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Madrone Problems in British Columbia

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Abstract: Reports of Pacific madrone (*Arbutus menziesii*) difficulties suggest that leaf problems caused by fungi and insects are of most concern to the public; such problems, however, usually are transient. Of next concern, and more serious to the health of the plants, are cankers and dieback. Natural dieback is common under shaded conditions. A different dieback (frequently concurrent with smooth, black cankers) often occurs in urban areas. The native fungus (*Nattrassia mangiferae*) causes large, gnarly cankers, particularly common on trees near the ocean. A stress hypothesis is postulated as the predisposing factor for inducing these latter diebacks and cankers, as they are associated with man-made root disturbances.

The mild climate of south coastal British Columbia (BC) is also the northern range of Pacific madrone (*Arbutus menziesii*). There are no funded research efforts into madrone disease or insect problems in BC. Because of the deluge of phone calls from home owners, however, a series of pathologists made some careful observations that culminated in a Forest Pest Leaflet first published in 1976. This pamphlet was revised in 1983 and 1992 (Hunt, *et al.* 1992). Additionally, the Canadian Forest Service has pest rangers who monitor fluctuations in the incidence of native pests and scout for possible introduced pests. This is done primarily for commercially important host species, but occasionally collections are made from madrone. Pest identifications are determined at the Pacific Forestry Centre herbarium (DAVFP) or insectary. One result of this work is development of a computer data base and a periodically updated Host Index (Lowe 1977 and Ginns 1986) that lists 83 fungi and 15 chewing insects associated with madrone.

The most common home owner problems are leaf spots and leaf insect activity (Table 6-1). Leaf spotting fungi intensify their activities during wet winters and springs. Leaf blotching is particularly notice-

Table 6-1. Percentage occurrence of madrone problems at 5 year intervals in British Columbia.

Madrone problems	1974-79 Extension data only	1990-94 Forest Insect & Disease Survey collections only
Leaf spots	20	18
Leaf insects	18	18
Winter damage	9	9
Construction/ Site disturbance	13	0
Weed & feed	4	0
Cankers/Dieback	11	27
Root rots	7	0
Trunk rots	4	0
Exobasidium	4	27

able when accompanied by winter wind damage. Arctic outflows come down coastal fjords and across the coastal islands where madrones grow, blasting trees with frigid, forceful gales. These winds desiccate leaf margins or even blacken all the leaves on trees. These are the previous growing season's leaves, and are shed in July, leaving only the current green healthy appearing leaves. Hunt, *et al.* (1992) recommend various remedies.

The next most commonly encountered problem by home owners is usually associated with home owner activity [*e.g.*, construction/site disturbance or herbicide application (Table 6-1)]. This is a far more serious problem than blighted or winter damaged foliage. Trees stressed by home owner activity frequently go into a decline characterized by dieback and smooth, black cankers. Natural dieback and cankering also occurs with regular frequency (Table 6-1) and may complicate causal diagnosis.

Madrone is very shade intolerant (Krajina, *et al.* 1982). Shade intolerance results in a natural dieback of the poorly photosynthesizing lower branches. In natural forests it becomes overtopped by Douglas-fir (*Pseudotsuga menziesii*), and the whole tree may weaken and die. On dry sites, where madrone does not compete with Douglas-fir, it appears susceptible to drought dieback during exceptionally dry years.

Here, however, it seems adapted to the site, for it readily sprouts up again from basal adventitious buds. Putative clones of madrone can be found growing in circles around the putative long gone ortet (mother tree), or a similar clonal stand can arise from long lines or masses of tissue wedged in rock fissures and crevices. Such ramets are young, but the situation suggests that the clone is very old—having died back and resprouted many times.

The fungus *Nattrassia mangiferae* (H. Sydow & Sydow) Sutton & Dyko (= *Hendersonula toruloidea* Nattrass; see Sutton & Dyko 1989) causes *Arbutus* canker of madrone. These natural cankers are typically sunken in the center, and because of their perennial nature, develop knots of callus on the periphery (Hunt, *et al*. 1992). They may become large with age, and if they girdle the stem, they can cause dieback. Such cankers are particularly common on seaside madrone. Byther (this volume) has recovered this fungus from large cankers lacking peripheral callus. This suggests the fungus is more aggressive in stressed trees (perhaps producing a large canker in a single year) or else the tree is too weak to produce callus tissue.

The more common dieback in urban situations is associated with stress such as house construction, paving over roots and construction of sewage drains. Hare (1979) and Harrington and DeBell (1993) hypothesize that stressful conditions that affect the roots induce copious flowering and berry production (as do stresses that are purposely applied to other trees to induce flowering, such as drought and girdling). In madrone the flowers are terminal with the vegetative buds originating at the base of the flower stalk. If copious flowering occurs for successive years, it appears that the basal vegetative buds may fail to break open. With no growing point, the branchlet dies back to the next living point. If many branchlets die back to a large branch, the large branch itself may die back.

Large, dying branches appear to have a necrotic leading front, similar to a cambial killing canker. These “cankers” are smooth and eventually turn black. They can be aseptically cut from a tree to stop their progression. Some seem to stop on their own. Limited isolations from such cankers have yielded a species of *Phadcidiopycnis*. This fungus was not pathogenic in healthy madrone. Several different species of opportunistic fungi may be able to take advantage of such

physiologically induced diebacks, but fail to be pathogenic to healthy madrone. To prevent such diebacks, root disturbances to madrone need to be minimized. If over flowering occurs and there is danger that vegetative buds may not get sufficient energy to break and grow, flowers and/or young berries can be removed from the tree.

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