

Pythium Diseases of Ornamental Plants

Introduction

Closely related to *Phytophthora*, *Pythium* species also attack the roots and stems of a range of ornamental plants. Whilst generally less damaging than *Phytophthora*, *Pythium* can nonetheless be troublesome, particularly on seedlings, cuttings, bedding plants and pot plants. Larger shrubs and trees usually tolerate infection without any adverse effects. However *Pythium*, together with some other soil-borne fungi and nematodes, has been implicated in the problem known as replant disorder, where a plant performs very poorly when placed in soil that has previously grown a plant of the same species. Roses are affected most commonly by this problem, where it is also known as rose sickness.

There are more than one hundred different species of *Pythium*, but not all of these are plant pathogens. Amongst those found attacking ornamentals are *Pythium irregulare*, *P. sylvaticum* and *P. ultimum*.

Key Facts

- *Pythium* species are a group of fungus-like organisms
- Not all species are plant pathogens
- They can survive in plant debris and soil for many years
- 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. damping-off, wilting
- 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



Seedling damping off

Symptoms

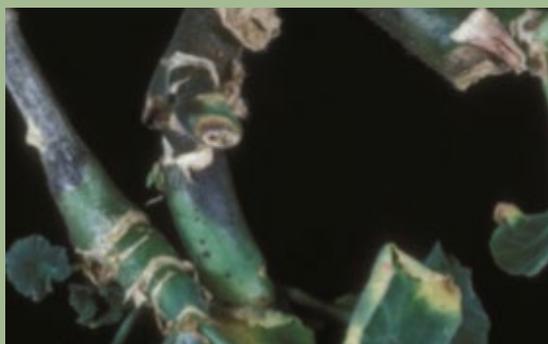
Pythium (together with *Rhizoctonia*) is a common cause of damping-off of seedlings. Damping-off may occur pre-emergence (resulting in gaps where the germinating seed has decayed) or post-emergence (where the seedling rots away shortly after it has appeared above soil level).

Pythium root rot may lead to the development of foliar symptoms, because the plant cannot take up enough water or nutrients through its damaged root system. The severity of these symptoms will therefore depend on the extent of the root decay. They may range from slight stunting and leaf yellowing to wilting and complete collapse of the plant.

Examination of the roots of an affected plant will reveal that they are brown and soft. In some cases the root cortex (outer tissue) comes away very easily, leaving the central stele (core).



Root and stem decay



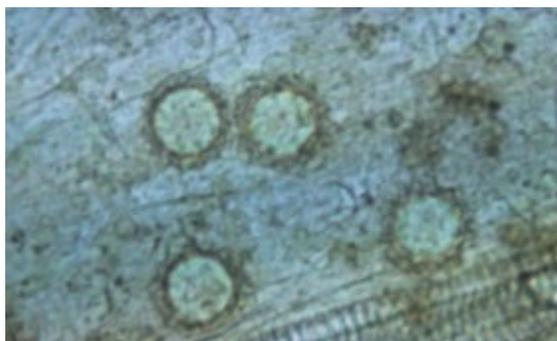
Pelargonium black stem rot

Pythium may also cause a soft decay of the stem base. The most spectacular example of this is black stem rot of *Pelargonium*, where much of the stem may be affected by a soft, dark, rapidly spreading decay.

Microscopic examination is usually required to see *Pythium*, but the organism is occasionally visible to the naked eye when the humidity is high, for example as a fine white or silvery growth over seedlings in a severe case of damping-off.

Biology

Like *Phytophthora*, some *Pythium* species produce tiny swimming zoospores, and the disease is therefore more damaging when the growing medium is overwet. *Pythium* also produces long-lived resting spores (oospores and chlamydospores). These are released from the decaying plant tissue and can contaminate most parts of a nursery such as floors, benches, capillary matting, danish trolleys, etc. Workers' footwear may also become contaminated, as may re-circulated irrigation water.



Oospores in celery roots

Where plants are in very close contact, *Pythium* can also spread from plant to plant as vegetative growth or mycelium. Rapid damping-off normally occurs due to this type of spread.

Both sciarid and shore flies can become contaminated with *Pythium* and spread the disease.

Diagnosis

Tests may include microscopic examination to look for characteristic fungal structures, or may involve floating plant material 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 increasingly could involve molecular tests. Fera has also developed rapid serological-based field kits that identify *Pythium* 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 *Pythium*. Various chemical or nonchemical (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 *Pythium* are available for use on ornamentals. Depending on the product, these can be incorporated into compost (and sometimes soil) or used as a drench. Check the product label for further application and crop tolerance details.

Preventative measures

- Ensure that soils, growing media and standing areas are well drained
- Ensure that water used for irrigation is free from *Pythium*. Cover storage tanks to prevent contamination from soil and plant debris. Fera can test water for the presence of *Pythium*
- 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 *Pythium*
- Dispose of *Pythium*-infected plants immediately and carry out rigorous hygiene measures to prevent further spread. Prevent run-off of water from infected to disease-free areas
- Avoid overhead irrigation where plants are affected by aerial *Pythium*
- There is anecdotal evidence of a reduction in disease levels through the use of compost teas or growing medium amendments (e.g. mycorrhizal fungi, composted bark or green waste). In most cases further research is required