

Demystifying Pythium diseases of golf course turfgrasses

By [Jim Kerns, Ph.D.](#) and [Lee Butler](#) | February 26, 2018 [0 Comments](#)



Pythium diseases are exceptionally important in turfgrass management. Yet, these diseases are oversimplified in how they are presented in the literature and commonly confused with one another. For example, in the “Compendium of Turfgrass Diseases,” *Pythium* diseases are lumped together in a single chapter. Yet, these diseases are some of the most important that golf course superintendents manage. Although there are five distinct diseases of turf caused by various *Pythium* species, this article will focus on *Pythium* blight, *Pythium* root rot and *Pythium* root dysfunction.



Figure 1A

Pythium blight (*Pythium* spp.) is a well-known disease, especially on cool-season turfgrass. However, it’s also a major problem on warm-season turfgrass, particularly on bermudagrass (*Cynodon dactylon* x *C. transvaalensis*) putting greens in the southeast U.S. This disease is associated with a foliar blight. Blight refers to the sudden, severe and extensive spotting, discoloration, wilting or destruction of leaves. Stand symptoms on cool-season turf initially develop as small, circular spots ranging in size from 3/4 inch to 2 inches in diameter, and in favorable conditions for disease, the spots can expand at an alarming rate into an overall irregular stand symptom (Figure 1A). Plants in affected areas are water-soaked, dark, and may feel oily when rubbed between the fingers. Symptoms on cool-season turfgrass develop rapidly during hot, humid weather and when soil moisture is abundant. *Pythium* blight develops on cool-season turfgrasses when nighttime temperatures are above 65 degrees F and soil moisture is saturated and/or relative humidity remains high for two or three consecutive days.



Figure 1B Pythium blight of creeping bentgrass (A) and bermudagrass (B) putting greens.

Conversely, on bermudagrass putting greens, symptoms develop as small brown or black spots ranging in size from 1/2 inch to 2 inches (Figure 1B). These spots can coalesce into large blighted areas quickly if conditions are conducive. *Pythium* blight develops on bermudagrass putting greens during the fall, winter and spring, but can develop during the summer months under periods of extended cloud cover and/or prolonged moisture. The disease is most severe after major rainfall events that saturate soils.

Pythium blight control

Fortunately, control of *Pythium* blight is similar between cool- and warm-season turfgrasses, except for the timing of fungicides and cultural practices. Fungicides that are most effective for *Pythium* blight include Alude (potassium phosphite, Nufarm), Appeal (potassium phosphite, Syngenta), Banol (propamocarb, Bayer), Segway (cyazofamid, PBI-Gordon), Chipco Signature (fosetyl-AL, Bayer), Stellar (propamocarb plus fluopicolide, Nufarm) and Subdue MAXX (mefenoxam, Syngenta).

Superintendents should base timing of these products on weather conditions. If applications are made preventatively, the low label rates are highly efficacious. Because conditions remain conducive throughout the spring, winter and fall on bermudagrass putting greens, we advise superintendents to consider a periodic application (every two weeks) of a phosphonate fungicide or phosphite to provide a base of *Pythium* protection. If a major rain event is in the forecast, an application of Banol, Segway, Stellar or Subdue MAXX would be warranted. Again, if the application is made prior to symptom development, a low label rate should be effective. However, if symptoms are present and the pathogen appears active, it's best to apply the highest label rate.

Any cultural practice that minimizes leaf wetness and ensures good drainage aids in *Pythium* blight control. Therefore, regular topdressing and aerification are important. Wetting agents to move water into the soil are important to slow the progression of *Pythium* blight. Other procedures such as dew removal or rolling, particularly on bermudagrass putting greens when the turf is not actively growing, is important for reducing the impact *Pythium* blight may have.

Other Pythium diseases

Pythium blight is a problematic disease of all turfgrasses in all sectors of the turfgrass industry, yet *Pythium* root rot and *Pythium* root dysfunction are most problematic on golf course putting greens. *Pythium* root rot is a destructive disease of creeping bentgrass (*Agrostis stolonifera* L.) and annual bluegrass (*Poa annua* L.) putting greens that are subjected to intense stress of frequent, low mowing.

Unlike other diseases such as dollar spot, there are numerous species that cause *Pythium* root rot. Thirty species are aggressive pathogens of creeping bentgrass, and research has shown they respond differently in vitro (in laboratory experiments) to fungicides. Research also has demonstrated that these organisms cause disease at varied temperature ranges. This likely explains variability of product efficacy among golf courses and emphasizes the need for a programmatic approach to managing *Pythium* root rot. The disease initially develops as small spots of water-soaked turfgrass. As the disease progresses, the symptoms coalesce rapidly and may severely affect large areas of turfgrass (Figure 2A). Stand symptoms may appear as distinct patches or may develop in large irregular areas. Roots normally are stunted and necrotic, and may even smell rotten. The disease is difficult to diagnose based on symptoms alone, and we suggest getting a laboratory diagnosis before pursuing a management strategy for *Pythium* root rot. On that note, there is still confusion — even among turfgrass pathologists — on the difference between *Pythium* root rot and *Pythium* root dysfunction.

Distinguishing between root rot and root dysfunction

Pythium root rot develops on cool-season putting greens during the summer months, when soils are warm and wet. The symptoms develop in areas where water collects, but the disease can affect higher areas after rainfall. The disease is most severe on putting greens in enclosed environments and/or shaded for long periods throughout the day. Symptoms appear in late May or early June, but can continue to develop new spots or continue to expand as long as soils are warm and wet.



Figure 2A



Figure 2B // *Pythium* root rot stand symptoms. (A) Stand symptoms of *Pythium* root rot on a creeping bentgrass putting green. (B) Stand symptoms of *Pythium* root rot on ultradwarf bermudagrass putting green.

On warm-season grass putting greens, the disease is most severe under low-light conditions, especially during the fall, winter and spring. Symptoms develop as small tan or whitish patches that may appear to run with water (Figure 2B). The symptoms are hard to distinguish from other bermudagrass diseases such as take-all root rot. As with cool-season grass, the disease is prevalent when soils are wet.

Cultural control of *Pythium* root rot revolves around limiting stress to protect rooting. Increasing mowing height can help alleviate symptoms, as can small increases in foliar nitrogen rates. Frequent topdressing and venting also improve infiltration and percolation of water, which should ultimately limit root rot development.

A number of chemicals control *Pythium* root rot. In our research, Segway has provided the best control of the disease, followed by Signature Xtra (fosetyl-AL, Bayer) and Apear, Subdue MAXX, Stellar and Banol. Terrazole (etridiazole, OHP) is effective, but the residual control lasted three to four days in our trials. For cool-season grass putting greens, we suggest starting with Segway at 0.45 fl. oz./1,000 sq. ft. when soil temperatures reach 65 degrees F at a 2-inch depth for four to five consecutive days in the spring. In North Carolina, this typically occurs around the middle of May. Timing in your area may vary, of course, but using a 65-degree F soil temperature is a good starting point. A rotation of Segway, Subdue MAXX and Banol on two-week intervals worked well in a program trial we conducted in 2016. We suggest watering all *Pythium* root rot applications in with 1/8 inch of water immediately after application. If Signature Xtra or Apear are applied in foliar sprays, control of *Pythium* root rot should be quite good as well.

These same chemicals will be effective for *Pythium* root rot on bermudagrass putting greens, but unfortunately, we do not know the precise timing of applications. *Pythium* root rot has been relatively rare on bermudagrass greens, and those who have had it have been successful with curative applications. Research at the University of Florida conducted by Billy Crow, Ph.D., observed increased infection by *Pythium* species when in the presence of sting or root-knot nematode. Based on these data and our observations, we always suggest conducting a nematode assay when submitting a diagnostic sample. Controlling *Pythium* root rot may start with management of plant parasitic nematodes.

Pythium root dysfunction is a different disease when compared to *Pythium* root rot. The symptoms initially develop on putting greens that are out in the open and predisposed to drought stress. The disease develops on high areas first and may resemble hot spots or drought stress. Yet hand watering these areas does not result in improvement. The disease is only formally documented on creeping bentgrass and is most severe on newly constructed putting greens, specifically those with rootzones of 85 percent sand or more. Symptoms are most prevalent during the summer months, but can develop in fall, winter and spring during warm, windy and/or dry spells.



Figure 3A



Figure 3B // Stand symptoms of *Pythium* root dysfunction. (A) Symptoms of *Pythium* root dysfunction on a creeping bentgrass putting green in North Carolina. Notice the orange margin around some of the patches. (B) Up close image of the typical patch symptom observed with *Pythium* root dysfunction. Also note the affected profile has little sand clinging to the root system, which is another diagnostic feature of *Pythium* root dysfunction.

Symptoms start as small, tan patches that range in size from 6 inches to 12 inches in diameter (Figure 3A). If conditions remain hot and dry, the patches will expand and may eventually reach 24 inches in diameter. Stand symptoms may resemble take-all patch of creeping bentgrass, in that the margin could have a yellow or an orangish border (Figures 3A & 3B). Unlike with *Pythium* root rot, the roots may not be stunted and are not necrotic or black. The roots will be a slight tan color or may have a buff appearance. They lack root hairs and the root tips are bulbous. In the field, sand will not cling to the roots because of the lack of root hairs (Figure 3B). The majority of the sand easily will fall off with a gentle shake of an infected plug.

Species associated with disease are *Pythium arrhenomanes*, *P. aristosporum* and *P. volutum*. We observed that *P. volutum* infects creeping bentgrass roots when soil temperatures are between 55 degrees F and 75 degrees F, but symptoms do not develop until the turf is subjected to heat stress. Thus, the best time to control the disease is during the infection window described above. Products that successfully control the disease are Insignia Intrinsic (pyraclostrobin, BASF), Lexicon (fluxapyroxad plus pyraclostrobin, BASF), Heritage (azoxystrobin, Syngenta), Fame (fluoxastrobin, FMC), Segway and a Chipco Signature/Banol tank mixture. When this disease was plentiful (2002 to 2008), three fungicide applications in spring starting when soil temperature at a 2-inch depth reached 55 degrees F sufficiently suppressed *Pythium* root dysfunction. We normally suggested starting with Insignia (0.7 fl. oz./1,000 sq. ft.), followed by Insignia again 28 days later, and a final application of Segway at 0.45 fl. oz./1,000 sq. ft. 28 days after the second application. This is an excellent strategy because the Segway application should be timed perfectly for preventative *Pythium* root rot control.

Cultural control

Cultural control of *Pythium* root dysfunction involves increasing mowing heights slightly prior to heat stress, keeping the soils as dry as possible during the infection period (55-degrees F to 70-degrees F soil temperatures), and slightly increasing foliar nitrogen amounts. Certain cultivars of creeping bentgrass were more resistant to *Pythium volutum*, but that work was conducted in 2008. We do not know the relative resistance of newer-generation creeping bentgrass cultivars.

Pythium diseases of turfgrasses are more complicated than most people think. They can be destructive and also difficult to diagnose. It's important to understand the subtleties of these diseases in order to manage them appropriately.

Finally, it is imperative to rotate the chemistries discussed in the article to reduce the risk of fungicide resistance. There are few new *Pythium* products in testing right now, so we must protect the efficacy of the products we currently have. For more information on these diseases and options for control, please visit NC State TurfFiles at turf.ces.ncsu.edu/diseases-n-turf/.

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