

Pinewood Nematode (Pine-Wilt Disease)

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Figure 1: Symptomatic Japanese black pine due to infection with pinewood



The pinewood nematode (*Bursaphelenchus xylophilus*) is the most destructive pest of forest and landscape pines in Japan. This nematode invades the stems and branches of pines causing a sudden wilting and death of the tree regardless of its age or size. The pinewood nematode was first thought to be a recent introduction into the United States; however, it is now believed to be a native pest, which had gone undetected. The pinewood nematode does not appear to represent a severe threat to coniferous forests in the United States but may cause random death of pines in the landscape.

The pinewood nematode has been isolated from twenty pine species in this country. Japanese black pine (*Pinus thunbergii*), Japanese red pine (*P. densiflora*) and Scots pine (*P. sylvestris*) are most susceptible (Figure 1). Most native pine species are somewhat resistant to the disease. In addition to pine, the nematode has been isolated from larch, balsam fir, spruce and deodar and Atlas cedar.

Symptoms

Symptoms usually become evident in late summer. The first observable symptom is a lack of resin exudation from bark wounds. The foliage then becomes pale green, then yellow, and finally, reddish brown when the tree succumbs to the disease. The wood in affected trees is dry and totally lacks resin. Symptoms usually become evident throughout the entire crown at once, but a slower, progressive decline may occur in resistant species.

Disease Cycle

The pinewood nematode is vectored from diseased to healthy pines by wood boring, pine sawyer beetles known as Cerambycids (Figure 2). These beetles breed in dead and recently killed pines.

In diseased trees, developing beetles become contaminated with the pinewood nematode and when adults emerge from the wood carrying the nematode, they fly to healthy pines where they introduce the nematode into feeding wounds. The nematodes migrate to resin ducts in the wood and feed on the cells lining the ducts.

Figure 2: Pine sawyer beetle



Under summer temperatures, the nematode reproduces very quickly and can complete its life cycle (from egg-hatch to maturity) in four to five days (Figure 3). Huge populations of the nematode develop throughout the tree which impedes water transport and causes the wilt symptoms. Highly susceptible pines usually die within three months of infection. Adult females lay eggs in trees weakened or killed by the pinewood nematode and the disease cycle is repeated. The pinewood nematode and the Cerambycid vectors are also associated frequently with blue stain fungi (*Ceratocystis* spp.), which also can cause wilting and death of pines (Figure 4).

Figure 3: Numerous pinewood nematodes in water



Figure 4: Blue stain fungi



Control

Immediate removal and destruction of pines killed by the pinewood nematode will help prevent spread of the pest to adjacent, healthy pines. Wood from the dead pines should be chipped, buried in a landfill, or immediately burned. Maintaining the vigor of pines through periodic fertilization and irrigation during dry periods may help prevent beetle attack and disease development. Protection of susceptible pines in areas confirmed with the nematode is possible through injection of a systemic insecticide.



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