



REPORT TO THE CALIFORNIA OAK MORTALITY TASK FORCE APRIL 2003

REGULATIONS

Over the past few months, USDA Animal and Plant Health Inspection Service (APHIS) has added five new hosts to the *Phytophthora ramorum* quarantine. Information on each of the hosts is noted below. For additional new host information, go to <http://www.suddenoakdeath.org>, Regulations, Federal, APHIS, and click on the USDA APHIS-PPQ link or go directly to the APHIS *Phytophthora ramorum* website at <http://www.aphis.usda.gov/ppq/ispm/sod/> under Recent Modifications to *Phytophthora ramorum* Regulations.

***Pieris formosa*, (andromeda), (Ericaceae).** All plant parts except seeds are regulated. Scientists in the UK reported *Phytophthora ramorum* causing stem and shoot dieback, along with leaf lesions similar to symptoms found on Rhododendron. The *Phytophthora ramorum* identification was based on cultural morphology of the pathogen isolated from stem and leaf lesions and then confirmed by polymerase chain reaction (PCR) and ITS sequencing. Koch's postulates were completed.

The infected plant was a single mature specimen of *Pieris formosa* var. *forrestii* (syn. *Pieris forrestii*) cultivar "Wakehurst" in a large, privately owned garden that is open to the public. *Phytophthora ramorum* had previously been identified at the garden on Rhododendron, at which time eradication measures were taken. Both plants have been destroyed.

***Viburnum tinus*, (laurustinus), (Caprifoliaceae).** Plants and stems are regulated. On *Viburnum tinus*, *Phytophthora ramorum* causes an aerial dieback, typically as a result of a basal stem lesion. Pathogen isolation, identification by morphology, confirmation by PCR, and Koch's postulates were completed in the UK. The container plant was found by inspectors at a garden center in southern England. The plant had recently been obtained from another nursery. Following disease confirmation, five plants and associated growth media were destroyed. The nursery that supplied the plants was intensively inspected and two additional *Viburnum tinus* plants were found infected with *Phytophthora ramorum*. The symptoms on *Viburnum tinus* are similar to those on *Viburnum x. bodnantense*. There are reports from the UK of the pathogen on a range of other *Viburnum* species. (*Viburnum* is a common forest plant in the Eastern United States as well as a common ornamental plant in the Western United States.)

***Camellia japonica*, (Theaceae).** Only leaves are regulated. Plant health authorities in the UK reported a finding of *Phytophthora ramorum* on *Camellia japonica*. The symptoms were water-soaked leaf spots. Pathogen isolation, identification by morphology, confirmation by PCR, and Koch's postulates were completed in the UK. *Camellia* is a common ornamental shrub grown throughout the United States.



***Quercus chrysolepis*, (canyon live oak), (Fagaceae).** Leaves, twigs less than 1 inch, and nursery stock are regulated. The first report of *Phytophthora ramorum* on canyon live oak in California was published in Plant Disease, March 2003. Vol. 87, Number 3. Shannon Murphy and David Rizzo, UC Davis, reported in August 2002 that *Phytophthora ramorum* was isolated from branches less than 2.0 cm in diameter on a canyon live oak (*Quercus chrysolepis*) in a state park in Marin County, CA. The shrub was a cluster of stems less than 1 m in diameter and 1 m high. Similar cankers were observed on small branches of adjacent canyon live oak. Many tanoak (*Lithocarpus densiflorus*), California bay laurel (*Umbellularia californica*), and evergreen huckleberry (*Vaccinium ovatum*) were also infected by *Phytophthora ramorum* at this site. Larger canyon live oak trees have been observed with bleeding symptoms typical of *Phytophthora ramorum*, but previous isolation attempts had failed.

***Trientalis latifolia*, (western starflower), (Primulaceae).** All plant parts except seeds are regulated. This is the first herbaceous plant to be identified as susceptible to *Phytophthora ramorum*. Western starflower is a perennial herb commonly found in the understory of redwood, coast evergreen, and yellow pine forests. *Phytophthora ramorum* causes leaf spots on this host.

The United Kingdom has revised and posted their pest risk assessment (PRA) for *Phytophthora ramorum*. The document has an excellent list of references and provides a concise overview of worldwide knowledge about *Phytophthora ramorum*. The PRA is posted on the UK Department for Environment, Food, and Rural Affairs (DEFRA) website at: <http://www.defra.gov.uk/planth/prah.htm#pra>.

The PRA reports that *Kalmia latifolia* (mountain laurel) has been found infected in the UK by *Phytophthora ramorum* under natural conditions. Mountain laurel is in the Ericaceae family. It is a common native shrub found throughout the Eastern United States, with large pink to white bell-shaped flowers. It is the state flower of Connecticut and Pennsylvania.

Also noted was *Phytophthora ramorum* recoveries from Rhododendron and Viburnum in Denmark as well as an interception of infected blueberry plants (*Vaccinium vitis-idea*) in Poland. Strawberry tree (*Arbutus unedo*) is listed as an additional host in Spain.

RESEARCH

The USDA Forest Service, Pacific Southwest Research Station, hosted a Research Needs Assessment meeting for Sudden Oak Death on April 1-2, 2003. The national team convened to identify research priorities for earmarking more than \$2 million in 2003 federal and State research funds. Requests for Proposals will be issued in April and will be mailed to the COMTF mailing list and posted at <http://www.suddenoakdeath.org>. For more information, contact Patrick Shea at Pjshea@davis.com.

**EDUCATION**

The second of three training sessions this spring on "Sampling, Recognition, and Mitigation Measures for Sudden Oak Death" will be held Wednesday, April 30, 2003 from 10:00 a.m. – 4:00 p.m. at the Hartsook Lodge, Richardson's Grove, near Garberville, CA. This northern most session is free and open to anyone interested in improving their recognition and sampling skills for detecting *Phytophthora ramorum*. The training will combine classroom and field activities. The **pre-registration deadline** for this class is **April 22, 2003**. The agenda and registration information can be found on the COMTF website at <http://www.suddenoakdeath.org>. For more information, contact Heather Matwich, CDF, at (916) 653-5123.

Note: State rules on becoming an "Official" sampler for Sudden Oak Death are expected to change with the harmonization of the federal and State quarantine. This class will no longer qualify Registered Professional Foresters to become "official" samplers. It is anticipated that only State and federal regulatory officials will be "official" samplers under the harmonized rule. However, all samplers may still send materials to the CDFA laboratory for diagnosis.

A Sudden Oak Death Tribal Summit was held April 8-9, 2003 at the Blue Lake Rancheria, Blue Lake (near Eureka), California. The meeting brought together tribal and agency land managers, tribal members, and Sudden Oak Death researchers to discuss issues of particular concern to tribal members. Tribal research priorities, regulatory issues and information needs were discussed. Many plants susceptible to *Phytophthora ramorum* are species of cultural significance to tribes. The meeting was sponsored by the Strategic Partnership Coalition, which is made up of nine Tribes and nine Federal and State agencies, in cooperation with UC Cooperative Extension, Humboldt County.

Oregon will hold its first statewide informational meeting and strategic planning session on *Phytophthora ramorum* entitled "Perspectives on the Sudden Oak Death Syndrome: Risks to Oregon Agriculture and Forestry" April 23, 2003, at Oregon State University, Corvallis. The meeting is intended to inform Oregon timber and agricultural industry members, special interest groups, and others about this new invasive plant disease and its potential impact on the state. On-going research, perceived risks to Oregon's industries, and a coordinated action plan for the state will be discussed. For more information, contact Dr. Nancy Osterbauer, Oregon Department of Agriculture, at: nosterba@oda.state.or.us.

RECENT PUBLICATIONS

Composting as a control for sudden oak death disease

Matteo Garbelotto; BioCycle; Feb 2003; Vol. 44, Iss. 2; pg. 53, 4 pgs

Dr. Garbelotto's article presents background information and results from laboratory and field research showing that *Phytophthora ramorum* may be killed during temperature-controlled composting of greenwaste from a large number of native California trees, shrubs, and herbaceous plants.



Clive Brasier's *Preventing Exotic Pathogen Threats to Forests, A Sideways Look at Plant Health*, presented in the regulations panel at the Sudden Oak Death Science Symposium in December 2003, is posted at the Symposium website:

<http://danr.ucop.edu/ihrmp/sodsymp/paper/paper35.html>. In his paper, Brasier plays devil's advocate by looking at biological weaknesses, market forces, and policies surrounding regulation of plant pathogens. Clive Brasier is an Emeritus Mycologist, Forest Research Agency, Farnham, Surrey, UK.

The American Phytopathological Society (APS) has posted all *Phytophthora ramorum* references published in their journals at: <http://sod.apsnet.org/resources.htm>. This link has been added to the COMTF website under Publications and Resources and will be part of the "Sudden Oak Death, How Concerned Should You Be?" International On-line Symposium, April 21 – May 4, 2003.

DATES TO REMEMBER

- 4/23 – Oregon "Perspectives on the Sudden Oak Death Syndrome: Risks to Oregon Agriculture and Forestry" informational meeting and strategic planning session; contact Dr. Nancy Osterbauer, Oregon Department of Agriculture, at nosterba@oda.state.or.us
- 4/30 – Training session on "Recognition, Sampling, and Regulations for *Phytophthora ramorum*;" Hartsook Lodge, Richardson's Grove, near Garberville, CA; contact Heather Matwich, CDF, at (916) 653-5123
- 4/21 – 5/4 - "Sudden Oak Death – How Concerned Should You Be?" International On-line Discussion Symposium at: <http://sod.apsnet.org/>
- 5/28 – Next COMTF meeting; Bay Area; details forthcoming
- 5/29 – Training session in the central SOD region (Bay Area) on "Recognition, Sampling, and Regulations for *Phytophthora ramorum*;" details forthcoming
- 6/28 – 29 – Jepson Herbarium weekend workshop; Sudden Oak Death weekend workshop with Dr. Matteo Garbelotto and Dr. Ellen Simms at the UC Botanical Gardens, Berkeley and five regions in the greater Bay Area; limited to 20 participants; contact Anneke Swinehart, Jepson Herbarium, (510) 643-7008

THE LEARNING CURVE

Koch's Postulates and the *Phytophthora ramorum* Quarantine

Traditionally regulators require Koch's postulates, basic principles of microbiology, to be completed before a plant species can be added to a quarantine. These steps are currently required by USDA-APHIS and the California Department Food and Agriculture (CDFA) for all new listings. Quarantines must be able to stand up in a court of law; therefore, completion of Koch's postulates is a legal requirement used to justify regulations. However, *Phytophthora ramorum*, with all of its complexities and unknowns, has begun to raise questions concerning the requirement that Koch's postulates be completed prior to regulation.



In plant pathology, Koch's postulates are used to demonstrate that a particular organism causes a specific plant disease. In the late nineteenth century, German scientist Robert Koch established a set of procedures to isolate and identify the causative agent of a particular microbial disease. The following four steps are known as **Koch's Postulates**.

1. The specific organism should be shown to be present in all cases of plants suffering from a specific disease, but should not be found in healthy plants.
2. The specific microorganism should be isolated from the diseased plant and grown in pure culture on artificial laboratory media.
3. This freshly isolated microorganism, when inoculated into a healthy laboratory plant, should cause the same disease seen in the original plant.
4. The microorganism should be re-isolated in pure culture from the experimental infection.

Some plants have been identified as susceptible to *Phytophthora ramorum* in nature through field symptom recognition, pure culture isolation, and positive culture identification based on morphological features as well as matching the cultured DNA using PCR (polymerase chain reaction) with known DNA sequences of *Phytophthora ramorum* from a database of genomes. However, for a variety of reasons there are often delays in completing the Koch's postulates process, including plants lacking leaves in winter, making them uninfected, or inoculations and isolations failing despite numerous symptoms in the field, under natural conditions.

For some of the known *Phytophthora ramorum* host species, symptoms have been seen in the field associated with oak, bay, and other known hosts, but attempts to culture these plants have failed. For example, big leaf maple (*Acer macrophyllum*) leaves were identified as symptomatic in areas with *Phytophthora ramorum*, but for unknown reasons the pathogen was difficult to isolate from these leaves. To determine if big leaf maple was susceptible to *Phytophthora ramorum*, scientists used a *Phytophthora ramorum* isolate from oaks to inoculate maple since the vast majority of isolates of *Phytophthora ramorum* are clones, regardless of the host. Approximately one year later, *Phytophthora ramorum* was culturally isolated from big leaf maple.

Situations such as this raise several questions: What is the risk of *Phytophthora ramorum* moving on a plant species that is known to be susceptible to the pathogen, but has not had Koch's postulates completed? If regulators bypass Koch's postulates and regulate a plant that does not pose a risk, what would the negative implications be? Is it appropriate to require Koch's postulates prior to regulating? How much information does completion of Koch's postulates really provide about risk of disease spread? Federal and state regulators are currently discussing these questions and USDA-APHIS will address this issue in the next interim rule for *Phytophthora ramorum*.