



Nematodes.

Not just a potato problem

As an industry, are we missing the extent of the damage?

Nematode identification and consultancy services



Original thinking... applied



A Fera nematologist/scientist identifying nematodes using the national reference collection and image analysis microscopy

As an industry are we missing the extent of the damage?

Nematodes are microscopic, non-segmented wormlike invertebrates, they are highly diversified and perhaps the most numerous multicellular animal on earth. The majority of nematodes are vermiform and approximately 1mm in length; one shovel-full of soil may contain over 1 million nematode specimens.



Viable *Globodera* eggs and hatched infective juveniles within a cyst

Potato Cyst Nematodes

Potato Cyst Nematodes (PCN) are considered to be the most damaging pest of potato crops in the UK responsible for yield losses of up to 35%. (AHDB, 2017)

PCN is the name commonly given to two species of cyst nematode that attack potatoes, *Globodera pallida* and *G. rostochiensis*. These are particularly difficult types of nematode to control as in both species the females form a hard covering around the eggs following death which protects the developing nematodes from damage, predation and chemical control. Normally, these microscopic eggs will hatch within 7-10 years but can continue to hatch for up to 25-30 years.

The introduction of PCN cysts into a field can go unnoticed for several years until the infestation reaches a harmful level. It is recommended that regular testing is carried out before signs of physical damage occur for efficient and sustainable management.

Look out for

- Mineral deficiency (roots are unable to absorb sufficient nutrients)
- Patches of stunted yellowing plants
- Wilting (due to inefficient, damaged root system)

Plant-Parasitic Nematodes

Plant-Parasitic Nematodes (PPNs) are responsible for £48 billion worth of crop damage per year worldwide (Nicol et al., 2011).

Among plant-parasitic nematodes, *Meloidogyne* spp. or root-knot nematodes are the most economically important group worldwide. These nematodes can parasitize nearly every plant species, resulting in devastating adverse effects on the quality and yield of host crops. Populations of these microscopic invertebrates can quickly build to damaging levels, sometimes in a single season.

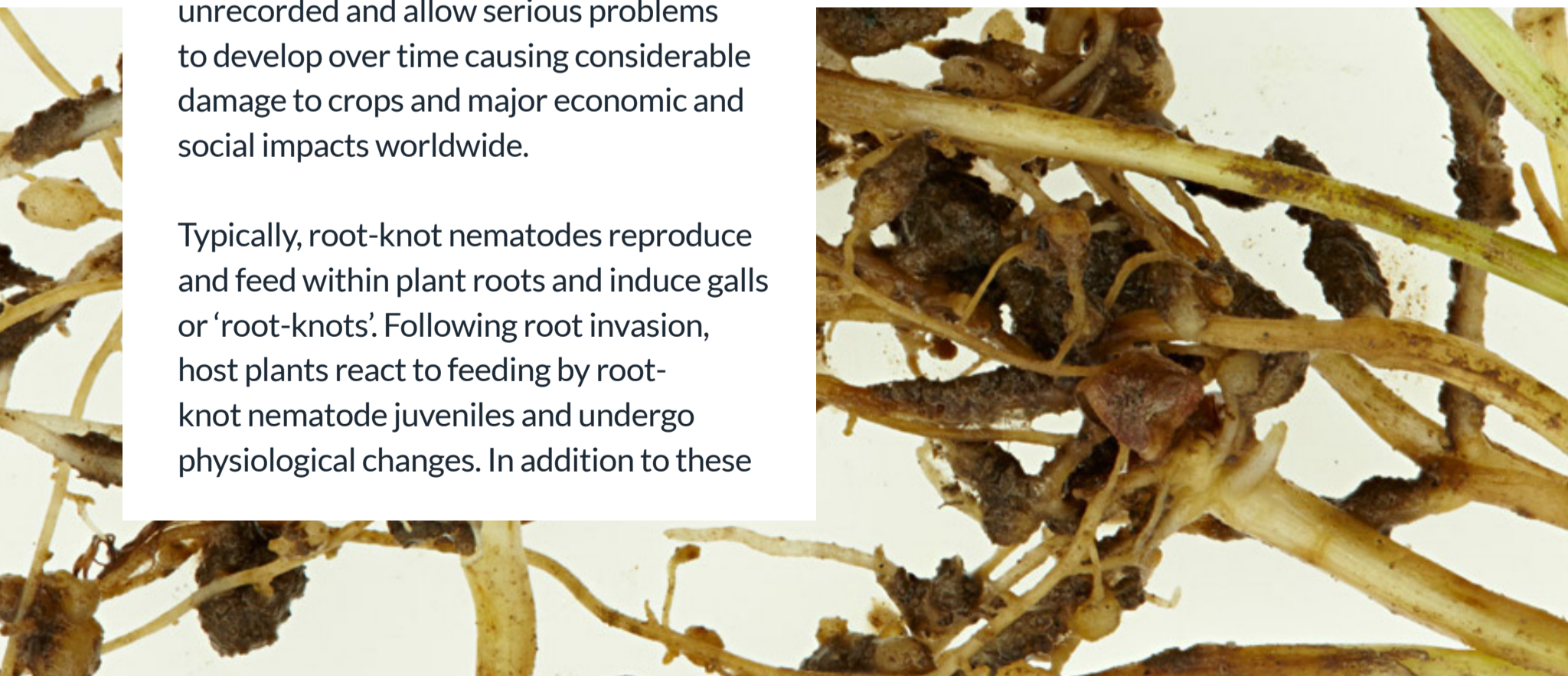
Plant-parasitic nematodes often produce symptoms on above ground plant parts which are assumed to be a nutritional deficiency, disease or even a lack of water. For this reason, many infestations can go unrecorded and allow serious problems to develop over time causing considerable damage to crops and major economic and social impacts worldwide.

Typically, root-knot nematodes reproduce and feed within plant roots and induce galls or 'root-knots'. Following root invasion, host plants react to feeding by root-knot nematode juveniles and undergo physiological changes. In addition to these

highly specialized cellular adaptations, root tissues around the nematode undergo hyperplasia and hypertrophy causing the characteristic root gall usually associated with *Meloidogyne* infestations.

The impact of root-knot nematodes on roots of host plants is characteristic, with large galls usually visible on plant roots. These galls affect the ability of the plant to uptake nutrients and water, resulting in above-ground symptoms such as;

- Stunting
- Wilting
- Chlorosis
- Distortion
- Premature senescence
- Low yield



Meloidogyne infesting the roots of wheat, causing root-galls

How can Fera help?

Effective management of plant-parasitic nematodes in soils should be based on accurate detection and identification, to understand the biology and host range of each species in the population, thus allowing appropriate management practices to be identified and introduced. Fera's team of nematode experts provide a unique free-living nematode identification service, and offers nematode detection and consultancy advice for all sectors of agriculture and horticulture potentially reducing yield loss.



Immature *Globodera* spp



Root-lesion nematodes causing root necrosis to host plant

Potato Cyst Nematodes

Early detection of PCN is key to preserving yield, reducing costs and infestations.

Ideally, sampling is carried out in autumn/winter immediately before potato cropping to determine levels of PCN prior to planting.

To ensure that rotation can be planned – sampling can be carried out at other time within the rotation.

Fera's original thinking Nematologists applied their expertise and knowledge to develop processing methods using bespoke equipment that have been recommended in the EPPO diagnostic protocols.

Our technique allows soil to be processed immediately upon receipt, ensuring an efficient service for our clients, without the need for drying which can affect the viability of the cysts, providing more accurate results.

All aspects of our PCN procedures are accredited to ISO 17025 standards, with the lab accredited to ISO 9001 standards.

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Plant-Parasitic Nematodes

Fera recommends that farmers analyse soil for PPN at pre-planting, post-harvest or when possible symptoms are observed. Good on-going management of nematodes requires a proactive approach to inhibit the increase of these pests.

Fera offers a unique identification service, being able to confirm the identity of nematode species within the field population. Management practices should be based upon correct identification and qualification, rather than solely on nematode counts.

This helps the customer to understand the biology and host range of each species in the population to develop effective management based on accurate data. Certain methods and analysis equipment is also accredited to ISO 17025 standards.

Fera houses one of world's largest nematode collection, including type specimens and live culture standards. Reference collections are fundamental for supporting correct identification of plant-pathogens as part of our unique Plant Clinic services and bespoke projects.



Fera's Integrated Crop Management Service offers farmers and agronomists a full package including Pathogen Diagnostics, Insect Monitoring, Nematode Testing and Soil Testing. Alongside normal farming practices this can increase yields and reduce costs.

Fera offers a unique free-living nematode analysis service that provides identification to species level, as part of the UK's largest Plant Clinic. Our experienced team also offers nematode identification and consultancy advice for any sector of agriculture or horticulture.




For further discussion of how Fera can help you, please contact us.



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