National Pest Alert

Sudden Oak Death

Phytophthora ramorum

The water mold *Phytophthora ramorum* is the causal agent of several plant diseases, including ramorum leaf blight, ramorum dieback, Phytophthora canker diseases, and the most well known, sudden oak death. The disease was first observed in 1993 in Germany and The Netherlands on ornamental rhododendrons and viburnum. In the United States, *P. ramorum* was first detected in Mill Valley, California, on tanoak in the mid-1990s. Since its discovery in the United States, *P. ramorum* has been confirmed in forests in California and Oregon and in nurseries in California, Oregon, Washington, and British Columbia. In 2004, distribution of infected nursery stock resulted in detections in 21 states.

Cheryl Blomquist, CDFA

Ramorum blight on camellia

Origin

The geographic origin of *P. ramorum* is unknown. Before the mid-1990s, there were no reports of this species in the United States or Europe. *P. ramorum*'s limited known geographical distribution in relation to its hosts' distribution and genetic makeup suggests it was recently introduced into the United States. The European and North American populations are thought to be distinct populations transported independently from another location, perhaps the site of origin.

Host Range

P. ramorum causes two types of diseases, bark cankers that may kill the host and foliar blights that may serve as a reservoir for the pathogen. In response to the identification of *P. ramorum*, the United States Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS) has developed a list of regulated and associated hosts. As of January 2005, 31 plant species or genera are considered hosts and another 37 plant species are awaiting experimental confirmation. To view the current list of regulated and associated hosts, please visit http://www.aphis.usda.gov/ppq/ispm/pramorum/pdf_files/usdaprlist.pdf.

Transmission

The spread of *P. ramorum* likely occurs by movement of infected plant material, wind-blown rain, and contaminated irrigation water. Dispersal by soil and potting mix is under investigation. Moist, cool, windy conditions are conducive to pathogen spread via dispersing spores from the leaves of foliar hosts. Certain foliar hosts support abundant spore production, and these plants may play an important role in *P. ramorum* transmission to bark canker hosts. Shipments of infected nursery stock have inadvertently disseminated *P. ramorum* throughout the United States.

Everett Hansen, Oregon State University and Jennifer Parke, Oregon State University

Ramorum blight on rhododendron

Symptoms and Identification

Bark canker hosts infected with *P. ramorum* are distinguished by droplets of dark reddish brown liquid on the bark ("bleeding"), usually not associated with cracks or insect

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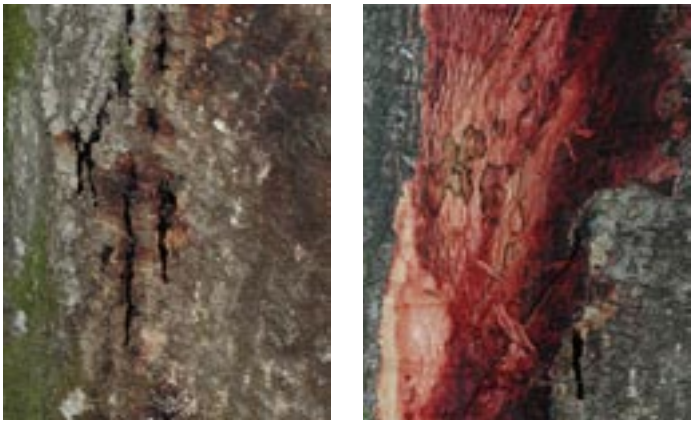
holes. If the outer bark is scraped away, a dark brown canker surrounded by a dark line is visible in the inner bark. The bleeding canker can girdle the tree and then the leaves turn brown and the entire crown dies. Tree death may occur within several months to several years after initial infection. Infected trees are attractive to *Monarthrum scutellare* and *M. dentiger* and bark beetles (*Pseudopityophthorus pubipennis*), and they may be colonized by the sapwood decay fungus (*Hypoxylon thouarsianum*). Infection on foliar hosts is indicated by dark grey-to-brown lesions with indistinct edges. These lesions can occur anywhere on the leaf blade, in vascular tissue, or on the petiole. Petiole lesions are often accompanied by stem lesions. Some hosts with leaf lesions defoliate and eventually show twig dieback.

Monitoring and Management Recommendations

In 2004, *P. ramorum* was confirmed in several large West Coast production nurseries and in several smaller production or wholesale nurseries. These facilities shipped 2.3 million potentially infected plants to 49 states and the District of Columbia. Only Hawaii was spared. USDA–APHIS, along with the Integrated Pest Management Centers, National Plant Diagnostic Network, U.S. Forest Service, State Departments of Agriculture, Cooperative Extension Services, and Master Gardeners launched a massive program to educate the public, track the shipments, test plants for *P. ramorum*, and destroy infected plant material. By the end of 2004, inspectors had found infected plants at 171 nurseries in 20 states. The goal of APHIS–Plant Protection and Quarantine (PPQ) is to determine the distribution of infected plant material in the United States and to limit the spread beyond infected areas through quarantines and a public education program.

Symptoms on affected hosts vary considerably by species, and it is difficult to differentiate *P. ramorum*-infected plants from those infected by other pathogens. If you suspect trees or plants are infected with *P. ramorum*, contact your state's university diagnostic laboratory or Department of Agriculture diagnostic laboratory immediately (contact university extension personnel for the address of the diagnostic laboratory). Plants infected with *P. ramorum* should be destroyed because no chemical control measures are currently available. Because *P. ramorum* is a regulated organism, destruction and disposal protocols are coordinated by state regulatory officials. If diagnosticians confirm *P. ramorum* infestation of plants at nurseries or other commercial landscape facilities, an Emergency Action Order from APHIS may be issued. The order may require that *P. ramorum*-infected plants and all susceptible plants within 2 meters of infected plants be destroyed and that all susceptible plants within 10 meters be held for 90 days until inspected.

Small lesions on Vaccinium infected by *P. ramorum*.



Bruce Moltzen, Missouri Department of Conservation

Symptoms caused by *P. ramorum* on tanoak. (Left) Outer bark, showing the "bleeding" canker. (Right) The same tree with the outer bark removed to reveal a canker in the inner bark.

For more information on *P. ramorum*, including program updates, sample questionnaire, fact sheets, regulatory actions, control and testing protocols, and links to other sites, please visit

http://www.ncipmc.org/suddenoakdeath

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