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Potato cyst nematode

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For many years, Australia has been the only large land mass in the world in which potato cyst nematode had not been found. However, in 1986, potato cyst nematode was found on four properties at Munster 10 km south of Perth, Western Australia.

Potato cyst nematode is a minute worm-like organism which attacks the roots of several plant species including potatoes, causing very high yield losses. It is a very serious pest of potatoes throughout the world and strict quarantine controls are enforced in countries and potato-growing areas free of the nematode.
Distribution

Potato cyst nematode probably originated with the potato in South America. It is now widely distributed in many potato-growing areas (Figure 1). Its main host is the potato, but it can also reproduce on other solanaceous crops such as tomato, capsicum and eggplant.

Life cycle

One life cycle is completed with each crop (Figure 2). Between crops, eggs survive in cysts in the soil. When a potato plant is growing, substances exuded by the roots stimulate the eggs to hatch. Each egg contains a second-stage larva which hatches, moves from the cyst into the soil and penetrates a host root just behind the root-tip. The larva establishes a permanent feeding site in the root and develops to become an adult.

Males leave the root and move through the soil. Females remain in the root, expanding and eventually rupturing it, but remaining attached by the head and neck only. After fertilization by the male in the soil, the female produces 300 to 500 eggs which she retains within her body. The female dies with the root, but her skin hardens and tans forming a protective cyst for the eggs.

There are two species of potato cyst nematode. Females of *Globodera rostochiensis*, the golden nematode, turn golden before becoming dark brown. *Globodera pallida*, the pallid nematode, remains white for longer before turning brown. The outbreaks in Western Australia have been of the golden nematode only.

Effects of potato cyst nematode

Low populations of the nematode may not be noticed. On one of the four quarantined properties, the number of nematodes was very small. On another property, no damage was obvious though counts indicated 70 eggs per gram of soil. On the other two quarantined properties, with as many as 200 eggs per gram of soil, root growth was inhibited so that plants were stunted, leaves were smaller and yellowish and the plants senesced earlier. Yields may be reduced by as much as 90 per cent, the result of smaller tubers. However, numbers of tubers and their other qualities are not affected.

Containing the pest

Where potato cyst nematode has been detected, the Department of Agriculture has immediately quarantined properties on which the crop was found. No soil is allowed to leave the site on machinery, footwear, bins, or by any other means. No solanaceous crop will be allowed to be grown on the infested areas until further notice. The infested crop is either sent for processing or destroyed by deep burial.

The four properties on which potato cyst nematode has been discovered and associated land have been fumigated twice with 500 kg/ha metham-sodium at Government expense. The search for potato cyst nematode is continuing. All potato crops in the State are being surveyed at maturity for the presence of potato cyst nematode on the roots, using the “forking” method developed in New Zealand. This method requires that one plant on each corner of a 10 m by 10 m grid be dug and its roots examined for white cysts. So far, no more infestations have been found.
Control

The most effective step that the industry can take now is to ensure that the nematode does not spread to "clean" areas. To achieve this, soil contaminated by nematodes must not be allowed to spread via seed, machinery, potato bins, vehicles or footwear.

The Department of Agriculture has started action to eradicate the nematode by fumigation and quarantining of affected sites. Fumigation should greatly reduce the numbers of the nematode, but cannot be guaranteed to kill them all. This means that affected properties will need to be kept free of solanaceous hosts until no more live eggs can be detected.

The nematode may also be present in some adjacent properties. If so, further frequent potato cultivation on these farms will eventually result in patches of unthrifty crop appearing. However, restricting potato crops to not more than one in every four years, plus the application of a nematicide before planting, should (according to information from New Zealand experiments) prevent this occurring. Between potato crops, it will be essential to control regrowth of self sets and other solanaceous hosts if a true four-year rotation is to be achieved.

Figure 2. Life cycle of potato cyst nematode

Crop damage caused by potato cyst nematode.