



RHIZOCTONIA DISEASES OF TURFGRASSES

Rhizoctonia diseases of turfgrasses in the Midwest are caused by at least two soilborne fungi, *Rhizoctonia solani* and *R. cerealis*. One or both fungi are present in practically all soils throughout the world. Both fungi are composed of a large number of strains or races that attack a wide range of different plants and include most vegetables, flowers, and field crops.

Symptoms of turfgrasses infected by species of *Rhizoctonia* vary widely and are easily confused with the symptoms of diseases produced by other pathogens. They vary with the specific combinations of turfgrass cultivar, soil and air environmental conditions, and the specific species and strains (or races) of *Rhizoctonia*. One or more species of *Rhizoctonia* infect all turfgrasses, causing foliar blights as well as seedling blights.



Figure 1. *Rhizoctonia* brown patch on a creeping bentgrass putting green.

Species of *Rhizoctonia* produce several forms of hyphae that vary according to their age. Diagnosticians with access to a good compound light microscope can distinguish species of *Rhizoctonia* by the mature hyphae, which usually branch at right angles. The hyphal branch is somewhat constricted at the point where it originates, and a septum separates the hyphal branch from the parent hypha close to its point of origin.

Trying to distinguish between the species of *Rhizoctonia* is difficult and requires special staining procedures to assess the nuclear condition of the hyphal cells. The mycelial cells of *R. solani* contain an indefinite number of nuclei (multi-nucleate) while those of *R. cerealis* have two nuclei per cell. When grown in the dark on laboratory media, cultures of *R. solani* are usually some shade of brown, and *R. cerealis* are buff-colored to white with hyphae of *R. cerealis* smaller in diameter (2.4 to 6 μm) than are those of *R. solani* (5 to 11 μm).

RHIZOCTONIA OR LARGE BROWN PATCH

Brown patch, also known as Rhizoctonia blight and Rhizoctonia leaf and sheath blight, is caused by *Rhizoctonia solani*. The disease is common in the Midwest in dense, highly fertilized turfgrass, during extended periods of hot, moist, overcast weather when the temperature at night is above 60°F (15°C) and the leaf surfaces are covered with water. All lawn and fine turfgrasses are susceptible to attack. *R. solani*

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will grow at any soil pH, temperature, and moisture level that will support the growth on fine turf and lawn grasses. Bentgrasses, annual bluegrass, and bermudagrass are damaged more than the coarser bluegrasses, fine-leaved fescues, and ryegrasses. Colonial bentgrasses are more susceptible than creeping bentgrasses. Both bentgrass species are particularly susceptible to brown patch when cut at golf-green height (5/32 to 1/4 inch) and grown under a high level of maintenance.

Symptoms

Closely clipped bentgrass turf. On this turf, which is commonly found on golf and bowling greens, the disease appears as roughly circular, light brown patches that vary in size from a few inches to 2 to 3 feet in diameter (Figure 1). Infected grass blades first appear water-soaked and dark, purplish green, but soon dry, wither, and turn light brown with dead leaves remaining upright. A dark, purplish to grayish black “smoke ring,” 1/2 inch to 2 inches wide and composed of wilted, recently infected grass blades, often marks the advancing margin. This ring, which contains webbed, water-soaked grass, is most noticeable either when the air is moisture saturated or during the early morning; it disappears as the grass dries. Usually, only the leaf blades are killed. After several mowings, new but thinned-out grass appears in the affected areas. Algae often invade diseased patches and may cause a hard dark crust.



Figure 2. Brown patch on bentgrass.

Higher-cut turf. On this turf, found on home and industrial lawns, parks, athletic fields, and golf course fairways, diseased patches usually are roughly circular, light brown, matted down, and up to 2 feet in diameter. The patches sometimes develop green centers and resemble the “frogeyes” of summer patch and necrotic ring spot. Diseased patches of grass, however, appear to be sunken (Figure 2). The appearance of the purplish to grayish black, smoke ring borders is rare in this type of turf.



Figure 3. *Rhizoctonia* leaf spot.

In light infections of brown patch, the affected turf generally recovers in 2 or 3 weeks. When the attack is severe, however, the crown, rhizomes, stolons, and roots turn brown and rot often killing large areas.

Leaf lesions (called *Rhizoctonia* leaf and sheath blight) also result from infection by *Rhizoctonia solani* (and *R. cerealis*) with irregular, water-soaked spots appearing first. The center turns a straw or ash brown color and is often surrounded by a dark border (Figure 3). The size of the lesion varies with the turf-grass species, ranging from a large spot (up to 1 centimeter) on tall fescue, to small lesions (about 1.5 mm) on bentgrass and bermudagrass. Turfgrass species grown in the Midwest on which leaf lesions have been observed include bentgrasses, bluegrasses, perennial ryegrass, tall fescue, bermudagrass, and zoysiagrass.

Disease Cycle

The *Rhizoctonia solani* fungus survives from year to year, principally in the form of hard, often rounded, dark brown to black resting bodies (bulbils; sclerotialike structures) that measure approximately 1/16 of

an inch in diameter (Figure 4). The bulbils, which are seldom seen by the turfgrass manager, occur largely in the thatch, in diseased grass tissues, and in the top half-inch of soil associated with organic debris. Bulbils are extremely resistant to heat, cold, drought, and fungicides. Each bulbil may germinate, cause infection up to 30 times or more, and survive in soil for a number of years. The *Rhizoctonia* fungus also survives in grass plants and debris, such as dried grass clippings. Species of *Rhizoctonia* also grow saprophytically in soil and may invade roots, causing a dark decay.



Figure 4. Sclerotia of the brown patch fungus on Seaside bentgrass plants.

During moist periods, when the soil-thatch temperature is above 47° to 60°F (8° to 15°C), the bulbils germinate by sending out delicate threads or hyphae in a radial pattern through the upper soil and thatch. The result is a somewhat circular spot of diseased grass. The hyphae penetrate and infect the grass plants through leaf pores (stomates), directly through leaf and stem tissue, or via mowing wounds. The lower leaves that touch the soil or turf mat are the first ones attacked. The fungus grows throughout the leaf tissues and grows up and over the grass leaves and sheaths. The spread from one grass blade to another occurs through droplets of dew or guttation water exuded at the leaf tips. Nutrients and organic compounds (primarily amino acids and sugars) in the guttation water stimulate rapid fungus growth.

As long as the temperature is favorable, the mycelium within grass clippings or thatch resumes growth and initiates infections in a film of moisture. Infection and disease development are slow at air temperatures below 70° to 75°F (21° to 23°C), however, the fungus grows rapidly on most grasses when the temperature is 80° to 85°F (26° to 29°C) and the air is moisture saturated. Large areas of turf can become completely blighted overnight. The pathogenic activity of *Rhizoctonia solani* is reduced when the air temperature reaches 90° to 95°F (32° to 35°C). Although brown patch occurs at low humidity levels, warm to hot rainy weather and a saturated atmosphere greatly speed disease development.

The severity of the disease is greatest in lush, succulent turf that has been both highly fertilized with nitrogen and watered, especially at night. Turfgrasses are more susceptible when grown at a moderate to high fertility level than at a low level of nitrogen fertilization. Resistance increases when the levels of phosphorus, and especially potassium, are increased.

Four conditions are necessary for *Rhizoctonia* or large brown patch to develop:

- the presence of the fungus in an actively growing state;
- a dense, well fertilized and watered stand of grass;
- prolonged periods of dew or the presence of a film of moisture on the foliage for 12 hours or longer;
- and a temperature of 70° to 95°F (21° to 35°C) for at least several hours.

If any of these conditions is lacking, the development of brown patch will be limited.

YELLOW PATCH AND WINTER BROWN PATCH

Yellow patch, or *Rhizoctonia* yellow patch, formerly called cool-weather brown patch, is caused by *Rhizoctonia cerealis*. Like *R. solani*, yellow patch is a common soilborne fungus that can infect all

northern turfgrass species. Yellow patch occurs most commonly in Kentucky bluegrass or perennial ryegrass sod that is two or more years old, with a thatch layer about 1 inch thick. The fungus also attacks annual bluegrass, creeping bentgrass, tall fescue, bermudagrass, zoysiagrass, and other turfgrasses (Figure 5). Disease attacks occur in early spring, winter, or autumn during very moist weather when temperatures are cool (below 50°F or 10°C). The patches may be scattered and distinct or, where numerous, may coalesce to cover large turfgrass areas.

Winter brown patch often occurs on bentgrass golf greens from autumn through spring when temperatures are well above freezing. Attacks are often superficial, in that the grass crowns and roots are not usually killed.

Symptoms

Yellow patch and winter brown patch are commonly seen as light green to yellow green, yellow, tan, straw, or bronze-colored rings and crescent-shaped patches, ranging from a few inches up to 3 feet in diameter, often with green grass in the center of the circles. Smaller yellow patches result from infections that occur under cold, wet conditions. The patches often have a distinctly sunken appearance due to the rapid decomposition of the thatch. The leaves of infected grass plants, near the margins of diseased patches, frequently have a characteristic reddish or reddish-purple appearance that begins at the leaf tip. The symptoms of yellow patch and winter brown patch appear in cool to cold weather (optimum about 40° to 60°F or 4° to 15°C) in the spring, autumn, and winter, and resemble the “frogeyes” of summer patch and necrotic ring spot. Attacks of summer patch and necrotic ring spot, however, occurs in hot weather. Turf affected by yellow patch and winter brown patch often take several months to recover.

Disease Cycle

Relatively little is known about the etiology of yellow patch. The *R. cerealis* fungus survives from year to year, as does *Rhizoctonia solani*, primarily in the form of minute, dark brown to black bulbils or as mycelium in both the thatch and diseased grass tissues, and soil near the surface.

Control

Yellow patch has not been controlled with any degree of success through the use of cultural or chemical practices. If yellow patch is serious, applications of nitrogen fertilizer should be reduced in the spring and/or fall, or an application of a slow-release form of nitrogen fertilizer should be tried.

Rhizoctonia or large brown patch can be controlled following the practices that are outlined below.

1. Provide for good surface and subsurface drainage when establishing a new turfgrass area. Grade for a slope of 2 to 4 percent, filling in depressions where water may stand. If soil amendments, such as peat moss, calcined clay, sand, topdressing, and compost are added, mix these into the soil uniformly. Test the soil reaction (pH) and follow the suggestions in the soil report. A pH level between 6 and 7 is best.
2. Maintain a proper balance of nitrogen, phosphorus, and potassium (N-P-K) according to local recommendations and a soil test. Recommendations will vary according to the grasses that are grown and their respective uses. Especially in hot weather, do not overfertilize with a quickly available, high-nitrogen material. Maintain adequate levels of phosphorus and potassium.

3. Water established turf infrequently, but deeply, early in the day during drought periods, so the grass can dry before night; moisten to a depth of 6 inches. Golf course superintendents should remove the dew and guttated water from golf greens early in the morning by hosing down the grass with water, dragging a garden hose or rope across the turf, or sweeping the green with a long bamboo pole or large brushes.
4. Increase light penetration, air movement, and drying of the grass surface by selectively pruning or removing dense trees and shrubs that border the turf. Space landscape plants to allow adequate air movement and to avoid excessive shade.
5. Remove thatch in early spring or late summer when it has accumulated to 1/2 inch. Use a vertical mower, power rake, aerifier or similar equipment. These machines can be rented at most large garden supply and tool rental stores.
6. Collect the grass clippings, where feasible, to remove a potential source of inoculum.
7. In order to help insure vigorous grass stands, follow the suggested insect and weed control programs for your area and note the grasses being grown there. Refer to Illinois Commercial Landscape Turfgrass Pest Management Handbook for specific recommendations.
8. No species of turfgrasses are known to be highly resistant to brown patch or yellow patch. Perennial ryegrass cultivars reported to have some tolerance to *Rhizoctonia solani* include All-Star, Barry, Belle, Birdie, Birdie II, Blazer, Citation, Citation II, Dasher, Delray, Derby, Diplomat, Fiesta, Gator, Manhattan II, Omega, Omega II, Palmer, Pennant, Pennfine, Prelude, Premier, Regal, Repell, Tara, and Yorktown II. Susceptible perennial ryegrasses include Campus, Eton, Game, Linn, Manhattan, NK-100 and -200, Paramount, and Yorktown. Tall fescue cultivars that are more tolerant to brown patch include Adventure, Apache, Arid, Bonanza, Chemfine, 5GL, Falcon, Galway, Jaquar, Maverick, Mustang, Olympic, Pacer, Rebel, and Trident. Very susceptible tall fescues include NK81425, Brookston, Barcel, Festorina, and Johnstone.

Scaldis is a moderately resistant hard fescue. The Kentucky bluegrass cultivars most resistant to yellow patch include Adelphi and Cheri. Very susceptible cultivars in the same study included A-34 (Bensun), Baron, Fylking, Merion, Parade, Shasta, and Touchdown.

9. When cultural practices do not check the development of brown patch, a preventive fungicide spray program may be needed. This is especially true for bentgrass cut at golf-green height and for which a history of disease exists. The first fungicide application should be made when the temperature at night is expected to remain at 65°F (18°C) or above, the daytime temperature will be 80°F (26°C) or above, and the air is near the saturation point for 12 hours or longer. Repeat applications are needed at 5- to 14-day intervals during hot, humid weather. When the turf receives over 1.5 inches of water in a week as either rain or irrigation, the interval between applications should be shortened to 5 days. Where feasible, the fungicide should be applied in the late afternoon or early evening when the temperature is 80°F (26°C) or lower.

For the most effective control of brown patch, spray 1,000 square feet uniformly with 5 to 10 gallons of fungicide suspension in water. Use the lower fungicide rates listed on the container labels in a routine preventive program; use higher rates for a curative program after disease is evident. Refer to Illinois Commercial Landscape & Turfgrass Pest Management Handbook for specific recommendations.

Fungicide use and restrictions are subject to change without notice. When mixing or applying any fungicide, carefully read and follow all the manufacturer's directions and precautions.