

Phytophthora Diseases

Introduction

Phytophthora diseases can be very damaging to many plants and a particular problem in ornamental horticulture. There are in excess of 100 different species of *Phytophthora*, and whilst the host range will vary between species, most are capable of attacking a wide range of plants. Species commonly found affecting ornamentals include *Phytophthora cinnamomi*, *P. cryptogea*, *P. citricola*, *P. cactorum* and *P. cambivora*.

Phytophthora species normally attack the root system and stem base (foot) of the plant, but they may also occasionally infect the aerial parts of the plant directly.

Root-rotting species, such as *P. citricola*, can sometimes affect foliage if spores or contaminated soil are splashed onto it. In addition, there are some species that do not affect roots but cause damaging foliar blights and dieback. These include *P. ilicis* (holly blight), *P. ramorum* and *P. kernoviae*.

Several species are quarantine listed organisms, such as *P. ramorum* and *P. kernoviae* that affect a wide range of plants. Others have a more restricted host range e.g. *P. fragariae* on strawberry plants. The presence of these or other exotic pathogens must be notified to the relevant plant health authority.

Key Facts

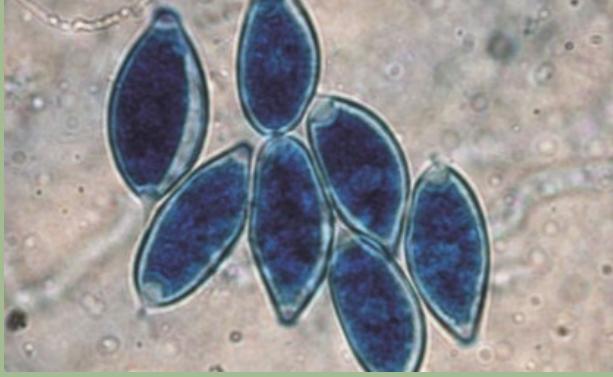
- *Phytophthora* is a group of funguslike plant pathogens
- They can infect all parts of the plant but usually attack the roots and stem base
- Symptoms are frequently first seen above ground e.g. wilting, discolouration of foliage
- They can survive in plant debris and soil for many years
- Spread may occur via movement of infected plants
- Contaminated soil, water, equipment and footwear may harbour the pathogen
- Good hygiene will help reduce risk
- Chemicals may be used to sterilise soil, standing areas, pots etc
- Protective and curative pesticides are available although most suppress symptoms

Symptoms

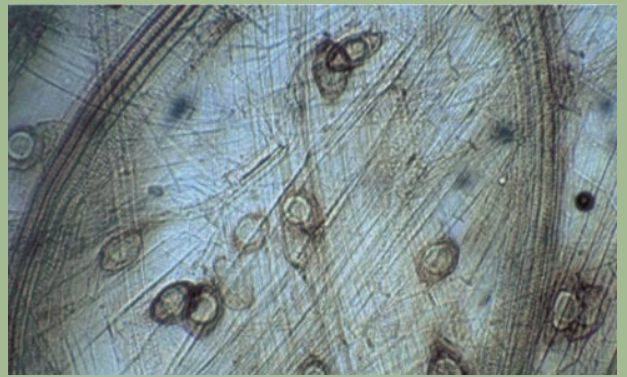
Roots and stem bases: Affected root systems are discoloured, decayed and lacking in fine, feeder roots. Scraping away the outer tissue of the stem base of a dying plant it may be possible to see an internal 'leading edge' of infection just above the soil or compost surface. The tissue above the leading edge will be healthy, but that below will be brown or reddishbrown.

Foliage: Foliar symptoms tend to appear when a significant proportion of the roots have been killed, or when the organism has invaded the stem base. These include wilting, shedding of leaves, dieback, and a gradual fading of colour from the foliage of plants such as conifers and heathers. Foliar symptoms occur as a result of problems with the uptake of water and nutrients from the diseased root system, and additional stress factors such as drought will hasten their onset. During the early stages of *Phytophthora* root rot there may be no obvious symptoms on the foliage so examination of the root system and stem base of affected plants is necessary. Some species may directly infect leaves causing dark brown to black water soaked leaf spots. The pathogen may progress down the leaf stalk and into the stem.

Stem lesions: Some species may directly infect stems causing brown to black water soaked stem lesions. These may result in wilting and aerial dieback but no stem or root death.



Sporangia



Oospores in root tissue

Biology

Phytophthora species are microscopic organisms. Although commonly referred to as fungi, they are now known to be more closely related to algae.

Phytophthora spreads by producing tiny spores called zoospores, which swim in water films and may be attracted by chemical exudates from the roots. Because the zoospores require water, the disease is always worse where there is poor drainage or water logging. The zoospores cannot swim far, but may be carried longer distances in drainage or run-off water. They may survive in reservoirs and storage tanks and their levels may fluctuate during the year. Fera has developed a range of tests for checking for *Phytophthora* in water.

Phytophthora species may also produce two types of long-lived resting spores known as oospores and chlamydospores. These are released as the roots decay and can contaminate soil, compost, standing areas, etc. Oospores in particular are capable of surviving for several years in the absence of a host plant.

Unfortunately, it is all too easy for infected plants to enter the supply chain unnoticed. As mentioned above, foliar symptoms may not be present in the early stages of the disease. In addition, most of the fungicides used against *Phytophthora* tend to check its development rather than killing it – once the activity of the fungicide has declined the progression of the disease may continue.

Diagnosis

Tests may include microscopic examination to look for characteristic fungal structures or may involve floating affected plant parts in a mineral solution to promote sporulation. Identification to species is more complex and may require isolation onto semi-selective media followed by morphological characterisation or could involve molecular tests. Fera has developed a range of species-specific assays in addition to employing more generic methods that check DNA sequence information to determine the species present. Fera has also developed rapid serological based field based kits that identify *Phytophthora* in plant material (available from Forsite Diagnostics www.forsitediagnostics.com).

Chemical control

A large number of disinfectants are available to treat standing areas, capillary matting, pots etc. These vary in their efficacy against *Phytophthora*.

Various chemical or non-chemical (e.g. steaming, solarization, biofumigation) methods can be used on infested soil. None are 100% effective and they will only penetrate to a limited depth. Plants can still become infected if the fungus is re-introduced into the treated area by drainage/run-off water or capillary action, or by the roots growing down beyond the treated soil.

A number of fungicides with activity against *Phytophthora* are available for use on ornamentals. Depending on the product, these can be incorporated into compost (and sometimes soil) or used as a drench. If in any doubt seek qualified advice.

Preventative measures

- Ensure that soils, growing media and standing areas are well drained
- Ensure that water used for irrigation is free from *Phytophthora*. Cover storage tanks to prevent contamination from soil and plant debris. Fera can test water for the presence of *Phytophthora*
- Consider the use of filters (e.g. slow sand filtration) or sterilisation (e.g. UV, chlorine) where water is re-circulated or known to be contaminated
- Use new pots, trays, etc. or at least treat any re-used items with a disinfectant
- Inspect bought-in plants. If possible, have a quarantine area where bought-in stock can be held and monitored for disease development for a few weeks
- When propagating, take cuttings from healthy plants only. Avoid taking cuttings of nursery stock close to the ground, as these could be contaminated by soil or compost containing *Phytophthora*