



Potato cyst nematode

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Common name

Potato cyst nematode, PCN, potato root eelworm or golden nematode.

Scientific name

Globodera rostochiensis (Woll.) Skarbilovich. Previously named *Heterodera rostochiensis*.

Introduction

Potato Cyst Nematode (PCN) is a serious pest of potatoes world-wide and is subject to stringent quarantine and/or regulatory procedures wherever it occurs. PCN can be a devastating pest of potatoes in temperate regions if not controlled.

It was introduced into Europe from South America in the mid-1880s and was first discovered in Australia in 1986 at Munster in Western Australia. PCN was first found in Victoria in 1991 on potato crops in market gardens in the Wandin-Silvan area and subsequently in several other areas.

There are two species of PCN, *Globodera rostochiensis* and *Globodera pallida*, but only *G. rostochiensis* is known to occur in Australia.



Figure 1. Symptoms of PCN infestation in a Victorian market potato crop. Plants on the left-hand side are stunted due to a heavy infestation of PCN.

Symptoms

Infested plants are stunted and may wilt, leaves may yellow or display a dull colour. Affected plants have a reduced root system which is abnormally branched and brownish in colour. At flowering or later, minute-white, yellow or brown spheres or cysts, about the size of a pin head (0.5mm), can be seen on the outside of roots.

Damage to the crop varies from small patches of poor growing plants to complete crop failure. Diseased plants first occur in isolated patches and these become larger with each new crop if potatoes are continually grown on the infested site. In light infestations, potato plants may show no above ground symptoms, but yield can be reduced. Light infestations can reduce tuber size, whereas heavy infestations reduce both number and size of tubers. PCN is not greatly influenced by soil type and temperature because the nematode thrives wherever potatoes are grown.

Description

Nematodes or eelworms are small worm-like organisms, less than 1 mm in length, which inhabit soil and attack plant roots. The cysts of *G. rostochiensis* (golden nematode) are white, yellow or golden in colour when they first form on roots (immature cysts) and become tan brown in colour when they mature.



Figure 2. PCN infested potato roots under high magnification. The cysts (small-yellow spheres) are the tanned remains of female nematodes which are the size of a pin head.

Biology

This organism survives in soil in the absence of a host as cysts which are the tanned remains of dead female nematodes each containing hundreds of eggs (up to 400). Each egg contains a curled-up juvenile nematode.

Immature nematodes or larvae emerge when eggs hatch under favourable conditions. Hatching is stimulated by chemicals leaking from potato roots. The juvenile nematode moves between soil particles and locates and invades potato roots. Once inside the root, the nematode punctures the plant cells and feeds with its needle-like stylet. Feeding induces changes in the plant root cells which become abnormally large.

Nematodes which establish feeding sites on the roots become sedentary females and progressively enlarge, rupturing the outer root tissue. Slender, male nematodes leave the roots and mate with females which now only have their heads embedded in the root and the lower parts of their bodies exposed. Once fertilised eggs develop inside the females which die about the same time as the potato crop flowers becoming the white cysts on the outside of the roots. When potato plants are lifted, the mature cysts drop off and remain dormant in the soil until further crops of potatoes are grown. In general, only one life cycle occurs on each growing crop and takes from 38-48 days to complete.



Figure 3. Mature PCN cysts as they appear after being extracted from soil. Each cyst is the size of a pin head.

Survival

Cysts containing viable eggs can survive in soil which has not been planted to potatoes for up to 20 years.

Dispersal

PCN is a soil-borne pest and is spread by transport of infested soil. For example, cysts can be carried in soil adhering to seed tubers, farm machinery, implements, boots, bins and plants, particularly bulbs. Cysts can also be transported by wind and flood water. In very rare cases in heavily infested crops, PCN cysts can develop on the potato tubers themselves.

It can take 20 years from the time PCN is introduced into a country before it is detected, and it takes approximately 6-7 years from its introduction into a potato paddock before numbers of the nematode reach a detectable level.

Locally, PCN is usually dispersed by farming activities, eg sharing farm equipment contaminated with infested soil. PCN has spread with the trade in new potato cultivars into the major potato producing regions of the world.

Host range

Potato (*Solanum* spp.), tomato (*Lycopersicon* spp.), egg plant (*Solanum melongena*), and some solanaceous weeds. Although the preferred host is potato, PCN can also infest tomatoes and other solanaceous plants, including the nightshade weed. Thus populations of nematode can build up in the soil as long as solanaceous crops are grown.

Control

PCN is difficult to control because the eggs and juveniles in the cyst are protected from desiccation and chemicals and remain dormant for many years in the absence of hosts. It is only when eggs hatch that the nematode can be controlled with nematicides.

Crop rotation is an effective and practical means of control. However, rotations of up to 10 years are necessary to reduce populations.

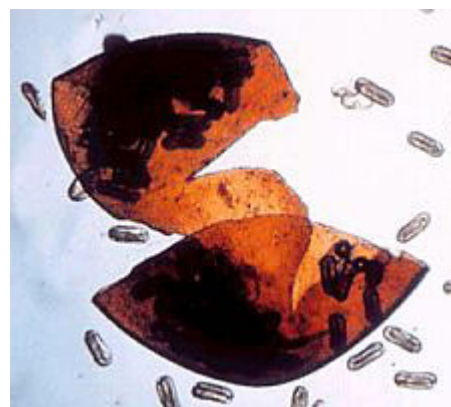


Figure 4. PCN cyst crushed open to reveal hundreds of eggs. Inside each egg is a juvenile nematode ready to hatch.

So far, only one type of PCN has been discovered in Australia (pathotype Ro1 of *Globodera rostochiensis*).

There is good resistance to this form of the nematode in the potato cultivar Atlantic. If Ro1 is the only pathotype present and in low numbers, then continually planting Atlantic for 7 years will be as effective in reducing the nematode population as treating soil with nematicides.

However, if the other PCN species is present, or if other pathotypes are present, then they will increase and become a major problem if Atlantic is used continually.

The best way to control the spread of PCN is to:

- Plant certified seed potatoes (certified seed potato crops are surveyed for the presence of PCN).
- Practise crop rotation.
- Avoid sharing farm machinery or implements.
- Avoid using second-hand containers which may contain infested soil.

- Avoid spreading soil from potato graders onto potato paddocks.
- Examine your crops for patches of poor growth, especially areas in a paddock where weeds have invaded.

Correct diagnosis is essential for effective pest and disease control.

For further information phone Crop Health Services on (03) 9210-9356 or fax (03) 9800 3521.

For further information on registered chemicals, phone DPI's Chemical Information Service.

Acknowledgment

Original author: Jillian Hinch, Plant Sciences and Biotechnology, La Trobe University, Bundoora, previously edited by Kathy Pullman.

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