The Distribution, Pathogenicity and Population Dynamics of *Pratylenchus thornei* on wheat in South Australia.

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Summary

The root lesion nematode (*Pratylenchus thornei*) has been identified as a damaging pathogen on cereals worldwide and within Australia in Queensland and New South Wales. In South Australia, *P. thornei* and *P. neglectus* have been found, but their importance to the cereal industry has yet to be defined. Although the research reported here focused primarily on *P. thornei*, several experiments involved *P. neglectus*. The major objectives of the project were to determine the distribution of both *Pratylenchus* species in South Australia, to study the field and laboratory population dynamics of *P. thornei* in relation to wheat yields, to determine its host range on a variety of cereal and non-leguminous hosts and to identify possible sources of nematode resistant wheat cultivars/varieties. The involvement of root rotting fungi with the nematode in wheat disease was studied in preliminary experiments.

The statewide survey for *P. thornei* and *P. neglectus* in soil and plants from the cereal growing regions in South Australia showed that there was a 90% chance of finding one or both species of nematode in a given soil type. *P. neglectus* was more commonly found in sandy soils, while *P. thornei* tended to be associated with clay soils, although this distinction was not definitive. The survey confirmed that both nematodes had a wide host range.

An assay for screening cereal and non-leguminous hosts was developed. Plants could be effectively screened over two months instead of five, using plants grown in a sandy soil in small polyethylene tubes inoculated with a non damaging initial density of 400 *P. thornei*. From the plants examined, varying degrees of nematode multiplication were evident for both nematode species. The majority of commonly cultivated Australian wheats were highly susceptible to *P. thornei*. Triticale, rye, oats and durum were moderately susceptible to resistant, while the non-leguminous hosts showed suggested resistance to *P. thornei*. Similar results were obtained for *P. neglectus*. However, in some instances differences in nematode multiplication between some varieties/cultivars
within the *T. aestivum* species were evident. The variety AUS4930 was one of the least susceptible wheats tested for *P. thornei*, but the most susceptible for *P. neglectus*.

Laboratory studies on yield relations and population dynamics on wheat found that *P. thornei* significantly affected many growth variables. In general, low initial densities at early stages of growth (up to 5 weeks) were associated with a stimulus of many plant growth variables, possibly a host response to damage. However, higher initial densities significantly reduced many growth variables, verifying that *P. thornei* damages wheat in its own right.

The field population dynamics and yield relations of *P. thornei* were examined in a two year trial established in the Barossa Valley in South Australia. *P. thornei* caused significant yield losses up to 38% on commonly cultivated South Australian wheats, however the initial *P. thornei* density associated with yield reductions was seasonally variable. Two suspected resistant wheat varieties, AUS4930 and GS50A, were confirmed as resistant in the field, and a common South Australian wheat (Warigal) was found to be highly susceptible. The population dynamics of *P. thornei* followed the general pattern of nematode behaviour, with low initial densities associated with high multiplication and higher densities with reduced multiplication. However, the equilibrium density for *P. thornei* was approximately 10,000 *P. thornei*/200g OD soil, which was well above previously documented *P. thornei* thresholds on cereal crops.

Preliminary studies investigating the mechanism of *P. thornei* resistance showed that in both wheat varieties AUS4930 and GS50A the resistance acted post-penetration. Genetic inheritance studies with AUS4930 and a commonly grown South Australian wheat suggested further selection of both parents was necessary to define accurately the genetic basis of the resistance.

There were synergistic associations of wheat damage with *P. thornei* and *P. neglectus* and two commonly occurring South Australian root rotting fungi, *Fusarium acuminatum*
and Microdochium bolleyi. It will be necessary to further investigate such associations, particularly before adoption of resistant cultivars, because fungal infection might lower resistance.

From this study *P. thornei* is considered to be economically important in South Australia. The polyphagous host range and polycyclic nature of the nematode will make effective control of the nematode difficult, but not impossible. The two wheat varieties, field selections of GS50A from Queensland and AUS4930, originally from Iraq, offer potential sources of resistance to *P. thornei* in the field. The influence of root rotting fungi in combination with Pratylenchus on resistance needs to be carefully considered for successful nematode control, as well as the inherent differences in cultivar reaction to the two nematode species.