

PCN – Sampling and laboratory guide



Introduction

An infestation of Potato Cyst Nematodes (PCN) is one of the most damaging pest problems facing our industry. Estimated annual yield losses could cost the sector as much as £26m. In a 2016 survey, 48 per cent of potato fields tested showed the presence of PCN.

Sampling and lab testing are vital, as, at low levels of infestation, no symptoms are seen in the field.

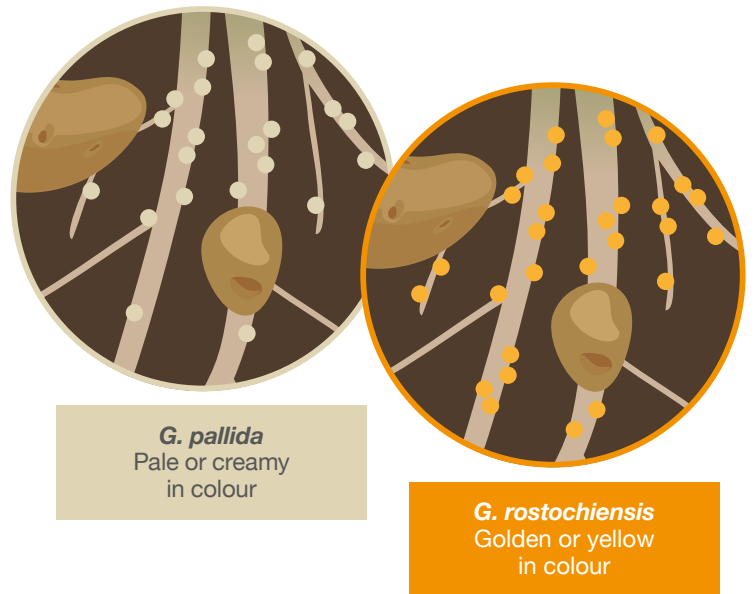
If infestations are allowed to thrive, they can be difficult to manage. The first visible signs are usually patches of stunted crop with weak vigour.

Different varieties of potato react differently to infestations of PCN. Each has a different level of resistance, the ability to restrict the reproduction of the pest, and tolerance, the ability to produce tubers while attacked by the pest, and these are not necessarily linked.

There are two different species of PCN. *Globodera pallida* (*G. pallida*), with pale coloured females and *Globodera rostochiensis* (*G. rostochiensis*), with golden coloured females, though these colours are only seen on recently emerged cysts.

Sampling and testing will not only tell you if PCN is present, but will also allow you to discover what species is present in the soil. This information, coupled with that of the resistance/tolerance of the varieties available to grow, is vital for the effective management of PCN.

This document provides a step-by-step guide to the sampling and testing process. If you have any further questions please contact your agronomist/advisor or your AHDB Knowledge Exchange Manager.



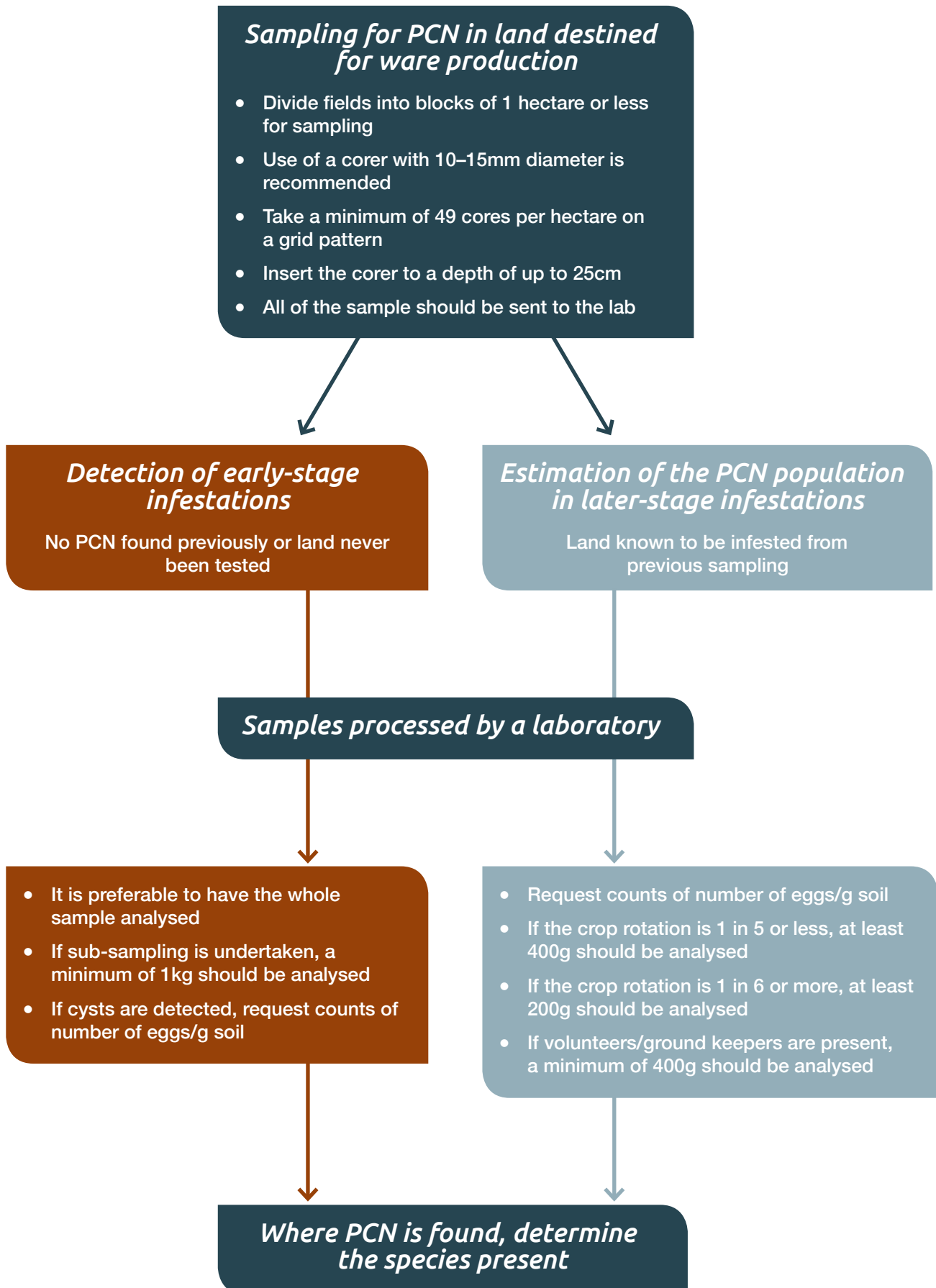
Sampling prior to seed crops

There are statutory regulations covering soil sampling for PCN in fields selected for potato seed production. 2010 saw the introduction of the new arrangements as a result of the implementation of Directive 2007/33/EC. It is a requirement of the Seed Potato Classification Scheme (SPCS) that all crops entered for inspection must be grown on land for which a PCN clearance certificate is in force at the time of planting. Issued by SASA in Scotland (see www.sasa.gov.uk/seed-ware-potatoes/nematology/soil-testing) and APHA in England and Wales (see www.gov.uk/guidance/the-seed-potato-classification-scheme).



'Resistance' and 'tolerance' to PCN attack, these are different and not linked to each other

Sampling for ware production

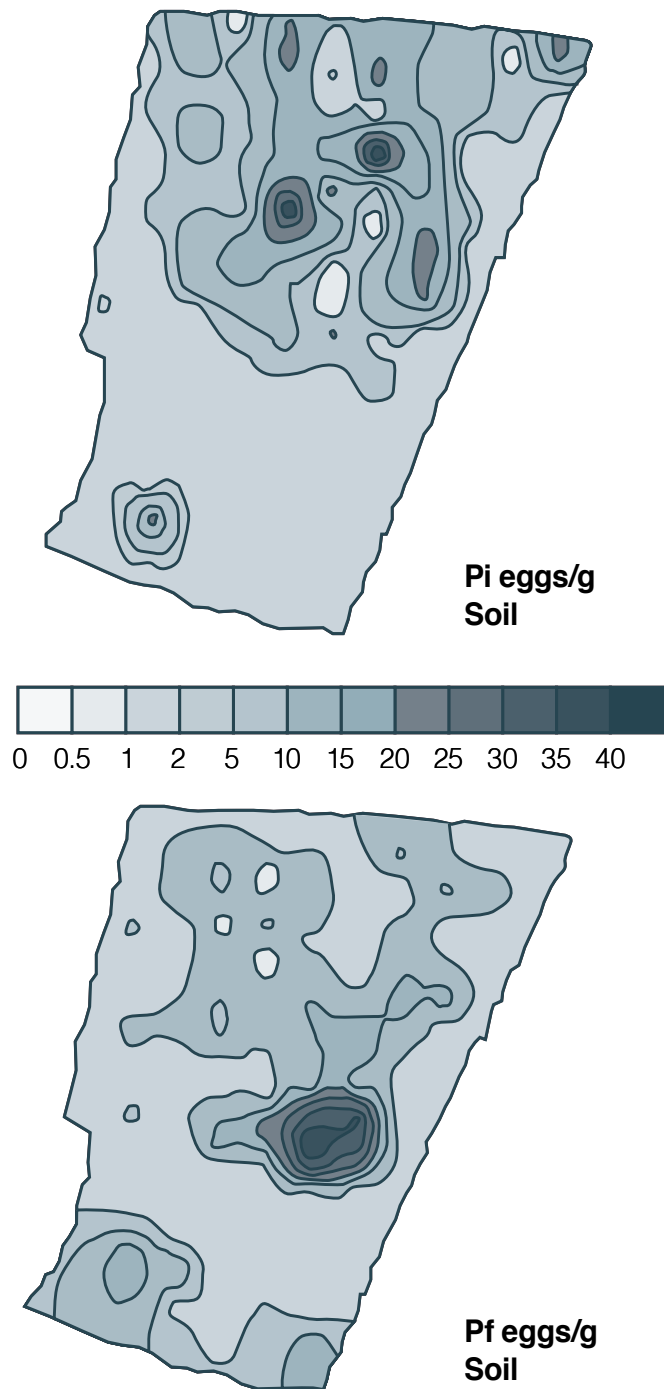


Sampling process

Distribution in the field

The distribution of PCN across a field is neither uniform nor random. Following initial infestation at one or more points, the focus spreads in a patchy manner, giving rise to secondary foci. Figure 1 illustrates both the variation common within a field and the way it can change over a season.

Foci, known as hot spots, are often elliptical in shape and spread in the direction of mechanical operations. Digital mapping using drones to record canopy development can indicate patches of a field with low vigour. Such areas often prove to be PCN foci.



Sampling: why, when and how?

The Nematicide Stewardship Programme (NSP), with AHDB support, has developed standardised protocols for land destined for ware production.

It is critical to sample soil from fields prior to planting. Effective management relies on knowing if PCN is present and, if it is, at what population density and what species.

Testing post-harvest also permits the efficacy of control measures to be assessed. However sampling can take place at any time and counts will be more reliable if samples are taken once several cultivation operations are completed after potato harvest. This ensures mixing of cysts within the soil profile.

When to sample

Historically, sampling has been done in autumn/winter, immediately before potato cropping. However, to enable rotations to be planned well in advance of potato planting, sampling can be done at other times within the rotation.



Even when all the above precautions are taken, there are still errors inherent in sampling, so it is long-term trends and yields that provide growers with the best picture for cropping decisions in any particular field.



An ATV with equipment for soil sampling for PCN

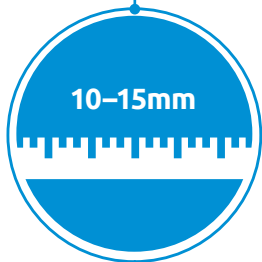
Figure 1. PCN egg numbers before (Pi) and after (Pf) a crop of potatoes in a 10.5ha field where the upper part of the field had been treated with a fumigant nematicide

Field protocol – How to sample:

Whether the land was sampled previously and no PCN cysts were found, or there is an unknown history of PCN, or even if PCN is known to be present – the sampling protocol is the same. Here's what to do:



Divide fields into blocks of one hectare or less for sampling



Use of a corer of 10–15mm diameter as recommended*



Take a minimum of 49 cores per hectare on a grid pattern**



Insert the corer to a depth of up to 25cm*

*Sample volume: If a corer of 13mm diameter is inserted to 20cm at 49 cores per ha, this will generate about 1.34L soil, equating to approximately 2.2kg in a mineral soil.

**W pattern: Sampling in a grid will give you the best chance of finding a PCN infestation, due to the irregular distribution in the field. Using 'W' sampling pattern is quicker, if you chose to use this method – ensure that your 'W' travels across the direction of cultivation, rather than with it.



G. rostochiensis eggs under the microscope

Laboratory process

What happens at the lab?

Laboratory testing for PCN is relatively inexpensive, in comparison to the money saved by catching an infestation early, costing in the region of £40+VAT for a single test (January 2018 estimate).

Responding to requests raised by growers, AHDB worked with NSP to provide more information on the approaches to be taken in the laboratory to process the samples:

Detection of early stage infestations

The entire sample must be processed, as any sub-sampling will reduce the chance of detecting cysts in the sample. For example, mathematical modelling indicates that processing 1500ml soil when there are 5 million cysts per ha results in a 72 per cent chance of detecting PCN, while, if only 400ml soil is processed, the chance is reduced to 32 per cent.

Estimation of PCN population in later stage infestations

This applies when PCN is known to be present and the requirement is to estimate the number of eggs/g of soil so management decisions can be made.

In such cases, increasing the size of the sample processed by the laboratory will reduce the margin of error. The minimum soil sample size that should be processed by labs is:

- If the crop rotation is 1 in 5 or less, at least 400g should be analysed
- If the crop rotation is 1 in 6 or more, at least 200g should be analysed
- If volunteers/ground keepers are present, a minimum of 400g should be analysed

Count the number of eggs, rather than simply the number of cysts and identify the species present.

What action to take

The results from soil tests will affect the development of an integrated pest management strategy. It is important to know the species of PCN present (*G. pallida*, *G. rostochiensis* or both). Varieties differ in their resistance and tolerance to the two species. More information is available in the AHDB Potato Variety Database. Results from your soil tests should be discussed with your agronomist/advisor.

In the past, a range of threshold levels of infestation were recommended for different forms of control. Given the evidence that PCN can multiply from population levels that are not detected, to highly damaging levels in one susceptible crop, even the slightest infestation should be taken seriously.

1 Do you have PCN?

2 Know the type of PCN you have

3 Know how the varieties of potato you grow will behave

4 Talk to your agronomist (or AHDB) about a PCN management plan

You can find out more about PCN on the AHDB Potatoes website: potatoes.ahdb.org.uk



Taking a soil sample for PCN. Note that you can only use a very small proportion of the field soil in a sample



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