PennState Extension

Rhizosphaera Needle Cast

Young trees sustain the most severe damage from rhizosphaera needle cast, but trees of any size can be affected. Damage causes discoloration of needles.

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Rhizosphaera-infected foliage on inner branches and lower parts of the tree. Courtesy of USDA Forest Service North Central Research Station Archive, Bugwood.org (#1406191)

Rhizosphaera kalkhoffii **Bubak**

Hosts

- Colorado blue spruce and Engelmann spruce most susceptible
- White spruce occasionally susceptible

Damage Potential

- Moderate

Symptoms and Signs

- May first develop in needles on lower branches
- Older needles may exhibit discoloration throughout the year

Late Fall Through Early Spring

- Yellow mottling of first-year needles

Early Spring (Before Bud Break)

- Yellow needles turn brown or purple-brown; black fruiting bodies with white cap protruding from needle stomata develop

Late Spring (After Bud Break)

- Initial casting of previous year's infected needles

Summer Through Early Fall

- Casting of previous year's infected needles, leading to large bare areas on trees; severely diseased trees might only retain current-year needles

Causes of Similar Symptoms

- Spruce spider mite
- Cytospora canker
- Flyspeck
- Environmental stress (drought)
- Nutritional deficiencies
- Spray damage

Identification

Rhizosphaera needle cast disease is caused by the fungus *Rhizosphaera kalkhoffii* Bubak. Colorado and Engelmann spruce are very susceptible, but Norway and white spruce are somewhat resistant. Young trees sustain the most severe damage, but trees of any size can be affected. Field identification is based on symptoms, but accurate identification requires laboratory analysis.

Healthy spruce trees will retain 5 or more years of needles. Those infected with *Rhizosphaera* may have only one year of needles. Foliage on inner branches and on the lower portion of the tree is more prone to infection since these areas tend to remain wet for longer periods. When the infection is severe, this disease will kill lower branch-es and infection will progress to the upper branches.

Yellowing needles of any age or any that are reddish brown to purple in fall are suspect. Look particularly at trees that appear thin on the lower half or are only

retaining 1–2 years of needle growth. Examine apparently healthy needles on these trees in early spring, prior to bud break. Look for minute, black fruiting bodies, 1⁄250 inch (0.1 mm) in diameter, in neat lines running the length of the needle.

Biology and Life Cycle

Rhizosphaera overwinters in infected needles on the tree. In spring, the fruiting bodies mature and push through the stomata. They appear as neat lines of tiny, black spots about the size of the stomata (Figure 1). About the time of bud break, they mature, and when there is adequate moisture, spores are released. The spores are splashed by rain to the new growth, where infection will begin. The spores enter the stomata of the healthy needle and germinate after a minimum of 48 hours. Under less favorable conditions, longer germination time is required. Most infection occurs in spring, but first-year needles are susceptible throughout the growing season. In some areas of Pennsylvania, a second infection period in August and September has been reported.

Figure 1. Fruiting bodies pushing up through the stomata. Courtesy of Tracey Olson, PDA

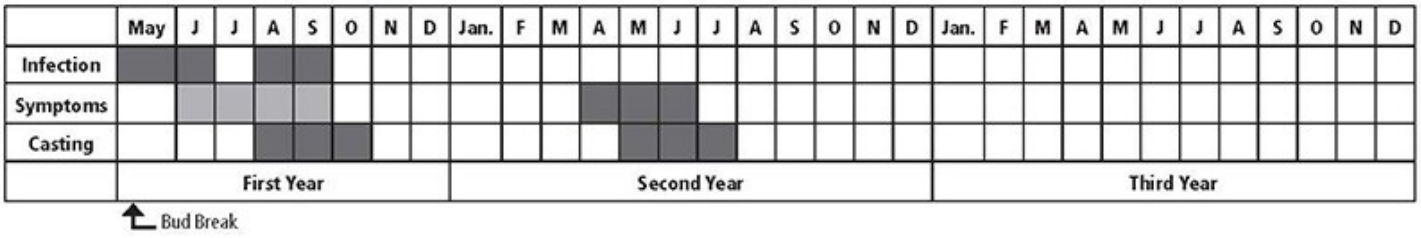
The disease continues to develop in the needle for the next year, but symptoms are generally not well expressed. This long period between infection and appearance of symptoms makes this disease difficult to diagnose and control. Around May, one year following infection, apparently healthy needles will bear mature fruiting bodies (Figure 2). During summer, these now previous year's needles will turn yellow and gradually reddish brown or purple by fall (Figure 3). This discoloration is very striking, particularly on Colorado spruce with bright blue color (Figure 4). Most infected needles are cast in the fall, but some infected needles will remain on the tree.

Figure 2. Apparently healthy needles bearing fruiting bodies. Courtesy of Tracey Olson, PDA

Figure 3. Infected reddish-brown needle in fall. Courtesy of Tracey Olson, PDA

Figure 4. Striking symptomatic color on Colorado blue spruce. Courtesy of USDA Forest Service Archive, Bugwood.org (#2634062)

Disease Cycle Calendar (Single Year's Growth of Needles)



The heavier the shading, the more intense the infection/symptom/casting.

Monitoring and Management Strategies

Plantation Establishment

- Plant on a slope with good drainage.
- Plant resistant varieties such as Norway or white spruce. Plant disease-free stock.
- Adequately space trees when planting to allow for air circulation and drying of needles.

Preseason

- Maintain proper weed control throughout season by mowing grass and brush.
- Scout for fruiting bodies in spring before bud break.

— Randomly select at least 20 trees to sample. Concentrate scouting on trees planted in areas that are more conducive for disease development.

— Using a 10X hand lens, examine the 2-year-old needles found on three lower branches of each tree sampled. Look for black fruiting bodies protruding from stomata openings.

— During dry weather, remove and destroy infected branches and trees.

Growing Season

- If at least half of the sampled branches have fruiting bodies on 10 percent of needles, consider treating the entire plantation with a fungicide application.
- Shear healthy trees first during dry conditions.
- At the end of the season, evaluate results and update records.

Control Options

Biological

- No recommendations are available at this time.

Mechanical

- Cut infected branches back to the main trunk.
- Do not leave live branches on the stumps of harvested trees.

Biorational

- No recommendations are available at this time.

Chemical

- Apply an appropriate fungicide when new shoots are ¾–1¼ inches long (needles are half elongated) and a second spray 3 weeks later (needles are fully elongated). Moderately infected trees may require 2 years of fungicide applications.
- In some areas, it may be necessary to make another application in mid-August to early September to prevent late summer infection.

Next Crop/Prevention

- Maintaining tree health and vigor can help guard against severe *Rhizosphaera* needle cast infection.