

# Phytophthora: a major disease of ginseng in New Zealand



Phytophthora root rot and leaf blight of ginseng are diseases caused by *Phytophthora cactorum*. This pathogen which has caused major problems in the American ginseng industry since at least 1912, is considered the most serious disease of ginseng. It is a major problem worldwide, capable of wiping out whole crops. Many crops grown in New Zealand have become infected with Phytophthora with devastating results. In some cases, whole gardens have been lost to the disease.

## Pathogen life cycle

*Phytophthora cactorum* over-winters either as mycelium in the soil, diseased plant tissue, or as oospores that are resistant to both cold and drought. When conditions are favourable, the oospores produce sporangia, which can be spread either by wind or splashing water. Sporangia deposited on susceptible plant tissue penetrate and infect the plant. If conditions are sufficiently moist, mobile zoospores develop either on infected leaves or in the soil. The zoospores then infect susceptible roots, forming mycelia. The mycelia are capable of spreading through the soil, infecting nearby plants.

## Symptoms

Leaf Phytophthora on ginseng is caused by germinating sporangia. Symptoms first appear as water-soaked lesions on the leaf surface. The lesions then become thin, brown and dry and eventually, the infected leaves collapse. Initially, the symptoms are very similar to those of botrytis (see Crop & Food Research Broadsheet No 127).

The first sign that ginseng is infected with root Phytophthora is when the leaves of infected plants begin to wilt. This is the result of the pathogen attacking the plant roots, thus reducing water uptake. The leaves may also take on a reddish colour normally associated with nutrient deficiency. When infected roots are dug up they appear brown and the interior is creamy-brown with a cheesy texture instead of being creamy-white and firm.

Often soil will cling to the roots and be difficult to wash off. As the disease develops, the infected roots become soft and pliable. They develop an unpleasant smell and eventually disintegrate.

## Environmental conditions

Phytophthora is a fungus that thrives in wet conditions. Canadian research indicates that the disease is most severe when soil moisture is above 60% field capacity, or in situations where water is allowed to pool. The disease often starts along shade cloth drip lines and in New Zealand has caused problems for growers who have used large leafed plants such as kiwifruit for shade. Water tends to collect on the large leaves and then drip from the leaf tips, causing water to pool below.

The fungus is active at temperatures of 6°C and above, so Phytophthora rots can occur at any time during the growing season. However, early spring when it is most likely to be wet is a critical time. The disease progresses slowly in hot dry climates.

## Phytophthora control

### *Cultural methods*

Management of the beds to ensure free and easy drainage is essential. Soil ripping and bed formation are advised. Beds should be formed on free draining soil. Tile drainage may be required if drainage is a problem. Sites prone to waterlogging should not be used for ginseng planting. Do not establish ginseng beds over compacted soil. Construct the beds so that surface water can run off easily and try and put new beds above existing gardens so that spores from infected plants do not wash into uninfected new plantings.

Consider restricting the movement of machinery and people through ginseng beds when they are wet or when there is standing water that could be splashed onto plants. Equipment should be used in younger gardens first and washed down before being moved into another garden. Tools known to have been in contact with Phytophthora should be thoroughly washed in a dilute bleach solution.

Over-fertilization and plant overcrowding can both cause dense canopies to develop, which will maintain high levels of humidity around the crop, creating ideal conditions for the development of the disease.

Forest and organic gardens should be small and widely spaced to reduce the chance that Phytophthora will spread.

The disease can spread rapidly, so one of the best control mechanisms is regular and thorough monitoring of ginseng gardens.

### *Chemical methods*

The integrated use of the fungicides fosetyl-Al (Aliette®) and metalaxyl (Ridomil®) is recommended for Phytophthora control in Canada. Remember that no fungicides are currently registered for control of Phytophthora rots on ginseng in New Zealand.

For prevention, Canadian recommendations suggest applying Ridomil 2G at 31.25 kg/ha with the first application made before ginseng emergence. In Canada, the application is repeated twice during the season at 4 to 6 week intervals depending on the weather. Ridomil should not be applied within 9 days of harvest and not more than three times during a season. Aliette at 5.5 kg/ha in 900 litres of water should first be applied between the first two Ridomil applications. The applications are repeated up to three times during the season with the last application prior to senescence when 50% of the foliage is still green. Canadian recommendations suggest that Aliette should not be applied within 30 days of harvest or more than five times in one season. It is important to ensure that accurate application rates are maintained and good spray coverage is achieved.

In the past, Phytophthora was successfully controlled by first removing and destroying infected plants and then all plants within a 1 metre radius of the infected area. This area was then drenched with Ridomil and the rest of the garden sprayed with Aliette.

In the USA, the fungicides mancozeb (Dithane®) and iprodione (Rovral®) are also used for the control of Phytophthora.

## Further reading

Davis J.M.; Shoemaker P.B. 1999: Ginseng Disease Control – Phytophthora and Alternaria. *Horticultural Information Leaflet No. 132*. North Carolina State University, North Carolina.

Anon. 1999: Ginseng Pest Control Recommendations 1999 – 2000. *Publication No. 610*. Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario.

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