



Rhabdocline and Swiss Needle Casts of Douglas-fir

Rhabdocline spp. & *Phaeocryptopus gaeumannii*

Introduction

Rhabdocline and Swiss needle cast diseases are both caused by fungal pathogens that infect only Douglas-fir. Infected needles become discolored and die and are eventually cast prematurely from the tree. In nurseries and Christmas tree plantations, these infections may sufficiently destroy the aesthetic value as to make the trees unsalable for use as Christmas trees or in landscape plantings. Rhabdocline infects the current season's needles. The Swiss pathogen also infects current season needles but may also infect needles the following season.

Symptoms and Signs

Needles infected with *Rhabdocline* spp. will exhibit one or more purplish-brown bands or spots which are evident on both the upper and lower surface of the needle. Usually just before bud break, the banded areas will begin to swell and split open lengthwise on the undersurface of the infected needles. This is in preparation for releasing infectious spores.

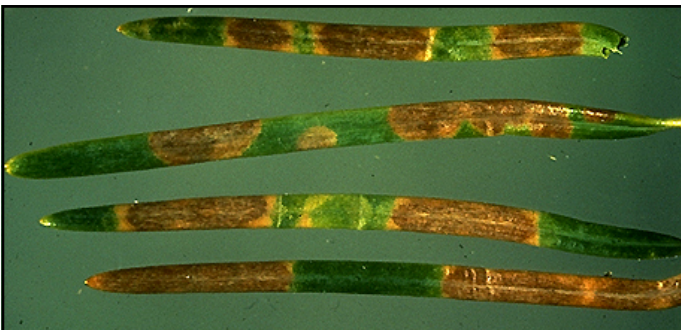


Figure 1: Bands and spots on needles infected with *Rhabdocline* as they may appear on the upper surface of infected needles (provided by Dr. George W. Hudler, Cornell University)

The black fruiting bodies (pseudothecia) of the Swiss needle cast fungus may be found on the undersides of infected needles in the spring after infection occurs. This is the only definitive sign of infection you will be able to find. The best place to search is in the lower crown on needles that have already begun to turn yellow or brown.

It may look as if there are two tiny rows of soot on the underside of each infected needle. Looking for scattered discolored needles near the base of the trees may help you to find the disease.



Figure 2: Black, soot-like fruiting bodies of the Swiss needlecast fungus as you might view them with a 10 x hand lens (provided by Dr. George W. Hudler, Cornell University)

In the Northeastern U.S., begin scouting for both of these diseases in early April before bud break. Scout on slightly overcast days as opposed to sunny ones, as it will make the discoloration of the needles stand out much better. Examine needles near the base of the tree first, as this is where infection by either pathogen is most likely to begin.



Figure 3: The extensive purplish-brown discoloration of foliage at the base of these trees may be more indicative of Rhabdocline than Swiss needle cast (provided by Dr. George W. Hudler, Cornell University)

Disease Cycle

As the Rhabdocline fruiting bodies mature in the spring, the undersides of the spots and bands rupture, exposing spongy, orange, spore-bearing fungal tissue. This tissue will protrude from the undersurface when conditions are damp. When this tissue begins to turn black, spore production and dissemination is complete. Infected needles then begin to drop from the tree.

If the infection level was severe, within a few weeks, the previous season's growth may hold few needles, and only the newly developing shoots may retain adequate foliage. In most cases, infection is much worse on the lower portion of the tree but if weather conditions the previous year were conducive to the spread of the fungus, infections may be found several feet high on even larger trees.



Figure 4: Splitting of the epidermis on the undersurface of a needle occurs as Rhabdocline fruiting bodies mature in the spring. (provided by S. L. Jensen, Cornell University)

The minute, spherical, black, fruiting bodies of *Phaeocryptopus* erupt through stomata on the undersides of the infected needles and release spores to infect the new growth. Although the fungus infects the newly expanding needles, it usually does not kill needles until they are 2 to 3 years old so you may need to examine two and three year old needles to find evidence of an infection.

One or more years after infection, needles infected with the fungus start to turn yellow or reddish brown and may be cast from the tree. Infection occurs mainly near the base of the tree and may leave the lower foliage looking thin and unattractive, with many branches having only the current year's growth remaining. If the tree is concurrently infected with Rhabdocline, needle loss may be even more severe.



Figure 5: Closer view of fruiting bodies of the Swiss needle cast fungus. The reddish-brown bands are due to a concurrent infection by a *Rhabdocline* sp. (provided by S.L. Jensen, Cornell University)

Management Strategies

Plantation or nursery grown trees that are severely infected by both fungi may be very difficult to bring back to good health even with multiple years of pesticide application. Rogue heavily infected trees that are close to harvest and that would require excessive time and effort to save. For trees exhibiting only minor evidence of infection on lower branches, pruning out infected branches may not only help increase airflow around the base of the trees but can remove some inoculum present on trees that may still be saved. This work should be done prior to Douglas-fir bud break in the spring.

To help prevent the spread of these diseases, plant trees only where there will be good air drainage, and keep the weeds down to encourage airflow between the trees. Do not practice stump culture in Douglas-fir plantings, i.e. do not try to train up low branches left where a tree was cut high to try to save time in producing a second tree. This practice allows for the foliage most likely to be infected to remain in the plantation and may encourage spread of these diseases.

Make appropriate pesticide applications to remaining Douglas-fir, especially if disease is not yet severe throughout the planting. Three fungicide applications are generally recommended to manage either of these diseases. The first should be made when at least 50% of the buds have broken and the new growth is 1/2 inch long. Make two more applications at two to three week intervals after the first.

Reference:

“Diseases of Trees and Shrubs”, 2nd ed. by W.A. Sinclair and H.H. Lyon. 2005, Cornell University Press.

Created SLJ 12/11

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