Plant Pathology
COLLEGE OF AGRICULTURAL & LIFE SCIENCES
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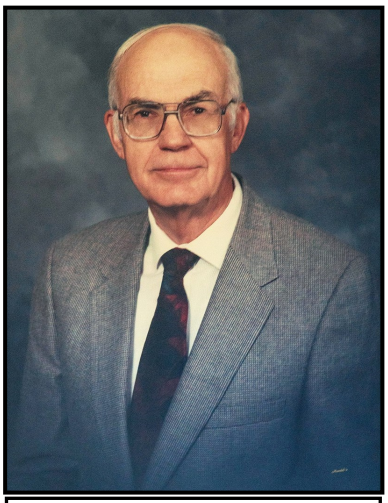
Necrotic Ring Spot of Turfgrass - Mystery Solved

Historically, some turfgrass diseases have been extremely difficult to diagnose and the following is the story of one such disease, necrotic ring spot (NRS) disease, as told by Professor Gayle L. Worf in 2025. NRS was particularly serious for sod growers and homeowners in the 1960s and this disease is still a serious problem in 2025.



Dr. Gayle L. Worf

…"In the 1960's, patch diseases came to the forefront as when they occurred they were so conspicuous, because of the dramatic severity of symptoms, which were various size patches and circles that turned yellow or brown and suddenly died. The popular press covered this disease as the Cincinnati Reds baseball field was affected, as well as the White House lawn. The prominent turfgrass pathologist, Dr. Houston Couch of Penn State, made widespread news in 1966, when he published in Phytopathology that the incitant was *Fusarium roseum*. His research could not be duplicated, and thus arose a serious controversy as to the true cause of this patch disease. I had my doubts about *F. roseum* being the pathogen, but I kept quiet. *Fusarium* spp. could be isolated frequently from infected roots but not always, and furthermore the fungicides that were ergosterol biosynthesis inhibitors did not control this disease. The search was on for the nature of the true pathogen.

Necrotic Ring Spot symptoms

Crown and root tissue from symptomatic plants were covered and infiltrated with dark hyphae of the rhizosphere, which were ectotrophic fungi. The challenge was to determine what fungus or fungi were the incitant of NRS. Slow going! We, meaning J. S. Stewart (staff), R. C. Avenius (undergraduate student) and I, had a dozen or so possible rhizosphere fungi that we had isolated in pure culture. We inoculated sod plugs and waited! Finally, after six or more weeks, our major suspect started killing the grass in the center of every inoculated plug, causing identical crown symptoms! One of my more exciting moments in my Plant Pathology career!

Turfgrass plugs inoculated with *Leptosphaeria korrae* (left) and non-inoculated (right).

Not wanting to get embroiled further into the controversy of Fusarium blight, I named the disease "necrotic ring spot" (NRS) to distinguish it from other patch diseases, such as Fusarium blight and summer patch. NRS is a cool season disease and symptoms cut off abruptly at higher soil temperatures. So I was able to avoid an entanglement with Dr. Houston Couch by giving this patch disease a different name. This was the first turf patch disease that became recognized for its true cause, as Koch's postulates had been completed.

Half-way home. But I didn't know what the fungus was. It sometimes produced small "Phialophora-like spores", but that meant very little. There were also certain *Rhizoctonia*-like characteristics, but that also told me nothing. I had hypothesized it might be *Gaeumannomyces graminis*, the take-all

pathogen of wheat with which I was quite familiar, because of similar disease patterns. Interestingly, Dr. R. W. Smiley, turfgrass pathologist at Cornell University, was seeing the same thing as I was observing. While he was on sabbatical in Australia, he encountered a turf disease similar to NRS, whose incitant was *Leptosphaeria korrae*. Dr. Smiley shared this information with me. By that time, I had inoculated several species of grass seedlings besides turfgrass with "my" fungus in the greenhouse. I hurried to the greenhouse to collect some roots from the inoculated oats, and there they were: asci and ascospores of the fungus! "My" fungus was confirmed to be *L. korrae*." (*Leptospharia korrae* was renamed to *Ophiosphaerella korrae* in 1989 by Shoemaker and Babcock.)

According to Dr. Paul Koch, NRS resulted in unexpected changes to the turfgrass industry in Wisconsin. The disease was so serious and had such an economic impact on the turfgrass industry (mostly the sod growers) that turfgrass managers thought that something had to be done. Their approach was to create the Wisconsin Turfgrass Association (WTA) in large part to support the research effort of Dr. Gayle Worf and his research on NRS. The WTA is now a powerful group supporting turfgrass research at UW benefiting the entire turfgrass industry. Another impact of NRS was that the WTA pushed for and financially backed the creation of the O. J. Noer Turfgrass Research and Education Facility.

Dr. Paul Koch speaking at a field day at the O. J. Noer Research Station.

The turfgrass industry is a one-billion-dollar business in 2025 in Wisconsin. Turfgrass is the state's fifth largest crop, covering about 300,000 acres. The number of homes in Wisconsin is about 2.8 million, and most of which have a yard, and there are countless parks, small and large. Recent years have seen the construction of several upscale golf courses, and Wisconsin is now known as an international golf destination. Wisconsin has 11 golf courses on the 2025 Golf Digest List of "America's top 100 Greatest Public Courses", which is more than any other state. Two of these, the Straits at Whistling Straits and Erin Hills, are among the top 10 golf courses. There are over 500 golf courses in Wisconsin ranging in cost and skill level required. The oldest golf course is Eagle Springs Golf Resort founded in 1893.

Whistling Straits, Sheboygan, WI

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