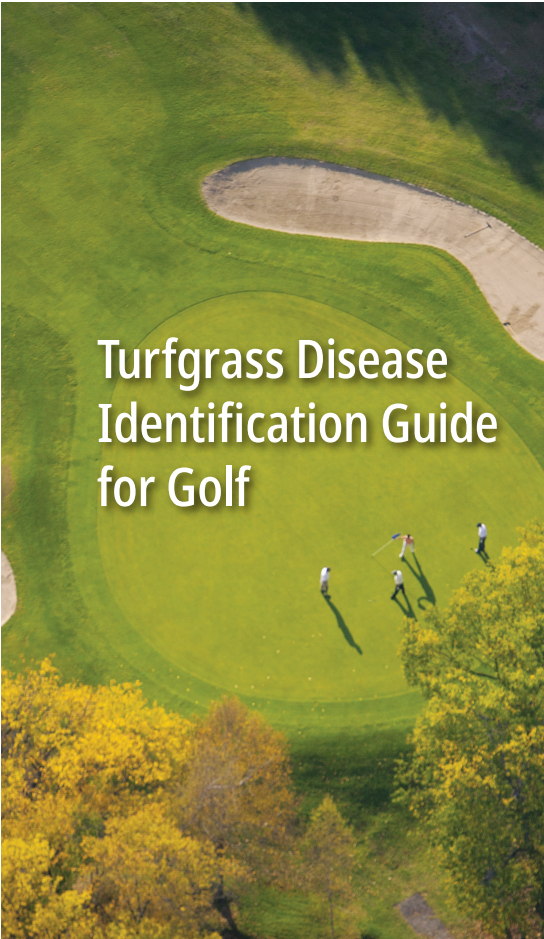




Turfgrass Disease Identification Guide for Golf

syngenta.



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Darkly Pigmented Ectotrophic Root Infecting Fungi

Necrotic Ring Spot

Causal Agent:

Ophiosphaerella korrae

Susceptible Turfgrasses:

Kentucky bluegrass and creeping red fescue

Symptoms:

Necrotic ring spot (NRS) first appears as small, light-green spots and progresses to thinned, circular patches approximately **90cm to 38cm** in diameter. Patches can expand up to **7.5cm** in diameter; eventually turn brown or straw-colored. The “frog-eye” symptom of living grass within a ring may be prominent, but arcs and rings can be diffuse, especially in red fescue. Disease is severe in shaded and sunny areas in bluegrass, but mostly restricted to shade for red fescue.

The pathogen attacks roots and rhizomes, and there are no distinctive leaf lesions or foliar mycelium. Roots of infected plants turn brown to black.

*Large rings and frog-eyes of NRS in sunny Kentucky bluegrass.
Courtesy of N. Tisserat*

Diffuse NRS rings in shaded Kentucky bluegrass



Necrotic Ring Spot

Conditions Favoring Disease:

Necrotic ring spot typically develops in moist areas in spring, but may not become apparent until heat and drought stresses place a lethal stress on infected roots in the summer. Seeded, as well as sodded sites, in newly cleared woodlands/sub-divisions are most susceptible, but older stands also are prone to damage, especially red fescue. Compacted soil, shade, high soil pH and high nitrogen fertility promote the disease.

Management Tips:

- Minimize shade!
- Raise mowing height.
- Reduce soil compaction through core aeration.
- Maintain adequate nitrogen and balanced phosphorous and potassium fertility.
- Avoid drought stress.
- Reduce thatch.
- Overseed with resistant cultivars or immune species (e.g., perennial ryegrass, and hard or tall fescue) where appropriate.
- Apply a proper systemic fungicide in late fall on a preventive basis where the disease is chronic.

Regions: Mostly Rocky Mountain states and Pacific Northwest; less common in the Northeast and Midwest; and uncommon in the Mid-Atlantic and transition areas.

Recommended Products:



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

Darkly Pigmented Ectotrophic Root Infecting Fungi

Spring Dead Spot (SDS)

Causal Agent:

Ophiosphaerella korrae, *Ophiosphaerella herpotricha* and
Ophiosphaerella narmari

Susceptible Turfgrass:

Bermudagrass, zoysiagrass and buffalograss

Symptoms:

Infected turf shows disease symptoms as they emerge from winter dormancy. SDS appears as bleached, straw-colored, circular patches that measure from 15cm to a few meters. Roots of affected plants shorten and turn dark-brown to black. Sometimes there is living grass in the center of patches (i.e., “frog-eye” symptom). Patches may be solitary or numerous and widespread.

Spring dead spot in a hybrid bermudagrass fairway



Spring Dead Spot

Conditions Favoring Disease:

SDS pathogens are favored by cool, wet weather in the fall when soil temperatures are below **21°C** followed by a cold winter. Significant levels of SDS may follow a mild winter, especially in highly susceptible cultivars. This disease is typically found where thatch is more than 1.5cm thick and in exposed locations. Heavy applications of nitrogen in late summer or fall increase disease severity. SDS is more severe in bermudagrass that is over three years old and in locations with long winter dormancy periods.

Management Tips:

- Avoid high amounts of late-summer or fall applications of nitrogen fertilizers. Modest amounts of nitrogen (**i.e < 36 grams N/ 100 m²**) in late summer do not appear to enhance the disease.
- Potassium should also be applied in the fall where the disease is chronic to boost winter hardiness.
- Apply ammonium sulfate or other acidifying nitrogen sources combined with potassium at spring green-up and thereafter until full recovery has been achieved.
- It is very important to control competing weeds in affected turf to enhance recovery of patches.
- Improve drainage and reduce thatch.
- Use hybrid bermudagrass cultivars with good winter hardiness (e.g., Latitude 36™, others).
- Apply preventive fungicides in the fall when soil temperatures are below 22°C. Two applications on a 28-day interval are recommended in most cases.

Regions: SDS occurs in bermudagrass where winter dormancy occurs. SDS is more severe in regions where winters are cold and there is a long dormancy period. SDS in buffalograss is uncommon and mostly occurs in southwestern transition areas.

Recommended Products:



*Syngenta supports a FIFRA Section 2(ee) recommendation for the use of Velista to control spring dead spot. Please see the section 2(ee) recommendation to confirm that the recommendation is applicable in your state.

Darkly Pigmented Ectotrophic Root Infecting Fungi

Summer Patch

Causal Agent:

Magnaporthiopsis poae

Susceptible Turfgrass:

Annual bluegrass, Kentucky bluegrass, and creeping red fescue; creeping bentgrass in transition zone areas.

Symptoms:

In Kentucky bluegrass, patches initially appear as slow-growing, thinned or wilted turfgrass. Tips of leaves are bleached-white (and can mimic dollar spot), and eventually spots/patches grow and turn yellow or straw-colored. As disease progresses, affected areas appear as circular or irregularly shaped patches that measure from several inches to 45cm diameter. Active patches are bronze-colored at periphery, then turn straw or tan-colored. Patches may become sunken and coalesce as they increase in size. Symptoms may exhibit a distinct ring “frog-eye” appearance, but mostly where a less susceptible grass species survives inside patches.

In annual bluegrass on greens, yellow rings, ribbons or spots may appear. In severe cases, infected areas are typically reddish-brown or bronze and creeping bentgrass is unaffected. Where there is a good mix with bentgrass, the disease begins at the interface between species and any “frog-eyes” are due to creeping bentgrass colonizing the center of older patches. Creeping bentgrass is susceptible to summer patch in the transition zone, particularly in high pH soils or where nematode populations are high.

Summer Patch

*Summer patch
devastating annual
bluegrass, but
not bentgrass in
a green.
Courtesy of
Pete Dernoeden, Ph.D.*



*Summer Patch in
a mixed annual
bluegrass-bentgrass
fairway.
Courtesy of K. Hopp*



*Summer patch in
Kentucky bluegrass.
Courtesy of
Pete Dernoeden, Ph.D.*



Summer Patch

Conditions Favoring Disease:

Root infection is initiated when soil temperatures exceed **18°C**; however, foliar symptoms are favored by day air temperatures over **29°C** and nights over **21°C**. Symptoms become noticeable during periods of summer heat and usually in areas of mostly full sun; the disease is far less common in shaded areas. Slopes and low areas prone to flooding are especially vulnerable. In greens, it is commonly found in areas that are sunny, exposed, and wet, such as in surface water drainage patterns. Compacted areas and soil pH > 6.8 favor the disease.

Management Tips:

- Use acidifying nitrogen fertilizers at appropriate times of year.
- Spoon-feed greens after disease subsides to promote bentgrass growth into damaged areas.
- Increase height of cut.
- Use lightweight equipment on affected greens.
- Avoid light and frequent irrigation; excessively wet soils favor the disease.
- Improve water drainage and air circulation.
- Convert to resistant species, such as tall fescue, bentgrass, or perennial ryegrass where appropriate.
- Preventively apply on a 21-28 day interval beginning in late-spring (i.e., mid-May most regions) until early August. Do not expect 100% disease control. Where chronic, use lower labeled rates on 14-day intervals. Application timing coincides with 18°C soils temperatures for three consecutive days at a 5cm depth.

Regions: Wherever Kentucky and annual bluegrass, and creeping red fescue are grown, but is most common in transition zone regions. May occur in creeping bentgrass greens in southern areas.

Recommended Products:



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

Darkly Pigmented Ectotrophic Root Infecting Fungi

Take-all Patch

Causal Agent:

Gaeumannomyces graminis var. *avenae*

Susceptible Turfgrass:

Creeping and colonial bentgrasses

Symptoms:

Take-all patch symptoms initially appear as small, circular reddish-brown spots. While infection of roots occurs during cool, wet weather in spring or fall, symptoms are most evident during periods of heat stress in rapidly drying soils due to dysfunction of infected roots. Symptoms progress to wilted (especially noted early a.m. in dew patterns), circular patches that are blue-gray, red-brown or bronze-colored. Patches can measure up to several feet in diameter. As bentgrass ages, or in less severe cases, patches often appear yellow (i.e., take-all decline).

Bronze to reddish-brown take-all patches in bentgrass. Courtesy of Pete Dernoeden, Ph.D.



Take-all Patch

In unusual cases, take-all patch may become chronic for many years and patches can exceed 90cm diameter.



Take-all patches that appear yellow indicate the disease is in decline.



Photos courtesy of Pete Dernoeden, Ph.D.

Take-all Patch

Conditions Favoring Disease:

Root infection typically begins during cool and wet weather between fall and spring and in areas with a root zone soil pH > 6.5. Take-all is most common in new sand-based rootzone constructions or where woodlands have been recently cleared. The disease typically appears in the second year following establishment. Severity normally decreases as bentgrass matures over a 2 to 5 year period, but in rare cases it can remain a chronic problem and patches may exceed 3' in diameter. Take-all can recur sporadically on much older sites when there is abnormally high rainfall in late winter and spring.

Management Tips:

- Ammonium sulfate used in conjunction with manganese sulfate has been shown to reduce take-all severity.
- Improve water drainage.
- Reduce thatch.
- In chronically severe cases, acidification of irrigation water may be necessary.
- Apply a proper systemic fungicide preventively twice in the fall with a follow-up application in early spring after the first mowing until decline is complete.
- Curative fungicide applications are far less effective.

Regions: Take-all occurs wherever bentgrasses are grown, but is most common in the Northeast, mid-Atlantic, Midwest, and Pacific Northwest.

Recommended Products:



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

Darkly Pigmented Ectotrophic Root Infecting Fungi

Take-all Root Rot

Causal Agent:

Gaeumannomyces graminis var. *graminis*

Susceptible Turfgrass:

Warm-season grasses including bermudagrass, St. Augustinegrass, seashore paspalum and kikuyugrass

Symptoms:

Symptoms appear in patches or rings up to several feet in diameter. Patches may coalesce to form large irregularly shaped areas, especially where turf is stressed from traffic, poor drainage, or shade. Affected turf initially shows symptoms of reduced growth, chlorosis, or leaf dieback. As the turf continues to decline it may turn tan, yellow or orange before collapsing and dying. Roots, stolons, and/or rhizomes are sparse and noticeably rotten in affected areas.



*Take-all root rot patches
and rings on bermudagrass
putting greens.
Courtesy Lane Tredway*



Take-all Root Rot

Conditions Favoring Disease:

The take-all root rot pathogen grows across a wide range of soil temperatures, but most infection likely occurs when the turf is weak or stressed. Low light levels combined with cool temperatures or extended periods of wet weather are the most common triggers. The disease is most severe in poorly drained areas and where soil pH is greater than 7.0. Stress from low mowing, inadequate fertility, excessive traffic, or shade cause the turf to be more susceptible. High populations of plant-parasitic nematodes also contribute to take-all root rot development.

Management Tips:

- Maintain soil pH below 7; most turfgrasses perform best when soil pH is between 6 and 6.5.
- Avoid lime applications unless directed by soil test results.
- Reduce turf stress by increasing mowing height, providing adequate fertility, and minimizing mechanical wear.
- Implement a nematicide program if populations are at damaging levels
- Cultivate regularly to increase soil aeration and root growth.
- Improve soil drainage and avoid over-irrigation.
- Make preventive fungicide applications on a 14- to 28-day interval when conditions are conducive to development.

Regions: On golf course putting greens, take-all root rot occurs throughout the transition zone and south. Limited to the Deep South on higher-cut turfgrasses, especially coastal areas where soil pH is high.

Recommended Products:



Fairy Ring

Causal Agent:

Mushroom and puffball fungi (i.e., basidiomycetes) of more than 60 species cause fairy ring. Some of the more common agents include: *Agaricus campestris*; *Lepiota* spp.; *Lycoperdon* spp; *Marasmius oreades* and many others.

Species occurring in sand-based greens are not as diverse. Puffball fungi producing white, egg-shaped, fleshy mushrooms are most common.

Susceptible Turfgrass:

All warm- and cool-season turfgrasses

Symptoms:

There are three types of fairy ring, which include either a simple ring or crescent of mushrooms (Type 3); those in which there is a ring or crescent of mushrooms and a green stimulation zone (Type 2); and the most important type, which causes dead zones (Type 1). Type 1 fairy ring appears in discrete circular rings, crescents and arcs in which edges initially display the blue-gray color of wilt. The reason for the wilt symptom is due to the fungal body (i.e., mycelium), which renders soil hydrophobic (i.e., repels water penetration). Hence, turf dies mainly from drought stress. As rings become more pronounced, the inner and outer zones of wilted or dead areas are darker green, especially in higher cut turf. On golf greens, distinct green zones are not always present, but some green stimulation usually is noted on peripheries of rings. The inner and outer green dynamic of rings is due to nitrogen release via organic matter degradation activity by the fungus and other microbes. During rainy periods, mushrooms or puffballs often appear in or adjacent to the dying or dead areas. Affected thatch usually has a light brown to orange color and infested thatch/soil typically has a strong mushroom odor. Sometimes, the whitish mycelium of the fungus can be seen in thatch or clinging to soil particles in affected areas.

Fairy Ring

Kidney-shaped Type 1 fairy ring on a green.



Type 2 fairy ring with puffballs.



Photos courtesy of Pete Dernoeden, Ph.D.

Fairy Ring

Conditions Favoring Disease:

Fairy rings typically appear in early-mid summer, but sometimes develop during mild, late-fall or winter periods. Heavy spring rains are especially conducive to their development. As summer progresses, symptoms and damage become more pronounced in response to heat and/or drought stress. The mechanism of damage is mostly due to the ability of these fungi to render soil hydrophobic; not parasitism.

Management Tips:

- Reduce thatch by vertical cutting and coring in the fall and/or spring.
- When wilt symptoms become evident, core or otherwise poke holes and flush a soil wetting agent to help alleviate hydrophobic soil conditions.
- Small amount of nitrogen or iron may help to mask some rings.
- On chronically affected greens, collars and approaches, preventively apply an effective fungicide in early spring in combination with a soil wetting agent.
- Repeat applications on a 28-day interval when soil temperatures are > 15°C are recommended to provide season-long control.

Regions: Fairy ring occurs worldwide in all turfgrasses.

Recommended Products:

 Briskway Fungicide	 Headway Fungicide	 Heritage Action Fungicide
 Posterity Fungicide	 Renown * Fungicide	 Velista * Fungicide
 Trefliti Nematicide/Fungicide		

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

Obligate Parasites

Powdery Mildew

Causal Agent:

Blumeria graminis

Susceptible Turfgrasses:

Primarily Kentucky bluegrass, less commonly creeping red fescue and potentially other grasses grown in shaded environments.

Symptoms:

The pathogen is an obligate parasite that can only survive and reproduce within living tissues. Powdery mildew first appears on leaf surfaces as a coating of fine, white mycelium bearing chains of spores. Affected areas appear to have been dusted with lime. Severely infected leaves turn yellow, then tan or brown in color. Infected turf in shaded areas often loses density. Highly susceptible cultivars may be severely damaged in shade.

White coating of the powdery mildew fungus on Kentucky bluegrass leaves.

Courtesy of Pete Dernoeden, Ph.D.



Powdery Mildew

Conditions Favoring Disease:

Powdery mildew is mostly a disease of shaded turf and where air circulation is poor. The disease is favored by humid, cloudy weather with air temperatures between **15°C and 22°C**. It can appear at any time from spring to fall, but is most common in the fall.

Management Tips:

- Prune tree limbs and eliminate brush to improve air circulation and improve sunlight penetration.
- Shaded turf requires half of the nitrogen versus full sun turf.
- Avoid high levels of nitrogen and irrigation that produce lush growth.
- Increase mowing height.
- Convert to shade-adapted cultivars or resistant grasses like tall fescue and hard fescue where appropriate.
- Normally, a single application of an appropriate systemic fungicide is highly effective for controlling the disease.

Regions: Mostly in northern, cool, humid regions where Kentucky bluegrass and creeping red fescue are commonly grown.

Recommended Products:



Obligate Parasites

Rusts: Crown, Leaf, Stem and Stripe

Causal Agent:

Crown—*Puccinia coronata*; Leaf—*Puccinia reconditia*;
Stem—*Puccinia graminis*; Stripe—*Puccinia striiformis*

Susceptible Turfgrasses:

Mostly Kentucky bluegrass, perennial ryegrass, and older zoysiagrass cultivars; less commonly tall fescue.

Symptoms:

Rusts are obligate parasites that survive and reproduce only within living tissues. Rusts become noticeable only when spores are produced. These pathogens cause light yellow flecks to form on leaves and sheaths. Yellow flecks enlarge and elongate. Mycelial masses formed within leaves rise and rupture the epidermis releasing spores that are yellow, orange, reddish-orange and rarely black. Severely infected stands lose density and appear yellow, orange or reddish-brown from a distance. Spores are so abundant that they can coat shoes with a yellow or rust dust of spores.

*Stem rust pustules on
Kentucky bluegrass leaves.*



Reddish-brown thinning of Kentucky bluegrass infected with rust.

Photos courtesy of Pete Dernoeden, Ph.D.

Rusts: Crown, Leaf, Stem and Stripe

Conditions Favoring Disease:

Rust diseases typically develop during cool and moist periods in fall, and sometimes spring. Rusts develop mostly in wet and shaded environments, but also affects open locations if weather conditions are overcast for long periods. Rust infections are most severe in slow-growing turfgrasses maintained under low nitrogen or where turf was stressed by heat and drought in summer. Although properly fertilized, highly susceptible cultivars can be severely damaged, even in full sun locations.

Management Tips:

- Convert to a species or cultivars that are resistant.
- Apply adequate levels of nitrogen.
- Reduce shade and improve air circulation.
- Reduce thatch and avoid drought stress.
- Normally, a single application of an appropriate fungicide is highly effective in controlling the disease.

Regions: All states where susceptible species are grown; especially the Northeast, upper Midwest and Pacific Northwest.

Recommended Products:

 Fungicide	 Fungicide	 Fungicide
 Fungicide	 Fungicide	 Fungicide
 Fungicide	 Fungicide	 Fungicide

Obligate Parasites

Stripe and Flag Smut

Causal Agent:

Stripe: *Ustilago striiformis*

Flag: *Ustilago agropyri*

Susceptible Turfgrasses:

Mostly older cultivars of Kentucky bluegrass; uncommon in perennial ryegrass and tall fescue.

Symptoms:

Smut is an obligate parasite that lives and reproduces only within living tissues; it becomes noticeable only when spores are produced. Flag smut is less common, but both smut diseases produce identical symptoms. Initially, symptomatic plants appear stunted and yellow-green. Spore-bearing bodies (i.e., sori) are produced below the epidermis, and as they mature, narrow, silvery-gray to black, elongated streaks of sori appear in parallel lines along leaf surfaces. As sori mature, they split the epidermis, shed their black spores, and leaves twist and shred. Infected stands lose density and generally appear drought stressed and/or in need of nitrogen.

Silver-gray parallel lines of spore bearing smut sori in Kentucky bluegrass.
Courtesy of R. Smiley.



Stripe and Flag Smuts

Conditions Favoring Disease:

Smut diseases develop during periods of overcast and wet weather in spring and fall, but are most prominent in spring.

Management Tips:

- Smuts are uncommon today since most improved Kentucky bluegrass cultivars are resistant.
- If smuts are a chronic problem, convert to a resistant bluegrass cultivar or to another appropriate species.
- Infected stands should be irrigated to avoid drought stress and fertilized appropriately to offset damage and promote recovery.
- A single application of an appropriate systemic fungicide normally is highly effective in controlling the disease.

Regions: Mostly where older cultivars of Kentucky bluegrass are grown. Inexpensive seed mixes can contain highly susceptible cultivars.

Recommended Products:



Obligate Parasites

Yellow Tuft (Downy Mildew)

Causal Agent:

Sclerophthora macrospora

Susceptible Turfgrasses:

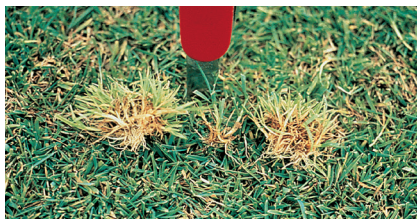
Affects all turfgrass, but is most notable in annual bluegrass and bentgrass golf greens; sometimes occurs in zoysiagrass. In St. Augustinegrass, the disease is called downy mildew because there is no tufting.

Symptoms:

Yellow tuft is most notable in annual bluegrass and bentgrass golf greens and seldom fatal. The pathogen is an obligate parasite that survives and reproduces only in living tissues. Infection occurs during cool and wet weather in spring and fall, and is most severe in low and wet areas. The disease becomes evident during prolonged periods of overcast weather at almost any time of year, especially late fall, winter and spring. In summer, infected plants normally appear healthy. Symptoms appear as yellow spots of tufted plants 0.6-2.5 cm in diameter. Leaves and tillers are yellow and clustered due to an abnormal, fungal-induced proliferation of tillers. Tufts are easily detached from turf, exposing clusters of short, stubby roots. Yellow tuft mimics annual bluegrass invasion in bentgrass greens in winter.

In St. Augustinegrass, the disease appears as white streaks parallel to the leaf veins, primarily during humid summer weather in wet and shaded areas. There is no tufting.

Yellow tufts with stubby roots in a bentgrass green.



Yellow Tuft (Downy Mildew)

Conditions Favoring Disease:

Yellow tuft mostly occurs in wet, poorly drained areas that are depressed, but infected plants can be found on slopes and other well-drained areas. This sophisticated pathogen produces swimming spores that infect seedlings and stem buds during rainy periods in spring and fall.

Management Tips:

- Improve surface water drainage.
- Increase air circulation.
- On greens, tufts are effectively detached via vertical cutting.
- Subdue Maxx one of the **few fungicides labeled for yellow tuft control**. Tank-mixes with Medallion or Daconil brand fungicides have been shown to improve control over Subdue Maxx alone.

Regions: Common in New England and the Pacific Northwest in all cool-season grasses and mostly bentgrass and annual bluegrass greens elsewhere. Seldom in zoysiagrass. In St. Augustinegrass, the disease is mostly found in the Gulf Coast region.

Recommended Product:



Pythium Blight

Causal Agent:

Pythium aphanidermatum, other *Pythium* species

Susceptible Turfgrasses:

All species, particularly bentgrasses, perennial ryegrass and tall fescue. Seedlings of all cool-season grasses are especially vulnerable. Warm-season grasses are also susceptible, particularly ultradwarf bermudagrass putting greens.

Symptoms:

Pythium blight on cool-season grasses appears suddenly during hot, humid weather, especially following thunderstorms. In contrast, outbreaks on warm-season grasses are most common during periods of cool, cloudy and wet weather. Initially, infected areas appear dark-gray and water-soaked in the early morning. Spots turn orange or bronze-colored, and turf dies in spots about 2-5cm in diameter. Spots may increase to > 15cm diameter, coalesce and rapidly blight large areas. Extreme blighting can occur in water drainage patterns. Fluffy, grayish masses of fungal mycelium often are seen in affected areas in the early morning when dew is present. Grayish-black “smoke rings” may develop at peripheries. Leaves collapse, mat and may have a slimy/soapy feel. Affected plants mat and usually are killed.

Pythium blight in bentgrass initially appears as reddish to orange-colored spots. Foliar mycelium and smoke rings often are present in the early morning. Courtesy of Pete Dermoeden, Ph.D.



Pythium Blight

Pythium blight is most damaging in low areas and in water drainage patterns.



Pythium damping-off in tall fescue seedlings.



Photos courtesy of Pete Dernoeden, Ph.D.

Pythium Blight

Conditions Favoring Disease:

Pythium blight of cool-season grasses is promoted by night temperatures > 20°C and very high humidity. It is most severe following a thunderstorm or heavy rain in summer, especially in wet and shaded areas where water puddles and/or in surface water drainage patterns. Seedlings and immature turfs in wet areas are extremely vulnerable. On ultradwarf bermudagrass putting greens, *Pythium* blight is common during periods of cool, cloudy, and wet weather in fall, winter and spring. The disease occasionally attacks other warm-season species under similar conditions.

Management Tips:

- Improve surface water drainage.
- Minimize shade and increase air circulation to speed drying of the canopy.
- Irrigate turf deeply and infrequently early in the day; avoid late-day and night irrigation.
- Avoid mowing wet turf when foliar mycelium is evident to minimize spread of the pathogen.
- Minimize nitrogen use during hot and humid weather.
- Monitor seedlings closely in late summer.
- Where a common problem, apply an appropriate fungicide preventively when weather conditions are favorable.
- Curative fungicide applications may not stop blighting for three days or longer.

Regions: Temperate and humid regions on cool- and warm-season turfgrasses.

Recommended Products:



*Syngenta supports a FIFRA Section 2(ee) recommendations for the use of Daconil Action (suppression) and Renown to control *Pythium* Blight. Please see the section 2(ee) recommendation to confirm the recommendations are applicable in your state.

Pythium Diseases

Pythium Root Rot

Causal Agent:

Many root-infecting *Pythium* species

Susceptible Turfgrasses:

Annual bluegrass, creeping bentgrass or bermudagrass on golf course putting greens.

Symptoms:

Symptoms of *Pythium* root rot (PRR) are highly diverse and a lab analysis usually is needed to confirm this disease. In high density bentgrasses, the disease appears as reddish-brown, blue-gray or purplish spots, patches and splotches that mimic wilt. In older bentgrasses, symptoms are non-descript and may appear as yellow, reddish-brown or bronze-colored, irregularly shaped areas of thinning and dying turf. PRR usually is first noted in clean-up areas and/or surface water drainage patterns where mowing stress is greatest. Pathogen activity is limited to roots and stems and there is no foliar mycelium.

Pythium Root Rot



In high density cultivars, PRR may appear as reddish-brown or purplish spots and splotches. Courtesy of D. Bevard.



In older bentgrass cultivars PRR symptoms are highly variable and may include chlorosis and reddish-brown splotches. Courtesy of Pete Dernoeden, Ph.D.

Pythium Root Rot

Conditions Favoring Disease:

At least 30 *Pythium* species are known to infect turfgrass roots, and as a group they infect across a wide range of soil temperatures. Wet soil conditions are the primary contributing factor, whether from frequent rainfall, over-irrigation, or poor soil drainage. Stress from heat, low mowing, traffic, and shade often trigger expression of symptoms and increase severity of the disease.

Management Tips:

- Improve soil drainage and avoid over-irrigation.
- Reduce mowing frequency, increase height of cut and use lightweight mowers; skip mowing clean-up passes as needed to minimize stress.
- Cultivate and topdress regularly to increase soil aeration and root growth.
- Reduce shade and increase air movement to maximize turf health
- Where *Pythium* root rot is a chronic problem, apply preventive fungicides on a 14- to 21 -day interval when soil temperatures are above 18°C.

Regions: All humid climates where annual bluegrass, creeping bentgrass, or bermudagrass are grown on putting greens.

Recommended Products:



Pythium Diseases

Pythium Root Dysfunction

Causal Agent:

Pythium volutum, *P. arrhenomenes* and *P. aristosporum*

Susceptible Turfgrass:

Creeping bentgrass putting greens.

Symptoms:

Pythium root dysfunction symptoms appear during periods of stress, especially heat, drought, and/or low fertility. Circles or irregular patches are up to two feet in diameter and initially show signs of wilt or nutrient deficiency. As the disease progresses, affected areas turn orange and eventually collapse to the ground. Roots are tan in color and sand falls away from them easily due to lack of root hairs. Reductions in root depth may not be evident during the fall and spring, but infected roots die back rapidly when soil temperatures exceed 29°C.



Reddish-brown patch symptoms of PRD mimicking take-all. Courtesy of L. Tredway.

Pythium Root Dysfunction

Conditions Favoring Disease:

Pythium root dysfunction is most common in creeping bentgrass putting greens less than 10 years old. Symptoms are most severe during hot weather in summer, but may also appear during fall, winter, or spring. Root infection occurs in fall to spring when soil temperatures are between **10°C and 24°C**. Above-ground symptoms are usually not apparent at this time except under extreme drought or nutrient deficiency. Root dieback occurs rapidly once soil temperatures exceed **29°C**, leading to expression of above-ground symptoms. The appearance of *Pythium* root dysfunction symptoms are enhanced by low fertility, drought stress, and low soil oxygen levels.

Management Tips:

- Provide adequate fertility based on soil and tissue tests; newly constructed creeping bentgrass greens should receive **20 to 30 grams N/ 100 m²** annually.
- Raise mowing heights above 3mm. During summer to alleviate stress.
- Avoid severe drought stress and apply soil surfactants on prescribed intervals.
- Employ hollow-tine aerification and topdressing in fall and spring followed by solid-tine aerification or “venting” in the summer to improve root survival.
- Apply effective fungicides in the fall and spring on a 21- to 28-day interval when soil temperatures are between 10°C and 24°C.

Regions: Most common in the transition zone where creeping bentgrass is marginally adapted; may also occur in northern locations during abnormally hot weather or intense management.

Recommended Products:



Rhizoctonia Diseases

Brown Patch, Cool-Season Turf

Causal Agent:

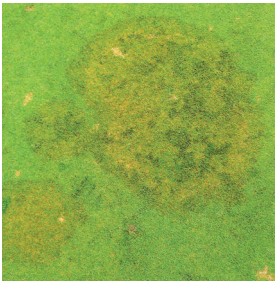
Brown Patch: *Rhizoctonia solani*

Susceptible Turfgrasses:

Primarily bentgrasses, perennial ryegrass and tall fescue; less commonly Kentucky and annual bluegrass.

Symptoms:

Symptoms of brown patch vary depending on turf species and mowing height. Brown patch typically appears as circular spots or patches of blighted turfgrass measuring 7.5cm to more than 90cm in diameter. The sudden, almost overnight, appearance of large, brown patches is diagnostic. Grayish foliar mycelium and grayish-black “smoke rings” on the peripheries of patches are mostly seen in the early morning. Leaf lesions are most distinctive and common on tall fescue, which are variously shaped, chocolate-brown and have a dark-brown border. On other species, there normally is just a brownish blighting and/or twisting of leaves. In Kentucky bluegrass, usually in wet shade, there can be brown “banding” lesions somewhat similar to dollar spot; the difference being that lesions are brown and not bleached white.



Brown patch with smoke rings in creeping bentgrass. Blackening in patches is due to algae.



Brown patch in tall fescue with smoke rings and foliar mycelium on a cloudy morning.

Photos courtesy of Pete Dernoeden, Ph.D.

Brown Patch

Conditions Favoring Disease:

Brown patch is favored by night temperatures > 17°C, humidity and long leaf surface wetness periods in summer. Rain, overcast conditions and thunderstorms provide ideal infection conditions. It is severe in shade and full sun, but areas around trees or wherever air circulation is poor are more severely blighted. The pathogen is mostly a leaf blighter and recovery with good management practices normally occurs in the absence of other stress factors.

Management Tips:

- Use mostly slow release nitrogen sources in fall.
- Improve air circulation and minimize shade by pruning/clearing trees and brush.
- Improve surface water drainage.
- Avoid a high canopy.
- Reduce thatch.
- Pre-dawn irrigation that “knocks-down” mycelium has been shown to reduce brown patch severity.
- Where common, use effective fungicides to prevent brown patch.
- Curatively, it is best to tank-mix appropriate contact and systemic fungicides to stop blighting more quickly.

Frequently occurs in: All regions where cool-season grasses are grown, especially transition areas.

Recommended products:

 Briskway [®] Fungicide	 Concert II [®] Fungicide	 Daconil Action [®] Fungicide
 Headway [®] Fungicide	 Heritage Action [®] Fungicide	 Instrata [®] Fungicide
 Medallion SC [®] Fungicide	 Renown [®] Fungicide	 Secure Action [®] Fungicide
 Velista [®] Fungicide		

Rhizoctonia Diseases

Large Patch (aka Zoysia Patch), Warm-Season Turf

Causal Agent:
Rhizoctonia solani

Susceptible Turfgrasses:

Zoyisagrass, St. Augustinegrass, centipedegrass, kikuyugrass, and seashore paspalum; occurs in bermudagrass but rarely causes significant damage.

Symptoms:

Symptoms of large patch vary depending on turf species and cultivar. Large patch was first described as a zoysiagrass disease, but all warm-season grasses can be affected. The pathogen attacks basal leaf sheaths causing small, reddish-brown or black lesions. As the disease progresses, rings and patches of blighted turfgrass measuring 12.5cm to 3m or greater in diameter can develop. Patches are reddish-brown to yellow in appearance, with a possible “orange firing” at patch periphery. Damaged leaves detach easily from stems. During winter, blighted patches and rings contrast with healthy dormant turf. At spring green-up, some new leaves may emerge from surviving crowns, but extensive damage can result in little or no recovery.

In bermudagrass, enormous patches may appear just after spring green-up. In bermudagrass, leaves are blighted, but usually there is no significant damage to stem bases and plants recover as temperatures rise.

Large patch in a zoysiagrass fairway with orange firing at peripheries of patches.
Courtesy of Pete Dernoeden, Ph.D.



Large Patch

Conditions Favoring Disease:

The disease is prominent in the fall and spring as warm-season grasses are transitioning into and out of dormancy. This disease is favored by high relative humidity, cool/cold temperatures and extended periods of overcast and rainy weather. Large patch is most severe in shady and/or poorly drained sites. Some fine-textured cultivars of zoysiagrass are highly susceptible.

Management Tips:

- Zoysiagrass requires only very modest amounts of nitrogen in summer; avoid nitrogen in the fall.
- In spring, do not apply any nitrogen until the disease becomes inactive.
- Vertical cutting affected zoysiagrass after 100% green-up and spoon-feeding (~ 120 grams N/ 100 m²) helps speed recovery if there are numerous surviving plants in patches. Severely damaged areas may have to be sodded.
- In bermudagrass, recovery is rapid following the application of a water-soluble nitrogen source; continue applying nitrogen every 14 days until full recovery has been achieved.
- Promote sunlight and air circulation, and improve surface water drainage.
- Avoid overwatering.
- Reduce thatch.
- Where common, apply an effective systemic fungicide preventively. Two applications in fall and one application in spring are recommended in most cases.

Regions: Mostly transition areas where zoysiagrass is commonly grown. Kikuyugrass in southern California and St. Augustinegrass, centipedegrass, and seashore paspalum in the Southeast. Rarely in bermudagrass, and mostly in transition areas where cold weather may occur at spring green-up.

Recommended Products:



*Syngenta supports a FIFRA Section 2(ee) recommendation for Velista fungicide to control large patch on all turf types. Please see the section 2(ee) recommendation to confirm the recommendation is applicable in your state.

Mini Ring/Leaf and Sheath Spot

Mini Ring/Leaf and Sheath Spot

Causal Agent:

Rhizoctonia zeae

Susceptible Turfgrass:

Bermudagrass and seashore paspalum, mostly on golf course putting greens

Symptoms:

Symptoms appear in mid- to late-summer and intensify as bermudagrass growth slows due to short day lengths and cool temperatures. Rings are 18-45cm in diameter and typically scalloped or irregularly shaped. Infected turf may initially show signs of drought stress, nutrient deficiency or poor growth before turning tan to orange in color. No distinct foliar or stem lesions are visible as infections are limited to the crown, stolons and roots.



Mini-ring symptoms on bermudagrass putting greens caused by Rhizoctonia zeae. Courtesy Luke Dant



Mini Ring/Leaf and Sheath Spot

Conditions Favoring Disease:

Infections occur in late spring through summer when soil temperatures are above **21°C**. Slowly growing bermudagrass is most prone to damage, particularly from low fertility or drought stress. Fertilizing with urea nitrogen has been shown to suppress mini ring development, whereas ammonium sulfate can increase disease severity.

Management Tips:

- Provide adequate and balanced fertility based on soil and tissue test results.
- Fertilize with urea nitrogen at **50 to 100 grams N per 100 square meters** per week when *R. zeae* is active.
- Apply preventive fungicides on a 14- to 21-day interval from late spring through summer – May through September in most areas.
- Systemic fungicides should be watered-in to deliver to the crown and root zone where the pathogen is most active.

Regions: Transition zone and south where bermudagrass and seashore paspalum are grown on putting greens.

Recommended Products:

 Briskway Fungicide	 Headway Fungicide	 Heritage Action Fungicide
 Medallion SC Fungicide	 Renown Fungicide	 Velista Fungicide
 Trefliti Nematicide Fungicide		

Rhizoctonia Diseases

Brown Ring Patch (aka Waitea Patch)

Causal Agent:

Waitea circinata var. *circinata*

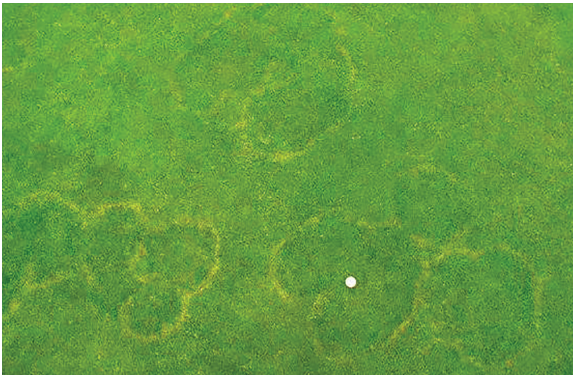
Susceptible Turfgrasses:

Annual bluegrass grown on golf greens; uncommonly creeping bentgrass

Symptoms:

The name brown ring patch is a misnomer, as the symptoms more closely resemble yellow patch. This disease is often referred to as Waitea patch for this reason. The disease mostly appears as solitary or clusters of yellow rings, a few inches to a foot or more in diameter. Grass in the center of rings often appears darker green. Aerial mycelium rarely appears in the field, but is easily induced in the lab. Symptoms are similar to yellow patch, which occurs during colder weather. While infected leaves die, turf usually recovers with the advent of sunny and dry weather.

Yellow rings of brown ring patch in an annual bluegrass green. Courtesy of J.Kaminski.



Brown Ring Patch

Conditions Favoring Disease:

Mild to warm temperatures (**16°C to 24°C**), overcast and rainy periods in late spring promote this disease.

Management Tips:

- Affected turf normally recovers with the advent of sunny and dry weather.
- Small amounts of water-soluble nitrogen (~ **120 grams N/ 100 square meters**) promote recovery.
- Rings may become numerous and objectionable and thus an application of an appropriate fungicide may be warranted.

Regions: In all regions where annual bluegrass can dominate golf greens, especially mid-Atlantic, southern California and transition areas.

Recommended Products *:

 **Banner Maxx II** *
Fungicide

 **Briskway**®
Fungicide

 **Concert II**
Fungicide

 **Headway** *
Fungicide

 **Heritage Action**
Fungicide

 **Medallion**®
Fungicide

 **Renown** *
Fungicide

 **Velista** *
Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for the use of Renown, Banner Maxx II, Headway and Velista to control Brown Ring Patch. Please see the section 2(ee) recommendations to confirm the recommendations are applicable in your state.

Rhizoctonia Diseases

Yellow Patch (aka Cool-Season Brown Patch)

Causal Agent:

Rhizoctonia cerealis

Susceptible Turfgrasses:

Mostly annual bluegrass and creeping bentgrass golf greens, collars and fairways. In southern regions, it occurs in rough bluegrass overseeded into warm-season grasses.

Symptoms:

The most common symptom of yellow patch is the appearance of yellow rings a few inches to over a foot in diameter. Rings may be solitary or numerous. Less commonly, solid yellow patches or reddish-brown rings develop. Reddish-brown rings are more common in bentgrass and may loop together like those on the “Olympic” flag. There are no distinctive leaf lesions and foliar mycelium seldom develop. Damage usually is superficial and affected plants normally recover with the advent of sunny and dry weather. This disease is very similar in appearance to Waitea patch (aka brown ring patch); which occurs during warm and rainy periods in mid-to-late spring.



*Yellow rings are the predominant symptom of yellow patch in annual bluegrass greens.
Courtesy of S. McDonald*



*Reddish-brown ring symptoms of yellow patch in creeping bentgrass.
Courtesy of Pete Dernoeden, Ph.D.*

Yellow Patch/Cool Season Brown Patch

Conditions Favoring Disease:

Yellow patch occurs from fall to spring during extended overcast, rainy and chilly (**10°C to 18°C**) weather. The disease is most severe when thatch is cold and wet for long periods.

Management Tips:

- Improve soil and surface water drainage.
- Reduce shade and increase air circulation.
- Apply small amounts of nitrogen (**~ 120 grams N/ 100 m²**) to promote recovery when turf begins growth in spring.
- Use a proper fungicide preventively in late fall/early spring where yellow patch is a chronic problem.
- Curatively, apply a proper contact fungicide plus a systemic fungicide, but don't expect rings and patches to recover until sunny and dry conditions recur.

Regions: In all cool-humid and transition regions. Also in rough bluegrass in southern areas.

Recommended Products:



Snow Molds

Gray Snow Mold (aka Typhula Blight)

Causal Agent:

Typhula incarnata and *Typhula ishikariensis*

Susceptible Turfgrasses:

All cool-season turfgrasses, especially golf course turfs, and lawns in high snow fall regions.

Symptoms:

Gray snow mold develops under snow cover and becomes evident at melt. It appears as light brown, gray or bleached patches ranging from a few inches to nearly 60cm diameter. The longer the snow cover, the larger patches become. Sparse to dense amounts of grayish mycelium may be seen on blighted tissue in the presence of melting snow. Leaves become matted and on close inspection, small pinkish-white to reddish-brown, and sometimes black masses of “resting mycelium” called sclerotia, may be seen on and/or embedded in blighted leaves. Sclerotia become shriveled when dry and may be so numerous as to give matted patches a speckled appearance.



Numerous gray *Typhula* blight patches on a fairway.



Gray and matted *Typhula* patch with mycelium at snow melt in bentgrass.



Reddish-brown, shriveled *Typhula* sclerotia embedded in matted leaves.

Photos courtesy of Pete Dernoeden, Ph.D.

Gray Snow Mold

Conditions Favoring Disease:

Deep snow cover usually is necessary for this disease to cause damage and it is most severe when snow cover lasts more than 20 days. These pathogens are mostly foliar blighters and in time turf would be expected to recover with proper management practices.

Management Tips:

- Mow turf regularly until dormancy.
- Avoid heavy applications of water-soluble nitrogen sources in late fall prior to dormancy.
- If possible, remove snow from greens before it begins to melt.
- Rake or otherwise break-up matted tissues and lightly fertilize in early spring to encourage new growth.
- In late fall, apply a tank-mix of a proper contact and systemic fungicides prior to snow cover, and again in mid-to-late winter to open turf if additional snow is likely.
- A curative fungicide application usually is not necessary, especially after sclerotia form.

Regions: In all regions where heavy snows occur; especially the Northeast, upper Midwest and mountainous areas. Occurs in the mid-Atlantic and transition areas during snowy winters.

Recommended Products:

 Banner Maxx II Fungicide	 Concert II * Fungicide	 Contend Fungicide
 Daconil Action Fungicide	 Headway Fungicide	 Instrata Fungicide
 Medallion Fungicide	 Renown * Fungicide	 Velista Fungicide

*Syngenta supports FIFRA Section 2(ee) recommendations for the use of Renown to control Gray Snow Mold. Please see the specific section 2(ee) recommendations to confirm the recommendations are applicable in your state.

Snow Molds

Microdochium Patch (aka Pink Snow Mold and Fusarium Patch)

Causal Agent:
Microdochium nivale

Susceptible Turfgrasses:

All cool-season turfgrasses, but mostly annual bluegrass, bentgrasses, perennial ryegrass, and sometimes tall fescue. Immature, fall-seeded stands are especially vulnerable. It is a major winter disease in seashore paspalum.

Symptoms:

Microdochium patch occurs anytime from late fall to early spring whenever conditions are overcast, cold and wet, and at snow melt. In the absence of snow (i.e., Fusarium patch phase), circular, reddish-brown, pink or tan spots 2.5-7.5cm diameter develop and grayish smoke rings (i.e., foliar mycelium) may be evident. In immature turf, patches may exceed 30cm diameter. In the presence of melting snow (i.e., pink snow mold phase), distinct circular patches develop, which usually have tan centers and pinkish-red fringes. Patches become larger under snow and range from 15-60cm diameter.

*Microdochium snow phase on
the edge of a collar.
Courtesy of Pete Dermoeden, Ph.D.*

Microdochium Patch



Microdochium Patch

Reddish-colored spots in the snow-free phase of Microdochium patch in an annual bluegrass fairway.



Immature, overseeded perennial ryegrass affected by the snow-free phase of Microdochium patch. New and old damage is evident.



Photos courtesy of Pete Dernoeden, Ph.D.

Microdochium Patch

Conditions Favoring Disease:

Microdochium patch can occur whenever temperatures range from 0°C to 16°C but chilly, wet and overcast weather are required in the absence of snow. The snow-free phase can appear from late fall to late spring, and can severely damage immature, fall seeded stands. The snow phase is more severe when snow cover exceeds 10 days. Leaves are blighted and recovery often occurs, but when snow persists for long periods significant damage can occur.

Management Tips:

- Mow turf regularly throughout fall until dormancy.
- Check seedling turf frequently, especially when blankets are used.
- Avoid heavy applications of water-soluble nitrogen sources in late fall prior to dormancy.
- In spring, apply small amounts of nitrogen frequently to promote recovery.
- Where common, apply a tank-mix of an effective contact fungicide plus a systemic fungicide prior to snow cover, and again in mid-to-late winter if additional snow is likely.
- A curative fungicide application is warranted in severely blighted stands, especially immature turf.

Regions: Throughout cool-humid, mountain, and transition regions in cool-season grasses where snowy or extended periods of chilly, wet and overcast weather are common. Is a major winter disease of seashore paspalum in Southeastern U.S.

Recommended Products:

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

Other Fungal Diseases

Anthracnose

Causal Agent:

Colletotrichum cereale

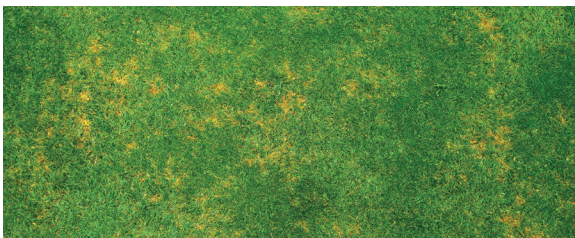
Susceptible Turfgrasses:

Primarily annual bluegrass and less commonly creeping bentgrass on greens and collars; sometimes fairways. Rarely in perennial ryegrass.

Symptoms:

Anthracnose can develop at any time of year, but it is most destructive during summer. It can cause a foliar blight and/or basal stem rot. Foliar blight occurs during summer stress, affected leaves exhibit a bright yellow appearance and turf thins-out. Black fruiting bodies (i.e., acervuli) burst through leaf surfaces and have distinctive black hairs. In the case of basal rot, infected plants initially have either an orange, bronze or yellow appearance. On greens, the disease usually first appears as speckles or yellow spots. Infected plants die in irregularly shaped areas. In mixed stands on greens, yellow blighted annual bluegrass develops in peripheral areas adjacent to bentgrass. Anthracnose never seems to attack both annual bluegrass and bentgrass on the same green or same golf course. On close inspection the presence of badly blackened stem bases and/or acervuli are diagnostic. Affected bentgrass usually has a reddish-brown color and acervuli normally are present on dying or dead leaves.

Initial symptoms of basal rot appears as yellow or bronze speckles in annual bluegrass greens. Courtesy of Pete Dernoeden, Ph.D.



Anthracnose

Advanced stage of basal rot in an annual bluegrass green.



*Blackened stem bases
(i.e., basal rot) caused by
anthracnose in summer.
Courtesy of S. McDonald.*



*Photos courtesy of
Pete Dernoeden, Ph.D.*

Anthracnose

Conditions Favoring Disease:

Conditions range from cold and wet to hot and dry, but it is most damaging in summer. Drought and high temperature stresses as well as low mowing and low nitrogen fertility are associated with severe outbreaks. Other important stress factors include intense traffic, soil compaction, and poor air and water drainage.

Management Tips:

- Increase height of cut and use solid rollers in summer.
- Apply small amounts of nitrogen (~ 50 to 100 grams N/ 100 m²) periodically throughout the growing season.
- Divert traffic and minimize mower stress.
- Light and frequent sand top dressings throughout the growing season help suppress the disease by cushioning stem bases.
- Avoid drought stress; syringe and hand water when necessary.
- Minimize encroachment and domination of annual bluegrass using appropriate growth regulators and/or herbicides.
- Preventive applications of appropriate systemic fungicides are highly effective, especially when combined with small amounts of nitrogen and an increase in mowing height.
- Curatively, apply an appropriate contact fungicide and systemic fungicide in combination with a small amount of nitrogen.

Regions: In all regions where annual bluegrass can dominate golf greens. Less common and more easily controlled in bentgrass if quickly diagnosed.

Recommended Products:

 **BannerMaxx II**
Fungicide

 **Briskway**
Fungicide

 **Concert II**
Fungicide

 **Daconil Action**
Fungicide

 **Headway**
Fungicide

 **Heritage Action**
Fungicide

 **Instrata**
Fungicide

 **Medallion**
Fungicide

 **Renown**
Fungicide

 **Velista**
Fungicide

Other Fungal Diseases

Bentgrass Dead Spot

Causal Agent:

Ophiosphaerella agrostis

Susceptible Turfgrasses:

Creeping bentgrass and hybrid bermudagrass grown on sand-based golf greens and collars.

Symptoms:

Disease appears initially as small, reddish-brown, tan or copper-colored spots 1.25 to 2.5cm diameter, which mimic ball marks. Spots enlarge to only 7.5cm diameter and have tan centers and reddish-brown leaves on the outer periphery of sunken spots. Bentgrass Dead Spots can be numerous and severely pit greens. Bentgrass Dead Spots can be misdiagnosed in new greens as ball marks, dollar spot or Microdochium patch.

*Bentgrass Dead Spots pits with reddish-brown peripheries in a bentgrass green.
Courtesy of Pete Dernoeden, Ph.D.*



Bentgrass Dead Spots

Conditions Favoring Disease:

Bentgrass Dead Spots are mostly a problem in new greens during the first to third summer following construction or via renovation by fumigation or new sand. They are most severe in open, sloped and sunny locations during hot and dry weather. Under ideal conditions, they hit fast and hundreds of Bentgrass Dead Spots may develop in a few days. The disease is not known to occur in turf grown on native soils. Bentgrass Dead Spots naturally decline and are seldom seen in greens older than six years.

Management Tips:

- Irrigate new greens judiciously with close attention to syringing and hand-watering during hot and dry periods.
- Apply small amounts of nitrogen (~ 50 to 100 grams N/ 100 m²) every 7-10 days to stimulate recovery from surrounding healthy plants.
- Fungicides often are applied curatively given the rarity of this disease.
- Curatively, apply a tank-mix of an appropriate contact fungicide and a systemic fungicide and use follow-up sprays every 7-10 days until the disease is arrested.

Regions: Potentially a problem in all new creeping bentgrass and hybrid bermudagrass greens after constructions and renovations.

Recommended Products:



Other Fungal Diseases

Dollar Spot

Causal Agent:

Cool-season grasses, found worldwide: *Clarireedia jacksonii*

Warm-season grasses, found worldwide: *Clarireedia monteithiana*

Red fescue, appear restricted to United Kingdom: *Clarireedia bennettii* and *C. homoeocarpa*.

Susceptible Turfgrass:

All cool-season and warm-season turfgrasses.

Symptoms:

Dollar spot symptoms vary with height of cut. Initial infections appear as specks or small spots of white or tan colored leaves. On close cut golf turfs, spots usually grow to a size of 1.25 to 5cm diameter, and normally are bleached white or straw-colored. Huge numbers of spots may develop, coalesce to blight large areas and become pitted. In higher cut lawns and roughs, bleached, tan or straw-colored leaves develop in spots that may enlarge to 7.5 to 10 cm diameter. Spots can coalesce and blight large areas. In most species, distinctive hour-glass-shaped leaf spot lesions bordered by dark-brown or purple-colored bands of tissue are diagnostic. In some species, like tall fescue and warm-season-grasses, there may only be tip die-back or irregularly shaped, tan lesions with dark-brown or purple-brown bands bordering lesions. White fluffy or cobweb-like mycelium often is observed in the early morning in the presence of heavy dew. During cooler spring periods, infection centers may appear pinkish or there may be a tan spot with a red/pink periphery.

Large numbers of dollar spot infections centers pitting a green.



Dollar Spot

*Cool-cold spring
dollar spot infection
centers are reddish
and may have foliar
mycelium.*



*Early morning
mowing (foreground)
reduces dollar spot
severity.*



*Hour-glass banding
in Kentucky bluegrass
and tip die-back
symptoms in tall
fescue (lower left).*

*Photos courtesy of
Pete Dernoeden, Ph.D.*



Dollar Spot

Conditions Favoring Disease:

Dollar spot can occur at any time from mid-spring to late fall. Most often, the disease activates in mid-spring when average night temperatures range from **13°C to 24°C**. Dollar spot is mostly favored by warm days, cool nights and heavy dews, but outbreaks can occur during much cooler periods (even in winter during mild periods in some regions). Poorly nourished turf and dry soil conditions enhance disease severity.

Management Tips:

- Dollar spot, often described as a disease of poorly nourished turf, also is destructive to appropriately fertilized turfs.
- After disease subsides, apply modest amounts of nitrogen (**~ 120 grams N/ 100 m²**) to enhance recovery to higher maintained turf; spoon-feeding (**i.e., 70 grams N/ 100 m²**) greens, collars and approaches every 10-14 days is powerful in promoting recovery.
- Reduce thatch.
- Increase air circulation.
- Avoid drought stress and irrigate turf frequently enough to maintain good soil moisture when the disease is active.
- Rolling, mowing in the morning, and dew removal help reduce disease severity on greens and elsewhere.
- Convert to a cultivar (especially for bentgrass), with improved dollar spot resistance.
- Apply appropriate systemic fungicides on a preventive basis.
- Curatively, it is best to tank-mix an effective contact fungicide and systemic fungicide in combination with a small amount of water-soluble nitrogen.
- At present, management and control recommendations do not differ between species of fungi causing dollar spot disease.

Stay one step ahead of dollar spot and sign up for alerts at GreenCastOnline.com/DollarSpot

Regions: Most economically important disease of turfgrasses worldwide.

Recommended Products:

 BannerMaxx II Fungicide	 Daconil Action Fungicide	 SecureAction Fungicide	
 Concert II Fungicide	 TreflntI Nematicide Fungicide	 Headway Fungicide	 Instrata Fungicide
 Posterity Fungicide	 Renown Fungicide	 Briskway Fungicide	 Velista Fungicide

Other Fungal Diseases

Gray Leaf Spot

Causal Agent:

Pyricularia grisea

Susceptible Turfgrasses:

Perennial ryegrass, tall fescue, kikuyugrass, St. Augustinegrass

Symptoms:

Symptoms of gray leaf spot vary depending on species. In perennial ryegrass and tall fescue, symptoms first appear as gray lesions on margins of leaves. Lesions may have a yellow halo and grayish leaf tips that are often twisted. Numerous, small, dark-brown lesions may also be present. In early morning hours, infected leaves may have a purple felted appearance, which is due to the production of enormous numbers of spores. Severely infected stands develop a grayish, drought-like appearance and collapse rapidly. Under less severe conditions, turf will appear yellow and thin.

In warm-season grasses, gray leaf spot appears as small, brown spots on leaves. Lesions enlarge and become oval to oblong with purple or brown borders up to 1.25cm length. Lesions may have a yellow halo and appear felted. The disease is mostly debilitating in St. Augustinegrass, but can cause severe damage to kikuyugrass.

Gray Leaf Spot

Gray leaf spot



Slowly developing gray leaf spot in fall in perennial ryegrass may only thin the stand. Inserts show the dark leaf lesions and leaf twisting. Courtesy of Pete Dernoeden, Ph.D.



Gray Leaf Spot

Conditions Favoring Disease:

Gray leaf spot can occur anytime between mid-summer and late autumn. The disease is favored by extended periods of heat and drought stress in late summer, but may develop in perennial ryegrass under colder conditions in late fall.

Management Tips:

- Avoid medium-to-high nitrogen levels during mid-summer.
- When active, mow when the canopy is dry and try to remove clippings.
- Maintain adequate soil moisture and avoid excessive irrigation.
- Do not use herbicides or plant growth regulators when the disease is active.
- Renovate damaged stands with species and/or cultivars with resistance.
- Where chronic, use appropriate systemic fungicides on a preventive basis.
- Curatively, tank-mix an effective contact fungicide and a systemic fungicide. Repeat on 7-10 day intervals until disease activity ceases.

Regions: Wherever susceptible species are grown; especially mid-Atlantic and transition regions for cool-season grasses, and gulf coast and southwestern regions for warm-season grasses.

Recommended Products:

Other Fungal Diseases

Leaf Spot/Melting-Out/Net-blotch/ Red Leaf Spot

Causal Agents:

Drechslera spp. and *Bipolaris* spp.

Susceptible Turfgrasses:

Creeping red fescue, Kentucky bluegrass, perennial ryegrass, tall fescue; creeping bentgrass and bermudagrass.

Symptoms:

Leaf spot causes reddish-brown or purplish-brown lesions, which may be oblong to irregular in shape. Lesions may have a tan center. In perennial ryegrass and tall fescue, lesions develop in the form of numerous brown specks or larger dark-brown oblong or purplish oblong lesions (i.e., net-blotch). Older, lower leaves of infected plants become shriveled. When infection is severe, almost all of the leaves and sometimes tillers die, causing severe browning and thinning of the stand— or melting-out. Most cases of leaf spot and net-blotch occur during extended periods of chilly, rainy and overcast weather in spring. Red leaf spot is an uncommon disease of some creeping bentgrass cultivars during mild summer periods, and as the name implies, lesions are red.

Leaf Spot/Melting-Out/Net-blotch/Red Leaf Spot

Reddish-brown leaf spot lesions with tan centers in Kentucky bluegrass.

Thinning of turf caused leaf spot melting-out in Kentucky bluegrass.



Dark, reddish-brown and oblong net-blotch lesions on perennial ryegrass.



Photos courtesy of Pete Dernoeden, Ph.D.

Leaf Spot/Melting-Out/Net-blotch/Red Leaf Spot

Conditions Favoring Disease:

Diseases caused by *Drechslera* spp. are most common in the spring and fall when weather conditions are chilly, rainy and overcast for long periods. Conversely, most *Bipolaris* spp. infect during warm-to-hot periods and when there are frequent cycles of wet and dry weather. On bermudagrasses, *Bipolaris cynodontis* and other species are encouraged by cool, cloudy and wet weather in fall through spring.

Management Tips:

- Increase height of cut.
- Avoid the application of high rates of water-soluble nitrogen in spring.
- Reduce thatch and minimize shade.
- Do not apply broadleaf weed herbicides or growth regulators when any of these diseases are active.
- Apply an appropriate fungicide at the first indication turf is going-off color and numerous lesions are present.

Regions: All areas where cool-season grasses are grown, especially cool and humid regions.

Recommended Products:

 Briskway [®] Fungicide	 Concert II [®] Fungicide	 Daconil Action [®] Fungicide
 Headway [®] Fungicide	 Heritage Action [®] Fungicide	 Instrata [®] Fungicide
 Medallion SC [®] Fungicide	 Renown [®] Fungicide	 Secure Action [®] Fungicide

Other Fungal Diseases

Red Thread

Causal Agent:

Red thread—*Laetisaria fuciformis*

Susceptible Turfgrasses:

All cool-season turfgrasses, but it is particularly severe in creeping red fescue, perennial ryegrass and tall fescue. The fungus can be saprophytic in dormant warm-season grasses.

Symptoms:

Red thread blights in distinct spots or circular patches, which appear pink or reddish-colored and range from 5 to 7.5 cm diameter. When active in the presence of dew or even melting snow, a bright pink to red gelatinous fungal growth can be observed on leaves and sheaths. Resting bodies (i.e., sclerotia) called “red threads” are invariably present. Red threads initially are gelatinous, but soon become bright red, hard and brittle. Blighted leaves eventually turn tan, but on close inspection red threads can be seen embedded in dead tissues. White to pink “cotton candy-like” fungal flocks occasionally develop within blighted canopies.



Bright red spots and patches of red thread in perennial ryegrass.



Cotton-candy tufts and pink gelatinous red thread sclerotia.

Photos courtesy of Pete Dernoeden, Ph.D.

Red Thread

Conditions Favoring Disease:

Red thread can develop almost any time of the year including at snow melt and in summer, but is most common during extended, overcast and rainy weather in spring. While red thread is widely reported to be most severe in poorly nourished turf, it can severely blight professionally managed turf fertilized with more than adequate nitrogen. Red thread can cause severe thinning and promote weed invasion, but turf normally recovers with adequate nitrogen fertilization.

Management Tips:

- Maintain proper nitrogen and potassium fertility.
- Apply small amounts (~ 120 - 240 grams N/ 100 m²) of water-soluble nitrogen to blighted areas to promote recovery.
- Blighting often reduces density when crabgrass and other weeds are germinating in spring and a preemergence herbicide should be used where the disease is common.
- Increase air circulation, improve water drainage and reduce shade.
- Preventive fungicide applications during cool, wet weather are highly effective. Curative applications quickly halt disease activity but turf recovery may be slow if weather and/or fertility levels are not conducive.

Regions: In all areas where susceptible cool-season grasses are grown.

Recommended Products:

 BannerMaxx II Fungicide	 Briskway Fungicide	 Concert II Fungicide
 Daconil Action Fungicide	 Headway Fungicide	 Heritage Action Fungicide
 Instrata Fungicide	 Renown Fungicide	 Secure Action Fungicide
		 Velista Fungicide

Other Fungal Diseases

Southern Blight

Causal Agent:

Sclerotium rolfsii

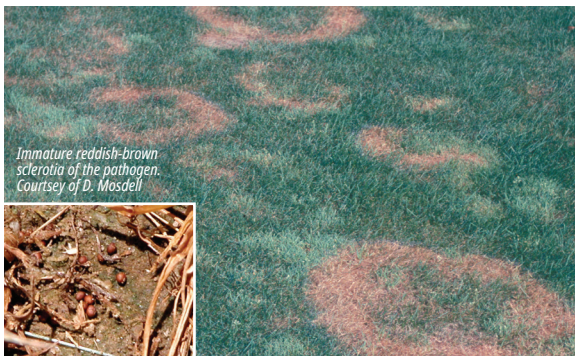
Susceptible Turfgrasses:

Potentially all turfgrasses, but primarily creeping bentgrass, annual and Kentucky bluegrasses, and bermudagrass grown on golf courses.

Symptoms:

Symptoms appear suddenly as small, circular, yellow, orange or reddish-brown circular patches; frog-eyes and crescents also are common. Patches increase rapidly in size and range from 15 to 90 cm diameter. During early morning hours when foliage is wet, a grayish-white mycelium may be seen, especially at the edges of patches. Numerous reddish to mustard-brown resting bodies (similar to sulfur coated urea granules) called sclerotia often are produced on thatch or soil in blighted areas. Turf is killed or severely damaged in a relatively short period of time.

Southern blight in Kentucky bluegrass.



Southern Blight

Conditions Favoring Disease:

Southern blight is promoted by very warm-to-hot nights, and extremely humid weather. High soil moisture and dense thatch layers promote the disease. In southern California, the disease can appear as early as May and continue throughout the summer. Since the advent of QoI/strobilurin fungicides, this disease has become less common.

Management Tips:

- Reduce thatch by coring and vertical cutting.
- Avoid excessively wet soil and thatch conditions.
- Use a soil acidifying fertilizer (e.g., ammonium sulfate and SCU) as the primary nitrogen source where the disease is common.
- Apply an appropriate systemic fungicide preventively where the disease has been a problem in the past.
- Curatively, tank-mix an effective contact fungicide and a systemic fungicide. Repeat applications may be necessary until the disease has been arrested.

Regions: Mostly southeast and southwest, especially southern California; sometimes in transition zone areas.

Recommended Products:



Other Fungal Diseases

Blue-Green Algae

Causal Agents:

Nostoc sp. and other species of blue-green algae, also known as cyanobacteria.

Susceptible Turfgrasses:

Mostly golf greens; occasionally in higher cut turfs during extraordinary wet and hot periods.

Symptoms:

From a standing position on overcast days, turf has a splotchy blackened appearance. The blackening is caused by massive growth of algal filaments. Filaments have a mucus-like coating, that develop into scums on thatch surfaces. Scums can seal surfaces causing oxygen deprivation and other problems.

A black, splotchy appearance of blue-green algal filaments and scums on a golf green.



Blue-Green Algae

Conditions Favoring Disease:

Blue-green algae are primitive plants that become highly invasive during extended warm, overcast and rainy periods in summer and fall. These algae are most common in shaded, low-lying, poorly drained, compacted or otherwise wet environments. Completely open, well-drained sites can be affected when rainy and overcast weather becomes prolonged. Scums can develop where water puddles in higher cut turfs that have poor density. Algal blackening also can occur during mild, overcast winter periods in some regions.

Management Tips:

- Increase mowing height and nitrogen fertility.
- Improve surface water drainage.
- Core, spike and/or vertical cut to reduce thatch, break-up scums and improve soil aeration.
- Remove or trim trees and shrubs to increase air movement and sunlight penetration in chronically affected turfs.
- Where chronic on greens, apply an effective algae-targeted fungicide (e.g., chlorothalonil, others) prior to a forecast of extended overcast and rainy weather in summer.
- Curative applications of a proper, algae-targeted fungicide is warranted on a 7-10 day interval until blackening dissipates.
- Frequent use of some DMI/SI fungicides can promote blue-green algal blooms on greens.

Regions: All regions that experience extended warm, overcast and rainy periods in summer and fall.

Recommended Products:



Syngenta Fungicide Summary

Pathogen	Appearance II	Banner Maxx II	Briskway	Concert II	Content	Daconil	Daconil Action	Headway	Heritage	Heritage Action	Instrata	Medallion SC	Posterty	Renoun	Secure	Secure Action	Subdue Maxx	Velista
Algae	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Anthraxnose	TM	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Bentgrass Dead Spot	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Bacterial Wilt	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Brown Patch	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Brown Ring Patch	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Copper Spot	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Dollar Spot	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Fairy Ring	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Gray Leaf Spot	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Gray Snow Mold	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Large Patch	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Rhizoctonia Leaf & Sheath Spot	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Leaf Spot (Drechslera)	TM	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Leaf Spot (Bipolaris)	TM	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Melting Out	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Microdochium Patch/ Pink Snow Mold	TM	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL

Ratings based on sensitive isolates: ● = best control; ▲ = better control; ■ = good control; ◆ = fair control; S = suppressing; NL = not labeled; TM = tank mix.

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

Pathogen	Appeal II	BannerMaxx II	Briksway	Concert II	Content	Daconil	Daconil Action	Headway	Heritage	Heritage Action	Instrata	Medallion SC	Posterity	Renoum	Secure	Secure Action	Subdue Maxx	Velista
Necrotic Ring Spot	NL	●	●	NL	NL	NL	NL	●	●	●	NL	NL	NL	2ee	NL	NL	NL	NL
Powdery Mildew	NL	●	●	●	NL	NL	NL	●	●	●	NL	NL	NL	2ee	NL	NL	NL	NL
Pythium Blight	NL	NL	NL	NL	NL	NL	NL	◆	●	●	NL	NL	NL	2ee	NL	NL	NL	NL
Pythium Root Rot	●	NL	NL	NL	NL	NL	NL	●	●	●	NL	NL	NL	2ee	NL	NL	NL	NL
Pythium Root Dysfunction	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Pythium Damping Off	●	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Red Thread/Pink Patch	NL	●	●	●	NL	●	●	●	●	●	●	NL	NL	●	●	●	●	●
Rust (leaf, stem, stripe)	NL	●	●	●	NL	●	●	●	●	●	●	NL	NL	●	●	●	●	●
Southern Blight	NL	NL	NL	NL	NL	NL	NL	NL	NL	◆	NL	NL	NL	NL	NL	NL	NL	NL
Spring Dead Spot	NL	●	NL	NL	NL	NL	NL	●	NL	NL	NL	NL	▲	NL	NL	NL	NL	NL
Stripe Smut	NL	●	NL	●	NL	NL	NL	●	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Summer Patch	NL	●	●	●	NL	NL	NL	●	●	●	●	●	NL	2ee	NL	NL	NL	NL
Take-all Patch	NL	●	●	●	NL	NL	NL	●	●	●	NL	NL	NL	2ee	NL	NL	NL	NL
Take-all Root Rot	NL	▲	2ee	●	NL	NL	NL	2ee	●	●	●	●	NL	2ee	NL	NL	NL	NL
Yellow Patch	NL	●	●	NL	NL	NL	NL	●	●	●	●	●	NL	●	NL	NL	NL	NL
Yellow Tuft	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	●	NL	NL	NL	NL	●	NL

Ratings based on sensitive isolates: ▲ = best control; ● = better control; ◆ = good control; ■ = fair control; S = suppression; NL = not labeled; TM = tank mix. Please see the Section 2(ee) Recommendation to confirm that the recommendation is applicable in your state. The recommendation must be in the applicator's possession at the time of application. All ratings assume pathogen is sensitive to a.i.s.

Combination Fungicides



Briskway®

Fungicide

GROUP	3	DIFENOCONAZOLE
GROUP	11	AZOXYSTROBIN

- Contains a DMI active ingredient and *azoxystrobin*, which work together to control over 20 summer turf diseases
- Can be used in high heat and humidity on sensitive turf species without temperature restrictions or negative plant growth regulation effects



Concert® II

Fungicide

GROUP	3	PROPICONAZOLE
GROUP	M5	CHLOROTHALONIL

- Includes two active ingredients to help prevent more than 13 diseases, including snow mold
- Contains a multi-site mode of action to help delay resistance



Contend®

Fungicide

GROUP	7	BENZOVINDIFLUPYR
GROUP	3	DIFENOCONAZOLE
GROUP	3	PROPICONAZOLE
GROUP	11	AZOXYSTROBIN

- Helps control multiple species and stages of pink and gray snow mold on fairways
- Contains four active ingredients in three FRAC groups to protect turf for up to 110 days under snow cover



Daconil® Action™

Fungicide

GROUP	M5	CHLOROTHALONIL
GROUP	P01	ACIBENZOLAR-S-METHYL

- Fortified with *acibenzolar-S-methyl* to stimulate the plant's natural defenses against diseases like dollar spot, algae and anthracnose for improved turf quality all season
- Helps turf quickly recover from stress like heat, drought and aerification
- Daconil Ultrex®, Daconil Weatherstik® and Daconil Zn® formulations are also available*

Combination Fungicides



GROUP	3	PROPICONAZOLE
GROUP	11	AZOXYSTROBIN

- Offers excellent broad-spectrum disease control on cool- and warm-season turf species, including spring dead spot, take-all root rot, take-all patch, summer patch, leaf spot and fairy ring
- Combines two systemic active ingredients with different modes of action, providing an excellent rotation product in agronomic programs to help delay resistance

GROUP	11	AZOXYSTROBIN
GROUP	P01	ACIBENZOLAR-S-METHYL



- Fortified with *acibenzolar-S-methyl* to stimulate the plant's natural defenses and systemically protect against a broad spectrum of diseases for improved turf quality all season
- The industry-standard for *Rhizoctonia* control
- Helps turf quickly recover from stress like heat, drought and aerification
- Heritage and Heritage G formulations are also available*



GROUP	3	PROPICONAZOLE
GROUP	M5	CHLOROTHALONIL
GROUP	12	FLUDIOXONIL

- Protects greens and tees against pink and gray snow mold and spring diseases such as anthracnose
- Contains three active ingredients and multiple modes of action for resistance management
- The industry-standard for snow mold control that is assured for 130 days under snow cover

Combination Fungicides



GROUP	M5	CHLOROTHALONIL
GROUP	11	AZOXYSTROBIN

- Controls and prevents key diseases via contact and systemic activity, including dollar spot, brown patch, yellow patch, powdery mildew and red thread
- Dual modes of action ensure proper resistance management



GROUP	P01	ACIBENZOLAR-S-METHYL
GROUP	29	FLUAZINAM

- Fortified with *acibenzolar-S-methyl* to stimulate the plant's natural defenses against diseases like dollar spot for up to 21 days plus bermudagrass leaf spot, while improving turf quality all season
- Helps turf quickly recover from stress like heat, drought and aerification
- Secure formulation is also available*

Specialty Fungicides



GROUP	33	POTASSIUM PHOSPHITE
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- Provides a deep, natural green color while enhancing turf quality and stress tolerance
- Controls important diseases such as *Pythium*, and is ideal for use in agronomic programs with Daconil Action or Secure Action fungicides for increased control of anthracnose, summer decline and more



GROUP	3	PROPICONAZOLE
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- Systemically controls more than 20 diseases, including dollar spot, leaf spot, patch diseases and snow mold

Specialty Fungicides



GROUP 12 FLUDIOXONIL

- Quickly targets pathogen spores to stop germination of key diseases, including snow mold, anthracnose, bermudagrass leaf spot and bentgrass dead spot
- Contact fungicide that protects on the leaf surface, in the thatch and at the soil surface to quickly reduce disease infection



GROUP 7 ADEPIDYN

- Provides up to 28 days of dollar spot control and delivers robust, consistent spring dead spot control
- Ideal for use in agronomic programs with Secure Action and Daconil Action for resistance management and broader-spectrum control



GROUP 4 MEFENOXAM

- Provides contact and systemic protection against *Pythium* blight, *Pythium* damping-off and yellow tuft (downy mildew)
- An excellent tank-mix partner with Appear II and Daconil Action fungicides in agronomic programs because of its efficacy and long residual of up to 21 days



GROUP 7 PENTHIOPYRAD

- Broad-spectrum SDHI and the only SDHI labeled to control anthracnose for golf
- Also protects against dollar spot, brown patch, spring dead spot, rapid blight, fairy ring and more



Turf & Landscape

In addition to its product portfolio, Syngenta offers many tools and programs on syngentaturf.sg to help you improve your turf.



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