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CANAVIRGELLA NEEDLECAST OF WHITE PINE

Canavirgella needlecast of white pine appears to be unusually widespread throughout Connecticut this Spring, 2010. Symptoms appear on trees in forests, woodlots, and landscapes. The prevalence of the disease is probably associated with the cool, cloudy, wet conditions of last year's spring and early summer, which were suitable for infection.

Canavirgella needlecast was first diagnosed in Connecticut in 1998 and is found along the Eastern Seaboard, from North Carolina to Maine. The first report documenting the association of the fungus *Canavirgella banfieldii* with this needlecast disease in the U.S. was published in 1996.

SYMPTOMATOLOGY AND DISEASE CYCLE:

Canavirgella needlecast, caused by the fungus *Canavirgella banfieldii,* is a disease of *Pinus strobus* (Eastern white pine) and *Pinus peuce* (Macedonian white pine). Infected trees appear distinctly off-colored and brown from a distance in spring (Figure 1). Upon close inspection, symptoms are confined to last year's needles.

Initial symptoms appear on the tips of infected needles in late summer, fall, or winter. They are yellowish-tan and develop a distinct reddish-brown color. By the following spring, infected needles curl and fade to tan or gray. (Figure 2).

Figure 1. Heavily infected tree in spring. Note overall brown appearance of one-year-old needles.

One of the diagnostic characteristics of the disease is that not all needles within a fascicle are infected. Additionally,

individual needles within a fascicle may exhibit differing amounts of symptomatic tissue (Figure 3).

Figure 2. Diagnostic symptoms of Canavirgella needlecast. Note reddish-brown color of infected needles.

Figure 3. Individual needles in a fascicle show different levels of browning.

When needles are infected with *Canavirgella*, the bases of the symptomatic needles usually remain green and all five of the needles and the fascicle often remain attached to the tree. Symptomatic portions of individual needles may break off before the fascicles drop during periods of normal needle shedding. The general symptoms of this needlecast have frequently been confused with those associated with acute ozone injury, stress, and other needlecast diseases. However, with ozone, symptoms usually develop on all of the needles within a fascicle and all needles exhibit the same extent of injury.

Fruiting bodies (spermagonia) of *C. banfieldii* begin to form under the epidermis on the stomatal (adaxial) surfaces of infected needles in late summer to winter. They appear as oval, blister-like, raised structures barely visible with a hand lens (Figure 4).

Figure 4. Developing fruiting body (spermagonium) of *C. banfieldii*. Note oval shape of the raised, blister-like structure (arrow).

Additional fruiting bodies (called hysterothecia) develop on adaxial surfaces of symptomatic portions of the needles throughout the winter and spring. These structures first appear as dull gray stripes along the length of the symptomatic portion of the needle (Figure 5).

Figure 5. Gray stripes of developing fruiting bodies in spring.

Hysterothecia mature in late spring to early summer. Many of these fruiting bodies can develop on an individual needle. These blacken as they mature—giving adaxial surfaces of infected needles distinctly raised black stripes (Figures 6, 7, and 8). These are visible with a hand-lens or even the naked eye.

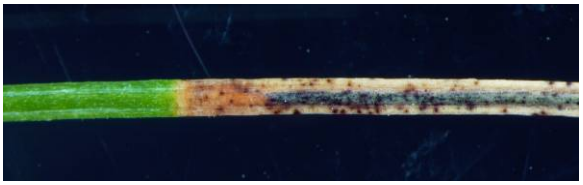

Figure 6. Developing fruiting body (black line) in infected portion of a needle.

Figure 7. Diagnostic blackened stripes on adaxial surfaces of infected needles.

Each hysterothecium contains many asci or spore "sacs." Spores (ascospores) of the fungus develop and mature within each ascus. Mature asci usually contain eight ascospores. These spores are thought to be released during the early stages of needle elongation and during periods of favorable, wet weather (Figures 9, 10, and 11).

Infection of succulent, elongating, current-season needles occurs in late June or early July. As with most needlecast pathogens, extended periods of free water on the needles are conducive for infection.

Figure 8. Close-up of infected needles. Note shiny black fruiting structures that develop in spring (arrows).

Figure 9. Cross-section through an infected needle. Note fruiting body splitting throught the epidermis on the adaxial surface of a needle (arrow).

The disease does not appear to be site-specific, since heavily infected trees have been found on warm, exposed, south-facing slopes as well as on cool, moist, north-facing exposures.

Secondary fungi are often associated with infections by *C. banfieldii*. The presence of these secondary organisms often creates problems with accurate diagnosis.

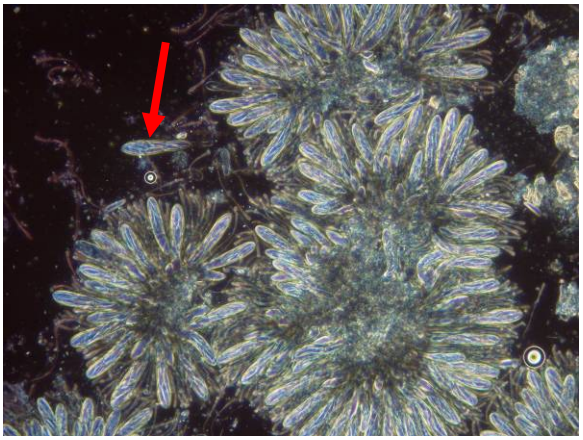

Figure 10. Microscopic view of many asci (spore sacs-arrow) than contain ascospores.

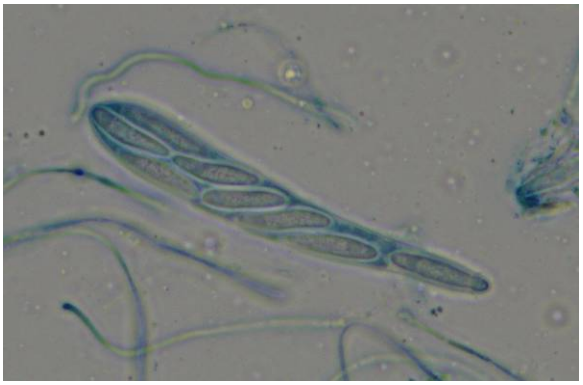

Figure 11. Each mature ascus (spore sac) usually contains eight spores (ascospores).

Not all white pines are susceptible to the disease, and it is believed that susceptibility may be hereditary. If this is the case, stands with related trees will show significant damage if susceptible, or relatively no damage if resistant.

MANAGEMENT STRATEGIES:

As with most needlecasts, Canavirgella needlecast rarely requires management because they are usually considered to be more aesthetic than life-threatening. However, there are situations when integrated, multifaceted management strategies might be necessary. This include following good sanitary and cultural practices. Tree vigor should be maintained by attention to watering, fertilizing (as determined by a soil test), and pruning. On the other hand, there are situations where they can be serious and cause permanent damage, disfigurement, or even tree death. Newly transplanted trees or trees weakened by environmental or site-related stress can be particularly sensitive to several years of repeated premature needle drop. In such cases, chemical control can be beneficial. However, once symptoms are visible on the needles, it is too late for chemical applications. Among the fungicides registered for homeowner use in Connecticut that have been found to be effective for managing Canavirgella needlecast is chlorothalonil. The pesticide label will contain information on dosage rates, application intervals, and safety precautions. Since this fungus infects newly developing needles in spring to early summer, the first fungicide spray is applied as needles emerge. Additional applications at intervals stated on the fungicide label may be necessary under unusually wet or prolonged spring conditions until needles reach maturity.

April 2010 (revised)