



## SUMMER PATCH AND NECROTIC RING SPOT OF LAWNS AND FINE TURFGRASSES

Summer patch and necrotic ring spot are separate diseases that, formerly, were collectively known as *Fusarium* blight. They are serious and widespread diseases of established Kentucky bluegrass turfs that are managed intensively and difficult to control. Summer patch, necrotic ring spot, and perhaps other components of the disease syndrome produce symptoms that are largely indistinguishable from each other.

The normally weak pathogenic, soilborne fungus *Magnaporthe poae* with a *Phialophora* state causes summer patch disease when hot, sunny days follow warm to hot, very wet periods. The soilborne fungus *Leptosphaeia korrae* causes necrotic ring spot and is favored by slightly cool temperatures and dry to wet conditions from spring to autumn and can persist through winter and early spring. The disease is most severe in late spring and early autumn. *Magnaporthe* and *Leptosphaeia*, which are ecologically very closely related fungi, also resemble the take-all fungus, *Gaeumannomyces graminis* var. *avenae*, in their dark brown to black mycelial growth (runner hyphae) over the roots, crowns, and rhizomes of grass plants at the edges of the patches and in their disease development. Also associated with diseased plants are species of *Fusarium*, which are widely distributed, but generally considered to be secondary pathogens or saprophytes. The *Fusarium* fungi may accelerate the expression of symptoms but do not appear essential to the final expression of disease.

Many bacteria, fungal species such as *Curvularia*, *Colletotrichum*, *Drechslera*, *Pythium*, *Rhizoctonia*, *Alternaria*, *Stemphylium*, *Trichoderma*, and yeasts can also serve as secondary colonizers or saprophytes of the weakened grass plants, thereby substituting or coexisting with the *Fusarium* species.



Figure 1. Late stage of summer patch showing circular, doughnut-shaped area of dead grass with healthy grass in center.



Figure 2. Large area of summer patch has caused brown to bronze patches on golf course.

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Grasses susceptible to one or more parts of this disease complex include Kentucky and annual bluegrasses, *Poa trivialis* or rough bluegrass, several fescues (chewings, red, sheep, and tall), colonial and creeping bentgrasses, Italian and perennial ryegrasses, bermudagrass, zoysiagrass, centipedegrass, many other forage, wild and weed grasses, and small grains.

Summer patch and necrotic ring spot can become severe when turfgrass, especially Kentucky bluegrass, is under stress and entering summer dormancy, although infection may have occurred several months earlier during cool weather. Prolonged periods of high humidity and warm to hot weather, with temperature ranges of 70° to over 100°F (20° to 37°C) during the day and about 70°F (21°C) during night, favor disease development. Moisture and heat stress, excessive watering, close mowing, a thatch exceeding 3/4 inch thick, with a soil reaction (pH) of above 7 or below 5, unbalanced applications of fertilizer—an excess of nitrogen and low levels of potassium and/or phosphorus—high populations of parasitic nematodes, such as the stunt nematode *Tylenchorhynchus dubius*, compaction, and other factors that predispose turf to stress conditions usually increase the severity of these diseases. The abiotic factors that most influence disease development appear to be related to the soil and thatch environment. In particular, the factors responsible for the rate of thatch decomposition, including good aeration under warm, moist conditions and an acidic or alkaline soil pH, are strongly implicated. These diseases of Kentucky bluegrass are generally not evident until the second or third year on newly laid sod and usually not for four years or more after seeding.

## SYMPTOMS

Scattered, circular, slow-growing, often thinned, light green or grayish green patches, typically 1 ½ to 6 inches in diameter, appear first. In warm to hot weather, they soon enlarge and rapidly fade to a dull reddish brown or bronze, then a light tan, and finally to a light straw color (Figure 1). The patches may become sunken elongated streaks, crescents, or roughly circular and 1 to 3 feet in diameter. The most characteristic symptom on Kentucky bluegrass in many areas of the United States is a roughly circular, doughnut-shaped area of dead or stunted grass up to 2 or 3 feet across, with tufts of apparently healthy grass in the center, giving a “frog-eye” pattern (Figure 2). Plants die as the basal stem, crown, root, rhizome, and stolon tissues are destroyed by a hard and tough, black, dark brown, or reddish brown dry rot. Serious turf damage occurs when the blighted areas are numerous and overlap. The circular patches tend to increase in size for several years. The dead turf is commonly invaded by weeds.

Frequently, more subtle symptoms appear. Irregular patches that resemble drought or chinch bug injury contain living plants scattered among dead or weak plants. The turf in these areas is stunted and often pale green to various shades of red, yellow, or tan, eventually turn a dull tan or brown, but does not develop distinct rings and spots. Such turf does not readily recover from mowing or adverse weather

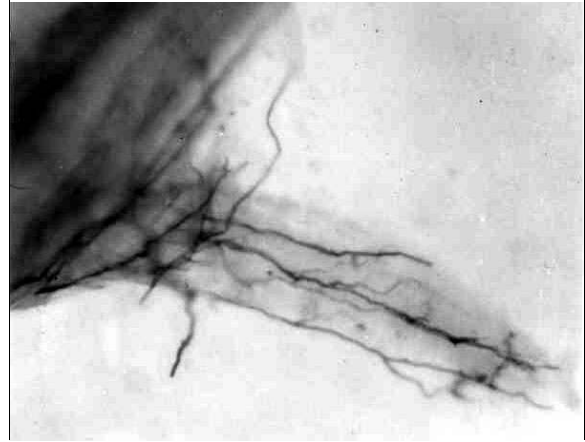


Figure 3. “Runner” hyphae of the summer patch or necrotic ring spot fungus growing over two roots (courtesy R.W. Smiley).

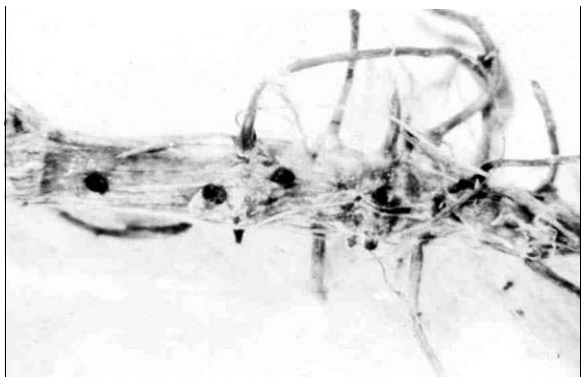


Figure 4. Dark pseudothecia of *Leptosphaeria korrae*, the necrotic ring spot fungus, growing out of Kentucky bluegrass root tissues (courtesy R.W. Smiley).

conditions.

## DISEASE CYCLE

The causal fungi grow outward radially at the rate of two to three inches per year for several years. Any one patch may “die out” or disappear after reaching a certain size. *Leptosphaeria* and *Magnaporthe*, which are difficult to identify and to isolate, are believed to survive seasons as mycelium and sclerotia in colonized grass debris in the thatch or soil and possibly on perennial parts of living grass plants. Healthy crowns, stems, and underground parts of turfgrass plants are invaded by the mycelium of the two fungi in cool to hot, moist weather. The fungi spread from plant to plant by strands of dark brown to black mycelium (runner hyphae) that grow over roots (Figure 3), crowns, rhizomes, or stolons and by infected plant debris adhering to mowers, aerification dethatching, and other turf equipment. Associated with the mycelium, and developing on crown, leaf sheath, and root tissues, are dark brown, flattened sclerotia and black, flask-shaped and beaked fruiting bodies called pseudothecia of *Leptosphaeria korrae* (Figure 4) that, when mature, contain large numbers of microscopic, needlelike ascospores. *Magnaporthe poae* (Figure 5) produces large numbers of microscopic conidia or phialospores. Symptom-free but infected sod, sprigs, and plugs also may serve to spread these diseases.

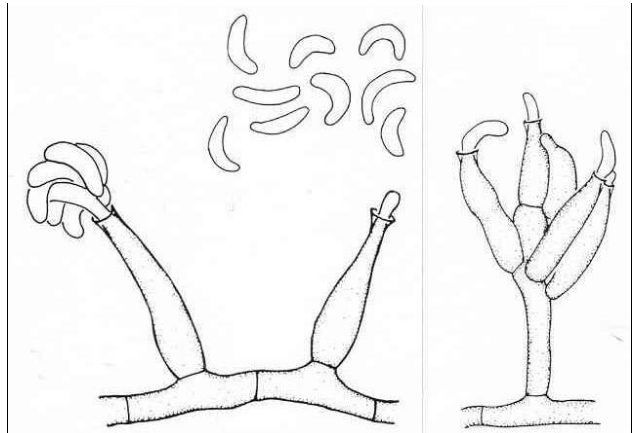


Figure 5. *Magnaporthe poae* with conidiophores and conidia (drawing by Lenore Gray).

## CONTROL

Follow the suggested cultural measures outlined below. Avoid as many environmental stresses as possible and keep the turfgrass growing steadily throughout the growing season.

1. The initial step in managing turf for control of summer patch/necrotic ring spot is to properly prepare the planting bed. These diseases are often most devastating in new housing areas where much of the topsoil is removed and sod is laid on a fine-textured, infertile soil that has been heavily compacted by grading and construction equipment and vehicles. Summer patch/necrotic ring spot can also occur when seed is planted into poorly prepared soils. Soil preparation is extremely important for the overall, long term health and quality of a turf.

Remove stumps, large roots, construction lumber, bricks, concrete, plaster, mortar, and other debris. Provide five to seven inches of good topsoil. Any soil amendments, such as peat moss, calcined clay, sand, or compost should be mixed uniformly into the upper six inches of soil. When needed, provide subsurface drainage with coarse textured amendments or underground drain tile. Provide good surface drainage by grading for slope of two to four percent and filling in depressions to achieve a smooth, uniform surface. Test soil and follow the soil test suggestions to adjust soil reaction (pH) to between 6 and 7.

Grow locally adapted, disease-resistant grasses in blends or mixtures. Avoid pure stands of very susceptible grass cultivars. Table 1 lists a number of modern Kentucky bluegrasses resistant to one or more diseases. Other Kentucky bluegrass cultivars generally considered resistant to summer patch and/or necrotic ring spot include Admiral, Banff, Bristol, Challenger, Columbia, Georgetown,

Glade, Majestic, Mystic, Nassau, Rugby, and Trenton. Susceptible Kentucky bluegrasses include Argyle, Delft, Kenblue, Merion, Newport, Nugget, Park, Plus, and Ram I.

Overseeding diseased turf with a blend of perennial ryegrasses or resistant cultivars of Kentucky bluegrass provides control. Cultivars of perennial ryegrass and tall fescue differ in their resistance to the summer patch fungus. Red fescues are generally considered resistant to these diseases.

4. Maintain adequate to high balanced fertility, based on soil tests and the recommended fertilization program for your area and the grass or grasses being grown. Avoid overstimulation with fertilizer, especially with a water-soluble nitrogen material, just before or during summer stress periods. Necrotic ring-spot and summer patch occur much less frequently when fertilizers that contain slow release forms of nitrogen are applied.
5. Mow frequently at the suggested maximum height (2 to 3 inches) for upright, lawn-type grasses; one-half inch or less for bentgrasses and bermudagrass. Remove no more than one-fourth to one-third of the leaf height at one cutting. Maintain a mowing height on Kentucky bluegrass turfs of 2 to 2½ inches in the spring and fall; 2½ to 3 inches in the summer.
6. Where feasible, collect the clippings. This is especially important under conditions of very high nitrogen fertilization during hot, very humid weather.
7. Water established turf thoroughly during drought periods. Moisten the soil to a depth of the root system at each irrigation. Repeat as needed, usually every 7 to 10 days if the weather remains dry. Maintaining adequate moisture on south- and west-facing slopes and next to sidewalks, driveways, and parking lots is important because these sites dry faster and have higher soil temperatures than other areas such as east- or north-facing slopes. Avoid overwatering and frequent sprinklings in late afternoon or evening. Daily watering may be needed in certain areas to prevent wilt and symptoms of summer patch and necrotic ring spot. Midday heat stress can be reduced by sprinkling (syrring) lightly one or more times between about 11:00 a.m. and mid-afternoon.
8. Reduce soil compaction in turf by directing traffic to paved areas through the use of fences, patios, ornamental plantings, or other means. Core aerify to reduce compaction one or more times per year when turf is actively growing (spring or fall for cool season turfs). Repeat operation until there are 18 to 36 holes per square foot, 1½ to 2½ inches dep.
9. Remove thatch in spring or fall when turf is actively growing and thatch has accumulated to one-half inch or more on higher cut turfs or one-eighth inch or less for fine turf. Use a vertical mower, power rake or similar dethatching equipment, often available from garden supply or tool rental stores. Take care using these power tools when working in areas with thick thatch; turfs may be rooted into the thatch and much live turf may be removed by these activities.

## **Fungicide Management**

Where the cultural practices outlined above (1-9) are not providing the expected control, preventive fungicide drenches may be applied. First, consider the total cost of the disease management program and potential loss from disease. Apply the first fungicide drench before disease is evident or when soil temperatures at the 2-inch (5 cm) level are about 70°F (21°C). Two or three applications are needed at 21- to 28-day intervals.

Carefully follow the manufacturer’s directions on the container label. Use one of the fungicides listed in the current edition of Illinois Commercial Landscape Turfgrass Pest Management Handbook. The only two fungicides that control both summer patch and necrotic ring spot are Banner and Rubigan.

(Mention of a trade name or proprietary product does not constitute warranty of the product and does not imply approval of this material to the exclusion of comparable products that may be equally suitable).

Table 1. Modern Kentucky Bluegrass Cultivars Adapted to Illinois and Reported to be Moderately to Highly Resistant (R)<sup>a</sup> to one or More Diseases

Kentucky Bluegrass Cultivars	“Helminthosporium” diseases	Leaf smuts	Leaf and stem rust	Necrotic ring spot	Dollar spot	Typhula blight	Septoria leaf spot	Red thread
America	R	R	R	R	R	(b)		
Bensun (A-34)	R	R	R		R			
Adelphi	R	R	R	R	R	R	R	R
Baron		R		R		R	R	R
Brunswick	R	R	R	R	R			
Cheri	R	R		R		R	R	
Eclipse	R	R		R	R			R
Enmundi	R	R	R	R			R	R
Glade		R	R	R		R		
Majestic	R	R	R	R	R	R	R	R
Midnight	R	R	R	R	R			R
Monopoly	R	R	R	R		R	R	R
Nugget	R	R	R			R	R	R
Parade	R	R	R	R	R	R	R	
Plush	R	R	R		R		R	R
Rugby	R		R	R	R			
Sydsport	R	R	R	R		R	R	
Touchdown	R	R		R			R	R
Victa	R	R	R	R			R	R

a A resistant (R) rating does not mean that a particular cultivar will be resistant in all locations every year. Due to the presence of physiological races or strains of the various fungi that cause these diseases, a cultivar may be susceptible in one locality and highly resistant in another. This is especially true of powdery mildew and is the reason we omitted this disease from our ratings.

b A blank under a given disease does not necessarily indicate susceptibility. In some cases it means that no data are available on which to evaluate the relative susceptibility or resistance to a particular disease.