

Root Lesion Nematodes

Are they invading your paddocks?

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Nematodes are small worms (less than 1mm) that live in the soil. Many species feed on tiny micro-organisms and are beneficial to the nutrient cycle. Others are pests and feed on the roots of crops (root-lesion nematodes), breaking down the walls of root cells therefore damaging the plant roots, causing significant yield losses.

The main species of root-lesion (pest) nematodes in the northern grain region are:

- *Pratylenchus thornei*
- *Pratylenchus neglectus*.

Some of these nematodes feed and reproduce inside plant roots (endoparasitic nematodes). Yield loss in crops such as wheat and chick peas can be significant. These can also build-up in numbers under many other crops. These nematodes can be found in the top layers of soil, but can also be concentrated around plant roots. They are microscopic and cannot be seen with the naked eye in the soil or in plants. The most reliable way to confirm the presence of root-lesion nematodes is to test the soil in susceptible paddocks.

Some varieties of wheat and chickpeas are the most susceptible to root-lesion nematodes, however other cereals such as oats and barley can also be susceptible, particularly where the same crop has been grown in the same paddock year after year. Sorghum varieties are generally resistant to pest nematodes.

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WHAT TO LOOK FOR

Indicators that root lesion nematodes have invaded a paddock include:

- Roots that are poorly branched, don't grow deeply in the soil and may lack root hairs.
- Roots that are often inefficient in soil nutrient take up (mainly nitrogen, phosphorus, zinc) and soil water.
- In wheat, the lower leaves are often yellow.
- There is often less tillering and poor canopy closure.
- Symptoms of nutrient deficiency (nitrogen, phosphorus and zinc) may be seen in the tops of the plants when the roots are damaged.
- Premature wilting can occur, particularly in dry conditions late in the season because stored soil moisture cannot be taken up properly by the damaged roots.
- With good seasonal rainfall, wilting is less evident and plants may appear nitrogen deficient.
- Wheat yields that deteriorate over several years may also indicate a nematode problem.

TREATMENT/PREVENTION

- Management is the key to ensure yield losses are minimised
- No chemicals are registered for use in cereals in northern grain region
- Consider crop rotation so that oats or barley are not planted in the same paddock year after year
- Rotate tolerant crop varieties with resistant crops if infestation is confirmed
- Avoid contamination, clean off machinery with a pressure hose after working in a paddock known to be contaminated
- Control runoff and soil erosion as nematodes can be spread in runoff water
- Conduct a soil test to check for infestation

Paddock history	2 years ago	Last year	This year		
Crop / variety	Oats	Oats	Oats		
TEST	RESULT	DISEASE RISK*			
		Not detected	Low	Med	High
<i>Pratylenchus neglectus</i>	<0.1 nematodes/g soil	■			
<i>Pratylenchus thornei</i>	0.2 nematodes/g soil		■		
Crown Rot	1.2 log(pg DNA/g soil)		■		

*Risk categories should be used as a guide only, may be subject to regional and seasonal differences, and may be revised over time.

UNDER EVALUATION					
TEST	RESULT	POPULATION DENSITY**			
		Not detected	Low	Med	High
Rhizoctonia	<0.48 log(pg DNA/g soil)	■			
Bipolaris	0.8 log(pg DNA/g soil)		■		
Pythium clade f	<0.6 log(pg DNA/g soil)	■			
Crown Rot (<i>F.culmorum/graminearum</i>)	1.2 log(pg DNA/g soil)		■		
<i>Ascochyta rabiei</i>	<0.05 log(kDNA copies/g soil)	■			

** Population densities are based on the distribution of pathogen levels detected in PreDicta samples over several years. These are not disease risk categories.

PATHOGEN COMMENTS:

Low Crown Rot: losses in bread wheat should not exceed 5%, risk greater in durum wheat
 Low P. thornei: Intolerant varieties may lose between 0-25% yield. Tolerant varieties should lose less than 2% yield.

PREDICTA-B TEST

Farmers can check their paddocks for pest nematodes via a special soil test called Predicta-B. This is a DNA based soil test that can identify soil borne diseases prior to sowing. An agronomist can collect the sample and submit for testing.

If pest nematodes are found, farmers can then make management decisions to mitigate the impact of these pests on potential crop yields.

In the recent DBnB project, 'The Secrets in the Soil', a number of southern Downs dairy farms were noted to have planted oats in the same paddocks consecutively for at least the past 3 years. This is a potential risk as pest nematodes can thrive in these conditions.

A Predicta-B test was performed on two of these farms to determine whether there was any sign of the pest nematodes.

In one example, a farm was found to have low levels of *Pratylenchus thornei* in the soil, as well as low levels of the fungus associated with crown rot. As aforementioned this could result in some yield losses if intolerant crop varieties were planted. It is a matter of the farmer being aware of the situation and planning accordingly.

The other farm that was tested showed no detection of any nematodes, therefore had no disease risk in the paddock tested at this stage.

If you have concerns about your crop performance you should consult with your agronomist. ■■



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QDAF: Root-lesion nematodes - Management of root-lesion nematodes in the northern grain region https://www.daf.qld.gov.au/_data/assets/pdf_file/0010/58870/Root-Lesion-Nematode-Brochure.pdf

Root-lesion nematodes

Management of root-lesion nematodes in the northern grain region

Examples of root-lesion nematode distributions

Figure 1: Examples of how root-lesion nematodes are distributed in soil profiles from a number of farms in the northern grain region just before planting in winter. In some cases, highest numbers are found in the upper layers of soils; in other cases, nematodes are more numerous deeper in the soil. If nematode numbers exceed 2000/kg soil (red dotted line) anywhere in the soil profile, then intolerant wheat varieties can lose yield.

What are the symptoms of infection?

Root-lesion nematodes are seen with the naked eye as light brown lesions. However, the damage they do to roots is not always obvious. Roots infecte branched, la soil profile. ' soil nutrient' under mort

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Summary

- Root-lesion nematodes, *Pratylenchus thornei* and *Pratylenchus neglectus*, have been detected at the northern grain region.
- Intolerant wheat varieties can lose more than 50% in yield and some chickpea varieties up to 20% yield fields and if they are at damaging levels is to have soil samples tested in a laboratory.
- Successful management relies on:
 - Growing tolerant crop varieties to maximise yields when root-lesion nematodes are present.
 - Rotating with resistant crops to keep root-lesion nematodes at low levels.
 - Cleaning soil from farm machinery to keep fields/farms free of root-lesion nematodes.

What are nematodes?

Nematodes are minute (mostly less than 1 mm long) eel-like worms that live in many environments including the soil. They are the most numerous multi-cellular animal life-forms on earth. Many nematodes feed on soil microorganisms and contribute beneficially to the cycling of nutrients. However, some species feed on the roots of plants. These plant-parasitic nematodes are equipped with mouthparts that form a retractable, hollow, spear-like structure ('stylet') which they use to break the walls of root cells and withdraw the contents for their nutrition.

Endoparasitic nematode species enter into the root tissues by using their stylet and head to physically break root cell walls and by excreting enzymes that dissolve cell walls. Ectoparasitic nematodes remain outside the roots and use their stylet to feed on root hairs and surface cells of the root.

Photo

Photo 1: Root-lesion nematodes and egg viewed under a microscope. The stylet in the nematode's mouth is used to break plant cell walls and for feeding.

What are root-lesion nematodes?

There are two important species of root-lesion nematode in the northern grain region, *Pratylenchus thornei* (the most commonly found species) and *Pratylenchus neglectus*. Root-lesion nematodes feed and reproduce inside plant roots (endoparasitic nematodes). The damage to the plant roots leads to yield loss in crops such as wheat and chickpea. These nematodes can also build-up numbers under many other crops. Root-lesion nematodes in the northern grain region can be found deep in the soil profile and in some cases peak populations occur 30–60 cm deep in the soil (see Figure 1).