NEMATODES IN SUGARCANE

Sugar Research Australia

INTRODUCTION

Nematodes have been known to cause crop losses in sugarcane for many years. Whereas they were once considered only a pest in coarse textured sandy soils, it is now recognised that nematodes are responsible for widespread yield losses across all sugarcane districts in Queensland and NSW.

DESCRIPTION: KNOW YOUR NEMATODES!

Nematodes are minute, eel shaped worms which live in all soils. They may be classed as either free-living or plant parasitic.

Free Living Nematodes (FLN) are ***beneficial*** - they feed on bacteria, fungi and other soil organisms and do not harm living plant roots. A diversity of FLNs, present in a high proportion relative to plant-parasitic nematodes is a sign of healthy soil, as they play a key role in converting nutrients in organic matter into plant-useable form. Their presence also helps maintain the population of the natural enemies of harmful nematodes.

Plant Parasitic Nematodes (PPN) attack the roots of living plants including sugarcane. There are many species of PPN, with the two most important pests of sugarcane being ***root-knot nematode*** (*Meloidogyne spp.*) and ***lesion nematode*** (*Pratylenchus spp*).

Stunt nematode (*Tylenchorhynchus annulatus*), ***dagger nematode*** (*Xiphinema spp.*) and ***stubby root nematode*** (*Paratrichodorus minor*) also cause economic damage.

Reniform nematode (*Rotylenchulus spp.*) and ***spiral nematode*** (*Helicotylenchus dihestera*) only cause economic damage when populations are sufficiently high.

As nematodes are small (most are <1 mm) and transparent they are invisible to the naked eye. Their presence may be detected by symptoms in the crop, or through soil testing.

It is believed that yield losses across all sugarcane soils in Australia are as high as 10% (Plant) and 7% (Ratoon)– an economic cost to the industry of around $82 M per year.

DISTRIBUTION

Plant-parasitic nematodes are widely distributed in cane growing soils, with at least five different species likely to be present in every cane field. The abundance and proportion of species will vary with soil type, climate and crop history. Rootknot nematodes are **mainly** found in the lighter, sandy soils, whereas lesion nematodes can be found in every cane field in Queensland and NSW.

DAMAGE

Root-knot nematodes and lesion nematodes enter the root tips, while most other nematodes feed on the outer surface of the roots. Damage to the roots will depend on the species present. However, typical symptoms are short, thickened and blackened primary roots with very few fine secondary or tertiary roots and with lesion nematode – the presence of many red lesions on root tips.

Excessive branching of primary roots may be evident. Swollen galls on the roots may be observed if root knot nematodes are present.

Root systems damaged by nematodes may be exposed to further attack by bacterial and fungal organisms.

*Galls produced by root-knot nematode **(above)** and lesions produced by lesion nematode **(below)**.*

BIOLOGY

Nematode life cycles are short, as little as 4-5 weeks in warm conditions, so populations can build up quickly. Adult females lay several hundred eggs, either in the soil, in the roots (in the case of lesion nematodes) or on the root surface (in the case of root knot nematodes). Juveniles hatch and undergo a series of four moults. Adults move slowly through the soil, attracted to the natural secretions of host plant roots. Plant parasitic nematodes require a food source in the form of living plant roots to complete their life cycle, although eggs may remain dormant in the soil for a few months.

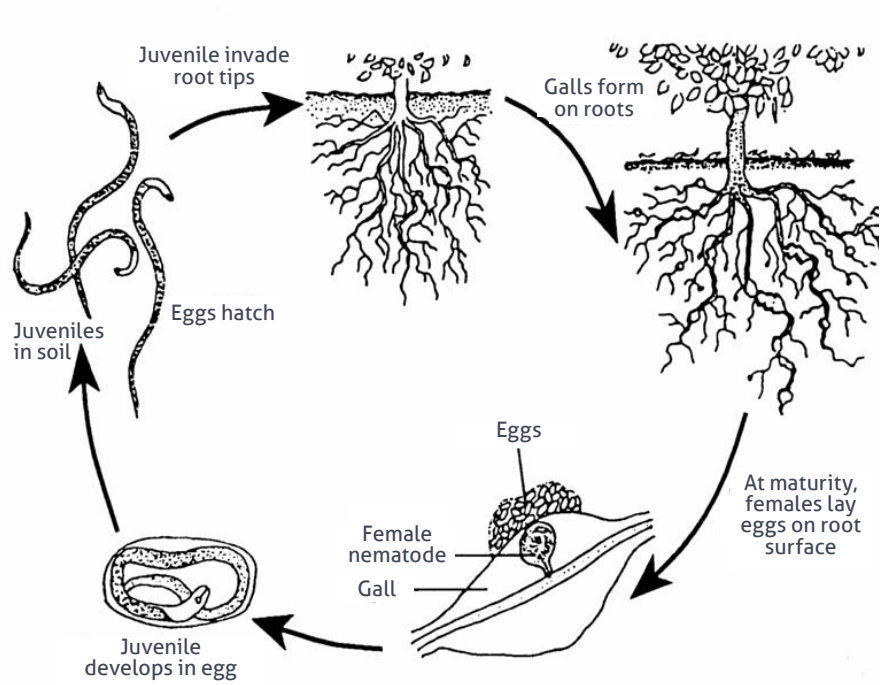
The damaged root system limits the ability of the plant to access moisture and nutrients, resulting in slower stalk growth and reduced crop yield.

Root-knot nematodes cause the most severe damage to sugarcane. They are present only in the lighter, sandy soils where nutrients are more limited and moisture stress is more likely, so the crop is more sensitive to root damage.

Although lesion nematodes cause more subtle damage, they are quite important pests because they occur in every soil type. The economic damage from lesion nematodes is often under estimated because above ground symptoms are not always obvious.

MANAGEMENT

- Monitor crops regularly to determine whether nematode populations are high enough to cause economic damage. Check plant roots for symptoms in fallow crops and before the 3-5 leaf stage (plant and ratoon cane). A soil test which can confirm the species present can be arranged through your QCROPS extension officer.
- Avoid plough-out/replant where possible.
- Include a legume rotation in your crop cycle. Soybean and peanut crops can reduce PPN numbers by 80-90%. Peanuts give better suppression of root-knot nematodes than soybean.
- Harvest plough-out blocks early to give maximum break before planting legume crops.



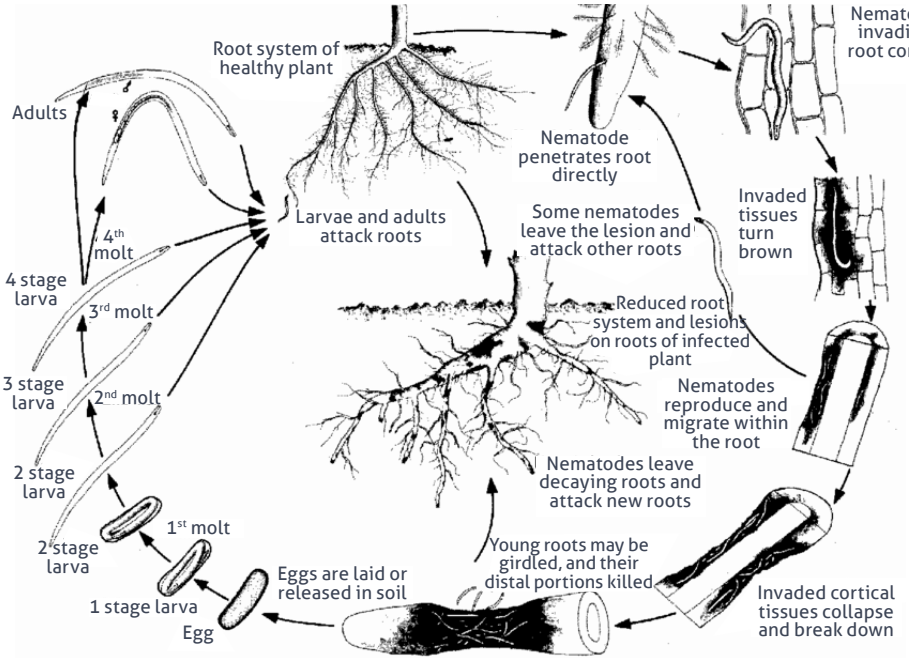
(Above) *Root-knot nematode disease cycle.*

(Above) *Peanut crop, a good rotation crop for suppressing root knot nematode numbers.*

- Make sure fallow crops are kept free of weeds - especially volunteer cane.
- Green cane trash blanket (GCTB). High populations of PPNs can quickly re-establish if a trash cover is not maintained.
- GCTB provides a better environment for beneficial organisms such as FLNs and predators of plant-parasitic nematodes.
- Minimum tillage systems which preserve the trash blanket between crops help minimise populations of PPNs. Tillage operations kill beneficial nematodes, allowing PPNs to quickly re-establish.
- There is currently only one Nematicide (Nimitz) that is registered for use in sugarcane Their use is generally restricted to light, sandy soils and they may only be economical when sugar prices are high and if monitoring indicates a high population of root -knot nematodes is present. These will kill some natural enemies and will only reduce nematode populations for a few months.
- Resistant varieties: currently no varieties are resistant to PPN in Australia. Recently SRA identified a number of wild cane (*Saccharum spontaneum*) possessed high resistance to lesion nematodes. Current SRA research is focused on transferring those resistant genes to commercial cane in order to develop nematode resistant varieties.

FOR FURTHER INFORMATION

If you wish to obtain further information regarding nematodes and their control, contact your local adviser.



(Above) Lesion nematode disease cycle (source: Agrios 2004).

***(Above)** Root lesion nematode larvae.*

***Note:** Nematicides are Dangerous Poisons. Always read and follow label safety directions. Products are poisonous if absorbed by skin contact, inhaled or swallowed*

***(Above)** Root knot nematode larvae.*

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