



Nematodes

Getting to the Root of the Problem

They may be small and difficult to see, but plant parasitic nematodes are the cause of significant crop damage and loss.

Fera, the former Government agency in the UK, estimates that they cost the worldwide food and farming industries around £48 billion/year, while FAO commentators suggest that 10% of world crop production is lost as a result of nematode damage.

Others, including global agrochemical specialist and manufacturer of Nimitz, Adama, put that figure much higher, at \$120 billion worth of damage in total, of which over \$9 billion is in the USA and \$12.7 is in Brazil alone.

Either way, all are agreed that the economic impact of nematodes is considerable, with all indications suggesting that it will only get worse.



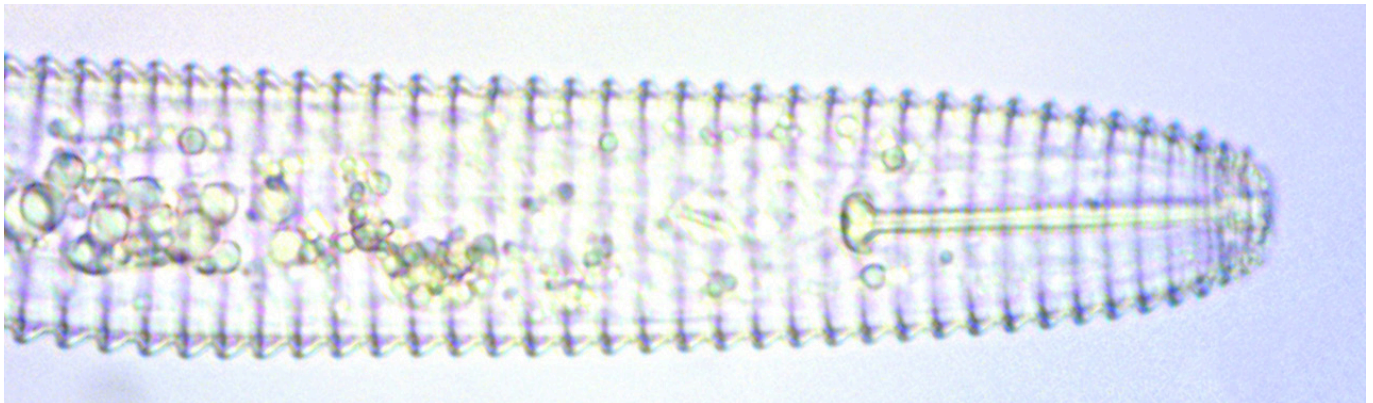
This picture shows a squash field with 100% crop loss caused by Root Knot Nematode. Homestead, USA, FL 2015.

Microscopic Pests

Often described as microscopic roundworms - many of which are invisible to the unaided eye, both when they are in the soil or within plant material - nematodes are adapted to live in many different habitats.

This versatility means that they are capable of causing yield, quality and marketability losses in a wide range of fruit and vegetable as well as in arable crops, making them a constant threat to growers and producers.

Of the thousands of nematode species identified by experts to date, most are characterised by a mouth spear or stylet, which is used for penetration of the host plant tissue.



The stylet at the mouth part of the ring nematode (*Mesocriconema* spp).

Problem Identification

What's more, their underground habit gives nematodes an advantage when it comes to predicting, identifying and controlling their numbers, especially as their initial presence often goes unnoticed and any symptoms are difficult to distinguish from those caused by other soil-related problems.

A further complication is that nematode distribution within fields and glasshouses tends to be patchy, points out Dr Andy Evans of SRUC in Scotland, as it is a result of their initial introduction to the soil and slow expansion from that area.

"That's why any symptoms tend to be irregular at first, often restricted to individual or small groups of plants," he cautions. "In the early days, they're all too easy to overlook."

The best way to identify nematodes is doing soil sampling, extract soil from the root zone and send to a nematode lab for genus ID. Once the nematode genus is identified there is more knowledge on what to do next, nematodes are classified as ectoparasites when they live and feed outside the roots and endoparasites when they feed and move inside the roots, according to that the control method could be different.

Symptoms

Warning signs to look for in the field include stunting, wilting, chlorosis, distortion, premature senescence and low yields, all things that can be confused with other problems, Dr. Evans advises.

“The damage that nematodes cause to plants increases with the numbers present – while there are other organisms that can invade the feeding lesions caused by nematodes and so make things worse.”

A reduced or thickened root system, for example, which is often seen with nematode damage, makes plants more susceptible to drought and other stresses, he warns.

The most symptomatic characteristic of a plant with nematode pressure that can not be confounded with other diseases or pests is ‘stunting’, the plant seems healthy with no signs of stress but when it is severely stunted more than likely is to plant parasitic nematodes.

“Several nematode species are also vectors for viruses, which is why nematode numbers are not always related to the symptoms seen on the crop.”



This picture shows severe stunting in cucumbers caused by Root Knot Nematode, Norman Park, Georgia USA.

Pic: *Pablo Navia*

Nematode Spread

The size and worm-like shape of nematodes allows them to move freely between soil particles. However, this is affected by moisture and soil type, with lighter soils allowing greater movement when sufficient moisture is present, although some nematode species prefer heavy soils.

In the same way, waterlogged soils restrict their movement, as do dry and heavy soils. However, nematode survival, growth and reproduction depends on other factors too – with soil temperature and the availability of a host plant also being important.

Given the right conditions, nematode populations can quickly build to damaging levels, something which most species are able to do within a single season. Multiplication can range from five to 1000 fold in that time, depending on the species, environmental conditions and host plant.

Controlling nematodes once the crop is in the ground is almost impossible, so action needs to start before planting, agree the experts.

“In practice, their effective management depends on an integrated approach, which uses nematode identification and population assessments from soil samples, together with cultural, physical and chemical methods, and helped by the use of resistant or tolerant crop varieties,” advises Dr Evans.

Nematodes – Key Facts

- Huge economic importance worldwide
- Thousands of species identified – best known include root knot, root lesion, cyst, sting and stubby root nematodes
- Small and difficult to see and find
- Most species attack plant roots
- Soil conditions and host plant are key to nematode survival
- Capable of rapid multiplication in short timeframe

Nematodes – Key Species

- Root knot nematodes – *Meloidogyne spp*
- Cyst nematodes – *Heterodera spp*
- Stem nematodes – *Ditylenchus spp*
- Potato cyst nematodes – *Globodera spp*
- Stunt nematodes – *Tylenchulus spp*
- Dagger nematodes – *Xiphinema spp*
- Lesion nematodes – *Pratylenchus spp*
- Sting nematodes – *Belonolaimus spp*
- Stubby root nematodes – *Trichodorus spp*

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