

56. *Rhizosphaera* Needle Cast of Spruce

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Rhizosphaera needle cast is caused by the fungus *Rhizosphaera kalkhoffii*. The disease was first observed on ornamental blue spruce in Connecticut in 1938.

Hosts and Distribution

The primary host for *Rhizosphaera* is blue spruce. Although it also infects white spruce, its variety Black Hills spruce, and Engelmann spruce, it is not considered a serious problem on these species. Douglas-fir has also been reported as a host. The disease is primarily a problem in nurseries, ornamental plantings, and Christmas tree plantations. It has been found in natural stands, but apparently the fungus causes little damage under these conditions.

The disease is currently causing serious damage in blue spruce Christmas tree plantations in Wisconsin, Michigan, Minnesota, Indiana, and Pennsylvania. A

1972 survey of 98 ornamental nurseries in Wisconsin showed the disease present on 12 percent of the blue spruce stock in 18 nurseries. The disease has also been found on ornamental blue spruce in Connecticut, New York, Massachusetts, Virginia, North Carolina, North Dakota, South Dakota, Quebec, and New Brunswick, and on natural blue spruce stands in Arizona. It has been found in natural Engelmann spruce stands in Colorado.

Symptoms and Signs

R. kalkhoffii infects blue spruce of all ages. Although infection takes place in the spring, the first symptoms are not visible until the following spring. Small dark brown or black spherical fruiting bodies (pycnidia) emerge through the stomata of infected needles (fig. 56-1). They can easily be seen with a hand lens throughout the year. Infected needles turn yellow in July and purplish brown by late August of the year following infection (fig. 56-2). The infected needles usually fall off in late summer of their second growing season, although some adhere over winter and produce spores the following spring. Needles on the lowest branches are usually infected first and the disease gradually progresses up the tree (fig. 56-3). On severely infected branches only current-year needles will be present as the second-year needles drop off in early summer.

Disease Cycle

The pycnidia on infected needles release conidia in late spring during periods of wet weather. Hyaline conidia (4 by 8 μm) are dispersed primarily by rainsplash to infect the newly emerging needles. Pycnidia will emerge from the stomata of these newly infected needles the following spring to start a new life cycle.

Damage

Although some tree mortality has been observed under epidemic conditions, the primary damage involves premature needle cast. Branches defoliated each year for 3 to 4 years will die. The trees become unsightly for ornamental purposes and are unmerchantable for quality Christmas trees. In the Great Plains, heavy infection occurs primarily in years with greater-than-normal spring rainfall.

Control

Cultural—The most important control procedure for this disease is to plant only healthy stock. Blue spruce

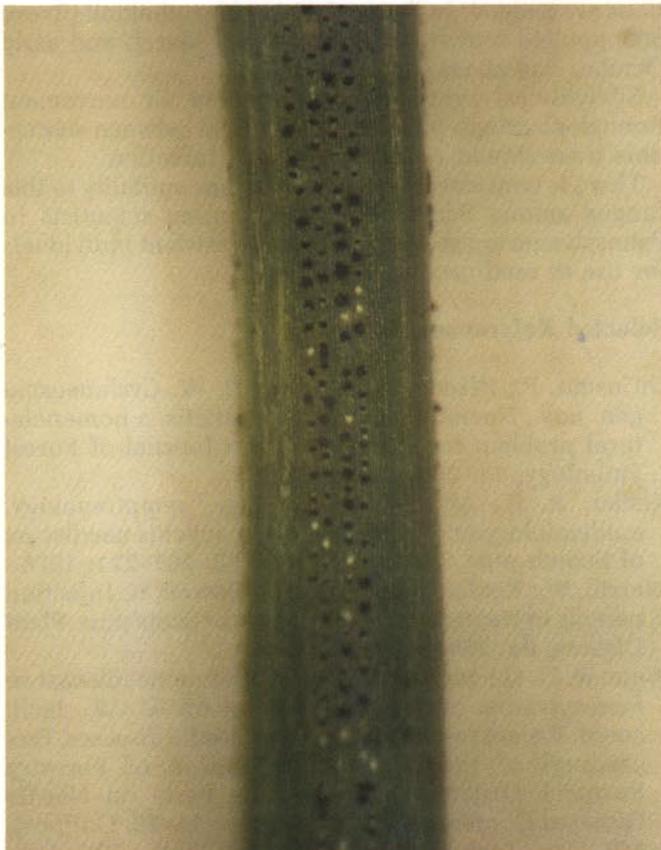


Figure 56-1. Fruiting bodies of *Rhizosphaera kalkhoffii* protruding from stomata appear as small black dots.



Figure 56-2. Infected needles eventually turn purplish-brown.

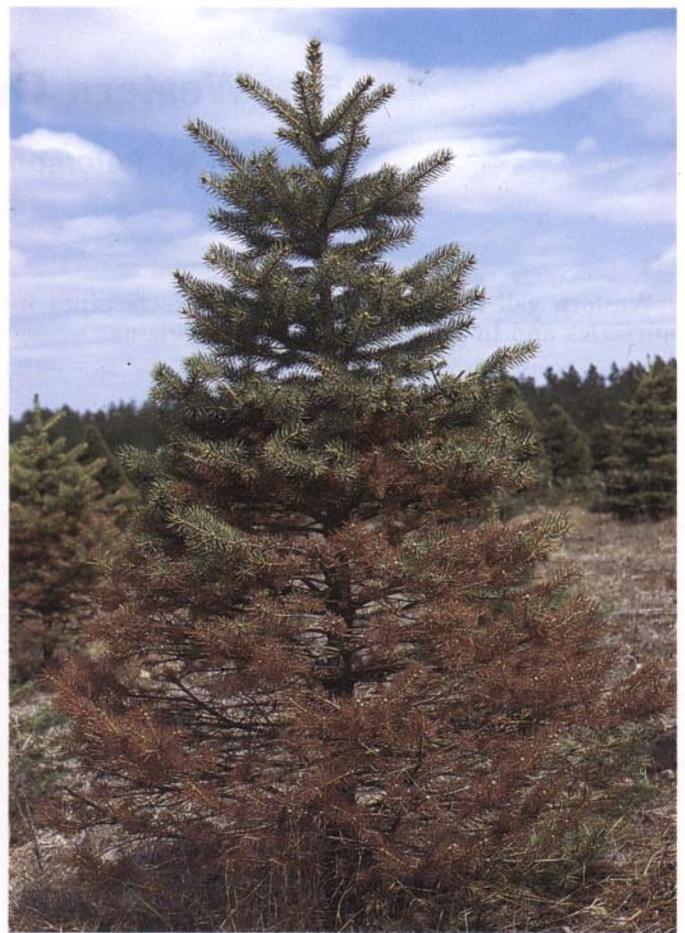


Figure 56-3. *Rhizosphaera* needle cast damage is most severe on lower portion of tree.

seedlings from nurseries should be inspected carefully for fruiting bodies of *Rhizosphaera* within the stomata. Infected seedlings should be returned to the nursery. Blue spruce plantations should be examined frequently for signs of *Rhizosphaera* needle cast. If the trees seem to be dropping their needles prematurely, a careful inspection should be made for the fruiting bodies of *Rhizosphaera* in the stomata of the needles. These can be observed throughout the year. Early identification of this problem will result in easier control as light infections can be controlled with only one or two fungicide sprays.

During shearing operations, healthy Christmas tree plantations should be sheared first to avoid the possibility of spreading fungus spores on the workers' clothes or shearing tools. Shearing tools can be sterilized by dipping in denatured alcohol for 3 minutes. Infected trees should not be sheared when the foliage is wet because the conidia are more easily spread to healthy trees at this time.

If possible, do not place new plantings adjacent to established trees. Do not bring infected needles into the area (such as spruce Christmas trees or branches). Promote good air circulation by maintaining open spacing and by mowing grass and brush.

Chemical—Infected trees can be sprayed with Bordeaux mixture 8-8-100 or chlorothalonil (Bravo). Both are effective and are registered for use. Fungicides applied in early June and again in early July give the most economical control in Minnesota and Wisconsin. In areas with a different growing season the spray schedule should be adjusted so that a protective spray is applied when the new needles are half elongated and again when needles are fully elongated. Two years of fungicide spraying will usually restore moderately infected trees to full foliage quality. Heavily infected stands will require more spraying. Early treatment will usually control *Rhizosphaera* needle cast after only one year's spraying. This may be the only treatment necessary until final harvest.

Selected References

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