



# Phytophthora root rot in Forest Nurseries



Drooping needles on infected seedlings (top) which fade and eventually turn brown (bottom).



Discoloured tissue beneath the bark.

## Causal organism

The most common causal agents of root rot in forest nurseries are species of the oomycete genus *Phytophthora*. *Phytophthora cinnamomi* and *Phytophthora cactorum* are widely distributed in New Zealand. ***Phytophthora* spp. produce motile zoospores that require free water for dispersal.** Although young seedlings of many plant species are susceptible to infection, phytophthora root rot is seldom a problem in plantations in New Zealand.

## Diagnostic features

***Phytophthora* spp. infect the roots and basal stem tissue, preventing the uptake of water and nutrients by the plant.**

Infected plants exhibit a dry chlorotic appearance with pale drooped needles and wilting of the growing tip. Tissue beneath the bark at the base of the stem is discoloured and roots are dark brown.

## Prevention and control

*Phytophthora* spp. are extremely difficult to eradicate and high standards of hygiene should be maintained to prevent introduction of the pathogen into the nursery. In sites where the disease is a threat, cultural and chemical control measures are necessary to minimise the risk of disease development.

### Cultural Control

Prevent waterlogging of soil by ensuring that sites are well drained. Ensure that drainage is directed away from other vegetation. Avoid the spread of contaminated soil from affected areas by washing vehicles, machinery, and footwear.

### Chemical Control

Chemical control measures should be considered from seedling emergence until the end of May. In particular, it is important to protect seedlings before root pruning, since mechanical injury may facilitate infection. Some chemicals may become less effective after prolonged use. A selection of chemical options is listed in the table.

Active Ingredient	Fungicides	Rate	Recommended use (NZ Agrichemical manual)
Metalaxyl-M	Ridomil® Gold MZ WG	12-50 kg/ha	Apply before seedling emergence. Do not use where Ridomil products have previously been ineffective.
	Ridomil® Gold EC	4.2 L/ha	
	Max MZ™	25-100 L/ha	
Phosphorous acid	Foli-R-Fos® 400	5 L/ha	Apply to actively growing plants before first appearance of disease and repeat at 2 to 4 week intervals. Use as high volume spray ensuring complete coverage.
	Foschek™	5 L/ha	
	Phosgard™	5 L/ha	
	Agri-Fos® 600	3.3 L/ha	

**In recent nursery trials, one single application of Foli-R-Fos® 400, applied to radiata pine seedlings one week before root pruning, reduced root rot incidence by up to 99%. In the same series of trials, Ridomil products were ineffective when applied at seedling emergence but reduced root rot by up to 60% when applied at the maximum recommended rate during the root pruning period.**