



Pythiums: In the Canopy, On the Roots

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How often do we see slow growth, poor fertilizer response, off-color and thinning out in bentgrass greens? These common symptoms were described by pathologists from all over the country as those associated with shallow, poor root systems. I know I saw many bentgrass samples this year that could be described that way.

At the recent national meeting of the American Phytopathological Society, a whole morning was devoted to a discussion of poor rooting and summer decline of creeping bentgrass greens. The timely and lively discussion was well-attended. It seems poor root development is plaguing superintendents throughout the country, and pathologists are wondering to what extent pathogens are involved. The main suspects are *Pythiums*. I write the plural form "*Pythiums*" here to highlight the fact that *Pythium* is actually a group of soil fungi that include many species, all of which are widely distributed in soil.

Why is *Pythium* suspected as a component of root rot in mature bentgrass? Isn't *Pythium* a foliar blight that you can almost predict like the sunrise when warm nights and high humidity coincide in summer? Isn't *Pythium* the cause of a seedling disease called damping-off? Yes, "*Pythium* blight", or "grease spot" is familiar to us because of the predictable environmental conditions under which it occurs in summer, and the occasional presence of mycelium in the early morning dew. *Pythium* rot of seedlings, called damping-off, occurs as seeds germinate or just as they emerge from the soil.

What is much more insidious, and unfortunately more common than we realize, is that many species of *Pythium* are active at cool soil temperatures (below 70F) and can cause root and crown rots of various intensity. *Pythiums* are "water molds" that release their spores directly following

a rain or irrigation, when the soil pores are saturated with water. *Pythium* is suspected to be involved in root problems associated with (1) slow growth in the early spring, when plants don't respond to fertilizer, (2) "summer decline" later in the season where weak, poor root systems can not keep up with canopy growth, and (3) new sand greens that turn yellow, wilt and decline. What is happening in these cases?

Pythium is suspected of "pruning" the root system to various degrees during phases of active root growth, sabotaging the plant's effort to establish a strong root system for the summer months. Seldom do the roots look rotted; more often they are simply stunted, short, and underdeveloped. It is generally agreed among pathologists who have studied poor root development that environmental and other kinds of stresses are involved (and may even be primary causes), which are predisposing factors for root infection by *Pythium*. This is different from foliar blight (the grease spot disease), which can occur on healthy, unstressed turf when the weather conditions are very favorable. When *Pythiums* are active at cooler temperatures, they seem to be part of a "root decline syndrome" that is characterized not only by the presence of *Pythium* fungi, but by other major stress factors on the turf. Dr. L.T. Lucas, from North Carolina State University, shared with us the most important stresses he has found associated with poor rooting:

1. high soluble salts
2. localized dry spots
3. high rates of sterol inhibiting fungicides/herbicides that inhibit root growth
4. greens that are closed in, without good air circulation, (also associated with foliar *Pythium* disease!)

5. poor drainage
6. clones of Penncross that have segregated out and appear more susceptible to root rots
7. high soil temperatures (he has measured over 112F in North Carolina)
8. heavy traffic
9. soil compaction

Managing turf with an impaired root system is one of the most difficult management challenges. Sometimes the affected parts of greens need intensive management, such as frequent syringing and light frequent fertilizer applications to help the roots supply the canopy with enough water (without keeping the soil continually wet) and nutrients through the worse parts of the summer. Since it's difficult to determine if *Pythium* is the cause of the poor rooting, it is hard to recommend fungicides. In cases where *Pythium* was likely involved, flowable formulations, applied as a drench, have been found to be most effective. Although metalaxyl products (e.g. Subdue®) are effective against foliar *Pythium* diseases, they have been found to be less effective against *Pythium* on roots. Other compounds, such as ethazol (e.g. Koban®) and Fluazinam® were reported to have some efficacy.

The general agreement at the end of the session was that poor root development in bentgrass stands is a major health problem for bentgrass greens all over the country. The causes appear to be a combination of wet soil, management stresses, traffic, disease, heat stress, and often poor air movement. The management challenge is great, but the goal is clear. A deep, healthy root system is the foundation of plant health, and in turf, with its lush canopy to support, this is especially true. ♣