



Grower Summary

FV 447

Carrots & Parsnips –
developing a strategy to control
free-living nematodes

Final 2016

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GROWER SUMMARY

Headline

A significant knowledge gap exists with regard to the impact of free-living nematodes (FLN) on carrot and parsnip production. A lack of available land to increase rotation length and considerable use of rented land are significant constraints for deploying novel strategies to manage free-living nematodes.

Background

For decades, commercial practice to manage free-living nematodes has been the application of synthetic chemicals. However, in recent years this practice has been challenged through legislation focussed on reducing the majority of active ingredients, including those currently available to manage nematodes. Furthermore, the societal push for sustainable agricultural production minimising environmental impacts, yet maintaining current yield through a balance of inputs, is an additional major driver. Thus, alternative management strategies for free-living nematodes are required. In the context of the carrot and parsnip sector, free-living nematodes have not been deemed a priority area for research funding. Available underpinning data, in an UK context, has primarily been provided through pot experiments which have limited relevance to field conditions. Thus the relatively narrow timeline for active ingredient removal has left the sector potentially vulnerable until alternative effective strategies for nematode management are identified and established. This situation was brought into sharp focus with recent production problems associated with one of the leading products in the marketplace. This led to an unexpected shortage of supply across numerous crop sectors and provided focus on how to address the implications of legislation to reduce available active ingredients.

Consequently, this review was initiated with the remit to collate previous work on free-living nematodes associated with carrot and parsnip production and to look beyond the UK and identify management practices that are being investigated and/or deployed elsewhere (potentially in other crops), and to highlight their potential or otherwise for the carrot and parsnip sector. Based on the review, seven action points have been identified for consideration by growers and agronomists with five topic areas recommended for research funding that have potential for contributing to long-term sustainable production of carrot and parsnip.

Summary

It is evident from the literature that significant knowledge gaps are present with regard to the impact of free-living nematodes associated with the production of carrot and parsnips in the UK. Beyond the UK, considerable research effort has been undertaken to determine alternative strategies for managing free-living nematodes. This study has evaluated the various strategies noting both advantages and disadvantages. A summary of the different strategies with likely useable timelines is presented in Table 1.

Table 1. Summary of available potential alternative management strategies for management of free-living nematodes based on literature analysis, noting availability of UK based data, potential for success and potential deployment timeline.

Management strategy	UK data available	Potential for success	Deployable timeline
Breeding for resistance	No	Limited given grower concerns	Long-term
Rotation	Yes	High	Immediate
Monitoring for free-living nematodes	Yes	High	Immediate
Biofumigation	Becoming available	Unknown – results to date inconsistent	Medium
Green manures and cover crops	No	Medium	Medium to long-term
Tillage	Limited	Medium	Short-term
Soil amendments	Limited	Good	Immediate to medium-term dependent upon the specific amendment
Biological control	Limited	Low to medium	Long-term with possible regulatory hurdles
Arbuscular mycorrhizal fungi	Yes	High	Medium

Ultimately, uptake and adoption of any or all of the above management strategies will be balanced against economic gain in terms of yield and quality improvement, traded off against cost of deployment. Furthermore, a barrier to adoption of new management strategies may

simply be that other pest and pathogens are deemed to be more economically important than free-living nematodes. These decisions are likely to be made at the resolution of the individual farming unit rather than sector wide.

Financial Benefits

One of the few tangible costs that can be calculated is if intensive soil sampling is used for assessment of free-living nematodes using state-of-the-art molecular diagnostics, the cost per hectare to the grower would be in the region of £70-£100 depending upon the selected service supplier.

It can be envisaged that going forward rented land with a known rotation comprising of few crops deemed as a good host for free-living nematodes could attract a premium rent. In addition, if fields had been subjected to pre-plant testing for FLN and shown to be FLN free or in low numbers a substantial premium could be levied on rental fields. Such an additional potential cost is intangible and would need to be balanced against economic loss in terms of yield and quality.

As limited underpinning knowledge of the economic impact of free-living nematodes on carrots and parsnip production in the UK has been published in the peer-reviewed or grey literature it is difficult to determine the financial benefit to be accrued from the stated recommendations. Whilst many practitioners have excellent farm records of quality and yield, at best symptoms can only be anecdotally attributed to free-living nematodes.

However, based on 2015 figures (British Carrot Growers' Association), 700,000 tonnes of carrots were produced from 9,000 ha with a marketplace value of c. £290M. Thus, based on typical damage levels of FLN across a range of crops, an estimate of an average 10% reduction in yield and/or quality due to the impact of free-living nematodes would result in an approximate minimum £29M annual cost to the sector. Using conservative values determined for other crops, if a number of alternative management strategies were used in line with the long-term recommendations, it can be speculated that free-living nematode could be reduced in the region of 10-20%, i.e. yielding a saving of in the region of £3-6M annually. It cannot be emphasized enough that these figures are speculative and should be considered with extreme caution.

Action Points

Potential actions to achieve short-term benefits include:

- i) Where possible increase length of rotation, even an additional one year may be beneficial.
- ii) Ensure that rotation crops include those that are poor hosts of FLN that impact carrot and parsnips, thus limit where possible, sugar beet, peas, beans and potatoes in the rotation which are known to increase damaging FLN.
- iii) Monitor FLN by soil testing using where possible molecular diagnostics to minimise costs and improve specificity of testing.
- iv) Optimal sampling for FLN monitoring represents a single composite sample per hectare. Each composite sample should comprise a minimum of 70 cores, taken to a depth of approximately 20 cm, collected randomly along a W shape walk.
- v) Apply organic matter prior to planting.
- vi) Where land is owned, rather than rented, consider inclusion of a cover crop within the standard rotation.
- vii) Be alert to the presence of root-knot nematode and take appropriate measures to minimise spread.