RESEARCH

[Editor's note: Researchers are checking on the accuracy of the identification of *P. ramorum* as the causal agent of this shoot rot of nutmeg. At this time, additional peer-review indicates the identification needs further confirmation.]

Mathew, S.K. and Beena, S. 2012. A new record of *Phytophthora ramorum* causing leaf fall and shoot rot of nutmeg (*Myristica fragrans*). Journal of Mycology and Plant Pathology, 42(4): 529-530.

Abstract: Severe defoliation of green leaves of nutmeg (*Myristica fragrans*) was observed in major nutmeg growing areas of Thrissur, Emakulam, Idukki, and Kottayam districts of Kerala, India, during the southwest monsoon period of 2011. Infection was observed on leaves, shoots and fruits. Symptoms first appeared as dark brown water-soaked lesions on the midrib of the leaves which enlarged and spread along the lateral veins to leaf lamina resulting in blighting. Petioles of the infected leaves showed black discoloration. On young shoots, black lesions were observed which enlarged in size resulting in rotting and drying up of shoots from the tip downwards. Leaf and stem infections resulted in extensive defoliation. The causal organism was identified as *Phytophthora ramorum* based on cultural, pathogenicity and morphological analyses. This is thought to be the first report of *P. ramorum* causing leaf fall and shoot rot of nutmeg.

McPherson, B.A.; Erbilgin, N.; Bonello, P.; and Wood, D.L. 2013. Fungal species assemblages associated with *Phytophthora ramorum*-infected coast live oaks following bark and ambrosia beetle colonization in northern California. Forest Ecology and Management, Volume 291: 30–42.

Abstract: *Phytophthora ramorum*, the causal agent of sudden oak death (SOD), has killed large numbers of coast live oaks (*Quercus agrifolia*), California black oaks (*Q. kelloggii*), canyon live oaks (*Q. chrysolepis*), and Shreve oaks (*Q. parvula* var. Shrevei) in coastal California, and tanoaks (*Notholithocarpus densiflorus*) in California and Oregon. Native and introduced bark and ambrosia beetles selectively tunnel into stem cankers caused by the pathogen. Beetle attacks have been shown to considerably shorten survival of infected coast live oaks. We hypothesized that this behavior facilitates the introduction into, and/or stimulates the activity of, decay and pathogenic fungi, which, in turn, accelerate tree death. The associations of infected coast live oaks, beetles, and sapwood-inhabiting fungi in two California forests were investigated to: (1) determine whether beetles introduce fungi into *P. ramorum*-infected coast live oaks, (2) catalog the community of fungal species isolated in pure culture from the sapwood of infected and uninfected trees, with and without beetle colonization, and (3) identify the fungi found on beetles reared from infected trees. We inoculated coast live oaks, and monitored symptom development (i.e., bleeding cankers and colonization by beetles) for 2 years.

Trees were categorized as (1) live inoculated, bleeding, and still alive, (2) inoculated, bleeding with beetle attacks, and still alive, (3) inoculated with beetle attacks, and dead, (4) felled, asymptomatic before beetle attacks, and (5) felled, asymptomatic after beetle attacks. Trees were felled at 6-month intervals, sapwood samples were plated on four types of growth media, and the ITS sequences of the rDNA regions of morphologically unique fungal cultures were determined. Thirteen species were identified in the sapwood of inoculated trees prior to beetle attacks and 26 species were identified in living inoculated oaks after beetle colonization. The known oak pathogens *Botryosphaeria corticola* and *B. sarmentorum* were isolated from all categories of inoculated trees as well as from beetles. Fungi reported elsewhere as pathogens that were isolated from beetle-colonized trees include an *Aureobasidium* sp., *Bartalinia robillardoides*, *Geosmithia fassatiae*, a *Monochaetia* sp., *Pleurostomophora richardsiae*, *Truncatella angustata*, and *Stereum hirsutum*. Nineteen fungal taxa were isolated from beetles emerging from infected logs, including *B. corticola*, *B. sarmentorum*, a *Pestalotiopsis* sp., *G. fassatiae*, a *Geosmithia* sp., an *Ophiostoma* sp., and an uncultured Pleosporaceae sp. Preventing beetle attacks might limit introduction of fungi into infected coast live oaks, increasing the effectiveness of resistance mechanisms against *P. ramorum*. Where the disease is not fatal, beetles attacking trees infected by this introduced pathogen may facilitate new ecological associations between fungi, beetles, and a native host tree species.

Prospero, S.; Vercauteren, A.; Heungens, K.; Belbahri, L.; and Rigling, D. 2013. *Phytophthora* diversity and the population structure of *Phytophthora ramorum* in Swiss ornamental nurseries. Plant Pathology. DOI: 10.1111/ppa.12027.

Abstract: Invasive oomycete pathogens have been causing significant damage to native ecosystems worldwide for over a century. A recent well-known example is *Phytophthora ramorum*, the causal agent of sudden oak death, which emerged in the 1990s in Europe and North America. In Europe, this pathogen is mainly restricted to woody ornamentals in nurseries and public greens, while severe outbreaks in the wild have only been reported in the UK. This study presents the results of the *P. ramorum* survey conducted in Swiss nurseries between 2003 and 2011. In all 120 nurseries subjected to the plant passport system, the main *P. ramorum* hosts were visually checked for above ground infections. *Phytophthora* species were isolated from tissue showing symptoms and identified on the basis of the morphological features of the cultures and sequencing of the ribosomal ITS region. *Phytophthora* was detected on 125 plants (66 *Viburnum*, 58 *Rhododendron* and one *Pieris*). *Phytophthora ramorum* was the most frequent species (59.2% of the plants), followed by *P. plurivora*, *P. cactorum*, *P. citrophthora*, *P. cinnamomi*, *P. cactorum/P. hedraiandra*, *P. multivora* and *P.* taxon PgChlamydo. The highest incidence of *P. ramorum* was observed on *Viburnum* × *bodnantense*. Microsatellite genotyping showed that the Swiss *P. ramorum* population is highly clonal and consists of seven genotypes (five previously reported in Europe, two new), all belonging to the European EU1 clonal lineage. It can therefore be assumed that *P. ramorum* entered Switzerland through nursery trade. Despite sanitation measures, repeated *P. ramorum* infections have been recorded in seven nurseries, suggesting either reintroduction or unsuccessful eradication efforts.

Tanoak will be the focus of the spring 2013 special issue of Madroño, a publication of the California Botanical Society. Several of the papers were presented orally at "Tanoak Wild: A Celebration," held June 22, 2012 in Petaluma, CA, as part of the Fifth Sudden Oak Death Science Symposium. "Tanoak: History, ecology, and values" highlights much of what has been learned over the past 10 years about this important Sudden Oak Death host. The issue documents how conservation of tanoak as a resource is a challenge that requires consideration of botany, ecology, forestry, and the conflicting values of diverse populations, all confounded by an emerging exotic pathogen. The following nine articles will be published in May 2013.

Bowcutt, F. 2013. Tanoak Landscapes: Tending to a Native American Nut Tree. Madroño (In press).

Wright, J.W. and Dodd, R.S. 2013. Could tanoak mortality affect insect biodiversity? Evidence for insect pollination in tanoaks. Madroño (In press).

Bergemann, S.; Kordesch, N.C.; VanSant-Glass, W.; Metz, T.A.; and Garbelotto, M. 2013. Implications of Tanoak Decline in Forests Impacted by *Phytophthora ramorum*. Girdling Decreases the Soil Hyphal Abundance of Ectomycorrhizal Fungi Associated with *Notholithocarpus densiflorus*. Madroño (In press).

McDonald, P.M.; Zhang, J.; Senock, R.S.; and Wright, J.W. 2013. Morphology, Physiology, Genetics, Enigmas, and Status of an Extremely Rare Tree: Mutant Tanoak. Madroño (In press).

Shelly, J.R. and Quarles, S.L. 2013. The Past, Present, and Future of *Notholithocarpus densiflorus* (Tanoak) as a Forest Products Resource. Madroño (In press).

Nielsen, B. and Alexander, J. 2013. Foods from the Tanoak Forest Ecosystem. Madroño (In press).

Dodd, R.S.; Nettel, A.; Wright, J.W.; and Afzal-Rafii, Z. 2013. Genetic Structure of *Notholithocarpus densiflorus* (Fagaceae) from the Species to the Local Scale: A Review of our Knowledge for Conservation and Replanting. Madroño (In press).

Dillon, W.W.; Meentemeyer, R.K.; Vogler, J.B.; Cobb, R.C.; Metz, M.R.; and Rizzo, D.M. 2013. Range-wide threats to a foundation tree species from disturbance interactions. Madroño (In press).

Cobb, R.C.; Rizzo, D.M.; Hayden, K.J.; Garbelotto, M.; Filipe, J.A.N.; Gilligan, C.A.; Dillon, W.W.; Meentemeyer, R.K.; Valachovic, Y.S.; Goheen, E.; Swiecki, T.J.; Hansen, E.M.; and Frankel, S.J. 2013. Biodiversity conservation in the face of dramatic forest disease: an integrated conservation strategy for tanoak (*Notholithocarpus densiflorus*) threatened by sudden oak death. Madroño. (In press).

MONITORING

***P. ramorum* was found on Japanese larch (*Larix kaempferi*) in Glen Dye, east** Scotland, for the first time in January. The site consists of four symptomatic larch trees adjacent to a public road; however, there are symptoms suggesting there may be disease adjacent to the infected trees. While it is unknown how the pathogen arrived at the location, there is suspicion that it may have been moved unintentionally on vehicles. The outbreak is far from the nearest known infected larch, and is of concern because the pathogen had previously been confined to the west coast of Scotland where conditions are wetter and more suited for disease establishment.

The landowner removed the infected trees as well as all of the larch within 100m radius of the site, per Forestry Commission recommendations. The coming year's aerial survey will now include Glen Dye and other high-risk locations in east Scotland. *P. ramorum* is causing extensive damage and mortality to larch trees and other plants across the UK. In Scotland there are now 137 positive larch sites impacting approximately 1,038 acres.

RELATED RESEARCH

Huai, W.-x.; Tian, G.; Hansen, E.M.; Zhao, W.-x.; Goheen, E.M.; Grunwald, N.J.; and Cheng, C. 2013. Identification of *Phytophthora* species baited and isolated from forest soil and streams in northwestern Yunnan province, China. Forest Pathology. DOI: 10.1111/efp.12015.

Jung, T.; Colquhoun, I.J.; and St. J. Hardy, G.E. 2013. New insights into the survival strategy of the invasive soilborne pathogen *Phytophthora cinnamomi* in different natural ecosystems in Western Australia. Forest Pathology. DOI: 10.1111/efp.12025.

Kong, P . 2013. Carbon Dioxide as a Potential Water Disinfestant for *Phytophthora* Disease Risk Mitigation. Plant Disease, 97(3): 369-372.

BIOSECURITY E-CONFERENCE

A UK "Pathways into Policy: International knowledge exchange on biosecurity governance and implications for tree pest introductions and spread" electronic conference is currently being conducted by Forest Research UK, the Food and Environment Research Agency, Imperial College London, and others. This e-conference focuses on knowledge gaps and research priorities around three themes: defining key pathways and assessing their significance; comparing approaches to pathway management and tree pest and disease prevention; and exploring underlying justifications for pathway management and tree pest and disease outbreak prevention. It closes March 13th. All contributors will be listed as co-authors in the final report generated from the meeting. To register and access the forum, go to: http://pathwaysintopolicy.forumotion.co.uk. For questions or more information, contact Emily Porth at emily.porth@forestry.gsi.gov.uk.

RESOURCES

A new UK biosecurity poster has been posted to the Department for Environment, Food, and Rural Affairs website. Intended for those who own or work in woodlands and forests, the poster raises awareness about pest and disease threats to trees and provides landowners and contractors with information on best management practices to minimize the risks of introducing pests and diseases into woodlands as well as to reduce the risk of spreading them further. To access the poster, go to: http://www.fera.defra.gov.uk/plants/plantHealth/documents/woodlandsPoster.pdf.

PERSONNEL

Ron Rhatigan has been selected as the new Field Coordinator for the Sudden Oak Death program in Brookings, OR, replacing Stacy Savona who is now a Stewardship forester in the same area. Ron's career has includes nine years at Oregon State University (OSU) as the Test Coordinator for the Northwest Tree Improvement Cooperative and six years as Senior Faculty Research Assistant in OSU's Cooperative Utility Pole Research Program to develop treatments to arrest wood decay. He was also involved in efforts on the Gasquet Ranger District in Northern California to control Port-Orford-cedar root disease, and selected Port-Orford-cedar for disease resistance trials. Ron can be reached at (541) 469-5040 or rgrhatigan@odf.state.or.us.

CALENDAR OF EVENTS

2/20 – 3/13 – UK "Pathways into Policy: International knowledge exchange on biosecurity governance and implications for tree pest introductions and spread" electronic conference. To register and access the forum, go to: http://pathwaysintopolicy.forumotion.co.uk. For questions or more information, see "Biosecurity E-Conference" above or contact Emily Porth at emily.porth@forestry.gsi.gov.uk.

3/6 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. This class is free and will be held rain or shine. To register, or for questions, email kpalmieri@berkeley.edu, and provide your name, phone number, affiliation and license number (if applicable), and the date for which you are registering. For more information, go to http://nature.berkeley.edu/garbelotto/english/sodtreatmenttraining.php.

4/10 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 3/6 listing above.

4/27 – Marin ReLeaf Work Day; 10:00 a.m. - noon; China Camp State Park; Work will include removing wire cages from oak saplings in study, moving number tags to branches, and recording GPS locations for each tree. For questions or more information on the work day, contact Sandra Sellinger at sandra@marinreleaf.org.

5/1 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 3/6 listing above.

8/24 – 25 - 5th *Phytophthora, Pythium*, and Related Genera Workshop; Beijing,

China; The first day focuses on the methodology for studying Oomycetes (particularly *Phytophthora* and *Pythium* species), while the second day will cover contemporary research topics. For abstract submission, registration, and workshop information, go to http://www.icppbj2013.org/file/workshop/5thInternationalWorkshop.asp.

9/4 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 3/6 listing above.

10/2 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 3/6 listing above.

10/23 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 3/6 listing above.

11/13 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 3/6 listing above.