New data on nematodes may prompt crop and rotation re-think

By Kirsty Owen, Tim Clewett and John Thompson DPI&F, Leslie Research Centre, Toowoomba

It can be difficult to know if your paddocks have a root lesion nematode (RLN) problem, but with careful management and planning, you can reduce crop yield losses from these elusive pests.

RLNs are microscopic and worm-like and live in the soil, out of sight. They feed and reproduce in plant roots, causing root malfunction, and when their populations reach damaging levels, cause significant yield loss in susceptible and intolerant crops, such as wheat and chickpea.

Symptoms of nematode infection can be indistinct but may include lesions on roots, poor growth and stunting of plant tops that often resemble nutrient deficiency or moisture stress.

There are two important RLNs in the northern grain region – *Pratylenchus thornei* and *P. neglectus*. *P. thornei* is found more commonly in this region, however, each species of nematode prefers different crop types so knowing which nematode species is present in your paddocks is important.

AT A GLANCE

The key to management of RLNs relies on three important points:

- Accurately identifying nematodes in your paddocks;
- Farm hygiene to prevent spread of infected soil on machinery; and,
- Growing tolerant and resistant crops to keep RLN populations at low, manageable levels.

The stunt nematode, *Merlinius brevidens*, was associated with poor growth of winter grain crops and was found in record numbers in northern NSW in 2007 – but its impact on winter grain crops in this region is largely unknown.

TABLE 1: Ratings of resistance and tolerance* to *P. thornei* and *P. neglectus* for the main wheat and chickpea varieties and other crops grown in the northern grain region

Crop	Rating	*P. thornei*		*P. neglectus*	
		Tolerance	Resistance	Tolerance	Resistance
Wheat	High	EGA Wylie	—		—
	Medium	Kennedy	EGA Burke		Strzelecki
	Low	EGA Hume	Petrie		Ventura
Chickpea	High	Jimbour	—	Amethyst	—
	Medium	Howzat	Norwin	Sona	Yorker
	Low	Sonali	Sona	Howzat	Sona
Other crops	High		Linseed Canaryseed Grain Sorghum Millet Lablab Pigeon Pea		Linseed Faba Bean Cowpea Lablab Mungbean Soybean Sunflower
	Medium		Oats Barley Fababean Maize Sunflower		Oats Barley Canaryseed Maize Navybean
	Low		Cowpea Mungbean Navybean		Forage sorghum Grain sorghum

*Except for wheat and chickpea up-to-date data on nematode resistance and tolerance at the level of cultivar are not yet available

New crop rotation data

Crop rotation with resistant crop species is the best method of management of RLNs because these crops limit reproduction of the nematodes. Where no resistant varieties are available, for example in wheat and chickpea, choosing tolerant crops is the best way to maintain good crop yields. Table 1 lists the tolerance of some wheat and chickpea varieties and a rating of resistance of other crops grown in the northern region.

It is important to note that there are differences in resistance and susceptibility of crops for each nematode species.

Our research to date has not shown any significant yield losses in summer crops considered good hosts of RLN such as, mungbeans for *P. thornei* or grain sorghum for *P.neglectus*. But the nematode populations under these plants can be quite dramatic.

Figure 2 provides a good example of this from a four-year *P. thornei* crop rotation trial that we conducted at Formartin, Queensland. Under successive resistant crops such as canaryseed followed by millet, *P. thornei* populations decreased by 50 per cent.

Under successive susceptible crops such as wheat followed by mungbean, *P. thornei* populations increased two-fold.

The changes in populations of *P. thornei* over the experiment demonstrate the importance of careful crop selection for maintaining low nematode levels. The real economic impact of these nematode populations was demonstrated in the final year of the experiment when, a susceptible wheat (Strzelecki) crop was planted on all plots.

The yields of the wheat were doubled in plots where successive resistant crops were planted.

Effect of drought on RLNs

RLNs have efficient means for survival during drought and bare fallow. They can wait, often deep in the soil, in a state of suspended animation (anhydrobiosis), until rain and new plant growth sends a signal for these pests to attack again. Nematode populations will quickly increase when a susceptible crop is grown.

FIGURE 1: *Pratylenchus neglectus* populations at our trial site at Kindon (150 km SW of Toowoomba) have remained very low, at almost undetectable levels, during the drought over the past three years. So it was remarkable to see the explosion in populations during the 2007 season under the susceptible wheat cv. Petrie at 0–15cm depth

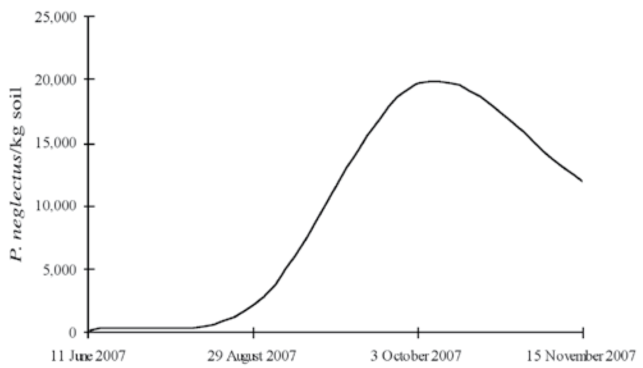
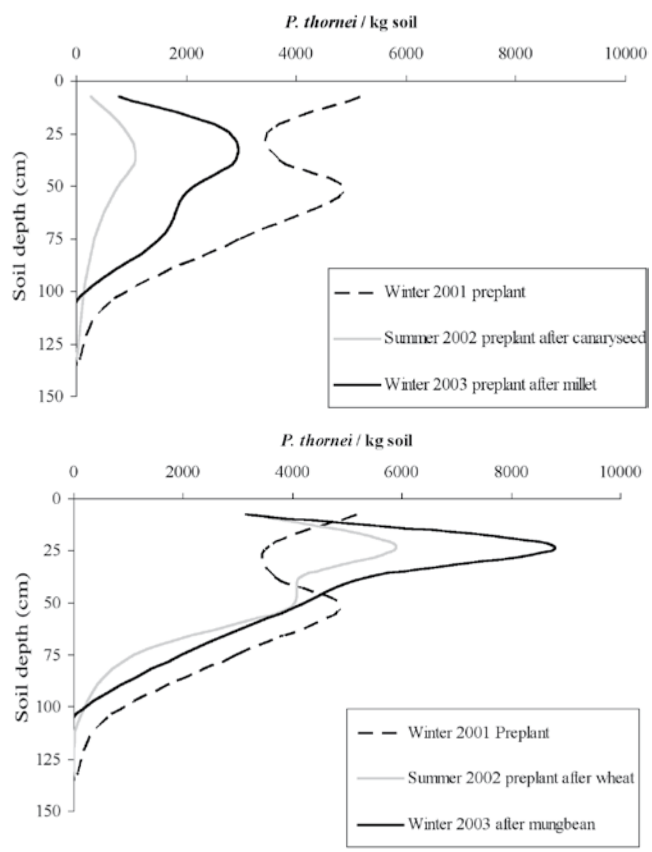


FIGURE 2: We followed populations of *P. thornei* in the soil profile during a four year crop rotation trial at Formartin (70 km W of Toowoomba)



The broken line in both graphs represents the population of *P. thornei* at the start of the experiment. In the top graph, two resistant crops, canaryseed followed by millet were grown reducing populations by nearly 50% compared to the initial sampling. In the bottom graph, two susceptible crops were grown, wheat followed by mungbean causing a 2-fold increase in *P. thornei* compared to the initial sampling in 2001.

In the final year of the *P. thornei* crop rotation experiment (see Figure 2 for details), yields of the susceptible wheat variety Strzelecki, were doubled in plots previously planted with resistant crops. These resistant crops included canaryseed followed by sorghum (wheat plots on the right) compared to the plots previously planted with susceptible crops such as wheat followed by mungbean (plots on left).

So don't rely on the recent drought to wipe out nematode populations. Figure 1 provides a good example of what happened at our *P. neglectus* trial site at Kindon, Queensland, in 2007 in a modest winter season with the susceptible wheat cv. Petrie.

Petrie yielded only 1.8 tonnes per hectare in this trial, but it ranked relatively highly compared to the other commercial lines tested, indicating a low to medium level of tolerance.

Petrie's high level of susceptibility to *P. neglectus* is clearly demonstrated in Figure 1 with nematode populations going from almost undetectable levels to 20,000 per kg of soil in seven weeks. Don't under estimate the ability of these nematodes to become a significant economic threat.

Another nematode problem?

In 2007, agronomists in the Mungindi and North Star districts, in northern NSW observed patchy, yellowing, unhealthy growth in paddocks of wheat, barley and oats. Soil samples revealed very high populations of the stunt nematode, *Merlinius brevidens* (up to 60,000 per kg of soil).

This nematode is widely distributed in cropping soils and is routinely identified and counted in research trials and farmer samples, but rarely encountered in such high populations. Crop damage was evident early in the growing season and became more apparent as the season progressed.

M. brevidens is a root-grazing nematode that causes symptoms of stunting, chlorosis and root malfunction. US research found that *M. brevidens* increased after wheat. Yield losses were observed in wheat and were generally more severe in barley and oats.

In contrast to the US studies, we found *M. brevidens* populations in the northern grains region in remarkably greater numbers. This new finding leads us to question the potential threat of this nematode.

USING THIS RESEARCH INFORMATION

- Determine if you have RLNs (we provide a 'test your farm service').
- If none are present, practise farm machinery hygiene measures to prevent the spread of nematodes onto your farm.
- If RLNs are present, rotate with resistant crops (see Table 1) to keep nematode levels at low, manageable levels.
- When growing susceptible crops such as wheat and chickpea, choose tolerant varieties to maintain good yields.

**For more information contact Tim Clewett on Ph: 07 4639 8846;
E: timothy.clewett@dpi.qld.gov.au** ■