Phytophthora Dieback and Root Rot

Ericaceous plants (rhododendrons, azaleas, and andromeda), lilacs, Potentilla and yews 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, these fungal diseases can kill landscape and nursery plants, 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 fungus (dieback) and Phytophthora cinnamomi fungus (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. Though few in numbers, 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. cinnamoni) 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. Watering via drip irrigation or using a water wand to keep water off the leaves will keep the fungus from splashing onto the plant. 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. If excess moisture is a problem planting in raised bed with the addition of sand and composted pine bark will help to control Phytophthora root rot. 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 a landscape plants is diagnosed with the disease, they should be removed from the site. Nearby plants should be carefully monitored to see if they start to show symptoms.

Prevention and management in the nursery require 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.

- Clear away all debris and old medium which may be contaminated with Phytophthora spores.
- Wash the area with a sanitizing agent to remove and destroy any disease agents.
- Maintain good general sanitation (eliminate debris, weeds and puddles, keep hoses off the floor).
- 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.
- Harvest cuttings from soil-free plant parts so that spores in the soil are not transferred to new plants.
- Periodically dip harvesting tools in 70% alcohol to prevent contamination.
- Apply appropriate fungicidal drenches and sprays after cuttings are potted or lined out.

Fungicides will not cure a plant if it is already infected but will provide preventative protection. Follow label recommendations. Consider growing root-rot-resistant species and cultivars:

**Evergreen Azalea Varieties**
- Alaska Morning Glow
- Chimes New White
- Corrine Murrah
- Eikan Pink Supreme
- Fakir Polar Seas
- Formosa Rachel Cunningham
- Glacier Redwing
- Merlin Sweetheart Supreme
- Pink Gumbo

**Rhododendron Varieties**
- Caroline
- Hampton Beauty
- Higasa
- Martha Isaacson
- Pink Trumpet
- Professor Hugo de Vries
- Red Head
- Rose Greeley
- Shin Ku Gen

Despite good cultural practices, pests and diseases at times may appear. Chemical control should be used only after all other methods have failed. For fungicide/pesticide information please call UConn Home and Garden Education Center weekdays, in Connecticut call toll free 877-486-6271. Out of state call 860-486-6271.

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