Phytophthora Root Rot On Woody Ornamentals

Fungus-like organisms belonging to the genus Phytophthora are soil- or plant-borne and all are plant pathogens.

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Phytophthora on African violet

Some species of *Phytophthora* attack woody ornamentals including arborvitae, azalea, beech, Chamaecyparis, dogwood, forsythia, Fraser fir, hemlock, Japanese holly, juniper, maple, Pieris, Rhododendron, Taxus and white pine. Other species attack herbaceous plants including annual vinca (Catharanthus), begonia, poinsettias, African violets, and many other plants.

Symptoms

Hosts with mild root rot

- smaller than normal foliage
- foliage with nutrient deficiency-like symptoms
- dead feeder roots
- dark streaks up stem

Hosts with severe root rot

- stunting of entire plant
- wilting
- smaller than normal leaves or needles
- reddish-brown discoloration of wood at soil line
- greatly reduced root systems
- roots with reddish-brown discoloration
- dead feeder roots
- new shoots do not develop
- death of plant

Hosts with cankers or stem rot

- slightly sunken dead area just under the bark (in the cambium)
- wood under the outer edge of the canker may be pink or reddish-brown in color
- bleeding from various points in the cankered area but the ooze does not smell badly
- stems and branches of herbaceous plants collapse

Conditions Favoring Development

Infection can occur over a wide range of temperatures: 15°C (59°F) to 28°C (82°F). 22°C (71°F) is optimum.

Soil moisture just below saturation allows sporangia to form in 4-8 hr and motile zoospores to be released in 10-60 min. Therefore, poorly drained or wet soil favor the pathogen. Zoospores infect feeder roots just behind the root cap. Soil pH plays little role in this disease.

Phytophthora overwinters primarily infected plant roots or stems and only to a small extent free of plant material in soil. The fungus can be splash-dispersed during heavy rains or overhead irrigation. It can be carried in run-off from plant to plant in the field or from an infected plant to the drain holes of containers of nearby healthy plants particularly if containers share puddles of water for an extended period.

Management

- Because *Phytophthora* usually stays associated with infected plants, a very important reason why it is dispersed long distances is through the shipment of infected plants. Therefore when new plants are purchased, keep those plants together and observe them carefully for any symptoms. Do no co-mingle plants from different sources so that if *Phytophthora* is detected, you will be able to

determine its source. DO **not** recycle the irrigation water for these plants until you are certain they do not harbor Phytophthora. (If *Phytophthora ramorum* is detected in plants, ALL plants in that shipment and all plants sharing recycling water will be ordered destroyed.)

- Grow resistant cultivars in any areas known to harbor *Phytophthora* . See the list below.
- Disease prevention must be the primary goal since no chemicals cure a *Phytophthora* -infected plant.
- Remove and destroy infected plants.

Nursery - Field

- Plant only in well-drained locations.
- If the area previously harbored *Phytophthora*, fumigate with a registered material before planting when soil temperatures are 10°C (50°F) or warmer at 15 cm (6 in.) depth and when soil moisture levels are adequate for seed germination. Allow adequate aeration time. (Such fumigation requires a specific pesticide license.)
- Irrigate plants to prevent drought stress. Drought stressed, Phytophthora -resistant plants lose the resistance and can attacked.
- Avoid overhead watering especially in late afternoon.
- Avoid using run-off water for irrigation.
- Certain chemicals can protect healthy plants.

Nursery - Container

- Use a well drained, pasteurized potting mix. Sand should not be considered sterile. Composted hardwood bark not only drains well, it usually contains other microbes that inhibit *Phytophthora* .
- Use clean containers
- Place containers on an area that has been graded to ensure drainage away from the growing area. Or, place containers on a 7-10 cm (3-4 in.) thick bed of gravel or other well drained material. Black plastic under this bed will prevent weed growth.
- Group different types of plants by water requirement so that plants are not over or under watered.
- Irrigate plants to prevent drought stress. Drought stressed, *Phytophthora* -resistant plants lose the resistance and can attacked.
- See chemicals below that are used to protect healthy plants.

Final Planting Site - Home or Commercial Planting

- Plant only in well-drained areas or grade or tile the site to ensure good drainage.
- Do not plant where Phytophthora -infected plants were previously located.
- Do not plant too deeply. Soil line should not be more than 2.5 cm (1 in.) over upper roots.

References

1. Benson, D. M. 1982. Phytophthora Root Rot - Phytophthora cinnamomi (p. 14-17); and Rhododendron Diseases (p. 69-71). In Diseases of Woody Ornamental Plants and Their Control in Nurseries. Ed. by R. K. Jones and R. C. Lambe. North Carolina Agricultural Extension Service, NCSU, Raleigh.
2. Lambe, R. C. and R. E. Baldwin. 1975. Phytophthora root rots and wilt of rhododentron, azalea, and related ornamentals. Plant Disease Control Notes. Extension Division, Virginia Polytechnic Institute and State University, Blacksburg. 6 pp.

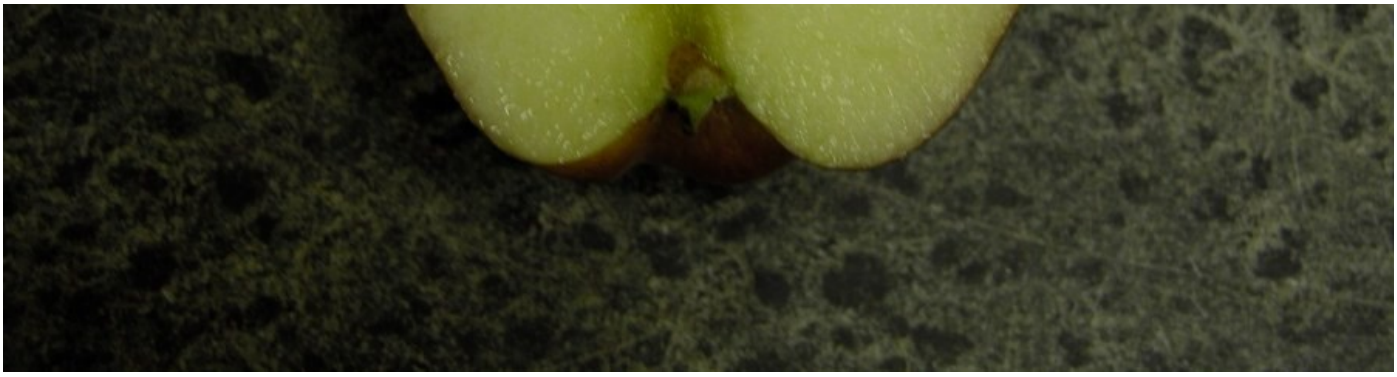
The following list is from: R. K. Jones and D. M. Benson. 1982. Phytophthora root rot and its control in nurseries. Plant Pathology Info. Note #202. Dept. of Plant Pathology, North Carolina State University, Raleigh.

Resistance of azalea cultivars to root rot caused by Phytophthora cinnamomi

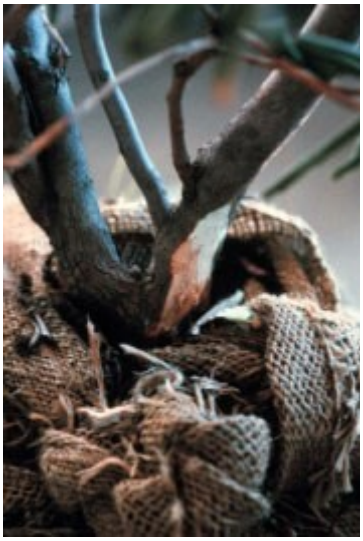
Resistant	Susceptible	Highly Susceptible
Formosa (I), Fakir (GD), Corrine Murrah (BA), Merlin (GD), Hampton Beauty (P), Higasa (S), Glacier (GD), Rose Greeley (G), Polar Seas (GD), Redwing (I), Chimes (I), Alaska (R), New White (I), Shin-Ki-gen (S), Rachel Cunningham (BA), Pink Gumpo (S), Eikan (S), Sweetheart Supreme (I),Morning Glow (K).	Barbara Gail (P),White Gumpo (S), Rentschler's Rose (W), Dorothy Gish (R), White Gish (R), Pink Hiawatha (P) Margret Douglas (BA), Gaiety (GD), Gloria (R), Kingfisher (W), White Christmas (W), Sensation (P), Prince of Orange(I), White Jade (BA), Copperman (GD), Hexe (K), Massasoit (K), Martha Hitchcock (GD), China Seas (G), Warbler (W), California Sunset (I), Amaghasa (S), Pride of Summerville (I), Hinodegiri (K), Flanders Field (P).	Robinhood (GD), Hershey Red (K), Herbert (K), Fortune (P), Catawba (GD), Marion Lee (BA), Snow (K), Royalty (G), Kow-Ko-Ku (S), Rosebud (G), Mrs. G. G. Gerbing (I), Coral Bells (K), Treasure (GD), Pat Kraft (BA), Saint James (BA), Carror (N), Purple Splendour (G), Pinocchio (GD), General MacArthur (K), Pink Pearl (K), Johga (S), Sunglow (N), Hino Crimson (K), Elaine (N), Emily (N), Pink Cloud (N), Adelaide Pope (N), Jane Spaulding (N).

- BA = Back Acres
- N = NCSU
- G = Gale
- P = Pericat
- GD = Glenn Dale
- R = Rutherford
- I = Indian
- S = Satsuki
- K = Kurume
- W = Whitewater

Phytophthora bleeding canker on beech.



Apple bait for *Phytophthora* detection.



Discoloration of the base of a Dieback of Ilex (Shamrock holly) from Phytophthora root rot.

rhododendron from Phytophthora.

Phytophthora on begonia.

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