

## Phytophthora Root Rot of Rhododendron and Azalea

Mary Ann Hansen, Extension Plant Pathologist, Department of Plant Pathology,  
Physiology and Weed Science, Virginia Tech

Wilt and root rot of rhododendron and azalea are symptoms of a disease caused by the soil-inhabiting water mold fungus *Phytophthora*. Several different species of *Phytophthora* have been reported to cause similar symptoms, but *Phytophthora cinnamomi* and *Phytophthora parasitica* are recovered most frequently from diseased plants in Virginia. In addition to rhododendron and azalea, *Phytophthora* species also frequently infect many cultivars of boxwood, andromeda, mountain laurel, blueberry, camellia, juniper, and yew.

### Symptoms

In the early stages of disease, symptoms consist of retarded growth, slight drooping of the foliage and off-color foliage. Infected broadleaf species wilt during the heat of the day (Fig. 1) and recover at night. Roots become discolored and die (Fig. 2). Dark or reddish brown discoloration may extend up into the wood of the lower stem (Fig. 3). Severely affected plants wilt permanently and turn brown.



Fig. 1. Wilting of susceptible plants in the field.  
(Photo by R. C. Lambe)



Fig. 2. Root rot on rhododendron caused by *Phytophthora cinnamomi*. (Photo by R. C. Lambe)



Fig. 3. Internal discoloration of the wood in the stem near the ground line following root infection.  
(Photo by M.A. Hansen)

### Environmental Factors Favoring Disease

Disease development is favored by high soil moisture and soil temperatures of 80°F and above. Infected plants growing on sandy soils are generally not as seriously affected by the disease, whereas those growing on

poorly drained soils wilt and die. On well-drained soils, only feeder rootlets are rotted, but when drainage is poor, the main roots and stem become discolored and infected plants wilt and die. Many areas of Virginia have soil that is heavy in clay, poorly drained, and conducive to *Phytophthora* root rot. Infected plants may also be brought into Virginia from other states. These plants may appear healthy when received, but wilt from root rot when exposed to local conditions of high soil moisture and high temperatures. Plants with root systems impaired by *Phytophthora* root rot may also be more sensitive to subsequent periods of drought.

Losses from *Phytophthora* root rot in commercial operations have decreased due to the increased use of well draining mixes, such as 100% pine bark. In general, root rot occurs less frequently on plants grown in mixes that have an air volume of 20-25%.

## Control

### Home Landscape

Planting sites should be well-drained. Growers often misinterpret wilt as a sign that a plant needs water and respond by applying more water. This reaction should be avoided in sites where plants are clearly receiving adequate water. The use of drain tiles to prevent rain water from collecting on the surface is suggested. Special care should be taken to set plants high so that the soil line is not more than one inch above the upper roots. Where subsoils are known to be poorly drained, planting on raised beds should be considered. After planting, the soil should not be mounded up around the base of the stem because this increases susceptibility to disease.

### Chemical Control

Chemical control of *Phytophthora* root rot in established plantings of rhododendrons and azaleas is difficult. However, the spread of the fungus from diseased plants to adjacent healthy plants may be checked by drenching soil around the healthy plants with a fungicide containing mefenoxam (e.g. Subdue MAXX), metalaxyl (e.g. Subdue), fosetyl-Al (e.g. Aliette), etridiazole (e.g. Truban) or etridiazole + thiophanate methyl (e.g. Banrot). Follow label rates and treat at four-week intervals during the summer when environmental conditions are favorable for disease. For further details on chemical control, consult the current Virginia Pest Management Guide for Home Grounds and Animals (VCE Publication 456-018) or the Virginia Pest Management Guide for Horticultural and Forest Crops (VCE Publication 456-017), <http://pubs.ext.vt.edu/456-017>. For information on the proper use of pesticides and fungicides, refer to any current VCE pest management guide.

In locations where plants have died from *Phytophthora* root rot in the home landscape, it would be advisable to replant with a cultivar that has resistance to the disease. A list of cultivars of azalea and rhododendron that are reported to have moderate to excellent resistance to *Phytophthora* root rot is provided below.

## Propagation

Before sticking a new crop of cuttings, remove old rooting media from the propagating benches. To reduce the possibility of pathogen infestations originating from soil on the floor of the greenhouse, propagate on raised benches. Flats, baskets, and greenhouse benches can be treated with a disinfectant, such as Greenshield or Physan 2.0, to eradicate plant pathogens from surfaces. Propagating tools should be steam-sterilized or soaked in a commercial disinfectant. If a commercial disinfectant is not available, use household bleach containing sodium hypochlorite (1 part bleach to 9 parts water). Propagating benches should also be surface-sterilized between each set of cuttings prior to filling with sterile rooting media.

## Containers

Containers should be placed on well drained sites, preferably on rock or gravel, so that any surface water contaminated with *Phytophthora* zoospores, which are motile in water, cannot enter the container through the bottom. Growing areas can be crowned to facilitate rapid runoff of water. If the water used for irrigation of containers is recycled, the hazard exists that the water may become contaminated with zoospores of *Phytophthora* spp. Chlorination will eliminate pathogens from the water.

## Field

Some growers have learned to reduce disease losses in heavy soils naturally infested with *Phytophthora* species by growing plants on hills in rows or on well drained, raised beds. It is suspected that most of the field spread of *Phytophthora* spp. results from movement of fungal zoospores in water. Because it is possible to introduce *Phytophthora* spp. into fields through an irrigation system that draws and recirculates water from a catch basin or irrigation pond, chlorination of the water may be necessary to eradicate fungi.

## Resistance

Many different rhododendron hybrids develop symptoms of *Phytophthora* root rot under natural conditions in Virginia. Field experiments with artificially inoculated plants have shown many well known hybrids and cultivars to be susceptible to *P. cinnamomi*, the most common species of *Phytophthora* found on azaleas and

rhododendrons in Virginia. However, some species and hybrids that have resistance to *P. cinnamomi* have been identified in experimental trials (Tables 1-3). Although performance of these species and hybrids in a given site may vary, resistant plants have a better chance of sur-

vival where *Phytophthora* diseases have been a problem in the past. Be sure to check with your nursery personnel for any newly introduced resistant cultivars that may not be listed below.

### Table 1.

Rhododendron hybrids with resistance to *P. cinnamomi*

#### Rhododendron Hybrids Highly Resistant to *P. cinnamomi*

Caroline  
Martha Isaacson  
Pink Trumpet  
Professor Hugo de Vries  
Red Head

#### Rhododendron Hybrids Moderately Resistant to *P. cinnamomi*

Bosley Dexter 1020  
Brickdust  
Broughtonni Aureum  
Disca  
Dr. A. Blok  
Dr. Arnold W. Endtz  
English Roseum  
Lucky Strike  
Madame Carvalho  
Mr. C. B. Van Nes  
Mrs. A. T. de la Mare  
Prize  
Rocket (Shammarello)  
Van Veen  
Wilbrit

### Table 2.

Rhododendron species with resistance to *P. cinnamomi*

#### Rhododendron Species Highly Resistant to *P. cinnamomi*

*R. davidsonianum* 'Serenade'  
*R. delavayi*  
*R. glomeratum*  
*R. hyperythrum*  
*R. lapponicum*  
*R. occidentale*  
*R. pseudochrysanthum*  
*R. poukhanense*  
*R. quinquefolium*  
*R. sanctum*  
*R. simsii*  
*R. websterianum*

#### Rhododendron Species Moderately Resistant to *P. cinnamomi*

*R. aberconwayii*  
*R. charitopes*  
*R. ciliatum*  
*R. hemitrichotum*  
*R. nitens*  
*R. oldhamii*  
*R. ponticum I*  
*R. ponticum II*  
*R. racemosum*  
*R. rigidum*  
*R. serphyllifolium*  
*R. shwelliense*  
*R. simiarum*  
*R. spiciferum*  
*R. yumnanense*

### Table 3.

Azalea cultivars with resistance to *Phytophthora* root rot\*\*

Alaska (R)  
Chimes (I)  
Corrine Murrah (BA)  
Eikan (S)  
Fakir (GD)  
Formosa (I)  
Fred Cochran (N)  
Glacier (GD)  
Hampton Beauty (P)  
Higasa (S)  
Merlin (GD)  
Morning Glow (K)  
New White (I)  
Pink Gumpo (S)  
Pink Supreme (I)  
Polar Seas (GD)  
Rachel Cunningham (BA)  
Redwing (I)  
Rose Greeley (G)  
Shin-ki-gen (S)  
Sweetheart Supreme (P)

\*\*Key to letters in ( )'s

BA Back Acres  
K Kurume  
R Rutherford  
G Gable  
N NC State University  
S Satsuki  
GD Glen Dale  
W Whitewater  
I Indian  
P Pericut

### Selected References

Benson, D. M. and F. D. Cochran. 1980. Resistance of evergreen hybrid azaleas to root rot caused by *Phytophthora cinnamomi*. Plant Disease 64: 214-215.

Hoitink, H. A. J. and A. F. Schmitthenner. 1975. Resistance of rhododendron species and hybrids to *Phytophthora* spp. root rot. American Rhododendron Society Bulletin 29: 37-4.

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