Preventive seed treatment fends off Pythium

By GREG LOBERG

Turf managers can encounter diseases caused by *Pythium* almost anywhere and anytime, and on any type of turfgrass. On seedlings the disease can kill a stand within 24 hours. While infections are not always lethal, there are significant reasons to prevent or contain them in high-maintenance turf.

Numerous species make up the group of pathogens called *Pythium*. These species are present in soil everywhere, but are not always pathogenic because the conditions of the host and the environment often limit disease development. They are versatile because the group consists of many species, and even isolates of these. Some prosper under cool temperatures. Others prefer warmer conditions. Worse yet, some have no temperature preference. All can express symptoms rapidly and produce up to four types of propagative and survival structures.

While temperature affects development of certain species or isolates, water conditions have even greater influence on the occurrence of *Pythium* outbreaks. Water films in soils and on plants are necessary for mobile spores, called zoospores, to move from plant to plant. This mobility speeds the spread of infections, which is why severe epidemics occur most often under high moisture. In fact, irregular patches of *Pythium* damage typically show up first along natural drainage patterns.

Rainfall, irrigation, dew and relative humidity all add to the formation of water films. Temperatures relate to these moisture conditions, as well as to plant growth, and can't be considered separately. For example, as day and night temperature differentials increase and relative humidity goes up, dews become heavier. Consequently, discussion of *Pythium* must include consideration of the moisture environment along with temperature interactions.

Pythium symptoms can be grouped into four primary categories, according to Dr. Eric Nelson of Cornell University. Early damage is termed damping-off. Later disease development can be characterized as root and crown rot, foliar blight and snow blight.

This discussion will be limited to the early category, both pre-emergence and post-emergence damping-off of turfgrass seedlings. Pre-emergence symptoms include seed decay and root necrosis. Plants may not emerge at all, or may wilt and discolor quickly after emergence due to root damage that began on the radicle.

Post-emergence symptoms include rapid wilting of seedlings and stand loss and may be accompanied by a web of mycelia. Surviving and apparently unaffected plants may actually suffer a loss of vigor due to sub-lethal root "nibbling." As the enzymes produced by *Pythium* break down cells in the root tip, the plant must expend extra energy to replace tissue. In addition, root hair damage means less water and nutrient uptake.

According to the Compendium of Turfgrass Diseases, damping-off is more likely to occur when seed germination and seedling growth are slowed by adverse weather or seedbed conditions. Heavy seeding rates maximize competition for moisture, light, air and nutrients. This is especially the case when overseeding into existing stands of turfgrass. In this case, seedlings are fully exposed to high inoculum densities of several pathogens, competition with larger plants for nutrients, shading by taller plants, and toxins produced during decomposition of organic litter in the thatch. Even in new seedings, however, competition frequently combines with environment to create plant stress and favor *Pythium* development.

An example of plants watered at 1/2 inch per day. The untreated was nearly destroyed, while Apron-FL fungicide applied at the full rate produced the thickest stand.

University of Arizona researchers have stated that at least three aspects of soil moisture contribute to infections. High soil moisture acts to:

- decrease plant vigor, which increases plant exudates — that is, the food source for *Pythium*;
- provide the environment for ready movement of these exudates necessary for pathogen germination and growth; and
- provide water-filled soil pores of the size required for oospore production and dissemination, thus multiplying the disease.

Their research goes on to describe the effect of soil moisture on the germination of zoospores, the main survival structures of *Pythium*.

High soil moisture is most favorable for *Pythium* oospore germination, but only if a food source (asparagine) is also present. At low soil moisture, or in the absence of a food source, oospore germination is minimized. Interestingly, oospore germination was similar in both sand and sandy loam soils.

So, *Pythium* damping-off is a persistent threat, and is encouraged by seeding rates and times and moisture conditions that are only typical of sound turf-establishment practices.

What can a turf manager do?

Use of a preventive seed treatment can reduce or eliminate initial stand loss during the critical early days of establishment. Gustafson, Inc., formulates and markets Apron-FL seed treatment fungicide for application as a commercial slurry and Apron Dry for application at planting. Both products contain the active ingredient metalaxyl, a fungicide highly effective against *Pythium*.

Researchers at the Gustafson Research and Development Center have conducted a number of studies to determine the activity and benefits of Apron-FL, the most commonly used formulation.

To evaluate the impact of watering rates on the efficacy of Apron-FL, perennial ryegrass seed was planted in pots at the equivalent of 20 pounds per 1,000 square feet. Water was applied at .5 inch and 1.0 inch per day, the latter rate being excessive. Seed left untreated and treated with half and full rates of Apron-FL was challenged with *Pythium* aphanider-matum.

When moisture is adequate, or somewhat excessive, seeds begin germination, simultaneously becoming an excellent food source for *Pythium*. The seed coat breaks open and stored energy is solubilized to feed the developing seedling. Unfortunately, exudates also become available to soil pathogens, such as *Pythium*.

This triggers another germination, as Pythium structures sprout germ tubes capable of penetrating plant cells. Roots begin to develop but also become a food source for the pathogen.

Without fungicide protection, germinating seeds may become infested with a web of mycelium even before radicle emergence. Appropriate fungicide applied at the full rate virtually eliminates this initial infection.

The tender shoots of seedlings at emergence are particularly vulnerable to attack. As grass seedlings grow, the concentration of fungicide within the plant will decrease. Eventually, if *Pythium* pressure persists, protection will be reduced below an adequate level through this growth dilution. This occurs within 16 days after planting, when they were about two inches tall.

The full labeled rate treatment, however, performs as well as the non-diseased, sterile check. The duration of protection is a function of fungicide dilution related to speed of plant growth and magnitude of disease pressure. In general, protection lasts at least seven to 10 days, but may extend several additional days.

In another study, evaluated 18 days after planting, Apron-FL was still providing protection. Again, the best treatment was the labeled rate.

Parallel results were shown where the percent stand averaged for six native grasses was maintained out to 18 days after planting, with the labeled rate performing best.

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