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COOL SEASON *Pythium*, also known as root *Pythium*, is a common disease of putting green turf, often occurring in early spring. While the disease can be observed in the fall, spring occurrence is far more common. However, in warm winters, the pathogen can become active very early in the season and result in late-winter damage. Cool season *Pythium* is a root pathogen. It remains in the soil and infects only roots, rarely moving into the foliar parts of the plant. The disease is caused by at least 11 different *Pythium* species. In New England, *P. graminicola* is a commonly found species infecting turf roots.



**Figure 1.** Root *Pythium* symptoms on creeping and velvet bentgrass are often observable as either large purple patches or sporadic purpling in early spring.

Cool season *Pythium* usually produces one of two different symptoms. When the pathogen infects bentgrasses, purpling is the most common symptom. Entire plants turn color in either large patches or diffusely throughout the stand. Purpling is also a symptom of cold stress and one should therefore be careful not to mistake *Pythium* for normal winter acclimation. On annual bluegrass, some purpling can be observed but yellowing and foliar death is more common. Generally, entire plants do not die but the oldest leaves senesce, leaving the appearing of a yellow or tan patch.

Assuming temperatures rise quickly and plants are adequately fertilized, many of the affected plants may partially recover. Unfortunately, the pathogen may remain active for many months, weakening root systems and exacerbating summer stress and summer diseases.

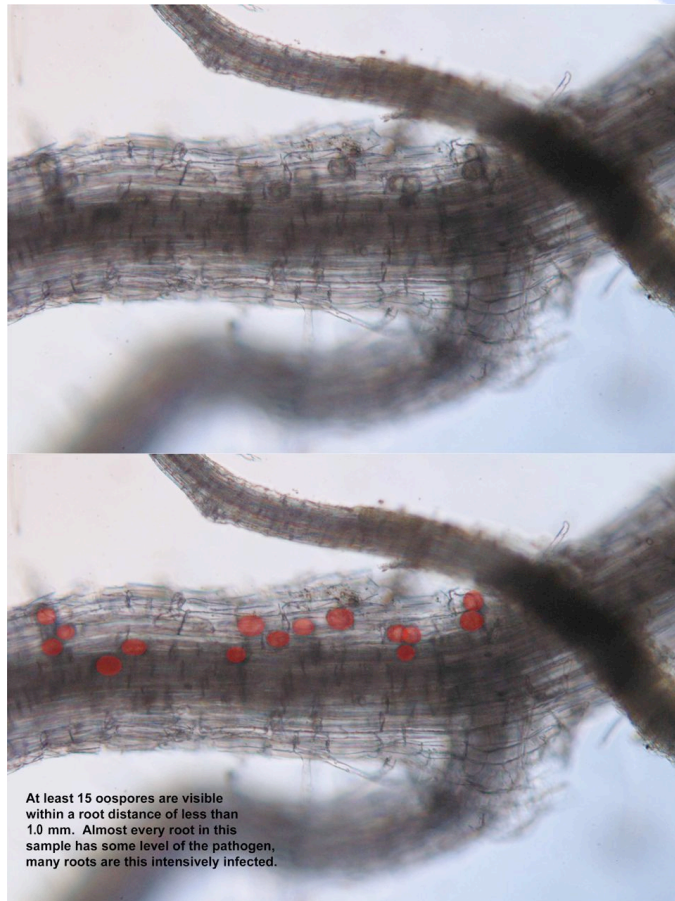
Cool season *Pythium* is difficult to diagnose without the aid of a microscope. Symptomatically, the disease can mimic snow molds in the early spring and other diseases towards the summer. Observance of oospores is necessary to confirm an outbreak. However, a small number of oospores can often be found at low levels in most roots. Consequently, is necessary to quantify the level of infection before conclusively identifying the causal agent as *Pythium*. Most cool season *Pythium* outbreaks result in dramatically reduced root systems, however, root rotting is not usually observed when the disease occurs in the spring.



**Figure 2.** *Pythium* species produce a long-lived resting structure known as an oospore. Oospores are often visible in roots that have been infected by cool season *Pythium*. In this picture, three *Pythium* oospores are clearly observable in the tip of a new root. Such infections dramatically reduce root growth, resulting in foliar symptoms and decline. All oospores have “double walls”, which allows them to be separated from other organisms often found in roots.

*Pythium* species can also cause a type of snow mold, known as snow blight. Although not very common in southern New England, it has been observed in parts of Maine and New Hampshire, particularly

under high humidity, as can be caused by greens covers. When snow blight occurs, damage is usually more severe than with root *Pythium* and foliage can be killed. Mycelium may or may not be observed in these outbreaks. The same species that cause root *Pythium* are often capable of causing snow blight.



**Figure 3.** In severe root *Pythium* infections, an entire root system can be full of oospores. In the two frames above, at least 15 oospores can be identified in a section of root less than 1.0 mm in length. At these levels, foliar symptoms are severe.

Controlling cool season *Pythium* can be achieved if preventative applications are made before infection occurs, in the early spring or late fall. A typical preventative *Pythium* chemical is Signature (Aliette Signature or Prodigy Signature). Because Signature move systemically throughout the plant, foliar applications will have an affect on root pathogens. Once

the pathogen has invaded plant roots, chemicals such as Banol (propamocarb) and Koban or Terrazole (ethazole) provide excellent control when watered into the soil at the highest labeled rates. Although Subdue (mefenoxam and metalaxyl compounds) can be used for cool season *Pythium* control, it is not nearly as effective as the other compounds. Subdue is far better suited to foliar *Pythium* blight (a summer disease).



**Figure 4.** Snow blight is a form of *Pythium* that results in symptoms similar to that of snow molds and can occur under snow or greens covers. Snow blight is not very common in southern New England. The symptoms above were caused by a snow blight infection in Maine, but also resemble severe cool season root *Pythium* on annual bluegrass.

Because cool season *Pythium* is a root pathogen, it is critical to get as much fungicide to plant roots as possible. While foliar applications can give some control, the most effective method of delivering chemicals to turf roots is to use high volumes of water during fungicide application or to water chemicals into the soil immediately after application.

If root *Pythium* is not controlled in the spring, it can cause damage into early summer, causing long lasting root decline that may ultimately lead to significant plant mortality in the height of summer.



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**PESTICIDES ARE POISONOUS!** Read and follow all safety precautions and all labeled directions. The label is the law. Handle carefully and store in original containers out of reach of children, pets or livestock. Dispose of empty containers immediately, in a safe manner and place. Pesticides should never be stored with foods or in areas where people eat.

When trade names are used for identification, no product endorsement is implied, nor is discrimination intended against similar materials. Be sure that the pesticide you wish to use is registered for the state of use.

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