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102. Reducing *Phytophthora*. Parke, J. Digger 54(9):41-44, 46. 2010.

Reducing *Phytophthora*

These top 10 tips will help prevent this group of pathogens from taking hold

By Jennifer Parke

Phytophthora species are some of the most problematic plant pathogens in nursery production systems. The quarantine pathogen *Phytophthora ramorum* has received the most notoriety, but many *Phytophthora* species pose a challenge for nursery growers.

These pathogens cause trouble because of their persistence and spread in infested soil and water, and their ability to attack a wide variety of plants. Some species cause root rot, whereas others cause foliar blight and shoot dieback. Several species can infect plant parts both above and below the ground.

In collaboration with Niklaus Grünwald and Val Fieland of the USDA-ARS Horticultural Crops Research Laboratory, Carrie Lewis and I (Oregon State University) recently completed a three-year project to determine the most common sources of *Phytophthora* con-

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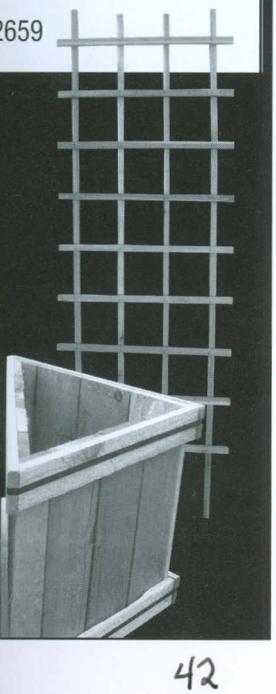

tamination in nurseries.

We applied a systems approach to identify three critical control points in nursery production systems: contaminated soil/gravel beds, contaminated irrigation water, and used pots. Another potential source of *Phytophthora* spp., not included in our study, is nursery stock brought in from off site.

So what is the take home message for growers? Here are the top 10 practical tips for nursery growers:

1. Be careful what you buy. The best defense is to not bring in any outside plant material. If you do, know your source. Make sure your supplying nursery uses excellent sanitation practices.

If you purchase *P. ramorum* host and associated host plants (HAP), purchase only from nurseries that are certified to be free of *P. ramorum*. (If you purchase HAP from out of state, you are required to notify the Oregon Department of Agriculture in advance so that they can inspect the plants). Certain plants are particularly prone to *Phytophthora* diseases, so be vigilant when purchasing them. These include *Araucaria, Arctostaphylos, Buxus, Camellia, Fagus, Kalmia, Ilex, Malus, Pieris, Rhododendron*, and many conifers *(Abies, Chamaecyparis, Picea, Pinus, Thuja, Tsuga, and Sequoia)*.

Phytophthora is less likely to be a problem in tissue culture plantlets than in rooted cuttings or older plants. Inspect all incoming plants and refuse any shipments that have suspect symptoms. Keep purchased plants in a separate area from your regular stock, and do not treat with fungicides effective against *Phytophthora*. Observe them for several weeks, or as long as is practical. Should disease develop, you have not exposed your entire nursery.

2. Don't use dirty pots. Re-using pots is a good idea for reducing costs, but make sure you aren't also recycling pathogens and weeds. Break the cycle by sanitizing pots before re-use. Several methods are available, including sanitizing with a hot water dip or soaking in a disinfestant, but most methods require washing to first remove old potting media and organic debris.

An exception to the need for pot washing is treatment with aerated steam at 165° F for a minimum of 30 minutes, which kills all plant pathogens except for a few viruses. This also kills all but the most resistant weed seeds. If you aren't set up to steam-treat pots yourself, there are several commercial enterprises that will come to your site and do it for you.

Although most growers who steam treat their pots do so to get rid of soilborne pathogens, many growers report substantial cost savings for labor and herbicides because of the excellent weed control achieved with steam treatment of pots.

Some growers are experimenting with solarization to sanitize pots. Pallets of pots are covered with clear plastic and left in the sun for several weeks during the summer. It is important to achieve sufficiently high temperatures even in the center of the stack.

Be wary of purchasing used containers if they have not been steam treated. There's a risk of unwittingly bringing in *Phytophthora* on used, untreated pots that have been purchased.

3. Keep propagation areas as clean as possible. Your propagation area should be the cleanest part of your nursery. Get rid of any weeds, sick plants, leafy debris or dying plants that could harbor pathogens. Use a source of clean water, such as well water, municipal water, or treated water. Disinfest your propagation beds between crops.

4. Ensure good drainage. Remember the disease triangle? A susceptible host, a virulent pathogen, and a conducive environment are all required for disease to occur. *Phytophthora* is likely to be present in your soil, so if you are growing susceptible plants, your best option for managing disease is manipulating the environment to be unfavorable to disease.

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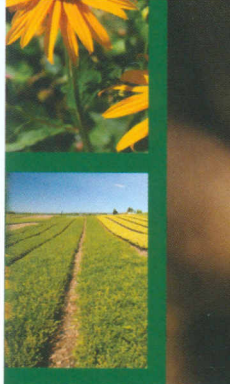

Phytophthora loves puddles. To prevent disease, do whatever you can to ensure good drainage. Prepare the nursery site to have an adequate slope and install tile drains and irrigation ditches to convey water to a central location for treatment.

5. Never put pots on bare soil. Many growers do an excellent job of producing healthy plants but then set their container plants on contaminated ground. *Phytophthora* moves easily from soil to pots by swimming through films of water or by being splashed onto plants. You should assume that all soil in nurseries, unless it has been fumigated recently, is laden with *Phytophthora* spp. Place a barrier between the soil and the containers: a layer of gravel or rock, or permeable fabric mesh.

6. Prevent the ground from getting contaminated. A common source of contamination is often infested soil or gravel beds.

Although the infected container plants have been destroyed, the ground under them has been contaminated by leafy debris that has fallen from infected plants. These spores survive in the top few inches of ground, embedded in the organic debris. When environmental conditions favor their germination several months later, they can produce millions of spores which can infect a new crop of container plants placed on the gravel.

Clean-up of these areas is very difficult, since fumigants are not effective in penetrating highly compacted ground. One option is to pave over contaminated gravel beds. Clean up leafy debris between crops. An ounce of prevention is worth a pound of cure.

7. Don't let container plants tip over. Research with *P. ramorum* showed that foliage of tipped over rhododendron plants could become infected after just a 10-second exposure to zoospore-infested water on the ground. Other foliar *Phytophthora* species may behave similarly.

8. Use only clean water for irrigation. *Phytophthora* species are water molds – aquatic organisms that have evolved to attack plants. They live in rivers and ponds, and are abundant in recirculated water systems.

Assume that your water is contaminated with *Phytophthora* unless it is from a well or municipal source. You can test your water for the presence of *Phytophthora* species with a leaf baiting method and ELISA test kit. The test will not tell you *which* species of *Phytophthora* is present, but it will tell you if your water is contaminated. Several water treatment methods are effective: UV, bromination, chlorination, and slow sand filtration. To learn more, attend a water treatment and water quality workshop (see sidebar p.46).

9. Don't keep sick plants. What do you do with plants that look sick or unthrifty? If many plants are affected, it is especially important to diagnose the problem. If you put 'reject' plants in a holding area at the back of the nursery, hoping they will get better, you are asking for trouble. Dispose of these plants, or compost them thoroughly to kill pathogens, otherwise you risk contaminating your whole nursery.

10. Be alert for disease symptoms. Monitor your plants for disease symptoms and train your employees to look for and report problems. Field workers are the "eyes" of the operation and if well-trained, can be your early detection system.

Encourage them to learn to recognize symptoms of plant diseases and pests, and reward them for reporting any problems. Give them time to attend a workshop on Phytophthora diseases at the North Willamette Research and Extension Center, or take the online *Phytophthora* course, which is offered in either English or Spanish. When in doubt, submit samples to the OSU Plant Disease Clinic.

The value of prevention

While *P. ramorum* cases in Oregon

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have dramatically reduced since the "scare" of 2004, nurseries across the U.S. need to pay special attention to sanitation. It's old technology, but it works. The payoff is reduced risk, and protection against *Phytophthora* as well as many other pests and pathogens. Your vigilance in preventing *Phytophthora* diseases is very important for maintaining Oregon's reputation for producing high quality, healthy plants.

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Other Options

- **Phytophthora Online Course: Training for Nursery Growers** (Oregon State University E-Campus). A free online course about the biology, symptoms, and management of Phytophthora diseases. English and Spanish language versions are available.
  http://ecampus.oregonstate.edu/workforce/phytophthora/
- **Bilingual Workshop Series for Best Management Practices in the Nursery Industry** (Oregon State University Extension and Oregon Department of Agriculture). A series of free workshops at the North Willamette Research and Extension Center on preventing Phytophthora diseases. See link for workshop topics and dates.
  http://oregonstate.edu/dept/NWREC/Events.php
- **An Online Guide to Plant Disease Control** (Oregon State University Extension). Search by plant name or pathogen name for information on management of plant diseases in Oregon.
  http://ipmnet.org/plant-disease/index.cfm
- **Water Education Alliance for Horticulture** (University of Florida). Information on water treatment technologies and water quality. Newsletter, webinars, and workshops. Note the water quality workshop in Oregon Jan. 18-19, 2011.
  http://watereducationalliance.org/default.asp
- **Plant Disease Clinic** (Oregon State University Extension). How to submit a plant disease sample for diagnosis.
  http://www.science.oregonstate.edu/bpp/Plant_Clinic/index.htm

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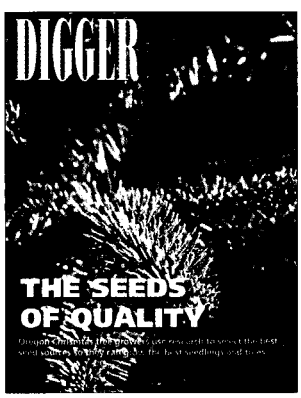

Cover: Most Christmas trees don't grow wild in the forest, one day to be cut down and taken home. They're grown on a farm (such as Yule Tree Farms, shown), but only after much thought and research goes into seed selection. Read about the process in our article on Christmas trees, starting on Page 24. Photo by Curt Kipp.

This page: Harvesting field-grown trees used to be painstaking, back-breaking manuel labor, but mechanization has taken much of the pain (and much of the cost) out of it. This Holmac 1205 Plus tree digger, sold in the U.S. by Plant Oregon, is one type of tree digging machine. Photo provided by Plant Oregon.

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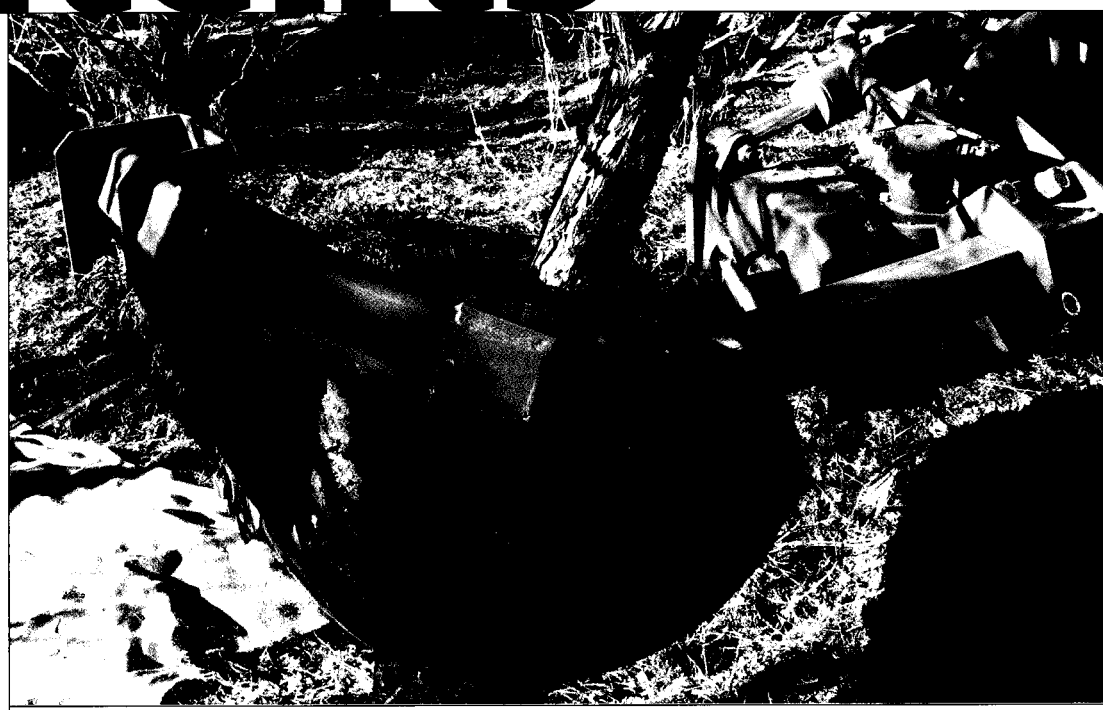

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