

# Managing *Phytophthora*

These top 10 tips will help prevent disease in your nursery

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.

Understanding critical control points (CCPs) in nurseries helps determine which best management practices will be most effective in reducing *Phytophthora* diseases. A CCP is the best point or step in the production process for minimizing the risk of contamination. Although every nursery operation is unique, there are several CCPs that are common to many nurseries. Knowledge of the CCPs in your nursery will determine which best management practices will be most helpful in reducing your risk of *Phytophthora* diseases. Implementation of these best management practices will also reduce your risk of other diseases, insect pests, and weeds. Below are 10 best management practices that will be most helpful in preventing *Phytophthora* diseases.

## 1. Ensure good drainage at your site.

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



**Boxwood plants in this poorly drained field developed *Phytophthora* root rot wherever water accumulated.**

managing disease is manipulating the environment to be unfavorable to disease. *Phytophthora* spp. release swimming spores in

water and waterlogged soil. To prevent disease, do whatever you can to prevent standing water. Prepare the nursery site to have an adequate slope and install tile drains and irrigation channels to convey water to a central location for treatment.



**Ensure good drainage to prevent standing water.**

## 2. 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



**Prevent diseased plants, like these infested with *Phytophthora ramorum*, from entering your nursery.**

be especially 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 them with fungicides effective against *Phytophthora* that would only delay symptom development. Observe them for several weeks, or as long as is practical. Should disease develop, you have not exposed your entire nursery.

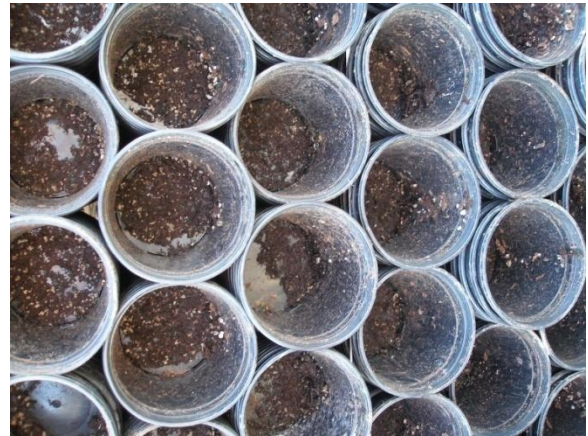
### **3. Keep propagation areas as clean as possible.**

Your propagation area should be the cleanest part of your nursery. Get rid of any weeds, sick or dead plants, or leafy debris that could harbor pathogens. Use your cleanest, best quality water for propagation of young plants. Use clean tools and clean container media. Disinfest your propagation beds between crops.

### **4. 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.

You can scrub the pots to remove old potting media and organic debris and then soak them for 30 minutes in a disinfectant such as 1 part bleach to 9 parts water.



**Sanitize containers before re-use, or buy new ones.**

You can also use heat to sanitize your containers and trays. Soak pots in hot (180° F) water for at least 30 minutes. Alternatively you can treat the containers with aerated steam at 140° F for a minimum of 30 minutes, which kills all plant pathogens except for some viruses. Treatment at 165° F kills all but the most resistant weed seeds. If your nursery isn't set up to steam-treat pots, there are 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. During the summer, pots are moistened, stacked, and covered with a double tent of clear plastic or placed inside an empty greenhouse. It is important to achieve sufficiently high temperatures even in the center of the stack. Guidelines from California suggest that temperatures of 158° F for 30 minutes, or



140° F for one hour, are required to kill *Phytophthora* spp.

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.

### 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.



**Containers should not be set directly on soil where *Phytophthora* can be splashed up onto plants, causing foliar blight and root rot.**

*Phytophthora* moves easily from soil to pots by swimming through films of water or by being splashed onto plants by irrigation water or rainfall. You should assume that all soil in nurseries, unless it has been fumigated recently, is laden with spores of *Phytophthora* spp. Place a barrier, such as a 3-4" layer of gravel or rock, between the soil and the containers.

### 6. Clean up leafy debris.

A common source of contamination is infested soil or gravel beds. Long after infected plants have been removed, the ground under them remains contaminated by leafy debris that has fallen from them. *Phytophthora* spores

survive in the top few inches of ground, embedded in the organic debris. When environmental conditions favor their germination several months later, *Phytophthora* spores can infect the new crop.



**Infested leaves can contaminate the ground, leading to infection of plants that are placed there later.**

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

### 7. Don't let container plants tip over.

Leaves of tipped over rhododendron plants can become infected with *P. ramorum* after just a 10-second exposure to zoospore-infested puddles. Other foliar *Phytophthora* species may behave similarly.



**Container plants that tip over onto wet ground can become contaminated with *Phytophthora* spp.**

## 8. Don't keep sick plants.

What do you do with plants that look sick or unthrifty? 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, otherwise you risk contaminating your whole nursery.

## 9. 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.



**Water used for irrigation should be disinfested to eliminate *Phytophthora* unless it is from a deep well or a municipal source.**

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-based field diagnostic kit. Several water treatment methods are effective including UV, chlorination, copper ionization and slow sand filtration. To learn more about water treatment options, see <http://www.watereducationalliance.org/>

## 10. Be alert for disease symptoms.

Monitor your plants for disease symptoms by scouting frequently. 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 *Phytophthora* Online Course to learn more about the biology and management of *Phytophthora*. The course, in either English or Spanish, is offered at no charge at <http://ecampus.oregonstate.edu/workforce/phytophthora/>. Submit questionable plant samples to the OSU Plant Disease Clinic for diagnosis.



**Regularly scout your plants for disease.**

## The value of prevention

While *P. ramorum* cases in Oregon have dramatically declined, 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 in your nursery is very important for limiting the spread of exotic diseases that threaten our forests, and for maintaining Oregon's reputation for producing high quality, healthy plants.



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