

## Ramorum blight - Sudden Oak Death Spreads to Nursery Stock

by Thomas D. Landis and Ellen Michaels Goheen

You may have read about a devastating new disease that was discovered in northern California a few years ago. Sudden oak death (SOD) is caused by *Phytophthora ramorum*, which pathologists refer to as “fungus-like organism”. At first, it seemed like nurseries had little to be worried about because the disease was only identified on wild trees in the coastal woodlands of northern California and southern Oregon. Things became more interesting, however, when the disease was identified on ornamental nursery stock. Because affected nursery plants are rarely killed, the name Ramorum blight is now used to distinguish the nursery disease from the tree killing cankers of SOD.

The identification of this new disease in nurseries is having serious and wide-ranging consequences, and they are changing week by week. The concern is real because *P. ramorum* had been previously identified in European nurseries and has apparently spread to forests. In March of this year, this disease was identified on camellias in two ornamental nurseries in southern California but not before infected plants had been shipped to 39 states. This prompted government agencies to take quick action. In mid-June, the Oregon Department of Agriculture authorized a temporary rule requiring all nurseries growing potential hosts to enter into “compliance agreements” and be inspected for *P. ramorum* before allowing shipment of host plants. This includes both within and outside of the state of Oregon. *Forest and conservation nurseries are affected because the host list includes Douglas-fir and many other forest and native plant species* (Table 1).

### Hosts and Basic Biology

Although it was originally found on native plants in northern California and southern Oregon, pathogen susceptibility tests have shown that *P. ramorum* has an extremely wide host range. Currently, this pathogen has been isolated from over 60 hosts. The Animal and Plant Health Inspection Service (APHIS) of the USDA currently recognizes 28 species in 12 plant families as being *regulated hosts*, and 18 of these are native trees and shrubs (Table 1). Although most are native to northern California, some species are very widespread. For example, Wood’s rose (*Rosa woodsii*) is found from Washington state to Texas and California to Wisconsin. Other genera on the list (*Pseudostuga*, *Quercus*, *Rhododendron*, *Rosa*) contain many important plants for reforestation and restoration. This pathogen has also

been isolated from other native plant hosts which are known as *associated hosts* until they go through a thorough screening process. This list contains other major genera such as *Abies*, *Fagus* as well as other oaks.

### Symptoms and Diagnosis

Identifying Ramorum blight is challenging to say the least because the symptoms caused by *P. ramorum* are different on different hosts. While the characteristic symptom of SOD is a bleeding bark canker on trees, the fungus causes leaf spots and shoot blight on shrubs like *Rhododendron* (Figure 1). Shoot dieback can develop when the disease becomes severe. Unfortunately, these symptoms can be very similar to other *Phytophthora* diseases. Other species exhibit more subtle symptoms such as small lesions on the lower leaves; these infected leaf drop off, making the disease more difficult to diagnose.

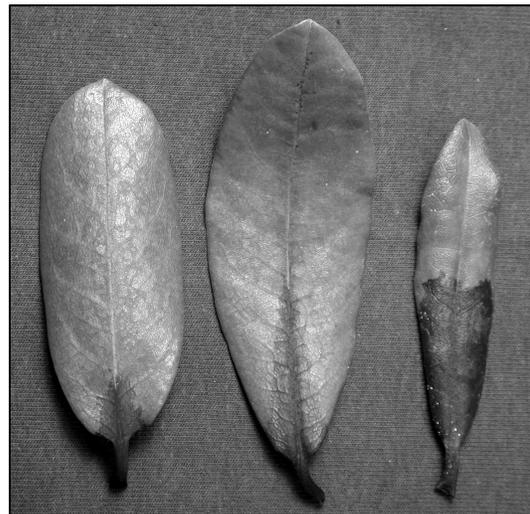


Figure 1 - On broadleaf nursery stock like *Rhododendron*, *Phytophthora ramorum* caused leaf spots and shoot blights which may be indistinguishable from other *Phytophthora* diseases (courtesy of J. Parke).

Because Ramorum blight is so difficult to diagnose with symptoms, chemical laboratory tests have been developed. Approved testing procedures have been developed by APHIS consist of an initial screening using the ELISA test and plant samples that test positive undergo further DNA testing. To complicate things further, two “mating types” of *P. ramorum* have been identified: Type A1 is found in Europe, while Type A2 occurs in California and Oregon. The concern is that mixing of these two mating types could produce a more potent strain of the fungus. Fortunately, a new rapid diagnostic DNA test has just been developed to distinguish these two mating types.

<b>Table 1 - Natural Hosts for Sudden Oak Death and Ramorum Blight, as Recognized by USDA-APHIS</b>	
<b>Scientific Name</b>	<b>Common Name</b>
<i>Acer macrophyllum</i>	Big leaf maple
<i>Aesculus californica</i>	California buckeye
<i>Arbutus menziesii</i>	Pacific madrone
<i>Arctostaphylos manzanita</i>	Roof's manzanita
<i>Frangula californica</i> ssp. <i>californica</i>	California buckthorn
<i>Heteromeles arbutifolia</i>	Toyon
<i>Lithocarpus densiflora</i>	Tanoak
<i>Lonicera hispidula</i>	Pink honeysuckle
<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Douglas-fir
<i>Quercus agrifolia</i>	Coast live oak
<i>Quercus chrysolepis</i>	Canyon live oak
<i>Quercus kelloggii</i>	California black oak
<i>Quercus parvula</i> var. <i>shrevei</i>	Shreve oak
<i>Rhododendron</i> spp.	Azaleas and rhododendrons
<i>Rosa woodsii</i>	Wood's rose
<i>Sequoia sempervirens</i>	Coast redwood
<i>Trientalis borealis</i> ssp. <i>latifolia</i>	Broadleaf starflower
<i>Umbellularia californica</i>	California laurel
<i>Vaccinium ovatum</i>	California huckleberry

In nurseries, the basic biology of *P. ramorum* is different from other *Phytophthora* species because it is primarily a foliar pathogen. Although we don't know much about how this fungus spreads, recent outbreaks have shown that it is very well adapted to the nursery environment. The fungus is capable of producing several different types of spores which allow it to survive harsh environment and still spread (Figure 2).

### Quarantines

Quarantine regulations are in place at both the federal and state levels to reduce the risk of spreading *P. ramorum* through infected nursery stock. As an example, let's look at the comprehensive regulations of the Oregon Department of Agriculture (ODA). This program is mandatory for nurseries that grow host and/or associated host plants, but is only voluntary for growers raising related plant species - within the same genus as a known host or associated host. The ODA program will include three steps:

- Annual survey and inspection of host and associated host nursery stock and/or plant materials at each growing site.
- Annual testing of samples using federally approved laboratory protocols to determine pathogen-free status.
- Participation in a renewable compliance agreement designed to maintain pathogen-free status until the next annual inspection and testing.

These regulations will be changing as new information develops so nursery managers should contact their State Department of Agriculture for the latest.

### Conclusions and Recommendations

This article makes no attempt to be comprehensive but is merely a vehicle for awareness. Growers wanting a more complete view on this disease should read the

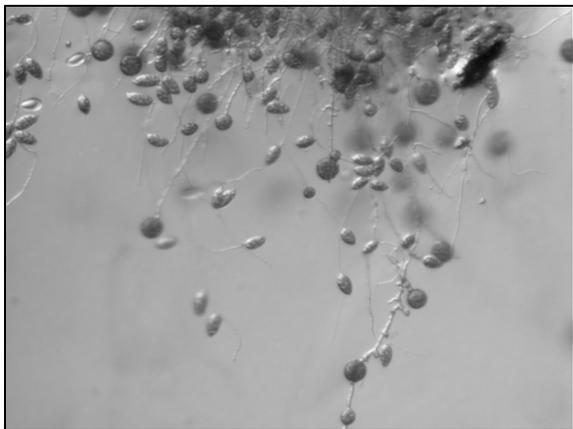


Figure 2 - *Phytophthora ramorum* produces several different spores types including round resting spores called chlamydospores and football-shaped sporangia, which release mobile zoospores (Courtesy of J. Parke).

“Nursery guide for diseases of *Phytophthora ramorum* on ornamentals: diagnosis and management” and “*Phytophthora ramorum*: a guide for Oregon nurseries”. Both are available in color as downloadable Adobe PDF publications on the websites listed in the References section.

*P. ramorum* is an aggressive pathogen that presents a serious threat and so nurseries need to become informed and stay abreast of developments. As already is happening in the Pacific Northwest, nurseries growing potential host plants will be facing legal restrictions on plant shipment. Because things are changing so rapidly, the latest and best information can be found on the following websites, or call the toll free hotline:

TEL: 1.888.703.4457

Websites:

[www.suddenoakdeath.org](http://www.suddenoakdeath.org)

[www.aphis.usda.gov/ppq/ispm/sod/](http://www.aphis.usda.gov/ppq/ispm/sod/)

## References and Further Reading:

Kroon LPNM, Verstappen ECP, Kox, LFF, Flier WG, Bonants PJM. 2004. A rapid diagnostic test to distinguish between American and European populations of *Phytophthora ramorum*. *Phytopathology* 94 (6): 613-620.

Oregon Department of Agriculture. 2004. Sudden oak death and related diseases. <<http://www.oda.state.or.us/plant/ppd/path/SOD/index.html>>

Parke, J.L. 2004. *Phytophthora ramorum*: a plant pathologist’s perspective. *Oregon Association of Nurseryman Digger* 48(5): 36-38,40-42.

Parke JL, Pscheidt J, Linderman R. 2003. *Phytophthora ramorum*: a guide for Oregon nurseries. Publication EM #8840. Corvallis, OR: Oregon State University Extension Service. 7 p. Available at the nursery link at <<http://www.suddenoakdeath.org/>>

Tjosvold SA, Buermeyer KR, Blomquist C, Frankel S. 2004. Nursery guide for diseases of *Phytophthora ramorum* on ornamentals: Diagnosis and management. 15 p. Available in the nursery link at <<http://www.suddenoakdeath.org/>>