14. Pitch Canker of Pines

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Revised from chapter by George M. Blakeslee, Thomas Miller, and Edward L. Barnard, 1989.

Hosts

Pitch canker, caused by the fungus *Fusarium circinatum* (syn. *Fusarium subglutinans F. moniliforme* var. *subglutinans*), has been reported on over 20 pine species throughout the world. In the Southern United States, hosts include slash, loblolly, longleaf, shortleaf, sand, spruce, and Virginia pine. In nursery settings, the disease is most serious on slash, longleaf, and shortleaf pine. In California, Monterey, knobcone, and bishop pines are the most widely affected host species. Monterey pines can suffer significant damage in seedling nurseries.

Distribution

This disease was first detected in the Eastern United States during the 1940s and can now be found throughout the Southern United States from Virginia to Florida, west to Texas in any natural forest, plantation, seed orchard, and forest tree nurseries that produce susceptible pine hosts. The fungus also has been introduced into California where the pathogen, with help from a suite of insect vectors, infects and kills susceptible pines in landscapes, native forests, Christmas tree farms, and seedling nurseries.

Damage

This disease can cause significant seedling mortality in the nursery and may appear as pre- and post-emergence damping-off or seedling culls at the end of the growing season. Also, seedlings that appear healthy but have latent infections may result in seedling mortality after outplanting and thus, additional losses may occur in the field.

Diagnosis

On young seedlings, lesions either on the stem at the groundline or on the upper taproot result in foliage discoloration and seedling death. Seedlings may either remain erect or collapse and be misdiagnosed as damping-off. Seed infestation by *F. circinatum* should be strongly suspected if poor germination and low stand densities are associated with individual seed sources. On older seedlings, stem lesions result in a purplish discoloration, followed by top dieback. Stem lesions near the groundline or the upper taproot usually cause discoloration and foliage wilt on the upper stem (fig. 14.1). If large enough, removal of the bark along the seedling stem or taproot of the seedling may reveal the darkly stained, resin-soaked xylem, which is a symptom of fungal infection (fig. 14.2).

The disease can be easily diagnosed later in the growing season as either single dead seedlings (seed infestation) or small groups (soil infestation) of seedlings found scattered throughout nursery beds (fig. 14.3). Look for discolored, yellow-green, brown to red foliage. On seedlings with succulent tissues, look for wilting foliage along the stem. Wilting results from the development of resin-soaked lesions either on the stem, near the groundline or on the upper portion of the taproot. Removing the bark exposes the resin-soaked wood, which is the primary method to confirm the presence of pitch canker when compared to a healthy, uninfected seedling (fig. 14.4). Particularly with longleaf pine, seemingly disease-free healthy seedlings with latent infections are lifted, only to die after outplanting in the field.

The fungus can be cultured from infected tissues on acidified potato dextrose

Figure 14.1—*Discoloration and foliage wilt of Monterey pine seedlings infected by* Fusarium circinatum. Photo by Cassandra Swett, University of California.

Figure 14.2—*Stained, resin-soaked xylem of a Monterey pine seedling infected by* Fusarium circinatum. Photo by Cassandra Swett, University of California.

Figure 14.3—*Sand pine seedling affected by pitch canker.* Photo by George Blakeslee, University of Florida.

agar. The pathogen is characterized microscopically by curved, multiseptate macroconidia, 32 to 53 by 3.0 to 4.5 microns (fig. 14.5) and abundant oval to oblong microconidia, 8 to 12 by 2 to 3 microns, produced on polyphialides (fig. 14.6); chlamydospores are absent. The fungus also produces coiled knots of hyphae that do not produce spores.

Biology

The most common mode of entry into the nursery is via infested seed. The fungus can also enter a nursery as airborne inoculum from nearby infected trees or can possibly be carried by insects. The distribution of infected seedlings within nurseries suggests that insects may be an important wounding agent. After a nursery becomes infested, secondary disease spread during the growing season probably results from inoculum produced on previously infected seedlings. Insects and their feeding activities may play a role in late-season infections.

Control

Prevention

Use disease-free seed to prevent the fungus from being introduced into the nursery and causing seedling mortality. Suspected seedlots should be tested to determine if the seed is infested. Infested seedlots should not be sown or at a minimum, should be disinfested using fungicidal seed treatments. Suspected seed or seed of unknown origin should not be mixed with other noninfested seedlots during processing and seed treatment. Within pine species, families can differ in susceptibility and some may

Figure 14.4—*Resin-soaking at the root collar of longleaf pine caused by* Fusarium circinatum *(left) and a healthy uninfected seedling (right).* Photos by Tom Starkey, Auburn University.

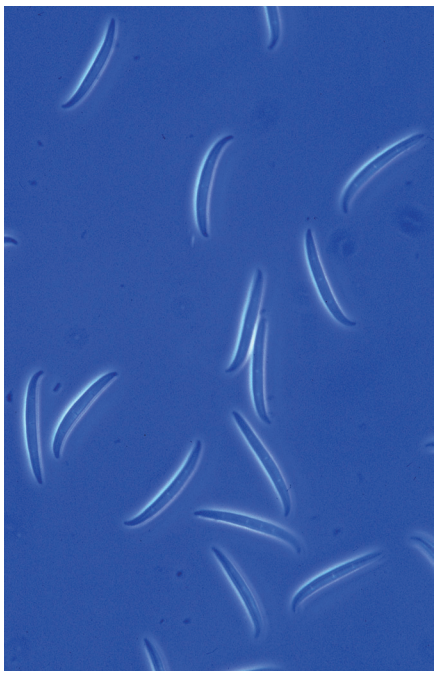

Figure 14.5—*Macroconidia of* Fusarium circinatum. Photo by Michelle M. Cram, USDA Forest Service.

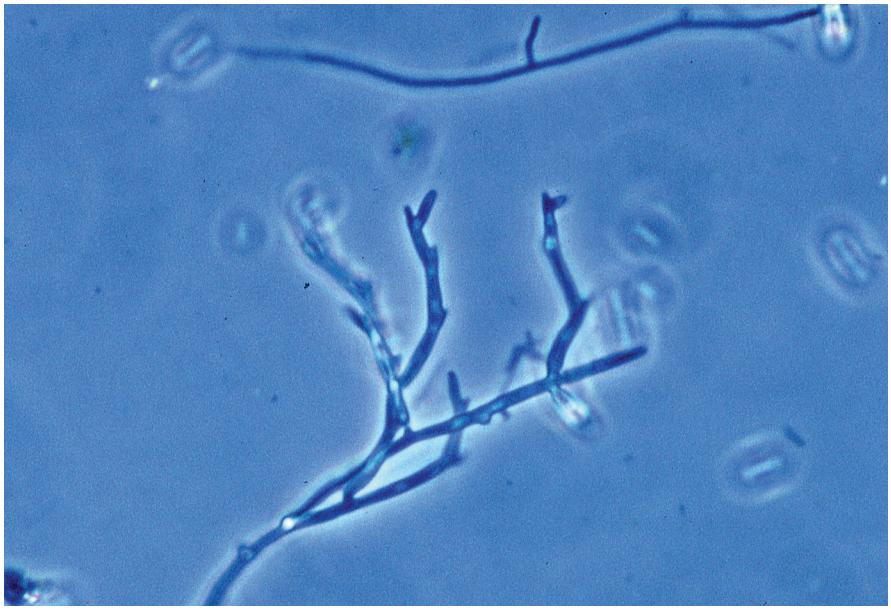

Figure 14.6—*Conidiophores (polyphialides) and microconidia of* Fusarium circinatum. Photo by Michelle M. Cram, USDA Forest Service.

sustain visible evidence of disease in seed orchards. Cones from those families should not be processed with disease-free cones. Proper cone and seed-handling procedures must be used to minimize fungal contamination of seed in the cone collection process.

Cultural

Remove pitch canker-infected trees in windbreaks, seed orchards, border plantings, or adjacent stands, thereby reducing nearby inoculum sources that could enter the nursery. Sanitation of seedling beds during the growing season may be achieved by removing and destroying infected seedlings from the nursery to prevent fungal spread. Care should be taken not to move soil associated with diseased trees into noninfested areas of the nursery. Soil treatment at infested sites with an eradicative material may be appropriate (see Chemical section that follows).

During lifting and packing, cull symptomatic seedlings to reduce dispersal of the fungus to outplantings and to minimize exposure of healthy seedlings to diseased ones. Culling is particularly important with longleaf pine that may be infected, but do not exhibit the symptoms in the nursery. Removing bark from seedling stems will expose the darkly stained, resin-soaked wood, which is a diagnostic symptom of *Fusarium circinatum* infection.

Chemical

Fumigate with standard formulations and dosage rates to eradicate the pathogen from the soil. Treating the seed with hydrogen peroxide or bleach may decrease the chances of seed infestations and subsequent seedling mortality by this fungus. The treatment of seed and timely applications of fungicides registered for the fungus will decrease the disease incidence. Registered efficacious fungicides for pitch canker control are limited. When an outbreak of the disease is observed, insect control (especially fungal gnats in containers) will help minimize the spread of the pathogen.

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