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Dr. Yonghao Li
Department of Plant Pathology and Ecology
The Connecticut Agricultural Experiment Station
123 Huntington Street, P. O. Box 1106
New Haven, CT 06504

Phone: (203) 974-8601

Fax: (203) 974-8502

Email: Yonghao.Li@ct.gov

Website: www.ct.gov/caes

NEEDLE CAST DISEASES OF SPRUCE

Two needle cast diseases caused by fungi *Rhizosphaera kalkhoffii* and *Stigmina lautii*, respectively, are commonly found on spruce trees in Connecticut. Infection of fungal needle cast diseases can cause early defoliation and significantly reduce the aesthetic values of the trees in landscape plantings and Christmas tree plantations.

SYMPTOMS AND DIAGNOSTICS

Typical symptoms of both needle casts are yellowing or browning of the second and third year needles and early defoliation. After several years of continuous infections, only the current year, green needles remain attached at the tip of branches (Figures 1 and 2). The new needles can remain symptomless until the end of the season or

until the following spring. Initial symptoms on infected needles begin as a yellow discoloration, and then turn purple or brown. Both needle casts can form black fungal fruiting structures in long rows that resemble as the arrangement of stomates on the needles. However, they can be distinguished by examining them under a dissecting microscope. The fruiting body (pycnidium) of *R. kalkhoffii* appears spherical and smooth (Figure 3), whereas the fruiting structure (sporodochium) of *S. lautii* appears hairy or feathery (Figure 4). Both diseases typically start on the lower branches and gradually move upward. Although these diseases ususally do not kill the tree, they deteriorate the tree's appearance.



Figure 1. Brown needles infected with *Rhizosphaera* needle cast



Figure 2. Defoliation caused by *Stigmina* needle cast



Figure 3. Spherical and smooth fungal fruiting bodies of *Rhizosphaera kalkhoffii* on the infected needle



Figure 4. Black, fuzzy fungal fruiting structures of *Stigmina lautii* on the infected needle

DISEASE DEVELOPMENT

Both pathogens overwinter in living or dead needles either on the trees or in fallen needles. Spores from the fungal fruiting structures are dispersed by wind-driven rain or by overhead sprinkler irrigation water. Spores land on new growth in the spring and infect the needles. Spore germination and infection require an extended period of moisture or water film on needles. So, rainy and wet weather conditions in the spring favor disease development. Symptoms and fungal fruiting structures on newly infected needles may take a whole season or longer to become visible. Stress from drought, compacted soils, and girdling roots may accelerate disease progression. Among the spruce species, Colorado Blue spruce and white spruce are susceptible, while Norway spruce is relatively resistant to the diseases.

MANAGEMENT

Resistant species: Planting resistant species is a very effective and economic way to prevent needle cast diseases in the areas where these diseases are problematic. To plant new trees, consider choosing the disease resistant Norway spruce.

Cultural practices: Promote good air circulation and reduce humidity by mowing grass near the trees. Plants should be spaced properly and pruned to remove dead or severely diseased branches. Rake and destroy fallen needles to reduce inoculum in the area. Avoid pruning or shearing of trees during wet weather conditions to reduce the risk of disease spread. Avoid planting young spruce trees near severely diseased trees. When necessary, water trees to prevent drought stress and to maintain the tree vigor.

Fungicides: Proper and timely fungicide applications can effectively control needle cast diseases. The first application should be made at bud break in the spring. A second application is needed when needles are fully elongated. Two or more years of fungicide applications are required to restore moderately infected spruce trees. Chlorothalonil, mancozeb, and copper hydroxide are registered for needle cast diseases. It is the legal responsibility for user to carefully read and follow the label.

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