

Managing Potato Cyst Nematodes in a changing environment

Vivian Blok, Mark Phillips & John Jones

PPI Programme, Scottish Crop Research Institute, Invergowrie, Dundee, DD2 5DA



Introduction

- Potato cyst nematodes are an introduced pathogen, originally native to South America
- They cause damage valued at £50 million each year in the UK (right)
- Further spread of PCN is occurring, with infestations identified in Ukraine and Idaho



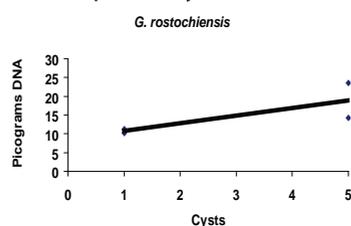
Management of PCN

- Two species of PCN are present in the UK - *Globodera pallida* (white) and *G. rostochiensis* (yellow).
- *G. rostochiensis* can be controlled with the H1 natural resistance gene but no single major gene is present that controls *G. pallida*. *G. pallida* is now the major problem in the UK.
- Control of *G. pallida* requires integrated management using partially resistant clones (developed at SCRI) coupled to long rotations and use of nematicides
- SCRI has helped develop a PCN management model to aid decision making by growers.
- Many nematicides are now being withdrawn, meaning that alternative control strategies are needed



New EU Directive on PCN control

- Land used for production of seed potato must be free from PCN
- A new EU directive on PCN control comes into force in 2010; one aim is to harmonise soil sampling rates for PCN across the EU. This will mean significant increases in the numbers of soil samples that need to be processed.
- Currently, soil samples are inspected visually.
- SCRI and SASA have developed a new quantitative PCR based diagnostic that can process large numbers of samples reliably and inexpensively.

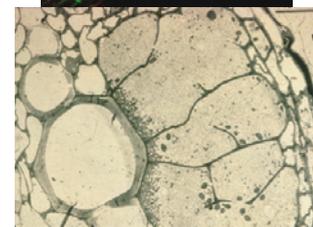
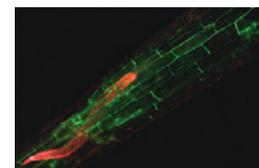


Sequencing the PCN genome

SCRI is a partner in a consortium that has received funding to sequence the genome of the white species of PCN *G. pallida*. The sequencing will be done at the Sanger Centre - the same UK institution that sequenced the human genome.

PCN has complex, biotrophic, interactions with its hosts. The genome project will provide information on how PCN:

- Locates and migrates through its host
- Establishes the feeding structure on which it depends for the nutrients required to develop to the adult stage
- Suppresses host defences throughout its development



In addition to providing scientific advances this project will have numerous practical outputs:

New nematicides

Knowledge of nematode genes and enzyme pathways will provide new targets for chemical control

Understanding of host-parasite interactions

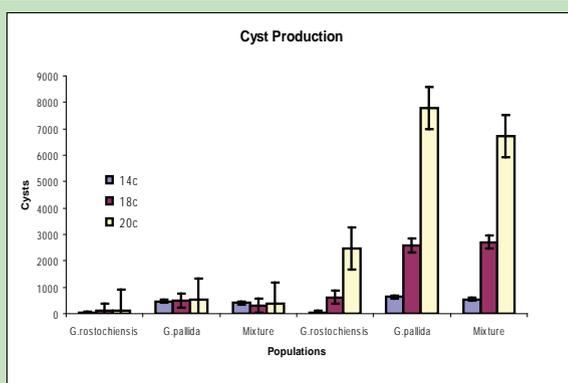
Better knowledge in this area will underpin GM strategies to control PCN and other cyst nematodes

Knowledge of how PCN interacts with natural enemies

To assist development of biocontrol strategies

Improved pest management

Based on a better understanding of dormancy and the molecular basis of resistance breaking by nematodes



The diagnostic test can also be used to monitor PCN under varying conditions.

SCRI have examined how nematode populations change under different potato genotypes and at different temperatures

Alarmingly, tests have shown that at increased temperatures two generations may occur with huge increases in nematode numbers.

These results have implications for management of PCN in the event of changes in the Scottish climate