



Necrotic Ring Spot

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What You Should Know

Necrotic Ring Spot (**NRS**) is a fungal disease that primarily affects the roots of turfgrasses. The disease occurs on turfgrasses worldwide. Many turf species can serve as host to the disease. In Utah, the disease primarily affects Kentucky and annual bluegrass turf, although it can occur on tall fescue grass as well. Other diseases can be confused with necrotic ring spot; therefore, an accurate diagnosis by a trained diagnostician is crucial to identifying the pathogen to properly address management of the disease. Management of this disease is difficult and requires an integrated approach utilizing cultural, chemical, and varietal control measures.

Introduction

Necrotic ring spot (*Ophiosphaerella korrae*) is a disease that infects cool-season grasses, primarily Kentucky bluegrass (*Poa pratensis*). The disease is damaging to bluegrass because the pathogen will infect and kill the crowns and roots, resulting in a slow recovery. This pathogen belongs to a larger group of pathogens that cause "patch" diseases in turfgrass, although taxonomically they are not related. A patch is characterized by the blighted appearance of turf in a section of otherwise green turf. Patch diseases are difficult to diagnose in the field because some of the symptoms associated with this pathogen can also be caused by a variety of other stresses. For example, stress caused by poor or extreme soil moisture, or improper mowing will result in brown turfgrass in irregular shaped patches. Diagnosis can also be difficult because of the similarity of individual symptoms between different pathogens.



Fig. 1. Necrotic ring spots showing distinct separation and clearly defined areas.



Fig. 2. A lawn showing more severe symptoms with coalescing ring spots.

Symptoms

During cool, wet weather circular patches of infected turf will develop. The first symptoms are small, light green areas of turf. These areas will get larger and under drought conditions can go beyond 2-3 feet. Symptoms may also increase in size and severity with successive years. As the leaves are infected, they will turn a reddish brown to bronze color then weaken to a light straw color (Fig. 1). NRS is considered a spring and fall patch disease because the cool, wet weather is conducive to development of this disease. The disease may develop in cool weather but heat and drought stress can exacerbate the symptoms, making them more noticeable (Fig. 2).



Fig. 3. Often diseased patches will have areas of regrowth occurring in their centers.

requently the turf will survive or recolonize infection centers, giving the patch a ring-like appearance, also known as the frog-eye effect (Fig. 3). A reddish-brown border may develop between the patches of infected plants and the healthy plants. However, in some cases all of the turf

in a patch will die resulting in a sunken depression. Foliage can also be yellow or brown and appear in scattered patterns that combine into larger areas of diseased turf. No leaf lesions are present on foliage infected with necrotic ring spot. As the disease advances, roots, crowns, and lower stems will develop a black or brown discoloration (Fig. 4) caused by the presence of dark fungal hyphae. Infected roots may become severely rotted. Pseudothecia, or fruiting bodies may become present on

the infected crowns or roots, although that is rarely seen in the field. Necrotic ring spot is usually more severe in turf established from sod and in areas with compacted soil and symptoms will usually appear two to three years after turf establishment.

Disease Cycle

O. korrae survives unfavorable conditions in plant debris and is thought to move from plant to plant by growing on the surface of roots and rhizomes. The hyphae colonize the surface of roots then injection hyphae enter the root and infect inside in the root cortex. Infection inside the roots causes a decrease in water and nutrient uptake by the plant leaving it more prone to other injuries especially during heat and drought stress. Roots, rhizomes, leaf sheaths, and crowns of turf are usually infected in spring or fall. Symptoms generally appear in late spring during cool, wet weather. In some areas the patches will fade with higher temperatures, while in other regions they may reappear under drought or heat



Fig. 4. Blackening of roots and rhizomes of *Poa pratensis* by *Ophiosphaerella korrae*.

stress. In the fall, infection centers will reappear and may continue through winter and early spring. Recovery from this disease is slow.

Diagnosis

To be sure that NRS is causing the symptoms in turf, samples can be collected and checked for the presence of the pathogen (Fig. 5 and 6). Your local county Extension agents may be able to do this for you as they often can provide diagnoses quickly and accurately. If confirmation is desired, then the sample may be sent to the diagnostic laboratory. To do this, collect samples of turf exhibiting symptoms of infection. Plant tissues should be sealed in a plastic bag and sent to: Utah Plant Pest Diagnostic Lab, Department of Biology, 5305 Old Main Hill, Logan, UT 84322. Care should be taken not to expose the bag to excessive heat or cold so that the specimen and pathogen remains alive until the sample is received. General instructions for sample collection and shipment can be found at: <http://utahpests.usu.edu/upddl/html/forms> and directing your browser to the diagnostic laboratory sample submission information.



Fig. 5. Dark hyphae of the NRS can be seen woven around a root of *Poa pratensis* (at the tip of the arrow). Other turfgrass pathogens can produce dark hyphae; however, they will tend to differ by forming infection cushions (such as with *Gaeumannomyces graminis* var. *graminis*) and larger, more dense, patches of hyphae. A proper diagnosis is important.



Fig. 6. A pseudothecium of *Ophiosphaerella korrae* embedded in a root of *Poa pratensis*. At first observation these appear to be soil granules and can be difficult to identify.

Management

Management practices that reduce stress on turfgrass, such as watering turf to avoid drought stress, will also help suppress necrotic ring spot. Normally, lawns should be watered deeply and as infrequently as possible without creating stress from overwatering. In the presence of necrotic ring spot, however, frequent watering will cool the grass and allow infected plants with depleted root systems to survive the late afternoon heat. Light applications of water can be applied daily to infected turf in hot weather to reduce heat stress and initiate recovery. Care should be taken to prevent over-watering. Compacted soils are more favorable for this disease to occur as well. Thus core-aeration, with clean equipment, will help minimize soil compaction.

Avoid nutrient deficiencies and maintain a balanced fertilization program, particularly for nitrogen, phosphorus, and potassium. The severity of necrotic ring spot is reduced when slow-release forms of fertilizers (specifically nitrogen) are used rather than quick-release forms. This allows for a more uniform release of nutrients throughout the season and avoids the bursts of growth

following fertilizer application. Recent research in Colorado suggests that formulations of sulfur coated urea (SCU) and applications of elemental sulfur as a soil amendment, help to suppress the disease. Lawns should be cut so the grass is 2.5 to 3.5 inches high.

Resistant Varieties

There are no varieties of *Poa pratensis* turf that offer complete resistance to this disease. Some varieties of Kentucky bluegrass have more tolerance than others. Older cultivars such as Adelphi, Eclipse, Midnight, Majestic, and Wabash offer moderate resistance, but finding seed of these may be more difficult. Newer cultivars, such as Monte Carlo, Baron, Blue-Tastic, Unique, Voyager, Beyond, Eagleton, Cabernet, Abbey, Award, and Brooklawn, are rated as being somewhat resistant to necrotic ring spot (from NTEP, see references) and it should be more easy to locate seed. All cultivar information is mentioned with the understanding that no endorsement of named cultivar(s) is intended, nor is criticism implied of similar cultivars that are not mentioned.

Planting mixtures of two or more grass species and two or more resistant cultivars will reduce the possibility of disease. Existing areas of infected grass can be overseeded with resistant varieties to reduce the incidence of necrotic ring spot. Another option is to overseed the area with perennial ryegrass (*Lolium perenne*) which is reported to be immune to NRS. Homeowners should be aware that different grass species and mixtures often results in color and textural differences; however, perennial ryegrass mixtures with Kentucky bluegrass are very desirable and will help to avoid necrotic ring spot.

Prevention

Plants that are severely infected can be easily removed from the soil because of widespread rotting of roots, rhizomes, and crowns. *Ophiosphaerella korrae* may be spread by infected sod and mechanical equipment. Effectively cleaning equipment (power steam washer) before working with healthy turf will help prevent the spread of this pathogen. Preventive fungicide application may help suppress the development of necrotic ring spot, but the timing of application is essential. Fungicides should be applied in the spring before the pathogen begins colonizing the roots. Chemical pesticides labeled for the control of necrotic ring spot include: thiophanate methyl, iprodione, fenarimol, myclobutanil, propiconazole, and azoxystrobin. However, researchers in Colorado have noted that control of this disease using fungicides has been erratic. All product information is mentioned with the understanding that no endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

References

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National Turfgrass Evaluation Program (NTEP), available online at: <http://www.ntep.org/>

Precautionary Statement: All pesticides have benefits and risks, however following the label will maximize the benefits and reduce risks. Pay attention to the directions for use and follow precautionary statements. Pesticide labels are considered legal documents containing instructions and limitations. Inconsistent use of the product or disregarding the label is a violation of both federal and state laws. The pesticide applicator is legally responsible for proper use.

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