

Information Sheet

8.2 Nematodes



Nematodes are the most abundant multicellular organisms on earth and occur in most environments. They are microscopic, worm-like organisms infecting plants, humans and insects. Nematodes occurring in soil, associated with cane roots, are divided into two groups: Free-living (good) nematodes and plant-parasitic (bad) nematodes.

Free-living nematodes contribute to nutrient recycling as they feed on bacteria, fungi, decaying organic matter and other nematodes in soil. Through feeding, digestion and excretion, minerals and nutrients are recycled back to the soil. In contrast, many species of plant-parasitic nematodes feed on sugarcane roots. They occur throughout the sugarcane-growing areas of South Africa and cause serious damage to the roots of sugarcane, particularly in sandy soils. This results in yield reduction of the affected crop and a reduction in the number of high-yielding ratoons from one planting. Thus far, 90 species of 28 genera have been recorded from the soil and/or roots of sugarcane.

▲ *Meloidogyne*, a plant-parasitic nematode.

Occurrence

Many different nematode genera are found in sugarcane fields in South Africa. Six genera are particularly widespread in the soil - namely *Pratylenchus*, *Helicotylenchus*, *Meloidogyne*, *Paratrichodorus*, *Xiphinema* and *Scutellonema* with the first three genera being more widespread in the roots. Other genera such as *Tylenchorhynchus*, *Criconematids* and *Longidorus* are also found, but occur less frequently and may be localised to certain areas.



Sugarcane roots infected with *Meloidogyne* ▶

The composition of a nematode community is dependent on many factors such as soil type, variety, altitude, previous cropping history and agronomical factors. It's been shown that *Pratylenchus* is more commonly associated with soils with a low pH. *Meloidogyne* is more common in sandier soils and *Xiphinema* is found in higher numbers in soil that has been in monoculture and undisturbed for long periods. *Hemicycliophora* is found in wetter soils, usually in irrigated areas or near riverbeds.

Biology

Nematodes are microscopic (cannot be seen with a naked eye) and are only visible under a microscope. The plant-parasitic (damaging) nematodes are identified by the presence of a stylet ("syringe" like device) on their heads which they use to puncture root cells and extract nutrients.

Nematodes typically have six life stages consisting of the egg stage, four larval (or juvenile) stages and an adult stage. The length of the life-cycle varies for each nematode genus and species and can range from 3-4 weeks for *Meloidogyne* species to 16-36 weeks for some *Xiphinema* species. However, this is affected by the type of crop, age of crop, soil type, and length and type of season. The nematodes in the larval stages are the ones that feed on plant tissues. Each female nematode typically produces approximately 500 eggs which can give rise to new offspring one month later.

Damage

Nematodes feed on both the sett and shoot roots of sugarcane. Feeding (mainly by the endoparasitic nematodes, *Meloidogyne* and *Pratylenchus*) on the sett roots of newly germinating sugarcane results in a reduction in the number of new tillers. This results in uneven germination which leads to competition between differently sized shoots and ultimately to a reduction in stalk number. Feeding (mainly by the ectoparasitic nematodes, *Xiphinema* and *Paratrichodorus*) on the newly forming shoot roots results in less uptake of water by the plant which in turn results in reduced stalk elongation and eventually shorter stalks.

Symptoms of nematode damage

Symptoms are not always visible and can often be confused with nutritional or moisture stress. Typical above-ground symptoms can include patchy distribution of cane, large open rows, chlorosis, stunting of internodes, wilting (particularly during periods of high transpiration and/or water stress), spiky leaves, reduced tillering and thin stalks. Below-ground symptoms can include:

- root galls (swollen area near the tips of primary roots, particularly when infected by species of *Meloidogyne*),
- root lesions (occurring as red, brown spots on the root tips, most commonly associated with species of *Pratylenchus*),
- stubby roots (short, stubby and swollen, absence of many lateral roots, usually from species of *Paratrichodorus*),
- surface necrosis (superficial discolouration, from the feeding of several migratory ectoparasitic nematodes).

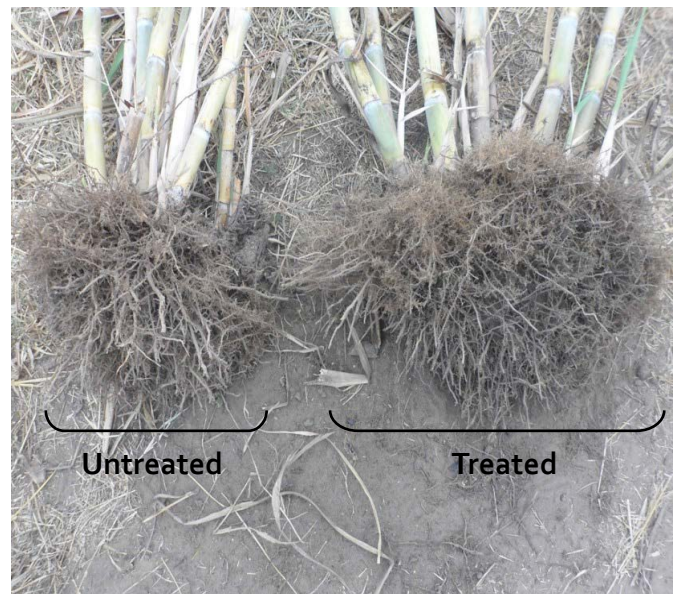
Other generalised root symptoms are the overall reduction of root mass, sparse root system, reduced root length and less development of secondary roots.

Effect on yield

Nematodes have been shown to reduce yield in the SA sugar industry by 800 000 tons of sugarcane per annum. This equates to an average of eight tons cane per hectare per annum across all sandy soils. Actual yield reduction for individual fields varies with soil type, nematode community pathogenicity and variety.

Management

Once damaging nematodes are present in a field, it's impossible to eradicate them. The best way to cultivate that field is to manage the nematode problem. Recommended solutions available to sugarcane farmers include chemical nematicides, appropriate green manure crops between sugarcane cycles, choosing a suitable variety, planting during the cooler months (when nematode activity is reduced) and applying organic amendments in the furrow at planting. See **SASRI Information Sheet 8.12 Nematode Management**.



▲ Root system of cane either left untreated (left) or treated with a nematicide (right).

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