Take-All Patch

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Look in any reference book on take-all patch, and you will find that this disease occurs mainly on bentgrass, when temperatures are cool, soil is moist and where soil pH is high. Unfortunately, these conditions are very typical for golf turf in Wisconsin. And we are indeed recognizing take-all patch as a problem on bentgrass fairways, tees and greens.

Take-all patch is a root disease caused by a common soil fungus. By the time it was recognized as a pathogen on turfgrass in the early 1930s, it was a well-known pathogen on cereal grasses. Because cereals are one of our most important food crops, you can imagine that *Gaeumannomyces graminis,* the take-all pathogen, is one of the best-studied root pathogens. This is fortunate for turfgrass pathologists, who can use this information as a basis for investigations of the disease on turf.

Take-all patch can persist from year to year, with varying intensity depending on weather and host stress. The fungus requires rather high soil moisture to grow and establish itself. It is most active during cool, wet weather. However, symptoms are often more apparent in late summer and early fall. This is because vigorously growing plants often do not succumb to the fungus until the stress of heat, drought or other factors finally tip the balance in favor of the pathogen.

At the edge of a diseased patch of turf, the plants have few roots, and detach easily from the soil if you gently tug them. If you look at the remaining roots under the microscope, you'll see dark-brown hyphae, resembling thick, dark thread, running over the surface of the roots. In mixed strands, the bentgrass will often be killed, leaving other grasses intact. As a band-aid measure, diseased bentgrass patches may be repaired with a piece of fescue or Kentucky blue grass sod. These species are generally not susceptible to take-all.

One of the main soil properties affecting take-all disease is soil pH. J.D. Smith, working at the time in Great Britain, was the first to show definitively that the pH in the top one-half to one inch of soil is critical to the development of take-all patch. This top layer of soil is where the pathogen is most active and where most microbiological activity takes place. He showed how liming with fine grade lime could lead to outbreaks of take-all patch, and how acidification with ammonium sulfate helped to control the disease.

This sensitivity to soil pH offers an opportunity to control this disease within a fertility program. Indiscriminate use of lime or alkaline fertilizers should be avoided, especially if you know the pathogen is present. Even if your soil is generally more acidic, low dosages of lime or alkaline materials can raise the pH of the top one-half inch of soil very quickly. It is these quick changes in pH which can be most conducive to take-all development. Maintaining the turf so that the top inch or so of soil is around 6.0 or slightly less is the best way to reduce the risk of take-all. Fertilization with ammonium sulfate has been reported by several turf pathologists to be quite effective in clearing up take-all patch over two or three seasons.

New bentgrass plantings are especially prone to take-all patch, especially if claimed from recently forested areas or if the soil was fumigated before planting. These are situations in which the microbial activity is very low. Take-all patch is an example of a disease that is easily suppressed by the activity of other microorganisms. *G. graminis* grows extensively outside of the root before it actually enters and infects the root, so it is open to competition and attack from other microorganisms that grow on roots. In the early 1980s, dramatic photographs were published showing how bacteria colonize and parasitize *G. graminis* on wheat. We don't know for sure, but it is likely this biological control happens on turf roots, too.

If left alone, take-all of cereals will decline over a period of about 5 years following a severe outbreak, and eventually disappear. This is thought to be due to changes in soil chemical properties, such as pH, and an increase in biological control that eventually suppress the activity of *G. graminis.* There are a few reports of this occurring in turf also.

G. graminis spreads slowly by growing from infected roots to new plants. Spores are not produced very often. The fungus is spread over longer distances by the movement of infected plant tissue during cultivation, such as core aeration, dethatching and perhaps even on golf shoes. Thus it may be practical to work areas known to have severe take-all separately.

Gaeumannomyces graminis, like most turf pathogens, is common in turf. Our goal in take-all control is not complete eradication, but to keep this fungus from causing visible symptoms. I believe our increasing knowledge of turf soils and management practices that suppress the pathogen are leading to stable and effective ways to keep this disease in check.