



## Integrated Pest Management Program

Plant Science and Landscape Architecture  
Extension

# *Phytophthora* Dieback and Root Rot

Ericaceous plants (rhododendrons, azaleas, andromeda) experience serious disease problems caused by various species of the fungus *Phytophthora*. Disease problems can develop as either shoot dieback or root rot, depending on the fungus species and when it entered the plant. Eventually, landscape and nursery plants can be killed by these diseases, but they are a more serious concern in container-grown nursery stock. There are a number of species that cause both diseases, but the two most common are *Phytophthora cactorum* (dieback) and *Phytophthora cinnamomi* (root rot).

### Life Cycle

Before discussing these two diseases and their management, a brief introduction to the life cycle of this fungus would be helpful. There are four possible forms of infective structures produced by *Phytophthora*-sporangia, zoospores, oospores and chlamydospores. Water is required for germination of all spore types.

The sporangia are vegetative structures that can germinate by a germ tube that produces new mycelium. However, they usually convert their structures into motile spores (zoospores) that exit through the tip of the sporangium. These spores have a "tail" that enables them to move in water. They are attracted to amino acids and other chemicals given off by roots or succulent plant parts. After a zoospore contacts one of these plant parts, it sheds its "tail" and produces a germ tube that penetrates the plant and forms mycelium in the plant tissue.

Oospores develop from the sexual combination of two fungi and serve as a fungus resting stage. Although they are few in number, they are important because they combine the genetic material from two different fungi. Chlamydospores are vegetative cells, found within hyphae, that develop thick walls and also serve as resting structures. Both of these stages germinate through a germ tube that can develop into either mycelium or sporangia depending on the species. They can also withstand adverse environmental conditions.

### Disease Development

Plants that contract dieback (*P. cactorum*) become infected when zoospores are splashed by water from the soil to plant leaves. In order for this type of mobile spore to enter the plant, the leaves must be wet. Also, initial infection primarily occurs on young, tender leaves. Lesions begin to appear on the leaves in two to three days, particularly during hot and humid weather. These leaves will turn brittle and curl inward. The disease can then progress into the petiole and on into the stem, gradually working down the stem and into mature leaves. Infected leaves containing fungal spores fall to the ground or open to release spores, which allows the cycle to repeat. Also at this time, the spores of *Phytophthora* species, that can cause both dieback and root rot, can be moved into the soil by water. Eventually, these spores may contact and enter the fine roots of surrounding plants and cause root rot.

*Phytophthora* root rot disease (*P. cinnamomi*) begins with an invasion of the fine roots causing them to turn brown and die. The pathogen spreads into larger roots and moves towards the root crown. The plant can be girdled as the fungus moves up the stem. The stem cambium turns brown first followed by the phloem and xylem. Since root and stem tissues are being destroyed, the leaves will become chlorotic, roll downward toward the midrib and gradually wilt. One- to two-year-old container-grown rhododendrons that are highly susceptible to the disease may die within 14 days. Older landscape plants can show symptoms for a year before dying, or they may show no above ground symptoms until various stress factors cause the weakened plants to die.

### Prevention and Management

Disease prevention is easier in landscape locations than in nurseries. Since *Phytophthora* dieback affects the young upper foliage, low to moderate nitrogen fertilization prevents the plant from continually putting out new, vulnerable leaf flushes. *Phytophthora* root rot can be prevented in landscapes by locating the plants in areas that have good soil

drainage and do not suffer through extended wet periods, and by not overwatering. Also, there are cultivars and hybrids of rhododendron and azalea that are resistant to *Phytophthora* root rot that can be planted to reduce the risk of infection. If landscape plants are diagnosed with the disease, they should be removed from the site. Neighboring plants should be carefully monitored to see if they start to show symptoms.

Prevention and management in the nursery requires a variety of techniques due to the increased number of plants and certain nursery practices. Since container plants must be produced quickly, they receive high levels of fertilization to encourage new growth. Frequent overhead irrigation splashes spores into the air and onto young leaves. These two cultural practices make container-grown plants susceptible to *Phytophthora* dieback for the entire growing season. Also, the runoff from heavy and frequent irrigation of container-grown ericaceous plants moves the root rot fungus spores from infected plants to the roots of neighboring plants. The following lists provide a brief overview for *Phytophthora* prevention in a nursery.

### In the propagation area

1. Clear away all debris and old medium which may be contaminated with *Phytophthora* spores.
2. Wash the area with a sanitizing agent to remove and destroy any disease agents.
3. Maintain good general sanitation (eliminate debris, weeds and puddles, keep hoses off the floor).
4. Fill raised benches with fresh propagation medium containing 25 to 35 percent air-filled pore space. This will enable root initiation to begin quickly and make the plant less susceptible to disease.
5. Harvest cuttings from soil-free plant parts so that spores in the soil are not transferred to new plants.
6. Periodically wipe harvesting tools in 70% alcohol to prevent contamination.
7. Apply appropriate fungicidal drenches and sprays. After cuttings are potted or lined out, drench with a fungicide. Spray the first two weeks to control a variety of fungal diseases. Repeat the drench after six weeks. Once cuttings are rooted, drench with fungicides. After transplanting, repeat the drench but not more than once every six weeks. Follow label recommendations. For a list of recommended fungicides, contact your local Cooperative Extension center

### In the nursery

1. Select a root-rot-suppressive growing medium containing tree bark which provides good aeration and drainage. Tree bark also releases chemicals as it decomposes which kill *Phytophthora* spores.
2. Remove plant debris, which may contain pathogens, from - the container area
3. Place containers on well-drained & puddle-free beds (not plastic which allows for easy pathogen movement and accumulation of water around pot bases).
4. Manage the water system so that irrigation water does not spread pathogens or cause salinity problems.
5. Spray fungicides for dieback protection. Apply a fungicide to the soil or foliage for root rot control when temperatures favor disease outbreaks (75° to 95° F). Fungicides will not cure a plant if it is already infected but will provide preventative protection. **Follow label recommendations!** For a list of recommended fungicides, contact your local Cooperative Extension center. Or visit the on-line guides of [Cornell University](#) and [Penn State](#). This information may not apply to your state.
6. Consider growing root-rot-resistant species and cultivars (see *table below*).

**Cultivars resistant to root rot caused by *Phytophthora cinnamoni***

Evergreen Azalea	Rhododendron Hybrids: highly resistant	Rhododendron Species Highly resistant
Alaska Morning Glow	Caroline	<i>R. davidsonianum</i> 'Serenade'
Chimes New White	Martha Isaacson	<i>R. delavayi</i>
Corrine Murrah Pink Gumpo	Pink Trumpet	<i>R. glomerulatum</i>

Eikan Pink Supreme	Professor Hugo de Vries	<i>R. hyperythrum</i>
Fakir Polar Seas	Red Head	<i>R. lapponicum</i>
Fred Cochran		<i>R. occidentale</i>
Formosa Rachel Cunningham		<i>R. pseudochrysanthum</i>
Glacier Redwing		<i>R. poukhanense</i>
Hampton Beauty Rose Greeley		<i>R. quinquefolium</i>
Higasa Shin-ki-gen		<i>R. sanctum</i>
Merlin Sweetheart Supreme		<i>R. simsii</i>
Morning Glow		<i>R. websterianum</i>
New White		
Pink Gumpo		
Pink Supreme		
Polar Seas		
Rachel Cunningham		
Redwing		
Rose Greeley		
Shin-ki-gen		
Sweetheart Supreme		

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**Updated by:** Mary Concklin, IPM, University of Connecticut. 2011

**Prepared by:** Tim Abbey, Extension Educator-Nursery

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