

***Phytophthora ramorum* Infects Hazelnut, Vine Maple, Blue Blossom, and Manzanita Species in California**

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Phytophthora ramorum was isolated from symptomatic tissue of California hazelnut (*Corylus cornuta* var. *californica*), vine maple (*Acer circinatum*), blue blossom (*Ceanothus thyrsiflorus*), and two species of manzanita (*Arctostaphylos columbiana* and *A. manzanita*) in the spring of 2006. This is the first report of these plant species as natural hosts of *P. ramorum*. Symptomatic *C. cornuta* var. *californica* plants were found in Marin, Mendocino, and Sonoma Counties. Symptomatic *A. circinatum* plants were found among infected *Lithocarpus densiflorus* and *Umbellularia californica* trees in Humboldt Co. Symptomatic *C. thyrsiflorus* plants were found in Humboldt Co. within an infected forest of *Sequoia sempervirens*, *Pseudotsuga menziesii*, *L. densiflorus*, and *Arbutus menziesii* trees. Both *Arctostaphylos* species were found in Humboldt Co. Symptomatic hairy manzanita (*A. columbiana*) was found in Humboldt Redwoods State Park, near the Avenue of the Giants, within a forest of *P. menziesii*, *L. densiflorus*, and *A. menziesii* trees displaying unconfirmed symptoms of *P. ramorum*. Cultures of *P. ramorum* had not previously been obtained from *Arctostaphylos* species; however the pathogen had been associated with *A. manzanita* through PCR analysis of symptomatic tissue (1).

Field symptoms of ramorum blight on *C. cornuta* var. *californica* included leaf water-soaking and marginal necrosis. The infection apparently spread into young stems, causing shoot dieback (Fig. 1). *A. circinatum* exhibited petiole necrosis similar to symptoms observed on bigleaf maple (*Acer macrophyllum*). Leaf lesions, often appearing as marginal scorching, have also been observed on bigleaf maple but were not apparent on naturally infected *A. circinatum* (Fig. 2). *C. thyrsiflorus* and both *Arctostaphylos* species displayed leaf spots and stem lesions. Shoot dieback was observed in naturally infected *C. thyrsiflorus* plants (Fig. 3).

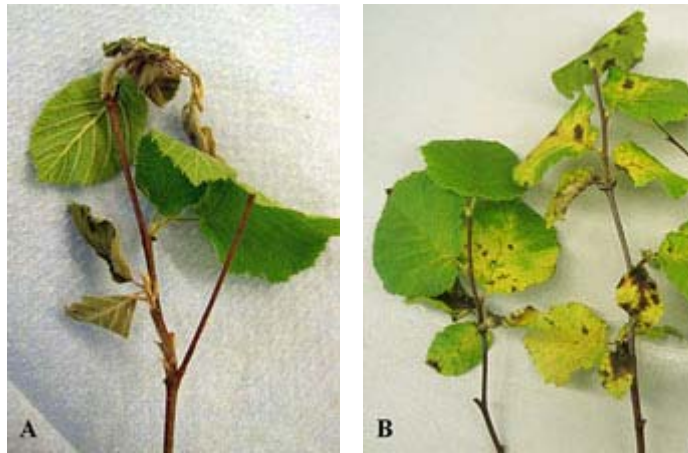


Fig. 1. *Phytophthora ramorum* blight symptoms on California hazelnut, *Corylus cornuta* var. *californica*, from natural infection (A) and laboratory detached shoot inoculation (B).

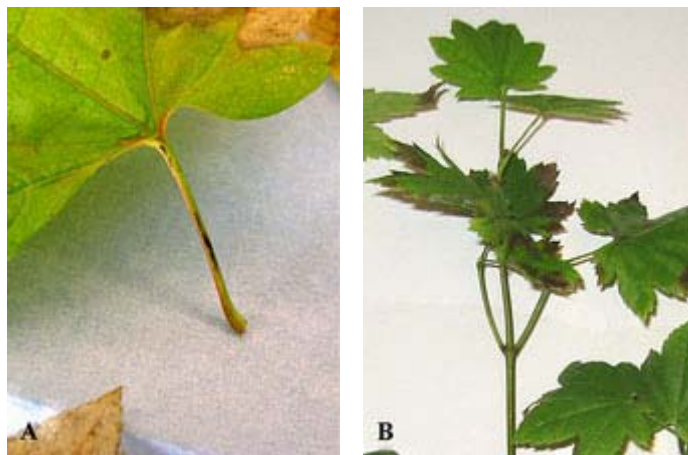


Fig. 2. *Phytophthora ramorum* petiole symptoms on vine maple, *Acer circinatum*, from natural infection (A) and blight symptoms on laboratory inoculated detached shoots (B).



Fig. 3. *Phytophthora ramorum* blight symptoms on blue blossom, *Ceanothus thyrsiflorus*, from natural infection (A) and laboratory detached shoot inoculation (B).

Association of symptomatic tissues with *P. ramorum* was confirmed by plating on PARP agar as described in Davidson et al. (1). Each isolate was tested for pathogenicity on its corresponding host by dipping five asymptomatic detached shoots for 1 min in suspensions of 10,000 zoospores/ml, which were produced as described in Davidson et al. (1). Control plants were dipped in distilled water. Treated shoots were placed in water-filled flasks in moist chambers for 5 to 11 days at room temperature in front of a south-facing window.

P. ramorum was re-isolated from symptomatic tissues of all inoculated shoots but not from control shoots. Symptoms on inoculated *C. cornuta* var. *californica* leaves included diffuse, light brown, water-soaked patches and discrete, dark, necrotic spots. Stem lesions were present but dieback was not observed, possibly due to the lack of actively growing shoots on inoculated material. Foliar symptoms on inoculated *A. circinatum* consisted of dark necrotic lesions and water-soaked patches, frequently along leaf margins. Petiole lesions were also present. Dark lesions formed on inoculated *C. thyrsiflorus* stems and leaves, resulting in dieback as lesions spread from stems into asymptomatic leaves. Extensive dieback was observed on both inoculated *Arctostaphylos* species, with lesions found on leaves, stems, and buds.

The native ranges of these new host species overlap considerably with regions that are considered to be highly favorable to *P. ramorum* epidemics (2,3). It is unknown how these newly-identified hosts affect the epidemiology of sudden oak death in California ecosystems or the spread of *P. ramorum* into uninfested areas. Finally, species that are very closely related to many of these are common elsewhere in North America where the climate has been estimated to be favorable to *P. ramorum* (3). Although deciduous trees such as *C. cornuta* var. *californica* and *A. circinatum* are leafless, and therefore presumably limited in their ability to support pathogen sporulation during the epidemic season in California, year-round rains in temperate climates could increase the importance that related species would play in epidemics.

Literature Cited

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