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Impact of increasing *Pratylenchus thornei* numbers on wheat yield – Come-by-Chance 2011

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Introduction

The root lesion nematode (RLN) *Pratylenchus thornei* (*Pt*) is widespread in cropping soils throughout the northern grains region. Wheat varieties differ in their level of tolerance to *Pt*. Tolerance relates to the ability of a variety to maintain yield in the presence of *Pt*, with an intolerant variety suffering greater yield loss than a moderately tolerant variety at the same *Pt* population. An indicative threshold of 2,000 *Pt*/kg soil is used widely by industry as the level at which yield loss starts to occur in intolerant varieties. However, it is not clear whether this threshold is a 'cliff-face' or does a progressively greater level of yield loss occur as the starting *Pt* population rises? Equally, what impact does an increasing *Pt* population at sowing have on the yield response of varieties with different levels of tolerance to this nematode?

A chickpea variety trial was conducted at Come-by-Chance in north-west NSW in 2010 under the National Variety Trial (NVT) network funded by the Grains Research and Development Corporation (GRDC). The harvested plots were left intact and soil cores were taken in March 2011 to assess the effect of chickpea variety selection on the build-up of *Pt* in the soil under the 2010 crop. The chickpea varieties differed in their resistance to *Pt* as reported elsewhere in this edition of the Northern Grains Region Trial Results. Consequently, *Pt* populations in individual chickpea plots from 2010 ranged from 2,292 up to 39,194 *Pt*/kg soil in the 0–30 cm layer.

The opportunity was therefore taken to split each plot randomly in 2011 and sow a moderately tolerant (MT) wheat variety, EGA Gregory$^{\phi}$ and an intolerant–very intolerant (I–VI) variety, Strzelecki$^{\phi}$ across the site.

Key findings

Growing the MT variety EGA Gregory$^{\phi}$ rather than the I–VI variety Strzelecki$^{\phi}$ provided a 46% yield benefit at a threshold (~2,000 *Pt*/kg soil) starting level of *Pt* and an 86% yield benefit at a 20x threshold level (~40,000 *Pt*/kg soil).

However, yield loss (~20%) still occurred at high *Pt* populations in the MT variety EGA Gregory$^{\phi}$.

There needs to be a greater focus on the ***resistance*** of all crops and varieties within the rotation sequence to avoid the build-up of high *Pt* populations within paddocks.

Site details

Location:	**Come-by-Chance**
Collaborating agronomist:	**Greg Rummery**
Collaborating grower:	**Bill Buchanan**
Sowing date:	**31st May 2011**
Fertiliser:	**50 kg/ha of Granulock 12Z at sowing**

Treatments in 2011

- Two wheat varieties: EGA Gregory$^{\phi}$ (MT) and Strzelecki$^{\phi}$ (I-VI)
- 102 plots of each wheat variety with starting *Pt* populations ranging from just over 2,000 (threshold) up to nearly 40,000 (20x threshold) *Pt*/kg soil.

Nematode testing

Even though we already had *Pt* numbers for each 10 m chickpea plot collected in March 2011 (102 plots) we decided to re-core each 5 m split plot separately immediately after sowing at the end of May 2011 (204 plots) to obtain more accurate starting numbers. Ten small soil cores (0–30 cm) over the newly planted wheat row were collected from each split-plot on the 1st June 2011. The ten cores from each split plot were bulked and sent to the South Australian Research and Development Institute (SARDI) for PreDicta B analysis of *Pt* numbers within each soil sample based on this sensitive and selective DNA test.

Results

The yield of both varieties decreased with increasing starting populations of *Pt*. The yield of the I-VI variety Strzelecki$^{\phi}$ ranged from an average of 4.17 t/ha at low *Pt* populations (threshold) down to around 2.61 t/ha at the highest populations (20x threshold). This was an average yield loss of around 37% (or 1.56 t/ha) between the lowest and highest *Pt* populations at sowing (Figure 1).

The yield of the MT variety EGA Gregory$^{\phi}$ was higher across all starting *Pt* populations than with the I-VI variety Strzelecki$^{\phi}$. However, the yield of EGA Gregory$^{\phi}$ still dropped from an average of 6.10 t/ha under low (threshold) levels down to 4.85 t/ha at the highest (20x threshold) *Pt* population. This still represented a 20% (or 1.25 t/ha) yield decline in a MT variety between threshold and 20x threshold *Pt* populations (Figure 1).

Choosing an MT over an I-VI variety has a large impact on profitability. At a low starting *Pt* population, around the 2,000 *Pt*/kg of soil indicative threshold, there was a 46% (or 1.93 t/ha) yield benefit of growing EGA Gregory$^{\phi}$ over Strzelecki$^{\phi}$. The impact of variety choice was even more dramatic at a much higher *Pt* population of around 40,000 *Pt*/kg soil with a yield benefit of 86% (2.24 t/ha) of EGA Gregory$^{\phi}$ over Strzelecki$^{\phi}$ (Figure 1).

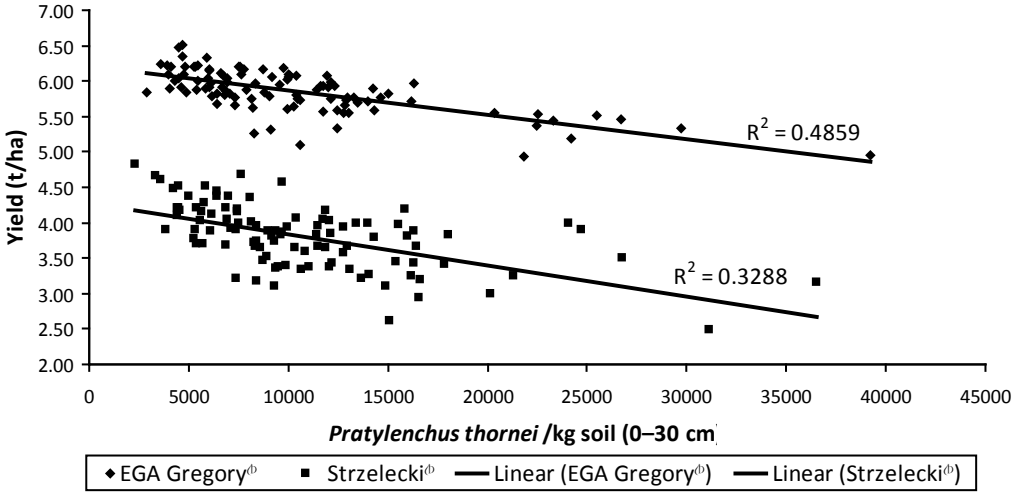

Figure 1: *Impact of* Pratylenchus thornei *population on the yield of a moderately tolerant (EGA Gregory$^{\phi}$) and intolerant-very intolerant (Strzelecki$^{\phi}$) wheat variety – Come-by-Chance 2011.*

Conclusions

Differences in the ***tolerance*** level of wheat varieties to *Pt* have a large impact on yield in the presence of this nematode. Choosing to grow a MT over an I-VI variety had a 46% to 86% yield benefit under threshold or 20x threshold *Pt* numbers, respectively.

The current industry accepted threshold of 2,000 *Pt*/kg soil does not appear to be a 'cliff-face' in that increasing yield loss still progressively occurred in both the MT and I–VI variety as the *Pt* population at sowing rose above this level. Unfortunately, the lowest population in this study was just above threshold (2,292 *Pt*/kg soil) so we could not determine what the yield curves for both varieties looks like as *Pt* populations move below 2,000 *Pt*/kg. Further research is required to determine if yield loss still occurs at even lower *Pt* levels below the accepted threshold and the interaction with variety tolerance.

Clearly yield loss still occurs in MT varieties such as EGA Gregory$^{\phi}$ under high *Pt* populations. This was not surprising as it fits with the definition of moderate yield loss with a MT variety. Current pre-breeding efforts have developed material which appears tolerant (T) of *Pt*. It would be interesting to test such material under a similar range of starting *Pt* populations, at the one site in the one season, as in this study to confirm if the yield response is effectively flat (i.e. no yield loss).

Growing MT varieties is a useful tool to minimise yield loss to *Pt*. However, high *Pt* populations still have a negative impact on yield in a MT variety such as EGA Gregory[b]. Hence, there needs to be a focus on the **resistance** of all crops and varieties within the rotation sequence to avoid the build-up of high *Pt* populations within paddocks.

Acknowledgements

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