40. Cylindrocladium Diseases

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Hosts

Cylindrocladium diseases, caused by several species of *Cylindrocladium* (primarily *C. scoparium, C. floridanum,* and *C. crotalariae),* affect conifer and hardwood seedlings of many species. In the North Central and Northeastern States and in the Province of Ontario, species most commonly affected include red and eastern white pines, along with black and white spruces. In the Southern States, seedlings of black walnut, yellow-poplar, sweetgum, eucalyptus, and eastern white pine are the most commonly affected. In addition, cherrybark oak, northern red oak, dogwood, redbud, and several ornamental shrubs are susceptible.

Distribution

These diseases are known to occur in 20 Eastern and Central States and in Ontario, Canada (fig. 40-1). In addition, a species of *Cylindrocladium* has been isolated from soil samples in one nursery in Washington.

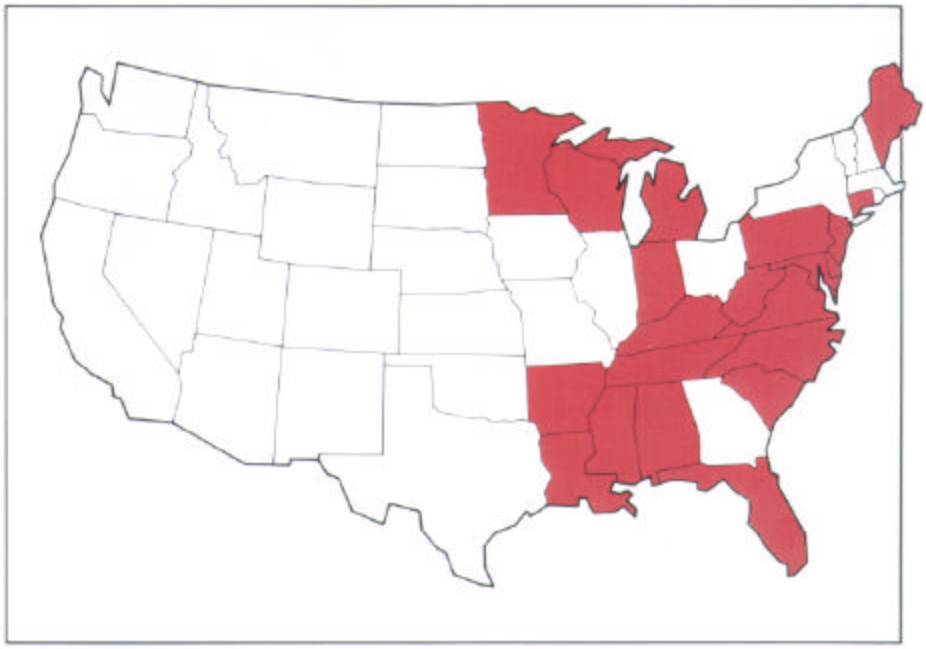

Figure 40-1—Distribution of Cylindrocladium diseases in forest tree nurseries.

Damage

Cylindrocladium diseases, especially those affecting the roots, can cause significant seedling mortality. Sublethal infections can result in stunting, chlorosis, or top dieback so severe that many seedlings must be culled.

Diagnosis

Infection by species of *Cylindrocladium* can result in a variety of symptoms. These include pre- and postemergence damping-off, root rot, foliage blight, and stem lesions.

Symptoms of root rot differ on seedlings of conifers and hardwoods. On conifers, look for necrosis of lateral and primary roots, frequently accompanied by blackening and slipping of the root cortex when the disease is at an advanced stage. On hardwoods, look for a pronounced blackening of the root cortex, frequently accompanied by longitudinal cracking. These symptoms occur on species such as yellow-poplar (fig. 40-2), black walnut, and sweetgum. Severe root infection can result in heavy mortality in both conifers (fig. 40-3) and hardwoods (fig. 40-4).

Stem infections on eucalyptus are frequently centered on leaf petioles. This fact suggests that infection begins in the foliage and progresses to the stems through the petioles.

Foliage blight symptoms on conifers such as eastern white pine are characterized by needle discoloration (yellowing and browning, fig. 40-5), necrosis, defoliation, and subsequent seedling mortality in severe cases.

Figure 40-2—Blackened roots on yellow-poplar, a symptom typical of Cylindrocladium root rot.

When conditions are suitable, abundant spores (conidia) may be produced on infected plant parts,

Figure 40-3—Beds of black spruce severely affected by Cylindrocladium root rot.

Figure 40-4—Beds of black walnut infected by *Cylindrocladium* sp.

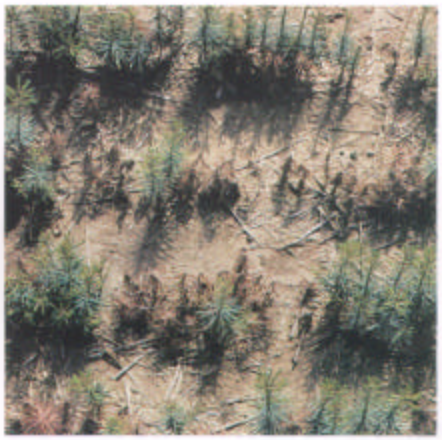

Figure 40-5—Symptoms of Cylindrocladium foliage blight (needle discoloration and necrosis) on 1-0 eastern white pine seedlings.

appearing as a white, powdery covering (fig. 40-6). Conidia of all species of *Cylindrocladium* are cylindrical with rounded ends. However, they vary in size and number of septations among species. Conidia of *C. scoparium* and *C. floridanum* have one septum, and are 50-60 x 4.5-6.0 and 36-57 x 2.6-4.6 microns, respectively. Conidia of *C. crotalariae* have two or more septa, and are 58-107 x 4.8-7.1 microns. Species of *Cylindrocladium* also can be separated on the basis of vesicle shape. Vesicles of *C. scoparium* are primarily ellipsoid (fig. 40-7); those of the other two species are globose (fig. 40-8).

Species of *Cylindrocladium* readily grow on most common laboratory media. Cultures are characterized by the production of abundant tiny, reddish-brown microsclerotia (fig. 40-9).

Figure 40-6—Stem of infected Eucalyptus covered with white spore masses (conidia) of *Cylindrocladium* sp.

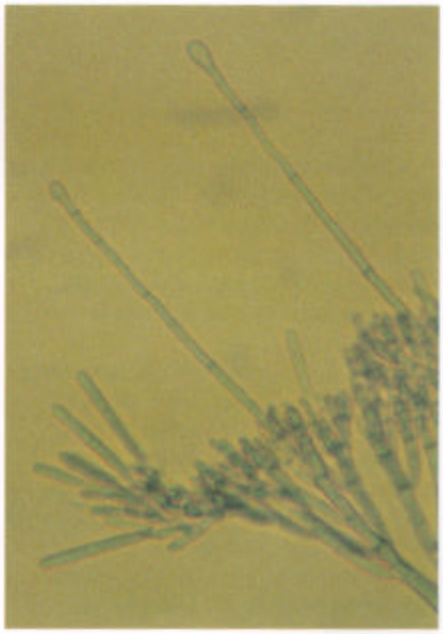

Figure 40-7—Conidiophores, conidia, and vesicles of *C. scoparium*. Note ellipsoid vesicles.

Figure 40-8—Conidiophores, conidia, and vesicles of C. *floridanum*. Note globose vesicles.

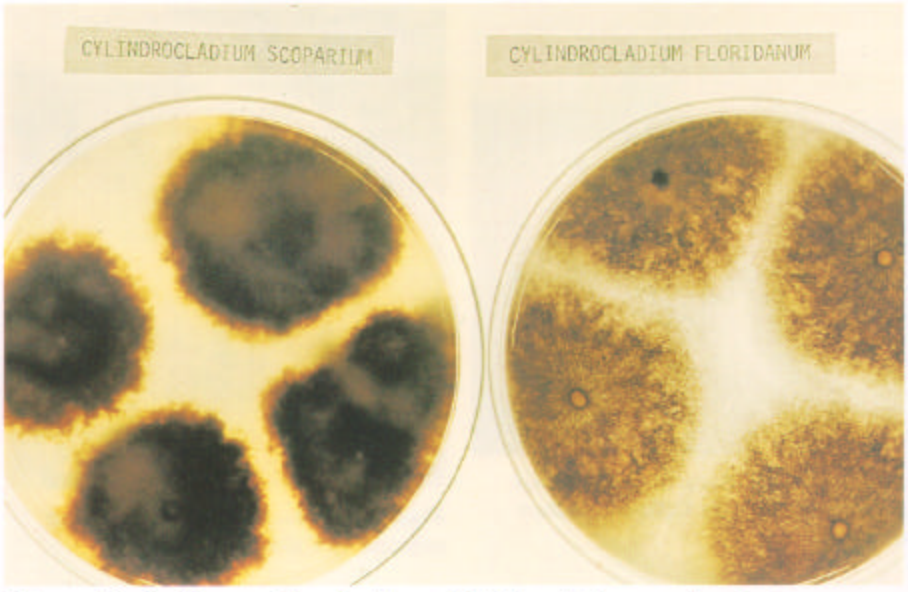

Figure 40-9—Reverse side of culture of Cylindrocladium sp. showing large numbers of microsclerotia.

Biology

Cylindrocladium spp. survive and overwinter as microsclerotia in infected plant tissues and infested soil. When seedling roots come in contact with the microsclerotia, they germinate and infection occurs.

During periods of high humidity and rainfall, foliage and stem infection may also develop from infection by airborne conidia or ascospores. However, perithecia and ascospores are rarely produced in bareroot or container nurseries and have only been observed in association with C. *crotalariae infections.*

The *Cylindrocladium spp.* also have the unique characteristic of tolerating a wide pH range for fungus growth and host infection. This reduces the effectiveness of nursery cultural control techniques.

Control

Prevention—Early detection, diagnosis, and evaluation of damage are essential. Delineate and avoid infested nursery sites as much as possible. Avoid nursery site contaminations through movement of either infected seedlings or infested soil between and within nurseries.

Cultural—Favor nonhost nursery cover crops such as corn and grasses over known host cover crops such as soybeans, clover, and alfalfa. Maintain optimum nursery bed seedling densities to promote seedling aeration and growth and to reduce damage to both roots and foliage. Rogue nursery seedbeds and cull lifted material. Remove and destroy all seedlings with either discolored or wilted foliage. Cull those seedlings with 25 percent or more visible root rot damage to the taproot.

Particularly for hardwood seedlings, minimize storage periods and maintain cold room storage temperatures at 35 to 40 °F.

Chemical—In infested nurseries, fumigate seedbeds immediately before sowing. Special considerations may be needed for soil fumigation preceding the cover crop to provide adequate endomycorrhizae on hardwood seedlings (see the introductory chapter on mycorrhizae). The most effective soil fumigant is a formulation of 67 percent methyl bromide and 33 percent chloropicrin. Employ deep soil fumigation (minimum of 12 in) when growing highly susceptible and deep-rooted hardwood species such as black walnut, yellow-poplar, and sweetgum.

Apply foliar fungicides to prevent foliage and shoot diseases on susceptible conifer and hardwood seedlings. Benomyl and chlorothalonil have been effective for this purpose on eucalyptus seedlings in a south Florida nursery; however, special local need registrations may be required in other States.

Dip seedling roots before transplanting. Dipping roots in solutions of benomyl has been effective in reducing losses from Cylindrocladium root rot on transplanted conifer seedlings in the North Central and Eastern States.

Selected References

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