

Assessment and mitigation of the threat posed by root-knot nematodes to potato production in the UK

Policy Summary



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1 Policy Summary

1.1 Background

Root-knot nematodes (*Meloidogyne* spp.) are the most economically important plant parasitic nematodes on a global basis. Unlike most plant pathogens, many root-knot nematodes can feed on an extremely broad range of plant hosts, making them extremely challenging to control. The most damaging species tend to establish in warm climates, so they have limited ability to survive the harsh winter conditions found in Scotland. However, recent studies on emerging pathogen threats indicate that root-knot nematodes are among the fastest spreading pathogens in response to climate change. The potential threat posed to the Scottish potato sector by root-knot nematodes, if introduced, has not previously been fully assessed.

1.2 Key Research Questions

1. What is the potential threat posed by endemic, established and potentially invasive root-knot nematodes to the potato crop in Scotland?
2. What are the key measures needed to prevent establishment of potentially damaging root-knot nematode species in Scotland?
3. What are the current control options available to growers for management of root-knot nematodes?
4. What is the potential for identification of novel resistance in the Commonwealth Potato Collection that could help with management of root-knot nematodes?

1.2 Research Undertaken

A desk study considering the potential threat posed to Scottish potato production from root-knot nematodes was performed, including an investigation as to the potential impacts of climate change on the ability of thermophilic species (those that thrive in warmer climates) to establish. This included a review of relevant scientific literature as well as recent pest reports from European and UK plant protection agencies. Current distribution of root-knot nematodes within Europe, and potential threats to UK crop production were reviewed.

We identified historical records of screening experiments for resistance to root-knot nematodes among wild potato species and were able to identify accessions in the CPC corresponding to 25 lines that showed some resistance to *Meloidogyne incognita*. These accessions were screened with *M. incognita*.

1.3 Main Findings

- Two species, *Meloidogyne chitwoodi* and *M. fallax* have the potential to cause severe damage to the Scottish potato crop and other crops commonly used in the rotation. Restrictions currently in place have been sufficient to prevent introduction of either species to date.
- Analysis of climate modelling data suggests that even under the most extreme climate change scenarios, conditions in Scotland are unlikely to allow thermophilic species of root-knot nematodes to establish, except under protected cropping conditions.
- It is possible that some native and established non-regulated RKN species in the UK are (unintentionally) kept in check by applications of nematicides used to control virus vector nematodes. Increasing restrictions on use of nematicides may mean that some root-knot nematode species become more problematic on carrots, parsnips and potato (*M. hapla*) or cereals (*M. naasi*).
- Climate change may exacerbate the damage caused by root-knot nematodes due to impaired ability to take up water.

- Natural resistance against RKN is not widely available in current potato cultivars. With the reduction in available active ingredients used to control plant parasitic nematodes, control options for RKN available to growers are limited.
- An extensive screen of wild potato relatives revealed that several CPC accessions showed resistance to *M. incognita*. These accessions may be useful for future breeding efforts aimed at developing potato that is resistant to these species.

1.5 Recommendations (and next steps if appropriate)

- The evidence to date suggests that measures currently in place are sufficient to prevent entry of the most potentially damaging species, *M. chitwoodi* and *M. fallax*. Given the huge damage potential of both these RKN species it is critical to ensure that these measures are not relaxed.
- *Meloidogyne chitwoodi* and *M. fallax* have not been found in Scottish soils, but in order to maintain vigilance, raising awareness of symptoms of RKN infection and ensuring training is kept up to date, particularly among those undertaking potato tuber inspections, would potentially help in early awareness of the presence of root-knot nematodes.
- Reductions in the availability and use of nematicides elsewhere in Scottish rotations may increase incidental damage from established RKN species to carrots, parsnips and potato (*M. hapla*) or cereals (*M. naasi*) so this risk should be factored into decisions about nematicide approvals.
- Information on the current distribution of non-regulated RKN in Scotland is required.
- Further information is also required on the interaction between cover crops and wildflower strips and RKN species, particularly as their use may increase as part of future policy or regenerative practices.
- In order to determine the utility of the newly identified resistance sources in future breeding programmes will require crossing and genetic mapping of these sources.

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