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GB PCN Forum Newsletter : November 2023 Edition



CUPGRA 



INTRODUCTION

David Almond – Co-vice Chair (CUPGRA) of the GB PCN Forum

Welcome to the GB PCN Forum's first Newsletter, please do circulate around all your colleagues. Part of this process is raising the awareness of this industry changing pest.

The steering group had its inaugural meeting in August and it was encouraging to see the depth of PCN knowledge and experience represented by the group members.

Clearly PCN is a major threat to the sustainability of the GB Potato industry. In forming the GB PCN Forum, we are confident that we can start to make a difference. The whole industry needs to buy in to the problems that we face and work together as one to come up with an approach that really works and ensures the long-term viability of our sector.

I am however confident that by adopting a "bottom up" approach to the translation and application of the best science, knowledge and research we can minimise the impact of the PCN in the future

The Forum expects to pull together existing and new knowledge and technologies for the industry to adopt in a multi-approached attack on the pest.

The Forum also welcomes your thoughts and ideas, so please do contact us if you would like to make a comment or have information you think we should have.

I hope you enjoy reading this newsletter and we look forward to being able to report on progress in future editions.

UPDATE ON PCN FORUM

Peter Craven, CUPGRA Secretariat

Following on from a collaborative and cross industry PCN forum and Workshop hosted by CUPGRA and GB Potatoes at NIAB in Cambridge in March this year, a steering group was created, and steps taken to create a national GB PCN Forum with the aim of finding practical solutions to 'Minimise the impacts of PCN on the GB potato crop'.

Working in conjunction with PCN Action Scotland the steering group met in August to discuss the outputs from the initial workshop and to set goals and priorities going forwards. The group meets again on November 2nd to discuss the initial priorities, being

- Quantification of the current problem and challenges, updating a national survey, and potential grants to explore.
- Communication/Education to industry

stakeholders, understanding life without nematicides. DEFRA policy engagement regarding cross border seed talks.

- Full review of current Scottish PCN work package, what has been done, considered, what is being taken forwards, what will work for England, what is missing that we need to address.
- Draft a current knowledge and best practice.
- Link up all work that is currently being undertaken on PCN and provide a channel for this information to be displayed and disseminated. Connecting the research.
- What funding and resources do we need to make this happen.

An output of the next meeting is to identify and engage with those best placed to help deliver these priorities, and to help formulate a structured plan of action. This process is by no means exclusive and we hope to welcome all interested parties to contribute.

PCN ACTION SCOTLAND

**James Price, project lead,
James Hutton Institute.**

The UK potato farming sector underpins an industry of approximately £4.5 billion. 77% of seed potatoes used in Great Britain originate from Scottish farms. However, this industry is under threat from potato cyst nematodes (PCN) which have been spreading across UK potato growing areas for decades. PCN drastically reduce yields and, due to the complex relationship with their host, are difficult to control. Legislation in Scotland prevents seed potatoes from being grown on land where PCN have been detected, reducing potential spread of contaminated seed. However, PCN are already present in almost 21,000 ha of Scottish soils. Recent predictions suggest that continued spread of PCN will cause the end of the Scottish seed potato industry by 2050, potentially only 5 rotations away.

Following a report in 2020, a Scottish Government PCN working group was initiated under the management of Scotland's Plant Health Centre. This group, consisting of over fifty government, academic, and industry partners, has received Scottish Government funding to provide practical solutions to PCN. This project aims to deliver a sustainable potato industry for Scotland through management of PCN. The James Hutton Institute, SRUC, SoilEssentials, Scottish Agronomy, BIOS, and SASA are all working together as part of PCN Action Scotland to deliver 9 packages of work:

1. **Economics** - Assessing the economic value of the potato sector and the current impact of PCN, providing economic analysis supporting different PCN control options.
2. **Decision Support System (DSS)** - Creating a digital platform to support decision making activities using analysed data from growers and other sources.
3. **Resistance Marker Development and Mobilising New Resistances** – Discovering and producing genetic markers linked to specific PCN resistance genes. Introducing new resistances from wild potato species into pre-breeding programmes to ensure long-term PCN resistance.
4. **Dihaploid Induction for Accelerated Crop Improvement** - Developing new diploid breeding material that contains genes for resistance against PCN.
5. **Mechanistic Understanding of Tolerance to PCN to Aid Breeding** - Examining genetic mechanisms that control tolerance and related phenotypic traits.



6. **Groundkeeper Control** - Delivering new methods for detecting and controlling volunteer potatoes within rotation.
7. **Novel IPM Tools** - Developing novel non-chemical PCN control options for use before potato cultivation and within rotations.
8. **National Knowledge Exchange and Communications Programme** - Engaging with and informing the potato industry supply chain to ensure the outcomes from all work packages have a positive impact on the Scottish potato sector.
9. **Policy** - Recognising the requirements for potential changes to PCN sampling, testing, and land management to protect the Scottish potato industry.

PCN Action Scotland has now existed for 3 years and is making significant progress towards its end goals. The PCN hub webpage (<https://www.pcnhub.ac.uk/>) was created to house key information relating to the PCN Action Scotland project. This includes detailed factsheets for each of the work packages, current Scottish government rules regarding PCN-related policies, key outputs, publications from the working group, and links to events.

For more information contact James Price (project lead), James Hutton Institute, e-mail:

james.price@hutton.ac.uk.



POTATO CYST NEMATODE: An old but persistent foe.

Dr Matthew Back, Reader in Nematology, Nematology Group, Centre for Crop & Environment Sciences, Harper Adams University

Potatoes have to be one of the most challenging crops to grow, partly because they are subject to an array of damaging pests and pathogens. Potato cyst nematodes (PCN) (*Globodera pallida* and *G. rostochiensis*) are no exception, being the most economically important pests of potatoes in Great Britain. Their quarantine status has a huge impact on the availability of land for seed, with zero tolerance for PCN infested land. As matters stand, James Hutton Institute have warned that Scotland could be limited to just 5 further harvests of seed. In ware crops, PCN have the potential to limit tuber number and yield; up to 80% loss is possible. Furthermore, root damage caused by juvenile nematodes can create entry points for pathogens such as *Verticillium dahliae* (Verticillium wilt) leading to premature crop senescence. Stolon canker caused by *Rhizoctinia solani* can also be exacerbated due to increased leakage of sugars from the roots of PCN infested plants (increased attraction towards the plant). When greater numbers of stolons are pruned by *R. solani*, the marketable fraction can be lowered and there is a higher incidence of greened tubers. Although we mostly focus on yield loss with PCN, the nematodes are known to invade the tubers causing cosmetic damage, which is known colloquially as 'pecking'.

It is well known that PCN are incredibly persistent, surviving in soil for 20 or more years due to the slow decline of the encysted nematode eggs. Decline rate is affected by PCN species, soil type, microbial antagonists and seasonal variation such as temperature and rainfall. Cysts are the old female bodies that tan and harden to act as containers for the nematode eggs; up to 500 eggs per cyst is typical but large cysts with high egg numbers have been recorded in Kenya. Mechanisms such as diapause and quiescence are crucial for preventing egg hatch in unfavourable periods. Unlike other cyst nematode species, PCN hatching is stimulated by hatching factors, e.g. α -chaconine, α -solanine and solanoeclipin-A, that are produced in potato root diffusates. In the absence of potatoes, hatching in soil water is limited.

According to the last survey that was undertaken by Katarzyna Dybal (Harper Adams University) in 2016, 48% of the ware growing land in England and Wales was infested with PCN with 89% of the PCN in this land being



G. pallida, 6% being a mixture of both species and 5% being *G. rostochiensis*. The dominance of *G. pallida* has continued to increase from the previous survey that was undertaken in 1999 (67% of infested land determined as pure *G. pallida*). Owing to supermarket

and consumer preferences for varieties with the *H1* gene (conferring resistance to *G. rostochiensis*) e.g. Maris Piper, *G. pallida* has become the big problem for many growers. Resistance to *G. pallida* is available but to a lower extent, particularly in pre-pack potatoes, and is 'partial' meaning that the resistance is quantitative (conferred by many genes). Partial resistance is still a useful tool in PCN management as it will lower the rate of multiplication. For instance, the variety Royal has a score of 3 (on the 1-9 scale) meaning multiplication will be 50% lower than the susceptible reference cultivar (Désirée).

The real elephant in the room, for PCN, is the continued threat of losing the remaining organophosphate nematicide. The product Nemathorin® (fosthiazate) is registered until 30/04/2026 but there is great uncertainty about its future with greater focus on greener measures of crop production. Should Nemathorin be banned, we would be left with products offering modest control e.g. Velum Prime® (fluopyram).

The future of PCN control is likely to be focussed around the selection of better varieties; ideally, those that offer strong partial resistance in combination with tolerance. Such varieties do exist but the options are extremely limited. In addition, PCN densities will need to be managed in the rotation by careful volunteer management, trap crops, biofumigants and extended rotations. Currently, research is being undertaken to improve our understanding of PCN and its management, in a future where chemical control is limited. A good example of this is the large collaborative project funded by the Scottish Government - See <https://www.pcnhub.ac.uk/> for more information. This is the first technical article for the PCN Forum Newsletter and is very much an introduction to the problem. Future issues will focus on specific topics related to detection, biology or management.



Harper Adams University



GROWER AND AGRONOMIST POINT OF VIEW AND IMPACTS

Graham Tomalin – VCS Potatoes.

Potato cyst nematode, PCN, is currently the pest causing the largest issues for UK potato growing when looking across all market sectors. Whether you are a ware grower protecting yield and quality or a seed grower trying to maintain completely clean land required by certification

systems both North and South of the border, PCN has impacts for the majority of GB potato growers.

PCN was first identified in the UK in 1913 with the source almost certainly from seed with South American origin. Since then, it has spread across GB either by soil or potato movement, this could be seed (more likely home saved) or waste ware/stock feed or just soil movement on machinery or grading waste.

The most recent England and Wales survey (AHDB funded summary 115R471 K.Dybal 2016) reported 48 % of land being infested with PCN. Of the two species currently found in the UK the survey indicated *Globodera pallida* within 89% of infestations, 5% of *Globodera rostochensis* and 6% with mixed populations.

The primary damage to potato crops is reduction in yield. However secondary effects can also be financial to the grower such as skin finish damage, changes in size profiles and dry matter caused by premature senescence of the plants.

As an agronomist I have a broad range of approaches to tackle the impacts of this pest within the fields/crops I am involved with, but population management is absolutely key to this.

This is achieved via a number of approaches:

1. Utilising variety resistance (either full or partial)
2. Lengthening rotations
3. Trap crops eg. *Solanum sisymbriifolium* or biofumigation
4. Nematicide treatments

In the first instance all of the above rely on accurate assessment of the population levels prior to a crop being planted. In my opinion the most intensive testing is required on fields where there has been no previous incidence or very low levels observed. Ideally these would be sampled with at least 1 test per ha and 200 to 400g of soil sampled within each test. If you can find an infestation at an early stage this can be managed to ensure no yield loss now and in the future with a range of approaches.

In fields with previous history, it is a case of determining population levels to establish which variety to grow, to both



ensure lower population increase and maintain maximum yield, or alternatively delaying the planting of a potato crop.

I also advocate testing on rotational land within a year following a potato crop. Although an extra cost it can both identify a low infestation that maybe missed if a further five years has elapsed. On land with known infestations this testing early improves planning, allowing time to plan for the use of trap crops/biofumigation or lengthening rotations.

The propagation of trap crops such as *Solanum sysmbriifolium* - Decyst or *Solanum scabrum* - Decyst Broadleaf, are still at very low levels in the UK. However recent trial work, co-funded by an Innovate grant, has helped improve many aspects of the crop agronomy to help growers establish more successful trap crops. <https://chapsolutions.co.uk/news/improving-pcn-trap-crop-success/>

Knowing the species you have in a field is also important to be able to use the correct management to minimize population increase. If you have grown many crops of M.piper an infestation will almost certainly be *G.pallida*. However if you have grown a range of varieties , some without the H1 Ro1 resistance gene, then I would advocate a speciation test on each field. Some newer varieties which have useful *G.pallida* resistance have no resistance to *G.rostochensis* eg Innovator/Elland so knowing the species will allow correct targeting of these varieties.

Assuming you have accurately identified a field infestation and decided to grow a crop rather than lengthen rotation the selection of a variety is key for reducing population increase (utilizing variety resistance) and maintaining programmed yield (utilizing variety tolerance) in combination with or without a nematicide.

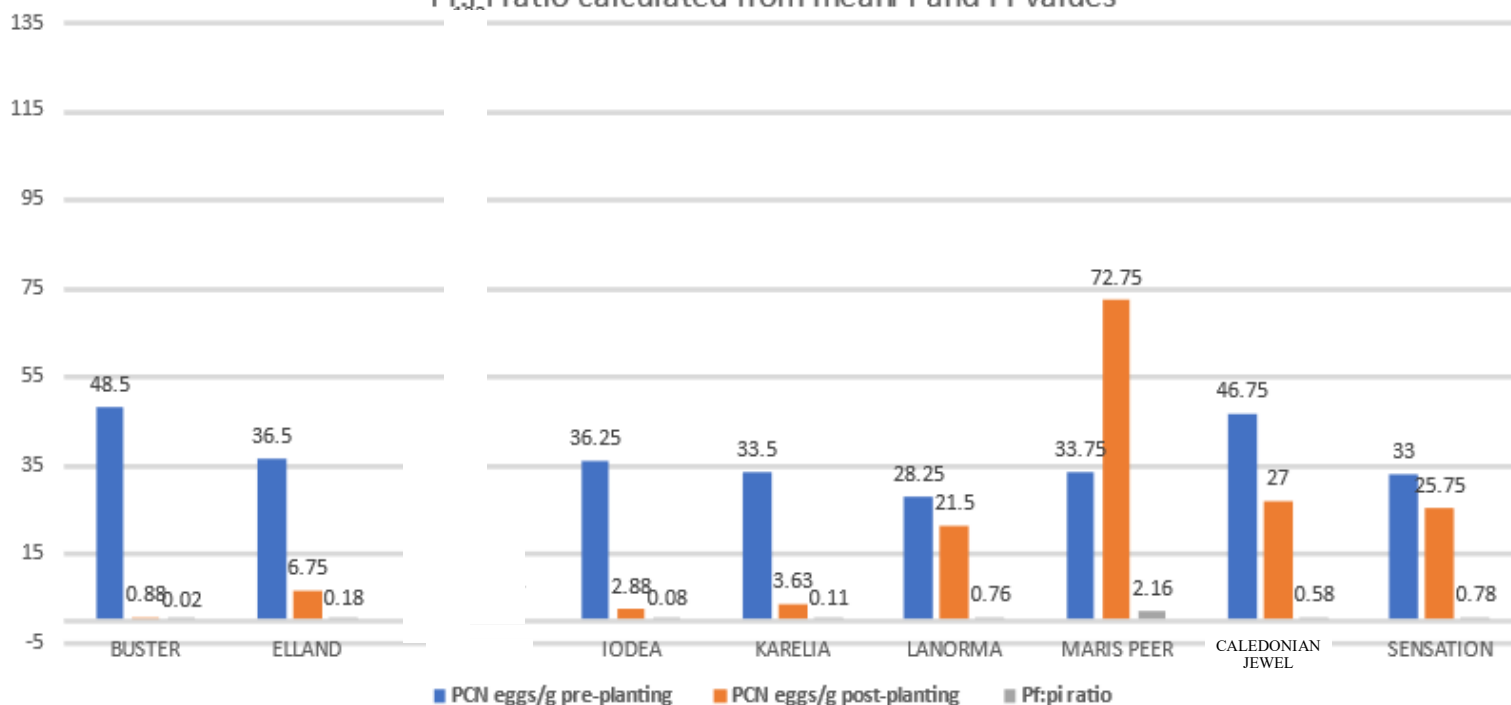
Trials assessing the performance of varieties with respect to resistance and tolerance to *G.pallida* have been undertaken for the AHDB in 2016, 2018 and 2021. In addition ‘The Potato Partnership’ – TPP have undertaken similar trials.

The results from the replicated TPP Integrated PCN control trial in 2022 demonstrated the effectiveness of the resistance for population management.

Focus on PCN integrated control



Pf:Pi ratio calculated from mean Pf and Pi values



Significant reduction in populations of *G.pallida* were observed for Buster, Elland, Iodea, Karelia and Caledonian Jewel. Useful partial population decrease was observed with Lanorma and Sensation compared to 116% increase with the non resistant M.peer.

Tolerance, the ability of a variety to produce yield in the presence of PCN, is more difficult to assess. Factors such as soil type (via nutrition/structure) and growing season can all have a factor on individual trials making comparisons difficult, however within a number of AHDB trials – Spot East 2016-2021 and TPP trial 2022 provided a useful guide below. However, it should be noted in a stressful environment at even moderate PCN counts a significant yield loss could still occur with varieties indicated to be Tolerant or moderately tolerant.

Tolerant	Moderately Tolerant	Moderately Intolerant	Intolerant
Royal Performer Cara Eurostar* Empress* Buster*	Iodea Forza* Lanorma	M.piper M.peer Shepody Arsenal*	Innovator Panther* Sensation*

* Caution Single Trial

TPP Trial 2022



Although the power of varieties is evident within these trials each variety must also provide all the attributes the end customer requires. This has slowed the uptake of resistant varieties, particularly within the pre-pack sector. However, in the last few years the number of varieties with acceptance and resistance has grown. The table below notes *G.pallida* partially resistant or resistant varieties within each market sector (some varieties below have no resistance to *G.rostochensis*)

In many situations where the decision is to grow a crop in a field with a population of PCN a nematicide is applied. These are some of the most expensive plant protection products applied to potato crops. To maximise the effectiveness of these products accurate application is vital. All applications should comply with the Nematicide Stewardship scheme guidelines. <https://nspstewardship.co.uk/>

Many trials have indicated the effectiveness of applications, particularly in the protection of yield. However it should be noted performance of

Processing	Pre-Pack	Crisping	Pre-pack Salad
Royal Performer Eurostar King russet Innovator Elland	Lanorma Buster Sensation Panther Elland Decibel Camel (red)	Arsenal Triple 7 Cinderella Amanda	Iodea Caledonian Jewel

nematicides depends on a wide range of factors from application accuracy, initial PCN levels and the accurate determination of these levels, variety tolerance/resistance, soil type, soil pH, nutrition and the growing season.

With the future of nematicide plant protection product approvals being unclear I believe it is vital growers focus on population management to enable financially beneficial crops to be grown in the future.



DATES FOR YOUR DIARY

BP2023

November 22nd and 23rd 2023. Harrogate, The Yorkshire Event Centre.

Find out more [here](#).

SPot Store First grower meeting:

Tuesday 5th December 2023. 09:00 Wisbech Rugby Club, Chapel Rd, Wisbech PE13 1RG

Find out more [here](#)

More meetings: Mid January in Yorkshire and Shropshire (dates and venues tbc)

CUPGRA conference

12th & 13th December 2023. Robinson College, Cambridge.

Find out more [here](#)

Potato days UK

4th & 5th September 2024, Nocton Farm, Nocton, Lincolnshire

More details to be announced

6th Symposium of Potato Cyst Nematode Management

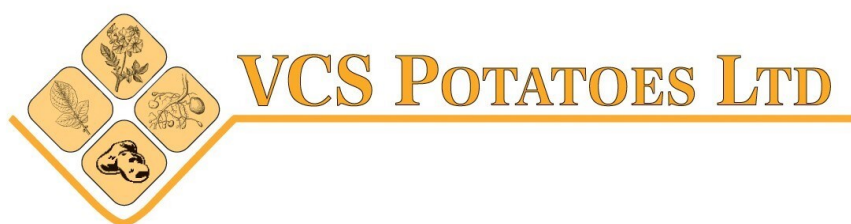
10 September 2024 - 11 September 2024

Find out more [here](#)

CLOSING REMARKS

The steering group is currently made of key industry representatives, chaired by Mark Taylor (GB Potatoes), with David Almond and Jamie Lee as co-vice chair (CUPGRA). Other members being Tim Rooke (NFU), Ian Toth and James Price (JHI / PCN Action Scotland), Matt Back (HAU), Mark Wilcox and David Nelson (FPSA), Jeff Beever and Matt Smallwood (PPA), Paul Wood (BPTA), Nick Winmill (Agrii), Darryl Shailes (Hutchinsons), and independent agronomists Mark Taplin, Graham Tomalin and Simon Alexander.

If you would like to be an active part in this forum, please contact any of the people above or Peter Craven (secretariat for CUPGRA) at peter.craven@niab.com or Graham Bannister (GB Potatoes) at graham.bannister@gmail.com



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