PLANT AND SOIL NEMATODES

ECTOPARASITIC PLANT-PARASITIC NEMATODES KNOWN TO CAUSE CROP DAMAGE IN AUSTRALIA

Plant-parasitic nematodes with quite different feeding habits damage the roots of crops grown in Australia. The sedentary endoparasites and migratory endoparasites are the most damaging nematodes and they are discussed in Fact sheets PSN 002, 028, 029, 031, 032 and 036. This sheet focuses on a third group: the ectoparasites.

What are ectoparasitic nematodes?

Plant-parasitic nematodes that remain in soil throughout their life cycle and feed by inserting their feeding spear into root cells are termed 'ectoparasites'. The genera commonly found in Australia are listed in Table 1. Most cause relatively little damage, but some reach high population densities in certain soil types or are particularly harmful to certain crops. Species that feed on the actively growing cells at the root tip produce the most severe symptoms, as root growth stops when those cells are damaged (Fig. 1).

Table 1. Pathogenicity of the most common ectoparasitic nematodes found on Australian crops

Potential to cause severe damage	Moderately pathogenic	Generally do not cause obvious crop losses
Needle (*Paralongidorus*)	Stunt (*Merlinius*, *Tylenchorhynchus*)	Spiral (*Helicotylenchus, Rotylenchus*)
Southern sting (*Ibipora*)	Ring (family Criconematidae)	Pin (*Paratylenchus, Gracilacus*)
Dagger (*Xiphinema*)		Sheath (*Hemicycliophora*)
Stubby root (*Paratrichodorus*)		

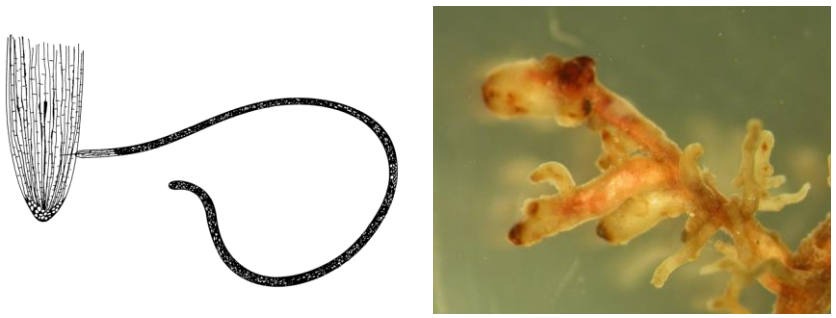

Fig. 1. A. Needle nematode (*Paralongidorus australis*) is one of the longest plant-parasitic nematodes (about 10 mm long) and it remains in the soil as it feeds on the root tips of rice. B. Dagger nematode (*Xiphinema* spp.) is one of the most widely distributed ectoparasitic nematodes. It occasionally reaches population densities high enough to damage roots, as in this example from sugarcane.

Needle nematode (*Paralongidorus* spp.)

In the 1970s and early 80s, paddy rice was grown in the Burdekin region of Queensland. About a week after rice seedlings were flooded, patches of stunted yellow plants appeared in the crop (Fig 2A), and these patches went on to produce very low yields.

Pathogenicity tests showed that a needle nematode that had never previously been described was the cause of the problem (Fig. 2B) and it was named *Paralongidorus australis*. The nematode was a native species that lived in flood-prone areas of the Burdekin (Fig 2C). As the nematode could only move readily in clay soils when they were flooded, paddy rice provided ideal conditions for the nematode to feed and multiply. Thus, the solution to the problem was to grow rice under rainfed conditions (i.e. upland rice).

Although formal surveys for needle nematodes have never been undertaken in Australia, results from diagnostic samples suggest they mainly occur in the tropics (i.e. north Queensland, the Northern Territory and northern regions of WA). For example, Broome in Western Australia and coastal locations from Rockhampton to Cairns in Queensland are the only locations where *Paralongidorus* has been found on turfgrass.

Fig 2. A. Above-ground symptoms of needle nematode on rice. B. Rice roots from a pot experiment in which the plants on the left were inoculated with needle nematode. C. Typical natural habitat of needle nematode.

Southern sting nematode (*Ibipora lolii*) on turfgrasses

Ibipora lolii is a damaging pest of turfgrasses (see Fact sheet PSN 027), but research is required to determine whether it is likely to damage grass crops such as sugarcane, cereals, and maize.

Dagger nematode (*Xiphinema*) and stubby root nematode (*Paratrichodorus*)

Both these nematodes feed on root tips and cause them to become stunted and swollen, and sometimes necrotic. Lateral roots are often produced above the damaged root tips. These genera also vector some plant viruses. There are many species in each genus and they are commonly found in sandy soils. Both genera will sometimes reach very high population densities on turfgrass (>1500 nematodes/200 mL soil), and in such situations, aboveground symptoms may be seen on golf greens. Root damage caused by *Xiphinema* has been observed on sugarcane and severe root damage caused by *Paratrichodorus* occasionally occurs on onion and other vegetable crops.

Stunt nematode (*Merlinius brevidens*) on cereals

Merlinius brevidens has been associated with poor growth of wheat and barley in the United States. For example, wheat yields increased by 20% when a nematicide was applied to fields in eastern Oregon where *M. brevidens* was present. Although *M. brevidens* occurs in more than 70% of grain-growing soils in Australia's northern grain region and population densities as high as 70 nematodes/g soil have been recorded, there has been no attempt to determine whether it causes yield losses in Australia.

Ring nematodes in the family Criconematidae

There are many genera and species in the family Criconematidae, but all individuals have a relatively wide body and a deeply striated cuticle. Ring nematodes are relatively common in soils but as they move very slowly, only a small proportion of the nematodes are recovered with extraction methods that rely on motility (e.g. the tray extraction method that is used in most Australian nematology laboratories). Extraction efficiency increases markedly when a sugar flotation and centrifugation technique is used to retrieve these nematodes. Consequently, the importance of ring nematodes has been probably underestimated in Australia, and so research is required to determine whether they are economically important.

Spiral, pin, and sheath nematodes

Spiral nematodes in the genera *Helicotylenchus* and *Rotylenchus* are very common in Australia. Both genera have a wide host range and are present in many cropped soils. Although they sometimes occur at population densities greater than 2000 nematodes/200 mL soil, there is no evidence to indicate that they are reducing plant growth or yield.

Pin nematodes (*Paratylenchus* and *Gracilacus*) are the smallest of the plant-parasitic nematodes, as most species are less than 500 µm in length. They are mainly found under native vegetation and when samples from cropped soils are processed, they are only observed occasionally.

There are many species of *Hemicycliophora* in Australia but they are not considered economically important. Sheath nematodes are mainly found on native vegetation and turfgrasses.

Author: Graham R Stirling, Plant and Soil Nematodes. **Contact details:** graham.stirling@biolcrop.com.au