Managing Pratylenchus/root diseases

Alan McKay[1], Sjaan Davey[1], Amanda Cook[2], Wade Shepperd[2] and Ian Richter[2]
[1]SARDI Molecular Diagnostics, Waite, [2]SARDI, Minnipa Agricultural Centre

RESEARCH

Location: Minnipa Ag Centre (S4)

Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2011 Total: 404 mm
2011 GSR: 252 mm

Paddock History
2010: Peas
2009: Wheat

Soil Type
Red sandy loam

Plot Size
12 m x 1.5 x 5 reps

Yield Limiting Factors
None

Key messages

- **Yield losses caused by Pratylenchus are still being defined, in the meantime growers should focus on implementing management strategies to reduce impact of Rhizoctonia; most of these also reduce impact of Pratylenchus.**
- **Cereal cyst nematode (CCN) is a potential risk this year, particularly in continuous cereal paddocks with high frequency of susceptible varieties e.g. Wyalkatchem.**
- **Take-all risk is also increasing in continuous cereal and cereal/grassy pasture rotations; this is driven by above average growing seasons on Eyre Peninsula for the past few seasons.**
- **Field trials are underway to assess the yield losses caused by Pratylenchus in current varieties. Results of the first trials indicate yield losses caused by Pratylenchus in 2011 were relatively small; this program is continuing to determine if losses are higher in different seasons.**
- **Pratylenchus multiplication varies between varieties, check the 2012 Cereal Variety Disease Guide for the latest resistance ratings. Note; some barley varieties are better hosts for *P. neglectus* than previously thought.**

Why do the trial?

The trials on Eyre Peninsula are part of a new larger program funded by GRDC (DAS00116) to develop reliable and efficient field trial protocols to determine the tolerance (nematode effect on yield) of new varieties to *Pratylenchus neglectus*, P. thornei and CCN plus calibrate the bioassays used to screen varieties for resistance (the effect a variety has on nematode levels in soil).

P. thornei usually occurs in the deep self mulching soils in southern Qld, northern NSW and the Wimmera region of Victoria. This nematode can cause substantial yield losses especially in the northen region. On Eyre Peninsula it occurs in soil types that are quite different from the other regions and is spreading. The *P. thornei* trials on Eyre Peninsula are replicated in Victoria near Horsham to determine if the varieties respond the same in both areas.

Background

There are two Pratylenchus species (also known as root lesion nematodes) on Eyre Peninsula, *P. neglectus* and *P. thornei. P. neglectus* is probably native and is widespread while *P. thornei* is most likely introduced and appears to be spreading. *P. thornei* is also considered to be more damaging than *P. neglectus.*

Previous research conducted in the early 2000s found that both Pratylenchus species can cause significant yield losses in the southern region, but the losses were often difficult to repeat across years. The new program aims to use new statistical methods and greater use of soil DNA tests, to develop a more robust field protocol to assess yield losses and define the seasons in which losses are most likely to occur.

How was it done?

DNA assays were used to select trial sites that contained only *P. thornei.* The best sites were then sampled on a grid to help position the sites.

The Minnipa trial was established in 2010 using narbon beans (susceptible) and field peas (resistant) to create paired plots with high and low *P. thornei* levels. These were over sown with 34 wheat and barley varieties in 2011 using a randomised block split plot design with 5 replicates.

P. thornei tolerance was assessed by comparing the difference in yield of each variety in the paired high/low plots. These plots were also sampled at seeding and after harvest to assess the variety effects on the nematode population.

- Wheat was sown on 24 May at 180 plants/m^2 and barley at 145 plants/m^2, with 50 kg/ha DAP.
- Treatments - 29 wheat and 4 barley varieties were sown in split plots with high and low levels of *P. thornei.*
- Measurements – yield plus initial and final nematode numbers per gram of soil.

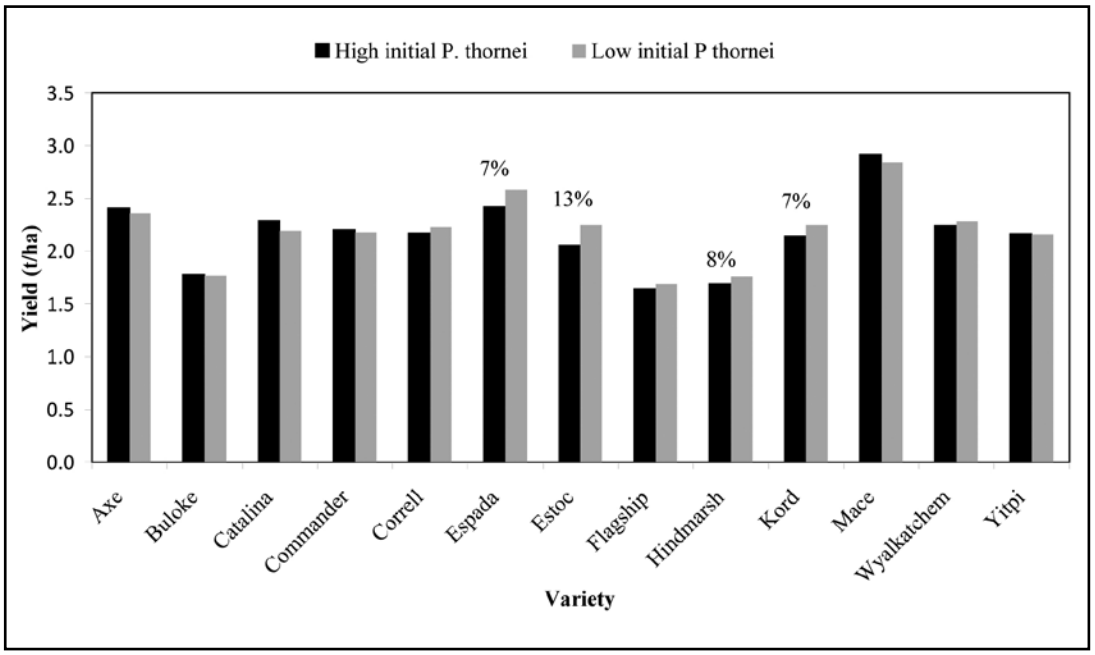

Figure 1 Yield of different wheat and barley varieties in paired plots with low (18) and high (133) levels of* P. thornei*/g soil at seeding at Minnipa 2011. Intolerant varieties lose more yield in the plots with high P. thornei level.

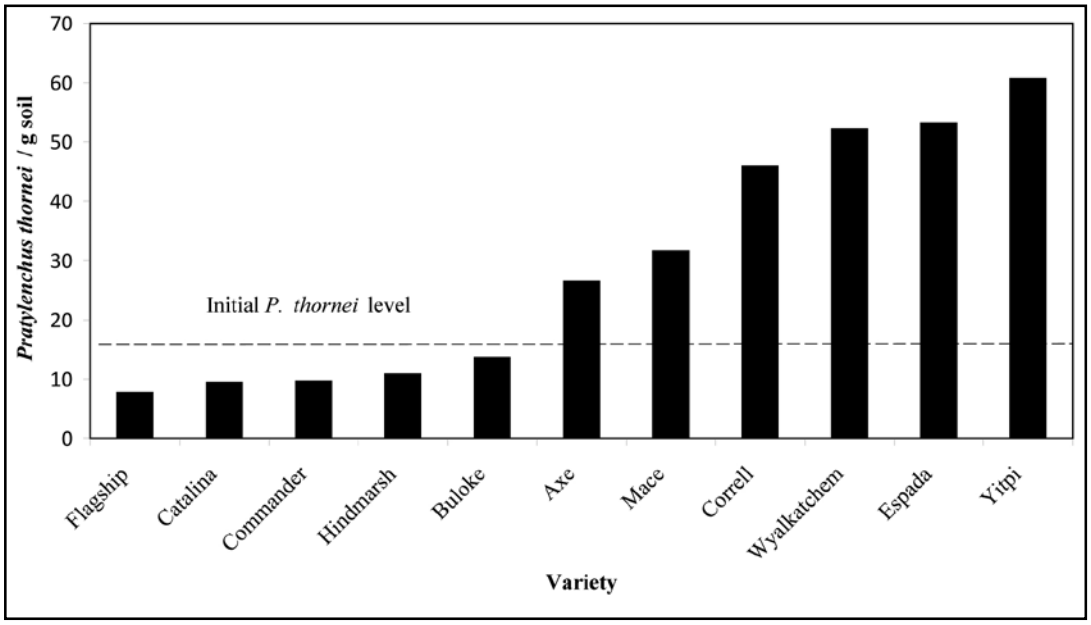

Figure 2 Effect of variety on P. thornei levels after harvest 2011 when levels at seeding were low, 18* P. thornei *per gram soil

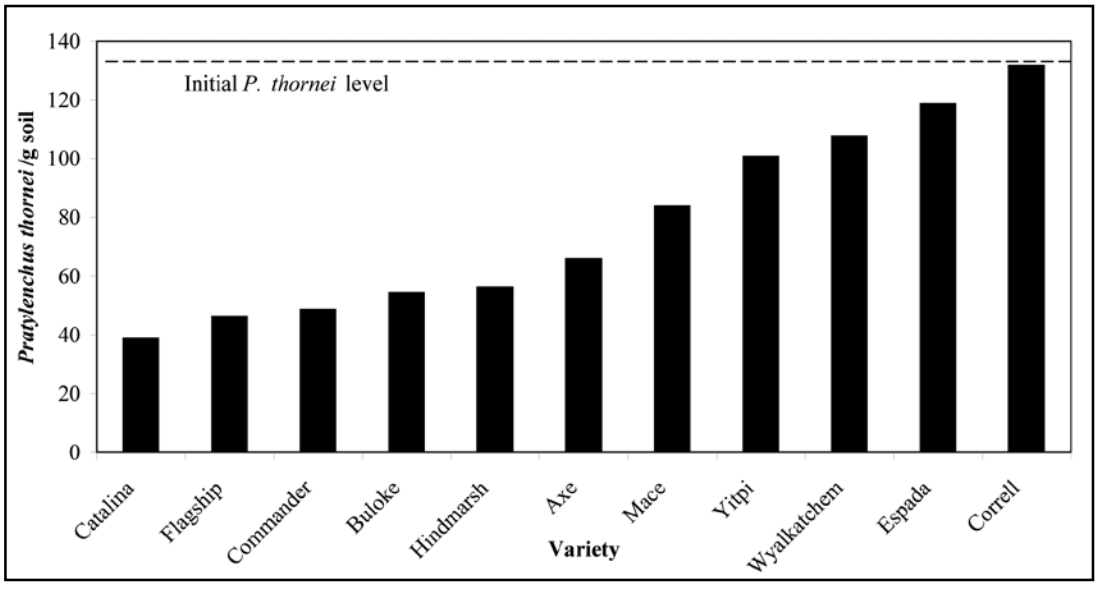

Figure 3 Effect of variety on P. thornei levels after harvest 2011, when levels at seeding were high, 133* P. thornei *per gram soil

What happened?

Yield losses caused by *P. thornei* were small. The varieties affected the most were Estoc (13%), Espada (7%), Kord (7%) and Hindmarsh (8%) (Figure 1).

Varieties varied greatly in their impact on the final nematode levels.

- The varieties that increased the low nematode levels the most were Axe, Correll, Espada, Mace, Wyalkatchem and Yitpi (Figure 2).
- Most varieties, except Correll reduced *P. thornei* levels in the plots that had high levels at seeding (Figure 3). Note; analysis of this data is still proceeding.

What does this mean?

- The levels of resistance in different wheat and barley varieties vary greatly; their resistance ratings are summarised in the latest Cereal Disease Variety Guide.
- Yield losses up to 10% were observed in some varieties in the high *P. thornei* plots which averaged >100 *P. thornei*/g soil at Minnipa in 2011. These losses are much smaller than would be expected in Qld and northern NSW for equivalent levels of *P. thornei.*
- The high *P. thornei* populations in this trial rarely occur in the field.
- Yield losses may be higher under different growing season conditions; this will be investigated in the current project.

How does this relate to previous information?

There is very little yield loss data for *P. thornei* on Eyre Peninsula to compare to. However the losses were slightly lower than in the Victorian trial which had a lot of stored moisture.

Will it require further research or a change in direction?

The trials will be repeated for at least one more season to determine if losses are higher under different growing conditions.

The 2011 results at Minnipa show that "check" varieties used in Qld to classify tolerance of new varieties do not work in the southern region, probably because the magnitude of the losses is smaller. Further work will aim to improve the efficiency of the protocol using split plots.

Can you validate the results with research from other areas?

Similar results have been obtained in parallel trials conducted near Horsham (Vic). However, this work needs to continue for at least one more season to assess impacts under different growing conditions.

Is the issue localised or does it apply elsewhere?

- *P. thornei* is the most important soilborne pathogen constraining yield in northern NSW and southern Qld. It has also been shown to be capable of causing significant losses in Victoria. It occurs in the deep self mulching clays; however it is clearly adapted to the soils on upper Eyre Peninsula and will probably spread further.
- *P. neglectus* is more widespread but it does not appear to be as damaging as *P. thornei.*
- The new research program aims to better understand the magnitude of losses caused by both nematodes and the seasonal conditions under which these are likely to occur.

Recommendations or take home messages

- Until more information is available on Pratylenchus, growers should focus on managing Rhizoctonia, Take-all and CCN. Most management practices to reduce yield losses caused by Rhizoctonia will also help reduce losses caused by Pratylenchus.
- The trial results show P. thornei multiplication varies greatly between varieties. This means crop/variety selection is a useful tool to manage Pratylenchus.
- If Pratylenchus levels are known to be high in a specific paddock, then growing a variety rated MR will help reduce levels, but make sure the variety is well adapted. At this stage, don't risk growing less adapted varieties just because they are more resistant to a specific Pratylenchus species.

Acknowledgements

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