Root lesion nematode 1996
tolerance, resistance and management strategies

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Tolerance and yield loss were determined in field trials by comparing yields in untreated plots with plots treated with nematicide. Resistance to *Pratylenchus neglectus* was determined in field trials by assessing numbers of nematodes in soil from all plots at sowing and immediately prior to harvest. As the nematicide also acts as an insecticide, all pulse and medic varieties at field sites were sprayed with insecticide during the season to eliminate any effects of insect damage. Data are presented as either nematodes per 200 grams of soil or per gram of soil.

Cereal tolerance / yield loss

A trial was established at Sandilands on Yorke Peninsula (YP) to determine tolerance and resistance of wheat, barley, oat and triticale varieties to *P. neglectus*. Field pea, faba bean, chickpea, vetch, canola and medic varieties were also included in this trial and will be discussed in the following section. Although initial nematode numbers at the Sandilands site were low (average of one *P. neglectus* per gram of soil at sowing) a yield loss of 13-17% was observed in the most intolerant wheat varieties Machete, 11/9 and Beulah. Buckley, Franklin, Carrolup, Wallaroo, Ouyen and Yallaroi were moderately intolerant with a yield loss of 9-11%. The most tolerant cereal varieties were Excalibur, Muir, Spear, Trident, Galleon, Chebec, Yanac, Frame, Bettong and Krichauff (Table 1).

In addition to the Sandilands site, two smaller cereal tolerance trials were sown on Upper Eyre Peninsula (EP) by Andrew Ware. One site (Condada) had pure *P. neglectus* (average of three *P. neglectus* per gram of soil at sowing) and a second site (Minnipa) had high levels of *P. thornei* (average of four *P. thornei* per gram of soil at sowing). The most intolerant varieties at the Condada *P. neglectus* site were Echidna and Machete with losses of 25% and 21%, respectively. The most tolerant varieties were Excalibur, Krichauff and Schooner (Table 2). Similar rankings were obtained from the Sandilands site, although some exceptions did occur, with Tahara and Echidna having higher yield loss on Eyre Peninsula. Sites and seasonal conditions will affect magnitude of yield loss caused by nematodes.

The most intolerant variety at the *P. thornei* site was Stiletto with a loss of 14%. Barunga Excalibur, Frame and Krichauff were moderately intolerant. Echidna, Tahara, Potoroo, Chebec and Schooner appeared most tolerant (Table 2). Although Machete appeared tolerant in this trial, previous research has indicated this variety is intolerant to *P. thornei*. These rankings were different to those obtained for *P. neglectus*, indicating the variation in tolerance response to the nematode species.

Pulse and oilseed tolerance / yield loss

Some varieties of canola were intolerant, with visual responses observed early in the season, and yield losses of 28% in Karoo and 10% in Rainbow. Narendra, Oscar, the breeders' lines BLN800 and BLN900 and Hyola 42 were more tolerant (Table 3).

Although pulses were sprayed for Heliothis, a heavy infestation still occurred and yield losses may have been over-estimated especially for faba beans, chickpeas, peas and vetch. The yields of chickpeas were very low at this site, because of contamination with regenerating medic. For these reasons all pulses require further investigation.

Table 1. **Yield loss in cereal varieties caused by *P. neglectus*, Sandilands, YP, 1996 (pre-sowing 1 nematode/g soil).**

Crop	Variety	Yield in untreated plots (t/ha)	Yield loss (%)
Wheat	Machete	3.1	17
Wheat	11/9	3.5	14
Wheat	Beulah	3.4	13
Wheat	Buckley	4.1	11
Barley	Franklin	3.8	11
Oat	Carrolup	3.2	11
Oat	Wallaroo	2.6	10
Wheat	Ouyen	3.6	9
Durum	Yallaroi	3.2	9
Barley	Schooner	3.4	8
Oat	Echidna	3.6	7
Oat	Bandicoot	2.5	7
Wheat	Bowie	3.6	7
Wheat	Barunga	2.9	7
Wheat	Tatiara	3.5	6
Triticale	Tahara	3.4	6
Oat	Euro	3.6	5
Wheat	Janz	3.8	4
Triticale	Abacus	3.4	4
Oat	Potoroo	4.1	4
Wheat	Excalibur	3.8	3
Triticale	Muir	3.2	3
Wheat	Spear	4.2	2
Wheat	Trident	3.6	0
Barley	Galleon	3.8	0
Barley	Chebec	3.6	0
Wheat	Yanac	3.2	0
Wheat	Frame	3.9	0
Oat	Bettong	3.4	0
Wheat	Krichauff	4.1	0

Table 2. **Yield loss caused by *P. neglectus* (pre-sowing 3 nematodes/g soil) and *P. thornei* (pre-sowing 4 nematodes/g soil), Upper EP, 1996.**

Variety	*P. thornei* (Minnipa)		*P. neglectus* (Condada)	
	Yield in untreated plots (t/ha)	Yield loss (%)	Yield in untreated plots (t/ha)	Yield loss (%)
Echidna	1.5	0	1.1	25
Machete	1.2	1	1.1	21
Janz	1.3	5	1.2	17
Tahara	1.3	0	1.3	14
Stiletto	1.2	14	1.5	11
Chebec	1.2	0	1.3	11
BT Schomburgk	1.3	2	1.3	10
Euro	1.5	5	1.4	9
Potoroo	1.7	0	1.5	7
Frame	1.3	8	1.5	6
Barunga	1.2	9	1.3	5
Excalibur	1.4	9	1.5	5
Krichauff	1.3	7	1.6	4
Schooner	1.5	0	1.6	1

Table 3. **Yield loss in pulse and oilseed varieties caused by *P. neglectus*, Sandilands, YP, 1996 (pre-sowing 1 nematode/g soil).**

Crop	Variety	Yield in untreated plots (t/ha)	Yield loss (%)
Chickpea	Amethyst	0.3	43
Chickpea	Tyson	0.7	37
Faba bean	Ascot	2.2	28
Canola	Karoo	1.1	27
Vetch	Languedoc	1.7	17
Pea	Bluey	1.4	16
Chickpea	Desavic	0.8	14
Canola	Rainbow	1.4	10
Pea	Laura	1.8	10
Faba bean	Fiord	2.8	9
Canola	Dunkeld	1.5	8
Vetch	Blanchefleur	1.5	7
Canola	Narendra	1.5	7
Canola	Oscar	1.7	6
Chickpea	Kaniva	1.0	5
Canola	BLN800	1.5	5
Canola	BLN900	1.7	5
Pea	Early Dun	2.5	3
Pea	Alma	2.5	2
Pea	Glenroy	1.8	0
Chickpea	Dooen	0.6	0
Canola	Hyola 42	1.7	0
Pea	Bonzer	2.0	0
Pea	Dundale	2.4	0
Vetch	Popany	1.1	0
Faba bean	Icarus	1.7	0

Cereal resistance

Nine wheat varieties were sampled in September/October from SARDI Field Crop Evaluation Secondary and Waite Wheat Breeding trials. Four sites were assessed for *P. neglectus* and one for *P. thornei*. Rankings at these sites were similar to those obtained for the Sandilands and Condada sites (Figure 3a). Excalibur, 11/9, Krichauff and RAC655 contained significantly fewer nematodes than Spear or Machete: 64% fewer *P. neglectus* (Figure 1a) and 58% fewer *P. thornei* (Figure 1b). *P. thornei* numbers were much higher than those for *P. neglectus*.

Figure 1a. Multiplication of *P. neglectus* on wheat (data from 5 reps at four sites: Streaky Bay, Minnipa, Kalanbi, Walker Flat). LSD 5% = 4.7

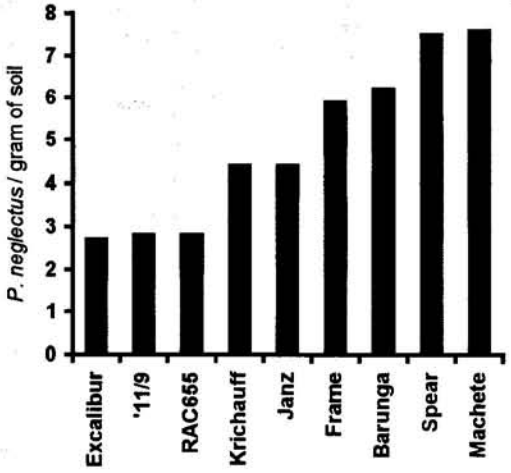


Figure 1b. Multiplication of *P. thornei* on wheat (data for 5 reps at one site: Nunjikompita). LSD 5% = 36.1

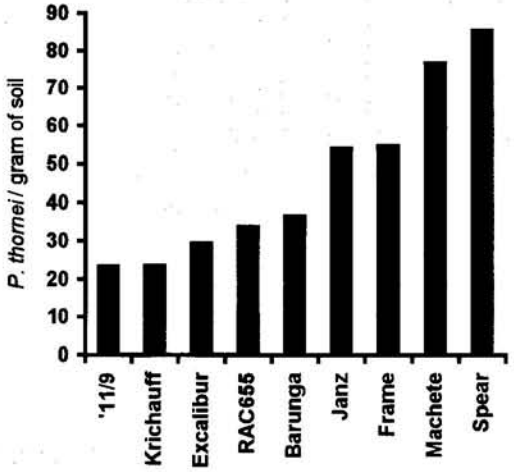
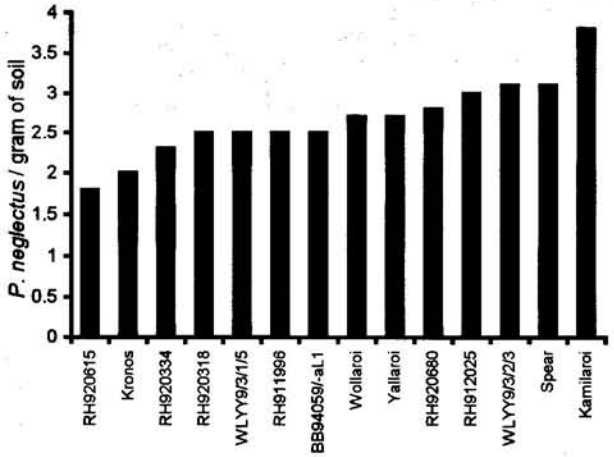


Figure 2. Multiplication of *P. neglectus* on durum wheat (4 reps at 3 sites). LSD5% = 1.9

Durum varieties and lines from trials established by Brenton Brooks (Waite Wheat Breeding) were assessed for *P. neglectus* at three sites (Walker Flat, Roseworthy, Minnipa) in September/October, and values compared with Spear. Durums were similar to Spear, although Kamilaroi contained significantly more nematodes (Figure 2). All varieties hosted similar numbers of nematodes, although further testing is required.



At the Sandilands site, initial *P. neglectus* numbers were low. Most varieties showed relatively low rates of nematode multiplication and many appeared to reduce *P. neglectus* numbers from the initial level of one nematode per gram of soil. In general the wheat varieties were the most susceptible, followed by oat and barley varieties. Excalibur and Krichauff wheat and Abacus, Muir and Tahara triticale were the most resistant varieties tested. Rankings from the Condada site were very similar but final nematode levels were much higher (Figure 3a). These rankings support previous research by Vanstone. Samples from the *P. thornei* site are still to be assessed.

Pulse, oilseed and medic resistance

Most pulse, oilseed and medic varieties showed low rates of nematode multiplication at the Sandilands site. Chickpea and canola varieties were the most susceptible: Desavic supported the highest nematode population, which was equivalent to the highest multiplication in the cereals (Buckley). Of the canola varieties, Hyola 42 had the lowest yield loss (Table 3) but was the most susceptible (Figure 3b) indicating that it is very tolerant. Canola plots will be re-sampled at the start of the 1997 season to determine if nematode levels have decreased over summer as a result of possible biofumigation action of canola roots and stubble break down. Pea and faba bean varieties were more resistant. With the exception of the medics, these field data support pot tests by Vanstone, indicating that canola, chickpea and vetch are more susceptible than pea or faba bean. Numbers obtained from medics at this site were lower than indicated from previous data, so further field tests are required.

Figure 3a. Multiplication of *P. neglectus* on cereals, Sandilands (YP) and Upper Eyre Peninsula, 1996. (Sandilands mean of 2 reps, EP mean of 6 reps).

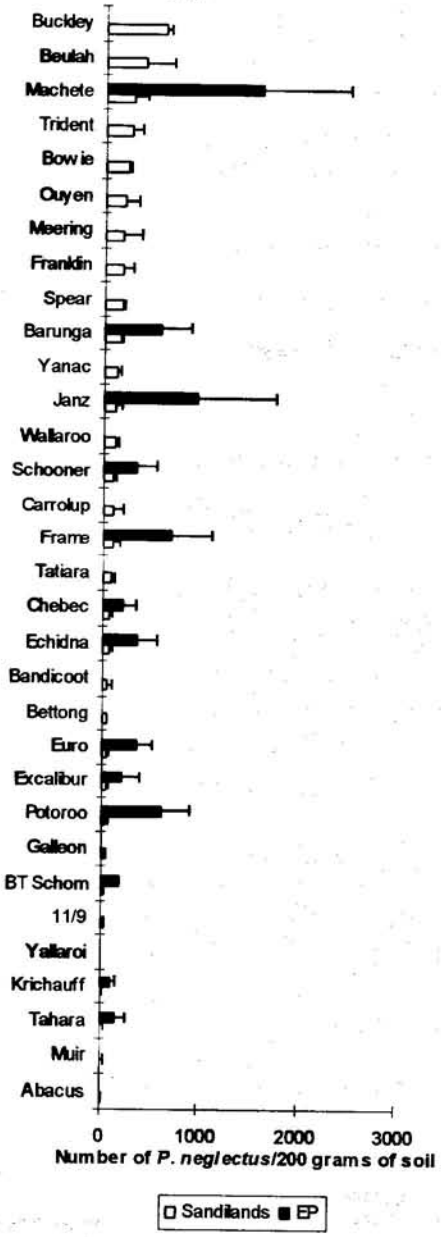
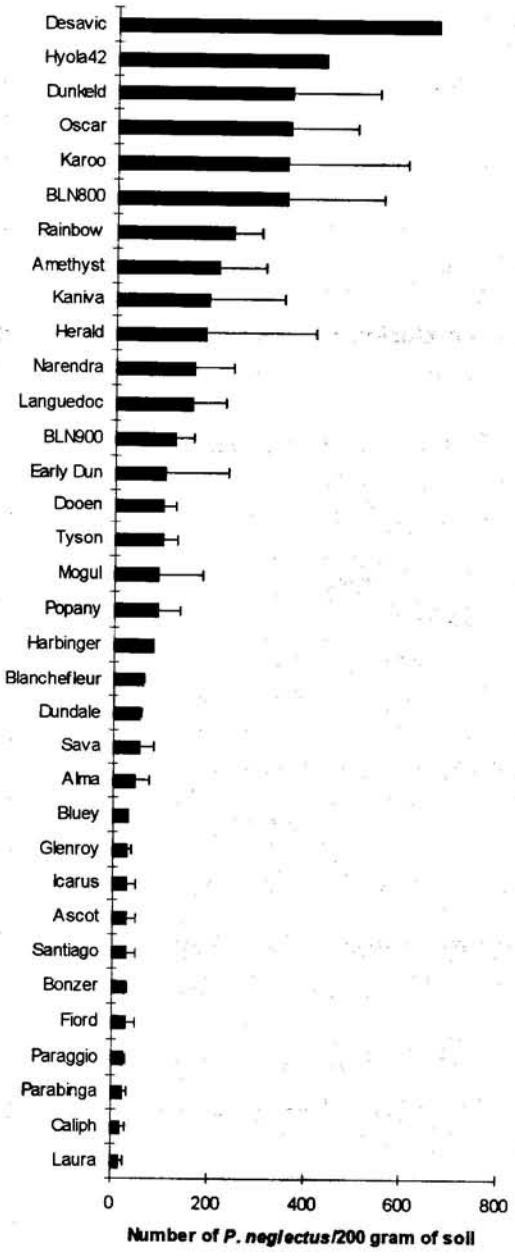


Figure 3b. Multiplication of *P. neglectus* on pulses, oilseeds and medics, Sandilands, 1996. (Mean of 2 reps; data for Desavic and Hyola 42 based on one replicate only).



Rotations and management

Rotation trials at Lameroo and Pinnaroo (established by Trent Potter, SARDI, Struan) were assessed for *P. neglectus*. Chebec barley and Janz wheat were sampled following a range of rotational crops. Cereal grown after faba bean, pea or peaola (poorer hosts to *P. neglectus*) was infected with 49% fewer nematodes than cereal after medic, chickpea or vetch (which are better hosts). The previous crop had more effect on nematode numbers in the wheat than in the barley, probably as Janz is more susceptible than Chebec (Figure 3a). Final samples from two rotation/tillage trials and two tillage/fertiliser trials on EP are yet to be assessed.

In a *P. thornei* trial and a *P. neglectus* trial on EP, the application of high rates of phosphorus (50kg P/ha) to Machete significantly reduced the magnitude of yield loss caused by the nematodes. At the *P. thornei* site, very high levels of nematodes (pre-sowing 33/gram of soil) caused a yield loss of 33%, which was reduced to 14% (significant at 5% level) with the application of high phosphorus. *P. neglectus* (pre-sowing 1/gram of soil) caused a 12% yield loss which was reduced to 6% (significant at 5% level) with the application of high phosphorus.

Conclusions

- Krichauff, Excalibur and triticales are consistently both more tolerant and more resistant to *P. neglectus* than other cereals in field trials.
- 11/9 appears to be more resistant to *P. neglectus*, although may be relatively intolerant.
- Franklin is more susceptible and more intolerant to *P. neglectus* than other barley varieties.
- Frame, Galleon and Chebec appear tolerant to *P. neglectus* and are recommended where CCN is a problem.
- Desavic chickpea and canola varieties appear more susceptible to *P. neglectus* (although further information on the potential of canola as a biofumigant is required).
- For *P. neglectus*, Karoo was the most intolerant canola and Hyola 42 was the most tolerant.
- Faba bean and pea varieties are more resistant to *P. neglectus* than other crops.

Acknowledgments

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Remember: BCDS Field Day - 17th September