

Phomopsis and Sudden Oak Death: A Tale of Two Nursery Nuisances

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Introduction

Tree nurseries, by their very nature, provide key components of the disease triangle (pathogen, host, and environment) simply by the widespread planting of susceptible host(s) grown under optimal conditions. Pathogens can severely impact the quality and quantity of seedling stock, making pest management a high priority in successful nursery practice. Careful inspections for symptoms and signs of fungal agents can improve the precision of cultural, chemical, and biological management strategies, as well as alert growers to newly emerging pests of concern. The purpose of this presentation is to highlight two such nursery nuisances and to discuss implications of their introduction, establishment, and management.

Phomopsis

Phomopsis juniperovora Hahn has an annual impact in nurseries that grow eastern redcedar (*Juniperus virginiana*) and Rocky Mountain juniper (*J. scopulorum*) across much of the northeastern U.S. In Missouri, this problem has been steadily increasing at the George O. White State Forest Nursery over the last several years. Part of the problem is believed to be the lack of overall resistance in seed sources and unequal coverage of preventive fungicidal treatments. Because susceptible foliage is present throughout the growing season in seedling beds, systemic fungicides containing the active ingredient thiophanate-methyl must be applied regularly during the growing season. Control of *Phomopsis* blight can be enhanced when chemical application is applied at 7- to 10-day intervals in conjunction with infected seedling removal during this same time period. Better design in delivery systems, particularly in the area of nozzle efficiency, may hold the key to improving treatment for this disease.

Sudden Oak Death (SOD)

The devastating consequences of global movement of pests and plants have been very severe in North America. Dutch elm disease (caused by *Ceratocystis ulmi*), chestnut blight (caused by *Cryphonectria parasitica*), white pine blister rust (caused by *Cronartium ribicola*), butternut canker (caused by *Sirococcus clavigignenti-juglandacearum*), and gypsy moth (*Lymantria dispar*) are but a few grim reminders of what can happen to tree populations without co-evolved resistance. Mountains and oceans that once prevented introduction of unwanted pests are now easily bridged in ever increasing global markets. Though introduction of exotic pests has increased over the years, climatic, topographical, and other barriers may still prevent their establishment. Nurseries will need innovative techniques to detect and prevent the spread of infected plant materials. If new pests become established, eradication will become a costly and time-consuming venture.

One new arrival impacting growers in California and the Pacific Northwest is the fungus *Phytophthora ramorum* Werres, the cause of sudden oak death (SOD), which was first reported in 1995 in central coastal California. Since then, tens of thousands of tanoaks (*Lithocarpus densiflorus*), coast live oaks (*Quercus agrifolia*), and California black oaks (*Q. kelloggii*) have been killed by the fungus, *P. ramorum*. On these hosts, the fungus causes a lethal bleeding canker on the main stem. Laboratory testing on northern red (*Q. rubra*) and pin oak (*Q. palustris*) indicate that these native Missouri trees are highly susceptible to this disease. Infected trees may survive for one to several years. However, once crown dieback begins, leaves turn from green to pale yellow to brown within a few weeks. Black or reddish ooze often bleeds from the cankers, staining the surface of the bark and the lichens that grow on it. Canker rots, slime flux, leaf scorch, root diseases, freeze damage, and herbicide

injury, all normal ailments on eastern oaks, may cause symptoms similar to those caused by *P. ramorum*. Missouri's oak resource has been determined to be at moderate risk according to a model developed by the USDA Forest Service based on host availability and climate.

Issue

In March 2004, the USDA Animal and Plant Health Inspection Service (APHIS) reported that two nurseries in California had tested positive for *P. ramorum*. Stock from Monrovia Nursery, Azusa, Los Angeles County and Specialty Plants, Inc., San Marcos, San Diego County were subsequently shipped to many locations throughout the northeastern U.S. In addition, a nursery in the State of Washington, where *P. ramorum* was also discovered, was still nationally distributing plants as recently as February 2005. Because this fungus has a broad host range, plants of greatest nursery concern included camellias (*Camellia* spp.), rhododendron (*Rhododendron* spp.), and viburnum (*Viburnum* spp.). At this time, however, only camellias have been reported to have been shipped nationwide. Given that widely traded ornamentals can carry the pathogen, and that important Missouri oaks are susceptible, there is a significant risk of introduction into eastern forests. Presently, the Missouri Department of Agriculture and APHIS are involved in tracing the origin and destination of potentially infected stock in order to target detection surveys and eradication measures. The USDA Forest Service has established ongoing survey plots in Missouri and surrounding States to monitor for possible spread into native oak forests. The

number of States instituting their own regulations to prevent the movement of SOD continues to increase. State regulations are in addition to the Federal quarantine that has been in place since the pathogen's discovery in California rhododendron nurseries in 2001.

Recommendation

Early detection will be important for successful eradication. As confirmation is pending in most States, the best recommendation is to inform the public where to address their calls concerning bleeding and oozing symptoms found on oaks. Because other maladies involving bleeding occur normally on oaks throughout the year, distinction can only be made by collecting a sample and sending it to a laboratory for a tentative identification. Both Missouri Department of Agriculture and the Missouri Department of Conservation diagnostic clinics continue processing samples by cross-checking and, if isolated, forward possible positives to labs in Ohio, Minnesota, and Mississippi for confirmation using polymerase chain reaction (PCR) protocols. Nurseries themselves within infected regions have begun taking steps to change the way in which they grow planting stock. Planting blocks of susceptible host between blocks of nonsusceptible hosts can prevent the movement of the pathogen within the operation. In addition, chemical studies are showing some efficacy. Copper compounds may be used for preventive coating of trunks; phosphorous acid and metalaxyl may be used for curative treatments. Further studies are also underway to determine potential negative effects of these treatments, as well as optimize delivery rates of active ingredients, ideal times, and methods for successful application.