

FPL 49 - Melampsora Foliage Rusts

The information accessed from this screen is based on the publication: Hunt, R.S. 1978. Melampsora Foliage Rusts in British Columbia. Forestry Canada, Forest Insect and Disease Survey, Forest Pest Leaflet No. 49 4p.

Introduction

Native melampsora rusts (Melampsoraceae, Uredinales) attack a wide variety of conifer hosts that belong to a number of different genera. Some of these rusts have intercontinental distribution, whereas others are restricted to North America. There have been no detailed studies to assess the impact of these rusts, but growth loss may be expected in severe cases, and mortality may occur when seedlings are infected. The market values of Christmas trees could be reduced by these rusts.

Hosts and Distribution

The native hosts and geographical distributions of the melampsora rusts in British Columbia are:

Conifer--aspen rust (*Melampsora medusae* Thuem.)

Primary hosts: Douglas-fir, western larch, tamarack, ponderosa pine and lodgepole pine.

Secondary host: trembling aspen.

Distribution: throughout Canada; also the U.S.A., Baja California, Argentina and Japan; possibly accidentally introduced to France and Australia.

Conifer -- Cottonwood Rust (*Melampsora occidentalis* Jacks.)

Primary host: Douglas-fir ([Fig](#))

Secondary hosts: black cottonwood and balsam poplar.

Distribution: throughout British Columbia; also in Alberta, Saskatchewan, and the U.S.A. from the Pacific Coast to Wyoming

Fir -- Willow Rust (*Melampsora abieti-capraearum* Tub.)

Primary hosts: alpine, grand and amabilis fir.

Secondary hosts: species of willow.

Distribution: throughout coastal and interior British Columbia; also in Alberta, Manitoba, Saskatchewan, eastern Canada, the U.S.A., Mexico, Central and South America, and Europe.

Hemlock -- Willow Rust (*Melampsora epitea* Thuem. f. sp. *tsugae* Ziller)

Primary hosts: western and mountain hemlock.

Secondary hosts: species of willow ([Fig](#)).

Distribution: throughout British Columbia; also in Alaska and Pacific Northwestern U.S.A.

Larch -- Willow Rust (*Melampsora paradoxa* Diet. & Holw.)

Primary hosts: western larch and tamarack.

Secondary hosts: species of willow.

Distribution: throughout western and eastern Canada; also in the U.S.A. including Alaska.

Ribes -- Willow Rust (*Melampsora ribesii-purpureae* Kleb.)

Primary hosts: currants and gooseberries.

Secondary hosts: species of willow.

Distribution: southern interior British Columbia; also Alberta, Yukon Territory, Alaska, Europe and Asia.

Life History

Basic information on life histories of rust fungi is given in Pest Leaflet No. 54. The following life history applies to all six *melampsora* foliage rusts known to occur on native trees of British Columbia.

Basidiospores from secondary hosts infect the new foliage of the primary hosts in spring, and aecia begin to appear on the primary hosts approximately 2 weeks after infection. The aeciospores infect the secondary hosts during the summer, and uredinia begin to appear on them approximately 2 weeks after infection. The urediniospores serve to spread and intensify the rust on its secondary hosts. Toward fall, telia instead of uredinia develop on the secondary hosts. They overwinter in a state of dormancy in dead leaves on the ground and germinate the following spring, at the time when young shoots of the primary hosts begin to break forth from their buds. The release of basidiospores from these germinating teliospores marks the end of the 1-year life cycle of host-alternating *melampsora* rusts in western Canada.

For *Melampsora medusae* and *M. occidentalis*, host alternation appears to be obligatory, i.e. the presence and proximity of both poplars and conifers is necessary for the rust's survival. For at least some of the willow rusts, such as the larch -- willow rust, host alternation is optional, i.e. the rust can survive and propagate itself for indefinite periods of time on willow without the need of a primary host.

Recognition

All foliage rusts cause yellow to orange discoloration or spots on the foliage of their hosts. *Melampsora* rusts differ from other foliage rusts in the type of aecium they produce on their primary hosts. Unlike those of other rusts, the aecia of *melampsora* appear flat as seen under the magnifying glass. As soon as they have broken through the epidermis of the leaf, their powdery, orange-yellow aeciospores are fully exposed. The aeciospores of *melampsora* are not covered by, or contained in, a membrane, as are those of other foliage rusts.

The following key may be used to differentiate between the *melampsora* rusts occurring on their primary hosts in British Columbia.

1. Aecia on leaves of currants or gooseberries - *Melampsora ribesii-purpureae* Aecia on needles of conifers go to 2.
2. Aecia on fir (*Abies* spp.) - *Melampsora abieti-capraearum* Aecia on hemlock - *Melampsora epitea* f. sp. *tsugae* Aecia on larch or tamarack - *Melampsora medusae* or *Melampsora paradoxa* * Aecia on Douglas-fir ([Fig](#)) - *Melampsora medusae* or *Melampsora occidentalis* *

Melampsora medusae is the only rust occurring on aspen in British Columbia, and *M. occidentalis* the only one on cottonwood and balsam poplar. The four *melampsora* rusts that occur on willow in British Columbia are so much alike in their spore states that they cannot be distinguished from each other, even by specialists.

Damage

Melampsora rusts attack the foliage of young primary hosts, most severely in the regeneration and sapling stages. The infected needles are killed and in years of severe infections all current year's foliage may be eliminated, resulting in growth reduction. On secondary hosts, they cause yellow leaf spots or blight and premature defoliation ([Fig](#)).

Survey records indicate that *Melampsora medusae* and *M. occidentalis* are the most commonly occurring *melampsora* rusts in British Columbia. In 1964, 1973, 1976 and 1977 heavy infections were reported on Douglas-fir ([Fig](#)) throughout the range of the host; in 1966, Christmas tree stock was heavily infected in the Canal Flats area and, in 1967, infection of new needles of Douglas-fir reproduction was up to 100% along valley bottoms in the Nelson Forest District. Occasionally cone scales are attacked, but no damage to seeds

occurs as happens with cone rusts.

Nursery damage is recorded on Douglas-fir, ponderosa pine and lodgepole pine. In 1973, and 1977 minor culling of Douglas-fir nursery seedlings occurred. Particularly in nurseries these rusts can cause considerable damage to certain exotic hosts such as *Pinus radiata* or *Larix leptolepis*, and native hosts such as *Pinus ponderosa*, and Douglas-fir, grown beyond their natural range (3). Native and cultivated black cottonwood, the secondary hosts, were also severely infected in the vicinity of the nursery (1). In forest stands, very few naturally infected seedlings were found, indicating that such infection is rare (3).

Control

In a greenhouse experiment, McBride (2) found that three species of bacteria, which are commonly occurring on healthy foliage of Douglas-fir, controlled *Melampsora medusae* on this host.

In conifer nurseries, with a history of severe rust occurrence control by repeated spraying with suitable fungicides during the first 3 weeks after but break may be effective, but chemicals are not economically justifiable in the forest. As a precaution attempts should be made to locate conifer nurseries far from poplars, or, if possible, poplars should be eradicated from nurseries and the surrounding area (4).

When conifers and *Populus* are planted nearby, as may occur in residential areas, the leaves of the *Populus* should be raked up and destroyed. This practice will remove the overwintering stage and thus help to avoid spring infection of the conifer foliage.

References

1. Forest Insect and Disease Survey, Forest. Br., Annual Reports, 1959, 1964, 1966-67, 1973, 1976-77, Queen's Printer for Canada, Ottawa.
 2. McBride, R.P. 1969. A microbiological control of *Melampsora medusae*. Can. J. Bot. 47: 711-715.
 3. Molnar, A.C. and B. Sivak. 1964. *Melampsora* infection of pine in British Columbia. Can. J. Bot. 42: 145-158.
 4. Ziller, W.G. 1965. Studies of western tree rusts. VI. The aecial host ranges of *Melampsora albertensis*, *M. medusae* and *M. occidentalis*. Can. J. Bot. 43: 217-230.
 5. Ziller, W.G. 1974. The tree rusts of western Canada. Dept. Env., Can. Forest. Serv. Publ. No. 1329, 272 p.
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Figures



Figure 237-0049. *Melampsora occidentalis* needle rust on Douglas-fir.



Figure 237-0052. *Melampsora epitea* rust on willow leaves.



Figure 237-0050. *Melampsora occidentalis* needle rust on Douglas-fir.