Confusion reigns

Naming cool- and warm-season Pythium diseases

by Dr. Eric B. Nelson

As the cover story describes, there are basically four types of disease groups incited by Pythium species:

- damping-off
- root and crown rots
- snow blights
- and foliar blights.

There has been a considerable amount of confusion over the common and quasi-scientific names applied to describe these different Pythium diseases. For example, we commonly hear the terms:

- "cool-season Pythium"
- "root Pythium"
- "cottony blight"
- "grease spot"
- "spot blight"
- "Pythium blight"
- "Pythium root rot"
- "warm-season Pythium"
- or just simply "Pythium"

applied to these four disease groups.

The elimination of confusion over which disease is being identified and discussed, through a clarification of terms for turfgrass managers, is critical to the successful management of Pythium diseases since the control strategies for each of the four types are quite distinct.

Cool- and warm-season Pythium: the difference

Perhaps the greatest confusion has developed over the distinction between "cool-season Pythium" and "warm-season Pythium". Often, those speaking of "cool-season Pythium" are referring to Pythium root rot, whereas those speaking of "warm season Pythium" are commonly referring to Pythium blight. The conditions that have typically been associated with cool- and warm-season Pythium disease are listed in Table 1. Both Pythium root rot and Pythium blight can occur any time of year under the appropriate conditions. However, most commonly, Pythium blight only occurs under the warm temperature conditions, whereas Pythium root rot can occur under both sets of conditions. In fact, the Pythium species responsible for Pythium root rot under warm temperatures are essentially the same as those causing Pythium blight under warm conditions (See Table 2 opposite). Similarly, the major root-rotting species at cool temperatures — *P. aphanidermatum, P. graminicola, and P. torulosum* — are also foliar blighters at cool temperatures. Important species such as *P. aphanidermatum* and *P. graminicola* are serious pathogens, regardless of the temperature.

Table 1

A comparison of cool and warm weather conditions for Pythium diseases on turfgrasses

Condition	Cool-Season Conditions	Warm-Season Conditions
Temperatures		
Day	50 - 65 F (10-18 C)	82 - 98 F (28-36 C)
Night	45 - 55 F (8-13 C)	68 - 75 F (20-24 C)
Relative Humidity	near 100% (day & night)	near 100% (night)
Cloud Conditions	overcast	hazy sun
Rainfall/Moisture	high/excessive	high
Turf Stress	important	not as important

Which species are the most significant?

The highly virulent species *Pythium aphanidermatum* and *P. graminicola* along with *P. myriotylum*, are usually the principal foliar blight species at warm temperatures. The same two species *P. aphanidermatum* and *P. graminicola* along with *P. arrhenomanes*, are principal root rot species at high temperatures. Although *P. ultimum* can been shown in testing to be highly virulent to turfgrass plants particularly at warm temperatures, it has rarely been encountered on golf courses or lawn turf.

The principal cool season root rot species are, again, *Pythium aphanidermatum* and *P. graminicola* with the addition of *P. torulosum* and *P. vanterpoolii*. Now little is known about the principal causes of cool weather blights,

as they are rare and studies of these diseases even rarer.

It is evident from Table 2 that *P. aphanidermatum* and *P. graminicola* are perhaps the most important Pythium species involved in both root rot and foliar blight symptoms, regardless of weather conditions. Additionally, both are important damping-off pathogens and *P. graminicola* may be an important snow blight pathogen, as well.

Much variability exists even within a species

Studies have shown that, at any given turfgrass site, on virtually any occasion, nearly all of the above-mentioned Pythium species are present within the turfgrass plants, usually in the roots and crowns. The question of how and whether or not symptoms are expressed may well depend not only on the species present, the amount of stress the plant is under, and the environment, but also which isolates of a given species is active.

Within a given species there is so much genetic diversity, that there are populations that behave differently in response to cool conditions than they do in response to warm conditions. For example, some isolates of *P. graminicola* recovered from bentgrass roots may cause high levels of disease at warm — greater than 82 F (28 C) — temperatures, but cause little or no disease at cool — less than 55 F (13 C) — temperatures. Other isolates of the same species may behave in just the opposite manner, with most disease symptoms apparent at cool temperatures. Still other isolates of *P. graminicola* have no temperature preference at all: they cause disease equally severely under both cool and warm temperatures.

Warm- and cool-season Pythium: no distinction

All of the important disease-causing Pythium species in turfgrasses are capable of inducing symptoms in turfgrass plants at both cool and warm conditions. Therefore, there are no distinct "cool-season" and "warm-season" Pythium diseases. Rather, root rot diseases and foliar blight diseases may occur over a wide range of temperatures.

Perhaps the concept of Pythium diseases can best be understood as being on a continuum in which perennial root infections first give rise to above- and below-ground symptoms of root rot under conditions of stress and high moisture but in the absence of any foliar mycelium. As temperatures increase and as dissemination of infection producing structures becomes more widespread and as the environment is more favorable to the activity of these Pythium species, the visual symptoms that we associate with Pythium infections become progressively more apparent on the surface of the turfgrass foliage. When the Pythium mycelium become clearly visible, late in the disease process, the possibilities for widespread epidemics are almost assured.

Table 2

Pythium species causing root rots and foliar blights at both cool and warm temperatures

	Root Rots		Foliar Blights		
Pythium Species	Cool	Warm	Cool*	Warm	Distribution
P. aphanidermatum	+++	+++	+	+++	All of U.S.
P. aristosporum	++	++	-	+	Mid-West & N.E.
P. arrhenomanes	?	+++	-	-	Mid-West & South
P. graminicola	+++	+++	++	+++	All of U.S.
P. myriotylum	-	++	-	+++	South
P. tardicrescens	+	+++	?	?	South
P. torulosum	++	-	+	-	All of U.S.
P. ultimum	?	?	+++	+++	?
P. volutum	+	+++	?	?	N. E. & Mid. Atlantic
P. vanterpoolii	++	-	+	-	Mid-West & N.E.

+++ = highly damaging, ++ = moderately damaging, + = slightly damaging, ? = disease-causing abilities unknown. * = very little is known about these diseases

How should turfgrass managers look at it?

From the turfgrass managers point of view, the actual temperature at which the symptoms occur has little to do with how control measures should be enacted. The critical factor in determining the success of a control strategy is whether the disease activity is localized in the root zone of the plant or whether it has progressed to the foliage. ■