



CALIFORNIA OAK MORTALITY TASK FORCE REPORT SEPTEMBER 2003

RESEARCH

A2 mating type found in the European *Phytophthora ramorum* population. European researchers have identified an A2 mating type *Phytophthora ramorum* isolate from a Belgian nursery. Information will be available in: Werres S., D. De Merlier. In Press. First detection of *Phytophthora ramorum* mating type A2 in Europe. Plant Disease.

This is the first time the A2 mating type has been recovered in Europe. The mating behavior of this isolate is different from that of other European isolates (Werres, unpublished data). Moreover, the isolate involved aligned with European A1 isolates (and not with American A2 isolates) in molecular tests (Cox gene-RFLP, AFLP; Peter Bonants, Hans de Gruyter et al., unpublished). *P. ramorum* is a heterothallic *Phytophthora* species and requires a mating partner for sexual reproduction (formation of oogonia, etc.). For further information, contact Sabine Werres at s.werres@bba.de (mating studies), Anne Chandelier at chandelier@cra.wallonie.be (source of new A2 isolate), Peter Bonants at peter.bonants@wur.nl, or Hans de Gruyter at j.de.gruyter@minlnv.nl (molecular studies).

A description of *Phytophthora nemorosa* will be published in the October – December 2003 issue of Mycotaxon (Vol.88 pgs. 129-138). The paper describes the new *Phytophthora* species as *P. nemorosa*, a foliar and bole pathogen of various evergreen hardwood trees. Previously referred to as “*P. ilicis*-like,” the known geographic distribution of *P. nemorosa* ranges along the Pacific Coast, from Big Sur (Monterey County, California) to the Coos Bay area (central Oregon). Below is the abstract, courtesy of the authors.

PHYTOPHTHORA NEMOROSA, A NEW SPECIES CAUSING CANKERS AND LEAF BLIGHT OF FOREST TREES IN CALIFORNIA AND OREGON, U.S.A.

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ABSTRACT

“*Phytophthora nemorosa*, a new species isolated from stem cankers on two species of Fagaceae and leaves of various hosts, is described. The new species resembles *P. ilicis* with homothallic, amphigynous antheridia and deciduous, semi-papillate sporangia, and has a related ITS-DNA sequence. Symptoms and host range are similar to *P. ramorum*,



cause of Sudden Oak Death and leaf blight and shoot dieback diseases in California and Oregon forests, although *P. nemorosa* does not appear to cause wide-spread mortality of oak trees.”

Along with *P. ramorum* and *P. nemorosa*, a third *Phytophthora* species has been repeatedly isolated from trees showing similar symptoms: leaf necrosis on *Umbellularia californica* and stem cankers on *Quercus agrifolia*. Colony and microscopic morphological characters of the California isolates were consistent with *Phytophthora pseudosyringae*, a recently described species recovered from rhizosphere soil of *Quercus* spp. and necrotic fine roots and stem necrosis on *Fagus sylvatica* and *Alnus glutinosa* in Germany and France (Jung *et al.* Mycological Res. 107: 772-789, 2003).

P. pseudosyringae has been found in coastal California counties from San Luis Obispo to Humboldt. It has also been isolated from one location in Mariposa County in the Sierra Nevada. Disease symptoms on *U. californica* and *Q. agrifolia* are similar to *P. ramorum*, although *P. pseudosyringae* does not appear to cause wide-spread mortality in oak trees. This is the first report of *P. pseudosyringae* in North America. The relationship between European and California isolates is not clear at this time. It is unknown whether *P. pseudosyringae* is native to California or is a recently introduced species. This first report of *P. pseudosyringae* in North America has been submitted to the journal Plant Disease for publication.

A molecular (PCR-RFLP) test has been developed by Laurens Kroon and Peter Bonants, Plant Research International, (Wageningen, the Netherlands) to distinguish European *P. ramorum* isolates from North American isolates. The test is based on a PCR method, using specific primers and digestion of the produced amplicon with a restriction enzyme. The resulting fingerprint pattern shows a clearly distinct pattern between both groups. The method has been evaluated on more than 50 isolates from the E.U. and more than 25 isolates from the U.S. It was presented at the December 2002 Sudden Oak Death Science Symposium in Monterey (See <http://danr.ucop.edu/ihrmp/sodsymp/paper/paper08.html>), and a manuscript describing the method has been submitted to Phytopathology. For information on this test, contact Peter Bonants at peter.bonants@wur.nl.

Kelly Ivors, post-doc in Matteo Garbelotto's laboratory, UC Berkeley, received awards from the *Phytophthora* Molecular Genetics Network (PMGN) and the Mycological Society of America (MSA) to participate in a research traineeship in Dr. Peter Bonants' laboratory at Plant Research International in Wageningen, Netherlands. Bonants and Ivors will investigate the population structure of *Phytophthora ramorum*. Ivors will spend six weeks with Dr. Bonants on this collaborative project, bridging the gap between the U.S. and European *Phytophthora ramorum* scientists.

**MANAGEMENT**

The California Department of Pesticide Regulation (DPR) has posted the Special Local Need, Section 24c registration for Agri-Fos to control *Phytophthora ramorum* to its website for a 30-day public comment period. Barring unexpected concerns, DPR will likely issue registration for Agrichem's product in early October. The posting is noted as Volume 2003-35 under Notice of Decisions at <http://www.cdpr.ca.gov/docs/nod/nodmenu.htm>.

The Special Local Need registration is for potassium phosphate use on oak and tanoak trees at risk of contracting *Phytophthora ramorum*. The COMTF will be sponsoring classes this fall on proper use of the material. Details will be forthcoming.

The second of two Sudden Oak Death collection yards under the SODBusters program is scheduled to open October 15th at the Vision Recycling collection yard located at the Ben Lomond Transfer Station in Ben Lomond, Santa Cruz County. In preparation for opening of the yard, a Sudden Oak Death recognition, sanitation, and disposal class is being offered to arborists, landscapers, and tree care professionals on September 23, 2003 at the Santa Cruz UCCE office in Watsonville. Once trained through a COMTF-sponsored class, trainees are able to use the collection yard facility for disposal of *Phytophthora ramorum*-infested material. For more information on the SODBusters' program, go to <http://www.ucfpl.ucop.edu/sodbusters/>.

The California Department of Forestry and Fire Protection (CDF) approved the Napa County Sudden Oak Death Hazard Tree Assessment, Removal, and Restoration Plan. The approval of county plans was delegated to CDF by the Legislature through Assembly Bill 2251, signed by Governor Davis in September, 2002.

MONITORING

The Phytophthora ramorum National Detection Survey has not found any evidence yet of P. ramorum in the seven eastern states participating in the pilot program. The 576 transects surveyed included 61 nursery perimeter locations and 105 general forest locations. To date, more than 800 samples in total have been submitted from Virginia, North Carolina, South Carolina, Tennessee, Georgia, West Virginia, and Pennsylvania. This survey complements the Pilot National Survey for Nurseries coordinated by the USDA-Animal and Plant Health Inspection Service (APHIS). Funding for the wildland surveys was provided by the USDA-Forest Service, State and Private Forestry. The survey is being conducted in cooperation with state forestry agencies and university extension departments. This survey developed and used the national *P. ramorum* risk map to target areas for survey that are at the greatest risk for infection. For more information on the pilot program, go to <http://ceris.purdue.edu/napis/pests/sod/natplan/nplan02.html>.



A current map of United Kingdom *Phytophthora ramorum* detections has been posted to the Department for Environment, Food, and Rural Affairs (DEFRA) website at <http://www.defra.gov.uk/plant/graphics/sod.pdf>. *Phytophthora ramorum* has been found at 266 sites in England and Wales, as well as approximately 30 sites in Scotland, Northern Ireland, and the Channel Isles. Findings have come on *Rhododendron*, *Viburnum*, *Pieris*, *Camellia*, *Syringa*, *Kalmia*, and a single finding on a pot-grown *Taxus baccata* (yew) plant. Infected plants have come from nurseries and plants growing outside in soil. To date, there have been NO findings on established trees.

Official Survey of Oregon Agricultural Commodities for *Phytophthora ramorum*. Nancy Osterbauer, L. Rehms and J. Hedburg. Since 2001, the Oregon Department of Agriculture (ODA) has surveyed Oregon nurseries, Christmas tree plantations, and other high-risk sites (i.e., botanical gardens) for *Phytophthora ramorum*. Survey results for the past three years are summarized below.

In 2001, 69 nurseries and high-risk sites were visually surveyed for *P. ramorum*, with a total of 2,657 rhododendron samples taken. While other *Phytophthora* spp. were recovered from the samples, *P. ramorum* was not. In 2002, 98 nurseries, Christmas tree plantations, and other high-risk sites were surveyed. The majority of the 3,927 samples collected were again from rhododendron. As in 2001, *P. ramorum* was not detected, but other *Phytophthora* spp. were recovered.

In 2003, 147 nurseries, Christmas tree plantations, and high-risk sites were surveyed for *P. ramorum*, with 6,002 samples having been collected. For the first time, *P. ramorum* was recovered from six of the nurseries surveyed in Oregon, in addition to other *Phytophthora* spp. having been recovered. At the six affected nurseries, all blocks containing infected plants were destroyed. Other host plants located within 10 m. of the infected blocks were placed under quarantine until pathogen-free status could be determined per USDA-Animal Plant Health Inspection Service (APHIS) requirements. To date, 1,802 samples have been collected and tested from the original infested nurseries during subsequent surveys; no *P. ramorum* has been found. In addition, delimitation surveys around the nurseries have detected no pathogen spread onto neighboring properties. For more information, contact Nancy Osterbauer, ODA, at nosterba@oda.state.or.us.

Recent Occurrences of *Phytophthora ramorum* in Oregon Forests

Alan Kanaskie¹, Michael McWilliams¹, Jon Laine¹, John Beeson¹, Ellen Goheen², Everett Hansen³, Wendy Sutton³, and Nancy Osterbauer⁴

1. Oregon Department of Forestry, 2. U.S. Forest Service, 3. Oregon State University, 4. Oregon Department of Agriculture, January 21, 2003

“Sudden Oak Death (SOD), caused by *Phytophthora ramorum*, was first discovered in Oregon in July 2001. Since then we have been attempting to eradicate the pathogen by



cutting and burning all infected host plants and adjacent apparently uninfected plants. Each year we conducted at least two aerial surveys (July and October) searching for recently killed tanoaks (*Lithocarpus densiflora*) in the forests of southwest Oregon. All dead tanoaks identified from the air were visited on the ground to determine cause of death and to attempt isolation of *P. ramorum*. We also conducted ground-based surveys to look for early indicators of infection on tanoak, rhododendron (*Rhododendron macrophyllum*), Oregon myrtle (*Umbellularia californica*), and evergreen huckleberry (*Vaccinium ovatum*) in the vicinity of all known infestations of *P. ramorum*.

The number of infected trees and the acres of forest infested with *P. ramorum* has decreased each year since we first discovered the pathogen in Oregon (Table 1). In 2003, most infected trees and new sites occurred within ¼ mile of eradication sites, with two exceptions: one new site (a single infected tree) was 1.8 miles north of the nearest eradication site, and; another (group of 12 infected trees) was 0.8 mile northeast of the nearest eradication site. Both of these sites are located in rather remote areas on private land with gated roads. The distribution of new disease patches suggests long distance aerial or vector spread. Each year new sites tend to occur either very close to eradication sites or in a northerly direction (following the prevailing rainy season wind direction) from previously known infestations.

Table 1. Occurrence of *P. ramorum* and Sudden Oak Death patches near Brookings, Oregon. Aerial and ground surveys combined.

Year	Number of tanoaks infected with <i>P. ramorum</i>	Number of new disease patches	Total acres in new disease patches each year
2001	91	9	40
2002	85	12	8

Monitoring within Eradication Sites

Host species sprouted prolifically following cutting and burning infested sites. Sprouts infected with *P. ramorum* were found commonly on more than 50 percent of the infested sites one year after treatment. Tanoak was by far the most common species infected, but rhododendron and evergreen huckleberry occasionally were infected. Symptoms of infection and recovery of *P. ramorum* were greatest during the winter-spring rainy season, and rare during summer. *P. ramorum* also was recovered from soils at several infested sites, but with very low frequency, and usually from soils associated with a known infected stumps. Similarly, sprout infection was strongly associated with stumps that were known-to-be-infected prior to treatment. Destruction of sprouts has been ongoing, and will be essential to curtail future spread of the pathogen.



Stream Monitoring

We baited streams with rhododendron leaves at 17 stations in the vicinity of known *P. ramorum* infestations. We recovered *P. ramorum* at least once from nine of these sites in 2003. *P. ramorum* was recovered from most streams draining infested sites and almost never from streams not associated with infested sites. However, *P. ramorum* was detected by PCR analysis in two streams that are not downstream of, or closely associated with, known infested sites.

Conclusions

Despite several new occurrences of *P. ramorum* in 2003, distribution of the pathogen in forests remains limited to a very small area near Brookings. New isolated infestations as far as 1.8 miles from other infestations suggest aerial or vector transmission. *P. ramorum* survived cutting and burning on most eradication sites, and is present at low levels in stump sprouts and soils. *P. ramorum* has been detected in several streams associated with eradication sites, and rarely in streams not clearly associated with known infestations. Efforts to eradicate the pathogen from Oregon forests will continue.”

REGULATIONS

The Oregon Department of Agriculture (ODA) adopted an emergency rule that requires all recipients of out-of-state tree and shrub nursery stock to notify ODA of the shipment for possible inspection of the plants. The new requirement comes following three separate instances of *Phytophthora ramorum*-infected nursery stock entering Oregon this year.

The emergency rule, which went into effect August 17, 2003, requires nurseries and retailers to contact ODA within two days of receiving an out-of-state shipment of tree and shrub nursery stock. Notification must include plant species, quantities, the source, and the recipient's contact information. Copies of regular shipping documents, such as load lists, are encouraged. ODA will contact nurseries within one business day following notification if the tree and shrub nursery stock needs to be held for inspection. Recipients are not obligated to hold the imported plants for inspection unless contacted directly by an ODA inspector. However, the imported tree and shrub nursery stock must not be sold or distributed to untraceable buyers (i.e. consumers) for one business day after notifying ODA. For more information, contact Jan Hedberg at Jan.Hedberg@oda.state.or.us.

Canada has released, for comment, “D-01-01 (9th Revision): Phytosanitary Requirements to Prevent the Entry of *Phytophthora ramorum* Associated with Sudden Oak Death into Canada.” Canada is proposing that the European Union increase its regulated area based on the wide distribution of the pathogen and also in response to many of the European Union's member states not providing their surveillance information on *Phytophthora ramorum*. Canada is also lifting restrictions on areas of the United States, as surveillance information continues to confirm the distribution of



Phytophthora ramorum. Under consideration is the deregulation of some California counties. Canada currently regulates the import of propagative material, including regulated species nursery stock, regulated species wood products with bark, non-propagative plant parts of regulated species, soil, and growing media. For additional information, contact Shane Sela at selas@inspection.gc.ca.

EDUCATION

The Department for Environment, Food, and Rural Affairs (DEFRA), UK, has issued a revised poster and information sheet on *Phytophthora ramorum*, that can be viewed at <http://www.defra.gov.uk/planth/what.htm>.

The presentations from Washington state's first Sudden Oak Death statewide informational meeting, July 9, 2003, in Pullayup, WA, are available at <http://www.ruraltech.org/events/sod/index.asp>. Streaming video of updates from CA, OR, WA, and BC industry concerns and regulatory programs may be downloaded.

WEB NEWS – WWW.SUDDENOAKDEATH.ORG

A new set of [photomicrographs](#), taken by Ed Florence, Professor Emeritus, Lewis and Clark College, Portland, OR, will be available Friday, September 12, in the image library under "Publications and Resources." These images illustrate the structural features of the pathogen on various hosts at a microscopic level.

A [list](#) of arborists and tree care professionals who have participated in COMTF training sessions is now available under "For the Homeowner." The list is sorted by county so the user can find a professional in their area who is trained in the recognition and sampling of *Phytophthora ramorum*.

CALENDAR OF EVENTS

09/23/03 – SODBuster Sudden Oak Death recognition, sanitation, and disposal class, UCCE Santa Cruz, Watsonville; contact Karl Buermeyer at krbuermeyer@ucdavis.edu

10/13/03 - Department for Environment, Food and Rural Affairs (DEFRA), U.K., will hold a meeting for interested organizations to discuss *Phytophthora ramorum* at the Central Science Laboratory, York. The current state of understanding of the disease and current controls will be explained.