

# Pythium

By David Reid

Pythium is a common problem in nurseries, so much so that some plant pathologists have called it the 'common cold' of plants. This fungus-like pathogen is fast growing and in the right conditions will reproduce rapidly, damaging roots and preventing nutrient and water uptake. This infection will cause poorly developed, diseased root systems, stunted growth and chlorosis, making the plant unsuitable for sale.

Whilst not all Pythium species are considered pathogens, the majority will cause stem rots, damping-off, seed decay, foliar blights and cutting rots. Classed as water moulds and having a presence in soil, media and aquatic environments, their ability to thrive under wet conditions, brought upon by poor drainage or excess irrigation, makes nurseries the ideal environment for them. Whilst having a wide host range, this pathogen should be of particular concern for those seedling growers, who are commonly affected by damping off during production, as they are extremely susceptible.

In addition to a preference for wet conditions, they will proliferate in the

presence of soluble salts in soils and soilless media. Reproductive success is heightened again with poor nursery hygiene; unclean tools, proximity to infected plants, reused pots/trays or almost certainly media reuse. Most species of Pythium also prefer temperatures that are unfavourable to root development and if growing in ground, poor crop rotation.

Root rot symptoms are generally restricted to juvenile or succulent tissues, and on older plant material, root tips and laterals are affected, whilst lignified (woody) tissue is generally not affected. After entering the plants root tips, it will proliferate in young cells, causing a black rot through the primary root and up into the stem tissue.

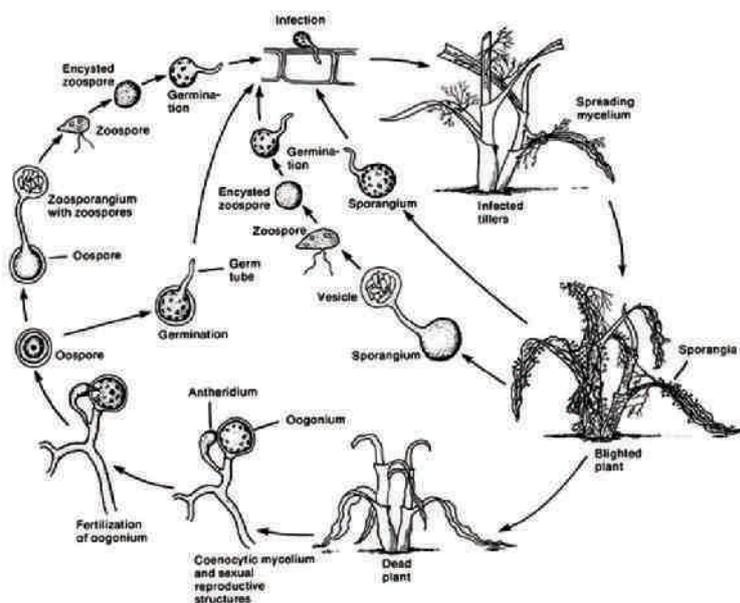
Spread into older roots is limited to the cortex, but ultimately an ongoing infection will cause rapid collapse and plant death.

Infection can often occur just below the root collar and in containerised stock, as the bottom of the pot can often remain wet. Pythium will find this as a perfect environment. It will infect a plant and colonise it by producing hyphae, which are filamentous threadlike cells that pull nutrients from a plant to spread further. When opposite mating hyphae meet they will produce tough, over-wintering, oospores, which can survive for years. These oospores will germinate when the conditions are right, producing more hyphae or it will develop zoosporangium, which in turn will produce zoospores that are motile (moving) in water. It's these zoospores that will swim until they find roots to infect.

## Pythium identification

Pythium root rot is easily confused with other fungi borne root rots such as *Rhizoctonia*, *Cylindrocladium*, *Fusarium*, *Aphanomyces* and *Phytophthora*. Identifying which species of Pythium has infected a plant is often dependent on temperature and host ranges, with some Pythiums' active only above 25°C.

Identifying Pythium can be difficult with a hand lense alone and will generally require isolation on an artificial media conducive to water moulds, followed by microscopic analysis.



Pythium life cycle. Image courtesy Grow Help, Queensland DAF.



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*Pythium root pseudobulb rot in orchid.*

While rapid diagnostic kits (similar to a pregnancy test) are available for *Pythium* and other common pathogens, it is important to note that *Pythium* can sometimes be a part of a pathogen complex. This pathogen may not be the primary cause of the plant's problem, but a secondary pathogen that's path of entry was aided by other issues. Lab diagnosis is always the best course of action for accurate identification.

- » *Pythium* root rots will make the roots appear water-soaked and the root cortex may easily slough off, leaving a white strand of vascular tissue or the stele. This characteristic however, cannot be used as a definitive answer to plant infection identification.
- » On the stems of cuttings, a soft, watery rot may develop and under wet and humid conditions a mycelial mat will form over seedlings.
- » Under microscopy, the key signs of infection will be the presence of round, thick walled oospores and zoosporangium in the cells of the plant root.
- » If the plant manages to survive a *Pythium* infection, the plant will have yellowing leaves and will be stunted in comparison with healthy plants. The lack of water and nutrients reaching the body of the plants is due to the now damaged root system.
- » The fine and colourless mycelial growth on the roots will not hold soil particles like *Rhizoctonia* will.

Accurately diagnosing this disease is essential so fungicide control is targeted; fungicides do not comprehensively treat all pathogens. Important to note is that if the soil or media dries out, new roots may be grown on the previously infected plant and the plant may never show overt symptoms of the disease, but may never reach its potential.

### Pythium vectors

The dominant methods of dispersal for *Pythium* zoospores, chlamydozoospores, oospores and mycelial fragments are:

- » Poorly managed media

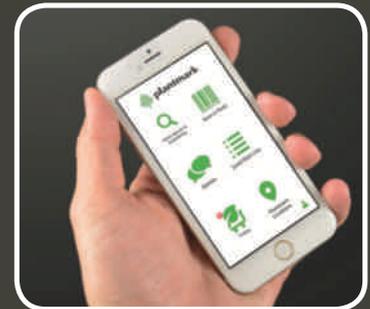


*Westringia* – healthy weeds at top indicate anoxic (no O<sub>2</sub>) environment.

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Petunia pythium root oospores x20



Petunia – roots



Petunia – closeup

Image courtesy Grow Help, Queensland DAF

- » Can be carried aerially on dust, so it is important to limit onsite dust movement
- » Untreated, recycled/dam irrigation water
- » Poor drainage in growing areas
- » Decaying plant material can release oospores and chlamydozoospores onto floors, trays, pots, benches, propagation equipment and footwear
- » Fungus gnats and shore flies have also been shown to vector *Pythium* within greenhouses.

## Management

Nursery hygiene is the first line of defence in excluding the pathogen from your nursery.

## Nursery hygiene

- » Regularly clean and disinfect all tools, trays, containers, equipment and benches
- » Carefully manage motherstock and remove any that appear to be affected by the pathogen
- » When taking cuttings ensure they are dry and taken away from the soil line
- » Remove any suspected infected plants from the nursery and disinfect/remove any associated containers or equipment.

## Media

- » Store media on a concrete surface that has drainage in place to prevent any run-off water entering the media bay
- » Source potting media from a supplier with proven pathogen risk management protocols i.e.: NIASA accredited supplier
- » Media with more than 70% holding capacity can increase the risk of infection

- » Peat/vermiculite mixes can be high in soluble salts that potentially damage roots, predisposing plants to infection (EC tests should be undertaken on water and media regularly).

## Irrigation/nutrients

- » Over-watering in combination with poorly draining soil or media will render plants susceptible
- » Ensure growth areas are free of water and have at least 75mm aggregate to promote drainage
- » Recycled irrigation water is commonly infected with *Pythium*, so it is essential that water is treated to minimise the risk of infection
- » Over-watering and overly moist soils will also encourage the proliferation of fungus gnats, vectoring *Pythium* throughout the nursery
- » An excess of nitrogen in over fertilised plants will suppress secondary metabolites or the plants defences and salt accumulation will also damage root tips, rendering them susceptible to infection

## Chemical control

- » Fungicide use for control is best used as a spot treatment or as a preventative approach, however application will rarely cure an infection alone and the pathogen may reappear
- » Incorporating granular fungicide into media is another option, however the continued use of chemicals in lieu of improved cultural controls can promote fungicide resistance
- » The use of biological control agents such as *Trichodermas* can provide some protection when pathogen pressures are low, however, if you are over-watering or using excess fertilisers their efficacy will be reduced significantly.

As with most nursery pest and disease issues, an integrated pest and disease approach is the preferred option for *Pythium* management. 🌱

## Further reading

Ken Pegg & Andrew Manners. *Pythium* species – A constant threat to nursery production

[http://www.ngia.com.au/Attachment?Action=Download&Attachment\\_id=1842](http://www.ngia.com.au/Attachment?Action=Download&Attachment_id=1842)



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