

symptom is not common across necrotic ring spot's whole range, and *it should not be considered diagnostic*.

Range and critical environmental factors

THE N.R.S. FUNGUS, *L. KORRAE*, can be found over the entire growing range for all cool-season, as well as some areas for warm-season, turf. It has been identified as the pathogen in spring dead spot, a disease of certain warm-season turf species.

The distribution of necrotic ring spot is greater in cooler wetter regions and less in hotter dryer regions. Two regions illustrate how environmentally dependent this disease can be:

- IN THE NORTHWEST, N.R.S. is a major disease on the cool, wet coastal plain west of the Cascade Mountains. It is much less of a problem on the hot, dry, eastern side of the mountains.
- IN NEW ENGLAND, N.R.S. is common, and produces patches that may reach 18–24 inches in diameter. It is just as prevalent in the Mid-Atlantic states, but the patches rarely exceed four to six inches in diameter.

Throughout its range necrotic ring spot is more of a problem on irrigated turf and sites where soils tend to hold water or are poorly drained—such as areas that are compacted, heavily thatched and root invaded, have impervious layers in their soil profile, or that have a high organic matter content. Compacted soils, soils with poor pore structure, and soils with poor soil chemistry—especially soils low in calcium and humic acid, the major components of soil particle flocculation and aggregation—can reduce or inhibit root reproduction and, thereby, increase the expression of necrotic ring spot symptoms.

With the exception of severe heat or moisture stress, *L. korrae* infected plants that are growing in loose, well-structured, properly drained soils with good soil chemistry can survive high infection levels that would otherwise prove fatal. All other things considered, the determining factor for whether a series of chemical controls should be applied should be the overall health of the soil.

When infected turf is treated at low levels

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Time of the year is a factor. If this photograph of infected bluegrass was taken in the spring, the damage is the result of an acute infection. If taken in the fall, the damage is more likely the result of a chronic infection.

Photo provided by Dr. Eric B. Nelson, Cornell University.

Susceptible species

NOT SIMPLY THE OCCASIONAL, “classic” patch disease of bluegrass, necrotic ring spot should be considered a common, chronic root-damaging infection that can adversely affect all of the common cool-season turf grass species, which are listed here in from the most to the least susceptible:

- FINE FESCUES
- ANNUAL BLUEGRASSES
- RYEGRASSES
- KENTUCKY BLUEGRASSES
- BENTGRASSES
- TALL FESCUES

Necrotic ring spot's effects vary by species. Individual varieties, within a species, may also show improved resistance to N.R.S. induced stress damage:

- RESISTANT SPECIES AND VARIETIES will show a markedly higher level of root establishment and regeneration, i.e. bluegrass varieties that are considered to have good sod-forming characteristics are probably better varieties than average or poor sod-forming varieties.
- IN MIXED VARIETY BLUEGRASS STANDS, it is not uncommon to find plants with little or no apparent damage next to plants that are dying.
- UNDER HEAVY DISEASE PRESSURE, tall fescues, which have larger root masses and are more resistant, may exhibit limited loss of root mass and associated leaf loss, but they rarely show major signs of damage.

The genetic ability to grow and replace roots varies from species to species and can prove to be an advantage:

- CREEPING FESCUES have small root masses and are highly vulnerable to N.R.S.,
- IN WET AREAS, ryegrasses may be highly vulnerable to the deforming affects of moderate infections.

Wet, cool, compacted soils and non-pathogenic site conditions can play a substantial role in the foliar expression of root disease symptoms. Under these conditions, some moderately tolerant varieties may prove to be susceptible. ■