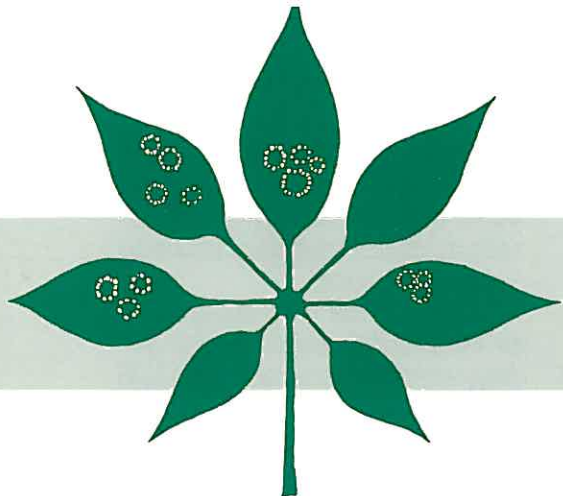


# PLANT DISEASES



## MANAGING NECROTIC RING SPOT ON TURFGRASS IN THE PACIFIC NORTHWEST

Necrotic ring spot (NRS) is a newly recognized disease of turfgrass. First reported in North America in 1982, and from the Pacific Northwest in 1984, NRS occurs primarily on Kentucky bluegrass turf. Because a number of different patch diseases display similar symptoms, it is easy to confuse this disease with summer patch, fairy ring, or *Rhizoctonia* yellow patch. During the late 1970s and early 1980s in the Pacific Northwest, turfgrass managers commonly confused NRS with take-all

patch, which occurs on bentgrass turf. The disease appears throughout Washington but is more prevalent east of the Cascade Mountains, where bluegrass turfs are more common. The disease also occurs in Idaho, Oregon, and British Columbia.

### Symptoms

Most commonly seen in the Pacific Northwest on 2- to 5-year-old Kentucky bluegrass lawns established from sod, NRS has also appeared on seeded bluegrass turf.

New NRS outbreaks usually appear in late summer to early fall as small, circular, chlorotic areas with thinning or dying grass (Fig. 1). The infected turf lifts easily from the soil, and both roots and shoots of the plants eventually die, creating a dead patch. Microscopic observation of the roots and the shoot bases reveals dark fungal mycelium strands, mostly oriented parallel to the root axis (Fig. 2). Initially, patches extend several inches in diameter, but can expand to form rings, arcs, or patches several feet



**Fig. 1.** Typical Necrotic ring spot symptoms on eastern Washington bluegrass turf late in summer.

**Fig. 2.** Seen through a microscope, *Leptosphaeria korrae* runner hyphae on infested roots aid in identifying this disease.

in diameter (Fig. 1). Actively expanding patches generally have a border of reddish brown turf. Weeds and unaffected grasses often invade the center of the patches, creating a donutlike appearance. Individual patches can coalesce to form large, irregularly shaped areas of affected turf.

### Causal Agent

The fungus, *Leptosphaeria korrae*, causes NRS on bluegrass turf, as well as spring dead spot on Bermudagrass turf. The fungus forms microscopic dark brown to black runner hyphae on the roots and lower crowns of infected plants (Fig. 2). Black, flask-shaped fruiting bodies called pseudothecia occasionally occur on infected tissues.

### Disease Cycle

Little is known about the organism's life cycle. This pathogen probably survives as mycelium on roots during unfavorable periods. When conditions are right for pathogen growth, it probably spreads from plant to plant by growing along the roots. Fruiting bodies have been observed in Washington during the fall. However, fruiting bodies are not common, and the role of ascospores from these bodies in the spread of this disease is unknown.

### Disease Development

Mild temperatures favor pathogen growth and development of NRS symptoms. Although the fungus can grow at temperatures as low as 40°F to 45°F, the optimum temperature for growth and disease development is 68°F to 78°F. Limited growth and disease development occur at temperatures above 85°F. East of the Cascades, the pathogen can be inactive during midsummer. Symptoms can disappear on properly maintained turf, only to reappear in the fall. Patch symptoms can persist through winter and early spring, and in some instances the pathogen is active

during late spring and early summer. West of the Cascades, the disease can be active from spring through fall, probably because of generally mild temperatures. If the turf has poor recuperative capacity, patches can be evident all year.

Moist conditions also favor growth of the fungus and production of fruiting bodies. Once the turf is infected, it can take 12 to 18 months for initial symptoms to appear. Depending on how it is managed, the turf may completely recover and appear disease free when environmental conditions do not favor disease activity. However, on poorly maintained turf that has limited recuperative potential, symptoms can persist for extended periods.

### Cultural and Nutritional Control

To manage NRS, employ an integrated approach based on cultural practices that discourage the disease yet favor turf growth. Consider factors such as site selection and preparation, variety selection, establishment method, fertilization, mowing frequency and height, water management, soil compaction, soil pH and thatch accumulation.

The effect of specific cultural practices on NRS is mostly unknown. However, practices that encourage deep rooting of turfgrass during spring and fall, and that preserve well-developed root systems during summer and winter can minimize NRS damage. The following cultural practices support good growing conditions for turf.

### Fertilization

A balanced fertilizer program includes three major elements—nitrogen, phosphorus, and potassium. East of the Cascades, use 4 pounds of available nitrogen per 1,000 square feet each season. Divide this amount into four equal parts (1 pound each) to apply in April, June, August, and November. Improved Kentucky bluegrasses require more nitrogen. They can receive up to 6 pounds of

available nitrogen per 1,000 square feet each season. Make four or five equal applications. Have your soil tested to determine phosphorus and potassium needs.

West of the Cascades, use 1 to 1 1/2 pounds available nitrogen (N) (one-third to one-half of the N in a slow-release form), 1/2 pound available phosphorus, and 1 pound available potassium per 1,000 square feet at each application. Do not exceed 1 pound of immediately available nitrogen in a single application.

You can supply these amounts by using 9 to 12 pounds of a 12-4-8 fertilizer or 11 to 16 pounds of a 9-3-5 mixture. Apply four times a year: November or December, then April, June, and September. If you fertilize at the lower end of this rate, make one or two additional applications of nitrogen alone at 1 pound per 1,000 square feet between these dates for maximum turf density and color. If you apply nitrogen in warmer summer months, use either a slow-release fertilizer or a lower rate of soluble nitrogen (1/4 to 1/2 lb N) to avoid burning the turfgrass or producing an excessive flush of growth.

An application of 2 to 3 pounds of sulfur per 1,000 square feet per year will improve turf quality and help suppress diseases such as Fusarium patch. Applying elemental sulfur or using ammonium sulfate as the nitrogen source will supply this amount of sulfur. Applying sulfur during hot weather (over 85°F) can severely burn the turf.

### Watering

Turf is healthier when you water it more deeply but less frequently. Turf watered daily is usually overwatered most of the time. Frequency of irrigation is determined by water-holding capacity of the soil, rooting depth of grass, weather conditions, and quality of grass desired. Lawn soil textures of sandy loam or heavier do not ordinarily require irrigation more than once a week. Light, sandy soils may



require irrigation more frequently. (See EB482, *Home Lawns*, and EB1280, *Turfgrass: Soil-Water Relationships*.)

### **Thatch**

Heavy thatch in the lawn can keep water and fertilizer from reaching the grass roots and can stress a lawn. Although no direct relationship exists between thatch development and the severity of NRS, make every effort to remove thatch more than 1/2 inch thick. (See EB1117, *Thatch and its Control*.) Select cultivars and proper management practices to control thatch and to help turf recover when disease conditions are less favorable.

### **Clean Equipment**

Since a soil-borne fungus causes NRS, equipment such as mowers probably do not spread this disease. Equipment such as dethatchers and aerifiers that can move soil or infected roots has the potential to spread this disease. To minimize the chance of spread, clean this type of equipment before use.

### **Sod vs. Seed**

Although most common on turf established from sod, NRS also occurs on seeded turf. Observations in the Pacific Northwest, north central and northeastern portions of the United States indicate that NRS symptoms rarely appear on turf at sod farms under a normal rotation. However, NRS has oc-

curred on some sod farms when turf is not cut and remains on the farm for a number of years.

### **Resistant Varieties**

Use mixtures of two or more grass species and two or more resistant varieties to reduce the chance of NRS developing on turf established from either sod or seed. Perennial ryegrasses and tall fescues appear resistant to NRS.

Greenhouse and field studies have shown that bluegrass and fine-leaved fescue cultivars vary in susceptibility to this disease. Data from field tests conducted in Idaho, Washington, Michigan, Wisconsin, and New York indicate that limited disease has developed on Adelphi, Classic, Eclipse, Majestic, Merion, Midnight, and Mystic bluegrass. Researchers found that disease symptoms varied on a large number of cultivars depending on the test location. Cultivars that showed consistently high susceptibility to NRS included Baron, Cheri, Columbia, Georgetown, Glade, Ram 1, and Sydsport. Until additional susceptibility information is available, use apparently resistant cultivars, such as those listed above, to minimize NRS development. Avoid sod or packages of seed predominantly composed of susceptible cultivars.

Melting out or leaf spot (caused by *Drechslera* [*Helminthosporium*] *poe*) can limit Kentucky bluegrass use in areas west of the Cascades. Of the varieties listed with some

resistance to NRS, only Midnight, Eclipse and Majestic would have sufficient resistance to melting out to allow their use (without fungicide treatment) in these areas.

### **Fungicides**

Extensive research in the Pacific Northwest has addressed the effectiveness of various fungicides in controlling NRS. When applied during April or May, Rubigan has provided effective control of NRS. A single application of Rubigan IAS at 4 to 8 fluid ounces per 1,000 square feet has controlled NRS in a number of Northwest areas. Two applications at 4 ounces per 1,000 square feet is not more effective than a single application at 8 ounces per 1,000 square feet. Although highly effective in reducing disease damage, Rubigan, particularly at the 4-ounce rate, does not generally provide 100% control of NRS. Apply it to the entire lawn, not just the spots. Rubigan also can result in a darker green turf and may reduce turf growth rate.

Research in other states has shown that watering in multiple applications of Fungo 50W during late summer at 4 to 8 ounces per 1,000 square feet gives some relief of disease symptoms.

Remember that fungicides are only one part of a total disease management program. Use fungicides according to label directions and in conjunction with proper cultural practices to gain the greatest benefits.

Gary A. Chastagner, Ph.D., Washington State University Plant Pathologist; Ralph S. Byther, Ph.D., WSU Cooperative Extension Plant Pathologist; Stanton E. Brauen, Ph.D., WSU Turf Science Associate; and Gwen K. Stahnke, Ph.D., WSU Cooperative Extension Agronomist; all located at WSU Puyallup Research and Extension Center.

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Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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