

Work Package 7: Integrated Pest Management



This work package is being led by Eric Anderson from Scottish Agronomy.

- Potato Cyst Nematodes or PCN are an important pest of potatoes and across Europe, PCN can reduce potato yields and quality.
- In Scotland, the PCN infested land area is doubling every 7 years¹.
- With chemical control options decreasing and an increasing emphasis on environmental impact, integrating different approaches is required to effectively manage pests (and diseases).
- For PCN, this currently includes using resistant varieties, controlling groundkeepers, applying nematicides and maintaining a longer rotation between potato crops.
- Other techniques such as trap cropping and biofumigation are used in the UK and abroad, but these are not yet widely used in Scotland.



Figure 1: Trap crops growing in a field (courtesy of Scottish Agronomy Ltd)

What is IPM?

Integrated pest management (IPM) is a whole farm approach to managing the land, maximising the efficiency of production whilst minimising negative effects on the environment. Reduced reliance on pesticides can be achieved by minimising pest, weed and disease risks through various approaches such as efficient use of chemical inputs, appropriate cultural controls, and enhancement of wildlife habitats².

Aim

To develop novel IPM tools, namely the use of trap crops and chitinous soil amendment as non-chemical control options for PCN.

Two new IPM approaches are being investigated in this work package:

1. **Trap crops**
2. **Chitinous soil amendment**



Figure 2: *Solanum sisymbriifolium* (courtesy of Scottish Agronomy Ltd)

Trap crops reduce PCN populations by stimulating the eggs within the cysts to hatch in the absence of potatoes. Once emerged, the juvenile nematodes are unable to create a functioning feeding site on the trap crop roots and their lifecycle is cut short. This reduces the number of cysts remaining in the soil to infect susceptible potato crops.

The project will identify the agronomic requirements of trap cropping and develop best practise guidelines working closely with a team at Harper Adams University which are running similar trials.

¹https://www.planthealthcentre.scot/sites/www.planthealthcentre.scot/files/2021-04/pcn_working_group_-_final_report.pdf

²<https://www.gov.scot/policies/agriculture-and-the-environment/pesticides/>

Three promising *Solanaceous* trap crop species include:

Solanum sisymbriifolium (sticky nightshade)

Solanum scabrum (Kenyan broadleaved nightshade)

Solanum chenopodioides (whitetip nightshade).



Figure 3: *Solanum scabrum* berries (courtesy of Scottish Agronomy Ltd)

Chitinous soil amendment is comprised of the shells from **shellfish** combined with wood chips. The application of chitin can **shift the soil's microbial balance** in favour of organisms which naturally **suppress chitinous pests**. **PCN cysts**, which protect the nematode eggs, **are chitinous** therefore an increase in soil microorganisms which can feed on chitin will **reduce the population of PCN**.

Potential benefits

- Chitin is a naturally occurring compound and has no detrimental effects on soil structure or other organisms.
- 63,000 tonnes of shellfish waste is generated in the UK every year. The application of chitin contributes to the circular economy, improving sustainability.
- Chitinous soil amendment has useful quantities of essential nutrients (N (10%), P (4.1%) and K (4.2%)).

The project will demonstrate the effect chitinous soil amendment can have on PCN levels in the soil and its integration into IPM strategies.

Work Package Success

1. Reducing PCN levels by introducing new IPM tools based on trap crops and chitinous soil amendment.
2. Optimise trap crop production and effectiveness for the Scottish climate.
3. Providing a sustainable technique for controlling PCN by reducing reliance on chemical control options.

							
1. Economics	2. Decision Support	3. Resistance Markers	4. Accelerated Breeding	5. Tolerance to PCN	6. Groundkeeper Control	7. Integrated Pest Management	8. Knowledge Exchange

More information and factsheets about each work package can be found on pcnhub.ac.uk