

PART II

**THE DECLINE OF
MADRONE IN
URBAN LANDSCAPES**

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Some Observations of Madrone Diseases

Ralph S. Byther

Abstract: Fungal diseases are commonly observed on Pacific madrone (*Arbutus menziesii*) in the Pacific Northwest. The purpose of this paper is to address some madrone fungal diseases and their contribution to tree dieback, mortality and overall decline. Numerous foliar diseases that infect madrone are not considered a major factor in Pacific madrone mortality. *Phytophthora* root rot and butt rot and possibly *Nattrassia* canker can increase tree mortality.

Pacific madrone (*Arbutus menziesii*) is subject to attack by several fungal pathogens causing foliar diseases, root and butt rot and cankers (a defined area of diseased tissue in woody stems). The role these diseases have in “madrone decline” has not been specifically studied. Most of the published literature deals with descriptions of the diseases and the responsible fungi (Davison 1972 and Hunt, *et al.* 1992). With the exception of root and butt rot, that can be fatal, the impact and control of these diseases is not documented.

METHODS

I was involved with madrone and its diseases for the past 20 years at the Washington State University Research and Extension Center in Puyallup, Washington where we identified various diseases when samples were submitted to the Plant Clinic (Byther, *et al.* 1996). On several occasions, my field work involved evaluation of diseased and declining madrone trees. Spores must be present to identify the fungus causing the leaf spot. Historically, samples of leaf spotting fungi submitted to the Plant Clinic were not actively sporulating, so immediate identification of the causal fungus was not possible. Isolation techniques are thus required to identify the fungus. In the fall of 1994 D.K. Bressette, R.L. Hummel and I went to Tacoma’s Point Defiance Park and Madrona Links Golf Course to observe madrone trees in poor

health. We revisited these same sites in early spring of 1995; thus, the following comments are based on somewhat limited observations.

RESULTS

Foliar Diseases

Leaf spots are commonly observed on the leaves of madrone (Plate 5-1). Fungi, as well as bacteria, cause these leaf spots. Microscopic observation of spores, either produced on infected leaves or isolated from leaf spots in laboratory cultures, is necessary to identify the specific fungus causing the leaf spot. At least 19 different fungi are associated with leaf spots on madrone. The genera most commonly found in Oregon, Washington and Canada are *Didymosporium*, *Diplodia*, *Coccomyces*, *Rhytisma* and *Mycosphaerella* (Hunt, *et al.* 1992). These leaf spots are most prevalent during the late fall, winter and early spring following mild, wet winter weather. These “year old” leaves are normally dropped and replaced by new growth in the spring. The detrimental impact of these leaf spots, therefore, is cosmetic and does not contribute significantly to overall tree performance. In other words, the leaves look bad in fall and winter, but their appearance improves after new leaf growth in the spring and summer.

A fungal leaf blister disease caused by *Exobasidium vacinii* occurs on madrone leaves. It produces circular, concave blisters which make this disease easily diagnosed (Plate 5-2). As with other foliar problems, this disease is not thought to significantly reduce tree growth, but it does hurt the aesthetic value of the tree.

Insect herbivores are often confused with fungal diseases. Chief among these are damages caused by the shield bearer (Plate 5-3) and leaf miners. These insects are not factors contributing to the decline of madrone.

Root Rots and Butt Rots

Phytophthora cactorum is responsible for a lethal disease of madrone that results in root rots and butt rots. Dark brown to black cankers appear at the base of the trunk, eventually girdling and killing the tree (Plate 5-4). Various foliar symptoms and branch dieback can occur as these trees decline. Although this disease is historically implicated as a major contributor to the decline and death of madrone trees in the Puget Sound area, I observed only occasionally trees with basal *Phytophthora* cankers. Numerous basidiomycetes have also been reported to be associated with wood rots of madrone, but these are not generally regarded as primary disease causing fungi.



Plate 5-1 Fungal leaf spots. At least 19 fungi cause leaf spot on Pacific madrone.

Plate 5-2 Leaf gall (blisters) caused by the fungus *Exobasidium vacinii*. Round, dark brown blisters form on the upper leaf surface; a white fungus growth forms on the underside and on infected fruit (byther, *et al.* 1996).



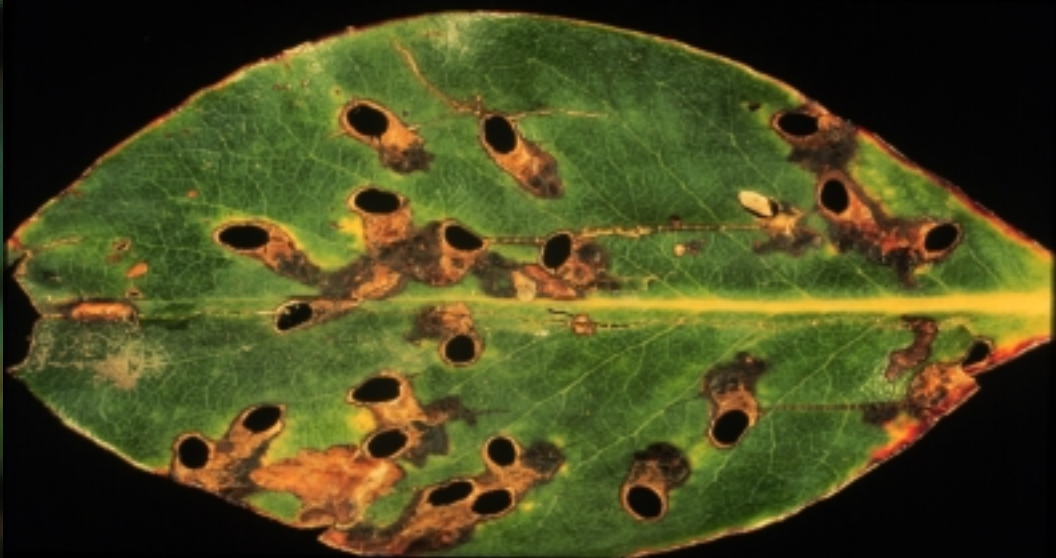




Plate 5-5 (above). *Natrassia* canker on madrone, showing the characteristic spiralled trunk. Sunken cankers develop and are surrounded by callous tissue. Girdling cankers cause extensive dieback.

Plate 5-3 (preceding page, upper right). Madrone shield bearer (*Coptodisca arbutella*) causes holes or circular brown mines. Holes are made when the insect weaves leaf surfaces together to pupate. This pupal cell drops to the ground creating the shothole appearance.

Plate 5-4 (preceding page, lower right). Collar or butt rot (*Phytophthora cactorum*). Dark, well-defined cankers develop at the soil line. Leaves are stunted and off-color prior to tree death.



Plate 5-6 (above). Madrone declining due to *Nattrassia* infection.

Sometimes dark, cankered areas at the base of a tree can be hard to delineate. In such a case the presence of *Phytophthora* can be made more apparent by simply wetting the base of the tree which will enhance the darkness of the cankered area. Butt rot can be caused by root rot from below or by cankers (not *Phytophthora*) from above spreading downward. If you dig into the soil and find dead roots, then *Phytophthora* is probably the causative agent of the butt rot. If you cut into madrone that appears to have this problem and find live tissue, then *Phytophthora* did not cause the canker.

Other Canker Diseases

Commonly occurring canker diseases on Pacific madrone in the Puget Sound area are caused by the fungi *Nattrassia mangiferae* (Plates 5-5 and 5-6) and *Fusicoccum*. *Fusicoccum* causes cankers without the presence of wounding. *Nattrassia* may also cause the trunk to spiral (Plate 5-5). Several other fungi are associated with limbs but are generally not regarded as primary pathogens. Although it is reported that this fungus produces spores throughout the year, spores are rarely found actively sporulating on samples submitted to the Plant Clinic. We did find cankers actively sporulating at our field sites in the fall of 1994, but cankers on these same trees were inactive on material collected during March 1995.

Previous laboratory studies indicate that injured tissues are more prone to attack by this fungus (Davison 1972). Exposing the trees to freezing temperatures or scalding them with a hot iron increases disease development.

All of the declining trees visited in the fall of 1994 had extensive canker disease symptoms. *Nattrassia* cankers were observed on twigs, branches, and trunks of all ages of trees. Since this fungus is reported and generally recognized as a weak pathogen, its involvement in the decline of these trees is unknown. Based on the limited observations I made, however, under some conditions this disease can significantly contribute to the decline and eventual death of the Pacific madrone.

LITERATURE CITED

- Byther, R.S., C.R. Foss, A.L. Antonelli, R.R. Maleike and V.M. Bobbitt. 1996. Landscape Plant Problems: A Pictorial Diagnostic Manual. Washington State University; Puyallup, Washington.

- Davison, A.D. 1972. Factors affecting development of madrone canker. *Plant Disease Reporter* 56:50–52.
- Hunt, R.S., B. Callan and A. Funk. 1992. Common Pests of *Arbutus* in British Columbia. Forestry Canada; Pacific Forestry Centre; Forest Pest Leaflet #29-6/63-1992E.