



Photo: CSIRO Land & Water

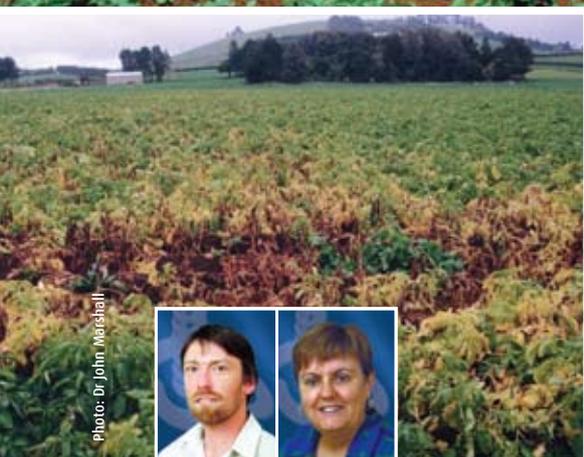


Photo: Dr John Marshall



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Potato cyst nematode in Australia

Healthy crop: A commercial potato crop with no signs of Potato Cyst Nematode. **INSET Paddock symptoms:** This crop, growing in New Zealand, shows typical symptoms of PCN infestation.

At a glance

- Potato cyst nematode (PCN) is widespread throughout the world, but it is not everywhere.
- PCN is regulated for quarantine and spread even in countries where it occurs.
- PCN will grow on tomatoes, eggplant and some weeds as well as potato. It can be spread by infected soil or contamination of ornamentals and root crops.
- PCN could cost Australian agriculture \$370 million in total during the next 20 years. Victorian farmers currently face a decision on how to proceed in dealing with PCN. In Western Australia, eradication appears to have been successful but final confirmation is pending.

Potato cyst nematode is an expensive problem throughout the world and efforts to control its spread affect the movement of produce in 106 countries. Widespread use of resistant potato varieties and nematicides means that major crop losses are now rare, but future control is still a vexed issue.

Nematodes may be tiny worms but some of them can cause big problems. One of these is the potato cyst nematode (PCN). Potato plants infected with PCN first occur in isolated patches which become larger with each new crop. Infested plants flower late, are stunted and may wilt. Leaves often yellow early. As infestations increase, production becomes affected. PCN can survive in soil for many years in the absence of hosts.

A worldwide problem

Everywhere in the world where it has become established, PCN has become an expensive problem, causing either major crop losses or costing considerable time and money in control regimes. In the last global survey, PCN was present or widespread in 23 countries and had restricted or limited occurrence in another 42. But, it has not been reported from 130 other countries.

PCN was first discovered in Australia during 1986, in Western Australia, then separately in Victoria during 1991.

Of the top 30 countries that Australia exported potatoes to in the last 10 years, mostly in nearby Asia, PCN was absent from 22, restricted in four and widespread

in four. PCN has implications for exports of many types of produce, especially to countries free of this pest, because PCN may be transported with many different commodities in soil.

Because of worldwide concern about PCN, Australian farmers need to be aware of the issues surrounding it. The number of countries regulating movement of produce because of the risk of PCN has doubled to 106 in the last 20 years. Even countries where PCN is widespread control the movement of produce to minimise further spread. In Europe, new regulations have just been implemented which increase testing and control over spread of PCN through the movement of potatoes and contaminated farm machinery.

PCN affects more than potatoes

When a PCN infestation is found, not just potato farmers are affected by the resultant quarantine. Anything that comes from soil which might contain PCN, such as ornamentals, root crops and machinery, is also affected. Many countries treat pest threats on a national basis unless evidence is presented otherwise. So, for Australian farmers, if PCN is present in one state, then produce from the entire country is regarded as potentially infected. That is unless it can be demonstrated that there are effective measures in place to prevent any spread from that affected state to the rest of the country.



Economic costs of PCN

While major crop losses overseas are now rare, this is only because of major expenditures on testing, resistant varieties and nematicides. In England, farmers spend an estimated \$100 million annually to protect the investment in their crop.

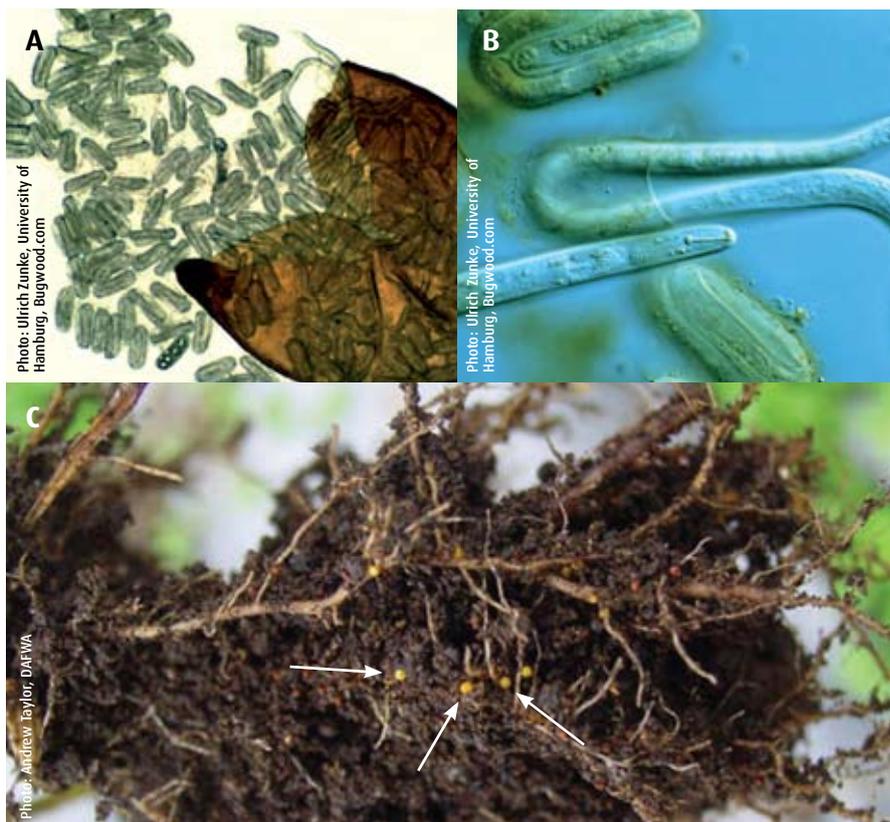
Economic modelling shows that the cost of PCN to Australia will be about \$370 million in total over the next 20 years if it becomes widespread.

Many Victorian farmers feel their only option is to manage PCN as it is too widespread to eradicate or contain.

But in reality, its distribution in Australia is currently unknown and the options available to potato growers will not be clear until this is known.

Population build-up

Overseas, it has often taken about 30 years for a newly-arrived pest nematode to adapt to local conditions, build up abundance and become recognised as a pest. This seems to apply to many different pathogenic nematodes, not just PCN. In the case of PCN in Australia, therefore, the processes



Cysts and eggs: The mature brown cysts (A) contain several hundred eggs — juveniles (B) hatch from the eggs, they penetrate the roots, feed and develop into swollen females whose bodies erupt through the root surface and appear as pinhead sized cysts (C).



of adaptation and population build-up could take some time.

PCN hails, like the potato, from the high Andes in South America where many factors including the soils and climate are different from Australian potato growing areas.

In Australia, the Victoria incursion of PCN was found 17 years ago. This means that Victorian growers still have a window of opportunity in which to deal with the nematode before numbers begin to increase rapidly and PCN becomes widespread.

But, if nothing is done, many people, not just in Victoria and not just in the potato industry, will be affected.

Economic modelling suggests that PCN could cost Australian agriculture up to 27 million dollars a year.

Eradication or control?

Western Australia and countries such as Israel, USA and Canada have chosen to eradicate PCN, and have instigated strict measures to facilitate this. In WA, the eradication appears to have been successful, but final confirmation is still pending. Victorian growers are currently faced with several options:

- To prevent the spread of PCN — limited success to date.
- Minimise the impacts where it is already present — the strategy used mostly in the EU.

- Eradication — possibly the best and cheapest option.

The widespread implications of a PCN infestation raises the possibility that those most affected need to be helped by those who will be affected later if the problem is not addressed.

This sort of compensation is happening in Idaho, USA.

While eradication has been successful in some places, the benefit of these eradications has yet to be calculated. But, an indicator is the recent eradication of another exotic pest nematode near Melbourne which had a benefit to cost ratio of about 10,000 per cent.

One important point is that the longer eradication is left, the more costly it becomes.

It needs to be stressed that an important first step in any eradication programme is identifying the national distribution of PCN. This has already begun as part of the emergency response to the finds in Victoria. It is also essential to understand PCN biology under local conditions, such as Australian populations under Australian conditions and how PCN spreads. The latter will help prevent it spreading during eradication.

Once this information has been collected, eradication can begin. This means using all the tools available. These include:

- Nematicides (chemicals that kill nematodes).
- Trap crops to induce PCN out of its protective cyst but not let it reproduce.
- Weed control to ensure there are no alternative hosts.
- Biofumigant crops to reduce soil populations.
- Seed certification.
- Resistant cultivars, although these have to be managed carefully to prevent nematodes overcoming the resistance.

All of this needs to be backed up by regulation and commitment to achieving the outcome. The USA has aimed to use a combination of these methods to eradicate PCN in Idaho in seven years. Armed with the right knowledge, Australian potato growers should be able to achieve the same result. 

CSIRO research

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