions that turn brown. Lesions may have a yellow halo. The leaf tips will have a twisted or fishhook shape.

Gray Leaf Spot

Conditions Favoring Disease:
Gray leaf spot favors temperatures between 80°F to 90°F. It is also found in areas with high nitrogen levels and that are stressed by various factors, including drought and soil compaction. This disease is most severe during extended hot and humid periods.

Management Tips:
- Avoid medium to high nitrogen levels during mid-summer.
- Irrigate turf deeply and as infrequently as possible to avoid water stress.
- Allow water to remain on leaves for only a short period of time.
- Reduce thatch by vertical cutting.
- When possible, plant turfgrass that is resistant to gray leaf spot.
- Avoid using herbicides or plant growth regulators when the disease is active.
- Apply contact and/or systemic fungicides on a preventive basis.

Occasionally occurs in: CT, KS, MA, NE, NH, NY, OK, RI, TX, VT.

Frequently occurs in: AL, AR, DE, FL, GA, IL, IN, KY, LA, MD, MO, MS, NC, NJ, OH, PA, SC, TN, VA, WV.

Labeled products:

BannerMaxx® II Fungicide	Concert® II Fungicide	Daconil® Fungicide
Headway® Fungicide	Heritage® Fungicide	Instrata® Fungicide
Medallion® Fungicide	Renown® Fungicide	

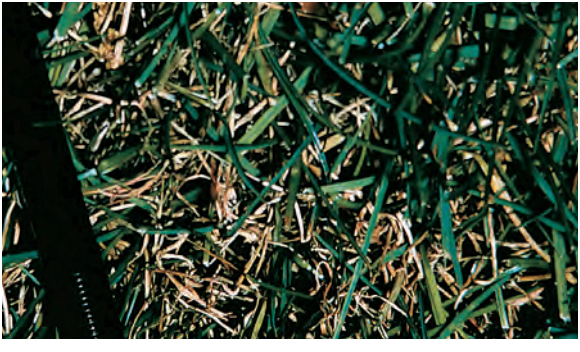
Leaf Spot/Melting-Out

Causal Agent:
Drechslera spp. and/or *Bipolaris* spp.

Susceptible Turfgrass:
Creeping red fescue, Kentucky bluegrass, annual bluegrass, perennial ryegrass, tall fescue, and some varieties of bentgrass and bermudagrass

Symptoms:
Leaf spot (melting-out) causes purplish-brown to black spots with tan centers on the leaf blade and sheath. The lower leaves of the infected plants become shriveled and blighted. When melting-out infection is severe, almost all of the leaves and tillers die, causing severe thinning of the stand—or melting-out. On cool-weather turfgrass, melting-out typically follows the appearance of leaf spots.

Melting-Out



Conditions Favoring Disease:
Leaf spot favors temperatures between 40°F and 80°F. It occurs in areas that experience more than 10 hours a day of foliar wetness for several consecutive days. It also favors high amounts of nitrogen and a low mowing height.

Management Tips:
- Increase the height of cut.
- Reduce turf stress by using lightweight equipment.
- Avoid the application of high rates of water-soluble nitrogen in the spring.
- Minimize the amount of shade.
- Irrigate turf deeply and as infrequently as possible.
- Reduce thatch in the early spring or fall for cool-season turfgrass and in the summer for warm-season turfgrass.

Frequently occurs in: All states.

Labeled products:

Banner MAXX II Fungicide	Concert II Fungicide	Daconil Fungicide
Headway Fungicide	Heritage Fungicide	Instrata Fungicide
Medallion Fungicide	Renown Fungicide	

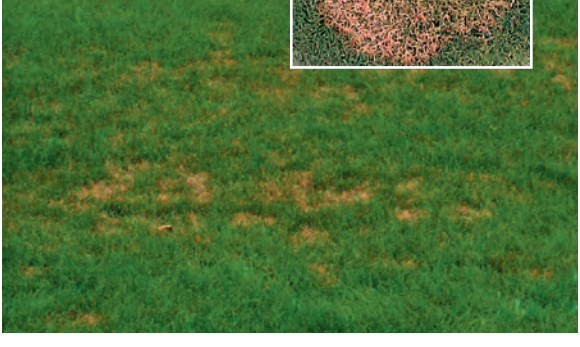
Red Thread and Pink Patch

Causal Agent:
Red thread—*Laetisaria fuciformis*
Pink patch—*Limonomyces roseipellis*

Susceptible Turfgrass:
All turfgrasses, but particularly severe on fine-leaf fescue, and perennial ryegrass

Symptoms:
Red thread causes patches that are reddish-brown in color and 1 to 4 inches in diameter up to 2 feet. Pink patch causes a gelatinous mass of pink mycelium with water-soaked leaves.

Red Thread



Red Thread at 20 feet.

Conditions Favoring Disease:
Red thread thrives in temperatures between 40°F to 85°F and in locations that are low in nitrogen. It also occurs in areas that experience more than 10 hours a day of foliar wetness for several consecutive days.

Pink patch usually develops in the presence of red thread. These two similar diseases often occur under the same conditions and at the same times. It is distinguished from red thread by the absence of "red threads," or sclerotia.

Management Tips:
- Mow turf frequently and collect clippings to remove diseased portions of the leaves.
- Maintain adequate nitrogen and a balanced fertility.
- Apply moderate to high amounts of phosphorous and potash.
- Maintain the soil pH between 6.5 to 7.0.
- Reduce shade.
- Increase the air circulation to the turf's drying process.
- Irrigate turf deeply and as infrequently as possible.
- Use fungicides to control disease when it is a chronic problem.

Occasionally occurs in: *Red Thread:* AL, AR, AZ, CA, FL, GA, LA, MS, NM, OK, SC, TX. *Pink Patch:* AR, AZ, CA, NM, OK, TX.

Frequently occurs in: *Red Thread and Pink Patch:* CO, CT, DE, IA, ID, IL, IN, KS, KY, MA, MD, ME, MI, MN, MO, MT, ND, NE, NH, NJ, NV, NY, OH, OR, PA, RI, SD, UT, VA, VT, WA, WI, WV, WY.

Labeled products:

BannerMaxx® II Fungicide | Concert® II Fungicide | Daconil® Fungicide
Headway® Fungicide | Heritage® Fungicide | Instrata® Fungicide
Renown® Fungicide

Southern Blight

Causal Agent:
Sclerotium rolfsii Sacc.

Susceptible Turfgrass:
Bentgrass, bluegrass, bermudagrass, ryegrass, and tall fescue

Symptoms:
Most common in warm regions. Symptoms begin as yellow circular patches, becoming chlorotic, then reddish-brown. Patches become thin through the summer, with grass being killed in rings that may grow to several feet. Mycelium may be visible on the ring edges when moisture is present. White sclerotia are produced in large numbers on dead grass, becoming yellow-brown with age. Frog-eye or crescent-shaped patches are common.

Southern Blight

Conditions Favoring Disease:
Sclerotia germinate above 75°F. Disease is most severe at 77–95°F. Day temperatures above 85°F and nighttime temperatures above 70°F favor southern blight development. Disease is most severe under hot, moisture saturated conditions such as wet weather following a drought period. Soils with pH below 6.5 and soils with high organic matter also encourage this disease. Mycelium move rapidly and extensively through thatch or soil, and are easily spread to non-infected turf.

Management Tips:
- Reduce thatch by verticutting or core aerification.
- Lime to raise pH above 7.
- Ammonium sulfate on greens and tees as a nitrogen source.
- Apply registered fungicides on a preventive basis.

Occasionally occurs in: CO, DE, KS, KY, MD, MO, NV, UT, VA, WV.

Frequently occurs in: AL, AR, AZ, CA, FL, GA, LA, NC, NM, OK, SC, TN, TX.

Labeled products:

Headway® Fungicide | Heritage® Fungicide | Renown® Fungicide

Yellow Patch/ Cool Season Brown Patch

Causal Agent:
Ceratorhiza cerealis (formerly *Rhizoctonia cerealis*)

Susceptible Turfgrass:
Bentgrass, annual bluegrass, perennial ryegrass, bermudagrass

Symptoms:
The symptoms of yellow patch (cool season brown patch) can vary depending on the grass cultivar, climatic and atmospheric conditions, soil, and intensity of the turfgrass management. This disease occurs from the fall through the spring or as the warm-season grasses approach or break dormancy, generally when air temperatures average 50°–65°F. It causes rings and patches or circular patches that are yellow, light-brown, or reddish-brown in color and that measure 5 inches to several feet in diameter. Leaf lesions rarely occur and gray "smoke rings"—thin borders around the diseased patches—sometimes occur. Damage is generally superficial, but thinning can occur during prolonged periods of wet weather in late winter and early spring. Yellow patch can also be a problem on overseeded greens (*Poa trivialis*) in the southern states.

Yellow Patch

Conditions Favoring Disease:
Yellow patch favors temperatures less than 60°F. It also occurs in areas that experience more than 10 hours a day of foliar wetness for several consecutive days. This disease is more severe in turfgrass with excessive thatch and high nitrogen levels.

Management Tips:
- Improve soil drainage.
- Use low to moderate amounts of nitrogen, moderate amounts of phosphorous, and moderate to high amounts of potash.
- Increase the air circulation.
- Minimize the amount of shade.
- Reduce thatch.
- Use contact or systemic fungicides preventively for best results.

Occasionally occurs in: AZ, CA, CO, CT, IA, ID, IL, IN, KS, MA, ME, MI, MN, MO, MT, ND, NE, NH, NM, NV, NY, OH, OR, PA, RI, SD, VT, WA, WI, WV, WY.

Frequently occurs in: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, NJ, OK, SC, TN, TX, VA.

Labeled products:

BannerMaxx® II Fungicide | Daconil® Fungicide | Headway® Fungicide
Heritage® Fungicide | Instrata® Fungicide | Medallion® Fungicide
Renown® Fungicide

Algae

Susceptible Turfgrass:
All turfgrass species mainly found on golf and bowling greens

Symptoms:
Green or bluish-black in color, typically forming a thick mat on the ground surface. It can be peeled off, when dry.

Algae

Conditions Favoring Disease:
Algae is very competitive in cool, moist, shaded locations. High surface moisture, inadequate drainage, and insufficient light and air movement also promote the growth of algae, as well as low fertility, high soil acidity, soil compaction, and excessive thatch. Algae can also be more problematic when using surface or retention pond water as often the algae may be present in the pond water. Some algal species are known to produce toxins which may contribute to turfgrass thinning.

Management Tips:
- Increase mowing height and nitrogen fertility.
- Improve drainage and avoid frequent, shallow watering.
- Aerify compacted soils.
- In areas with less sunlight, plant shade tolerant grasses.
- Trim back shady trees and shrubs to increase air movement and light penetration.

Frequently occurs in: All states.

Labeled products:

Concert® II Fungicide | Daconil® Fungicide | Renown® Fungicide

Medallion®* Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for use of Medallion® to control Algae. Please see the section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Pathogen	COMBINATION FUNGICIDES				SPECIALTY FUNGICIDES				
	Concert II Fungicide	Headway Fungicide	Instrata Fungicide	Renown Fungicide	BannerMaxx II Fungicide	Daconil Fungicide	Heritage Fungicide	Medallion Fungicide	SubdueMaxx Fungicide
Necrotic Ring Spot		✔		e	✔		✔		
Pink Snow Mold	✔	✔	✔	e	✔	✔	✔	✔	
Powdery Mildew	✔	✔		✔	✔		✔		
Pythium Blight		✔		e			✔		✔
Pythium Root Rot (Dysfunction)		✔		e			✔		✔
Red Thread/ Pink Patch	✔	✔	✔	✔	✔	✔	✔		
Rust	✔	✔	✔	✔	✔	✔	✔		
Southern Blight		✔		✔			✔		
Spring Dead Spot		✔			✔		✔		
Stripe Smut	✔				✔				
Summer Patch		✔	✔	e	✔		✔	✔	
Take-all Patch	✔	✔		e	✔		✔		
Yellow Patch/Cool Weather Brown Patch		✔	✔	✔	✔	✔	✔	✔	
Yellow Tuft									✔
Zoysia Patch		✔		✔			✔		

An "e" in the chart designates that Syngenta supports FIFRA Section 2(ee) recommendations for use of the noted products to control the corresponding disease.
Please see the Section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

Syngenta has a solution for every major turf disease. This chart contains labeled product options for key diseases and is an excellent reference for preventive treatment.

	COMBINATION FUNGICIDES				SPECIALTY FUNGICIDES				
Pathogen	Concert II Fungicide	Headway Fungicide	Instrata Fungicide	Renown Fungicide	BannerMaxx II Fungicide	Daconil Fungicide	Heritage Fungicide	Medallion Fungicide	SubdueMaxx Fungicide
Algae	✓			✓		✓		e	
Anthracnose	✓	✓	✓	✓	✓	✓	✓	✓	
Bentgrass Dead Spot		✓						✓	
Brown Patch	✓	✓	✓	✓	✓	✓	✓	✓	
Brown Ring Patch	e	e		e	e		e	e	
Copper Spot	✓			✓		✓			
Dollar Spot	✓	✓	✓	✓	✓	✓			
Fairy Ring		✓		e			✓		
Gray Leaf Spot	✓	✓	✓	✓	✓	✓	✓	✓	
Gray Snow Mold	✓	✓	✓	e	✓	✓	✓	✓	
Large Patch	✓	✓		✓	✓		✓		
Leaf & Sheath Spot/ Mini Ring		✓	✓	✓	e	✓	✓	e	
Leaf Spot	✓	✓	✓	✓	✓	✓	✓	✓	
Melting Out	✓	✓	✓	✓	✓	✓	✓	✓	
Microdochium Patch (*Fusarium* Patch)	✓	✓	✓	✓	✓	✓	✓	✓	

Combination Fungicides

Renown® Fungicide

GROUP	M5	CHLOROTHALONIL
GROUP	11	AZOXYSTROBIN

- No compromise contact and systemic protection
- A resistance management option even during summer stress periods
- Proprietary stick-and-stay technology
- Excellent control of tough turf diseases from root to leaf tip

Headway® Fungicide

GROUP	3	PROPICONAZOLE
GROUP	11	AZOXYSTROBIN

- Green and fairway fungicide with dual modes of action
- Controls major turf diseases, including brown patch and dollar spot
- Low 0.75 oz/1,000 ft^2 rate for cost-effective fairway control

Instrata® Fungicide

GROUP	3	PROPICONAZOLE
GROUP	M5	CHLOROTHALONIL
GROUP	12	FLUDIOXONIL

- Provides excellent control of snow mold
- Broad-spectrum disease control, including anthracnose, dollar spot, gray leaf spot, summer patch, and more
- Multiple active ingredients to optimize efficacy and resistance management
- Multiple modes of action for both contact and systemic protection

Concert® II Fungicide

GROUP	3	PROPICONAZOLE
GROUP	M5	CHLOROTHALONIL

- Ideal disease control for the entire course
- Dual modes of action, both contact and systemic
- Outstanding dollar spot protection at low rates
- Efficient and economical control of 13 prevalent turf diseases

BannerMaxx® II Fungicide

GROUP 3 PROPICONAZOLE

- Premier fungicide for preventive dollar spot control
- Broad-spectrum protection against summer patch, brown patch, and many other diseases
- Carries the *Caution* signal word
- Virtually no odor, in a highly compatible, easy-mixing MAXX® formulation

Daconil® Fungicide

GROUP M5 CHLOROTHALONIL

- No. 1 contact turf fungicide, with proven disease control
- An important tank-mix/rotation partner
- Effective in resistance management programs
- Premium, proven leading-edge formulation technology—sticks and stays
- Available as a WDG, flowable, and flowable with zinc formulations—efficacious against algae/cyanobacteria

Heritage® Fungicide

GROUP 11 AZOXYSTROBIN

- Maximizes disease control from root to leaf tip
- Broad-spectrum control of the toughest turf diseases
- Delivers total systemic control (roots, stolons, shoots) at every stage of pathogen's life cycle
- Available in a highly soluble, spreadable granule, a water-dispersible granule, and fast-acting turf liquid

Medallion® Fungicide

GROUP 12 FLUDIOXONIL

- Controls snow molds, anthracnose, brown patch, and bentgrass dead spot in turf
- Contact fungicide
- Unique mode of action allows for key use as a resistance management tool

SubdueMaxx® Fungicide

GROUP 4 MEFENOXAM

- The industry standard for *Pythium* control at an economical cost
- A great partner to a *Pythium* prevention program
- Leading-edge MAXX formulation technology
- Excellent root protection and systemic uptake

Syngenta supports FIFRA Section 2(ee) recommendations for use of Banner MAXX® II, Headway®, Concert® II, Heritage®, Medallion®, and Renown® to control Brown Ring Patch. Syngenta supports FIFRA Section 2(ee) recommendations for use of Renown® to control Necrotic Ring Spot, Pink Snow Mold, *Pythium* Blight, *Pythium* Root Rot, Summer Patch, Take-all Patch, Fairy Ring, and Gray Snow Mold. Syngenta supports FIFRA Section 2(ee) recommendations for use of Concert® II to control Algae and Gray Snow Mold. Syngenta supports FIFRA Section 2(ee) recommendations for use of Banner MAXX® II and Medallion® to control Leaf and Sheath Spot/Mini Ring. Please see the specific section 2(ee) Recommendation to confirm that the recommendation is applicable in your state.

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