Wheat and barley on medic pasture (Pratylenchus trial)

BCG in collaboration with Grant Hollaway (DNRE, Horsham)

The aim of this trial was to determine the impact of root lesion nematode (*Pratylenchus*) on wheat and barley production in the southern Mallee

Summary

Root lesion nematode (*Pratylenchus neglectus*) numbers were significantly less on cultivated medic fallow compared to sprayed medic fallow (September fallow). Cultivation is one way of reducing *Pratylenchus* numbers.

Cereal yields were higher on the cultivated compared to sprayed out fallow (direct drilled). Wheat and barley should not be direct drilled on medic fallow. The nematicides only slightly increased cereal yields so it is likely that factors, other than *P. neglectus* also contributed to the measured yield differences.

Background

Root lesion nematodes (*Pratylenchus*) are wide-spread in the Mallee and Wimmera and are known to cause significant yield losses in a wide range of crops. The most common species of root lesion nematode in the Mallee is *P. neglectus,* whilst in the Wimmera both *P. neglectus* and *P. thornei* are common.. The two species differ in their preference for crop types and even varieties within a crop. *P. neglectus* was the common species at the Birchip sites in 1997 and 1998. There is some evidence to suggest that wheat after medic pasture is often badly infected with the nematode. The BCG with support from DNRE have been investigating, at the Birchip sites, ways to reduce the impact of the nematode on wheat following medic pastures.

Methods

Treatments in 1998 included:

- spraying medic pastures early (September 1997) versus late (November 1997)
- long cultivated fallow (September 1997), short cultivation (February 1998) versus direct drilling
- three cereal varieties - Barque feed barley, Frame and Silverstar wheat
- a nematicide (Counter®)

All treatments were replicated (five times).

The population of nematodes present in each treatment was determined soon after sowing.

Results

Nematode numbers

Nematode numbers were significantly reduced by a short cultivation and even further by a long cultivation relative to the direct drill treatment at the Birchip site (Table 4.9). In addition, spraying medic pastures in early September also reduced nematode numbers compared with the late spray in November, but not to the same degree as cultivation.

Table 4.9 *P. neglectus* population (number/g dry soil) in relation to early and late spraying of medic pasture and length of cultivated fallow period at Birchip in 1998.

medic	Cultivated fallow length		
	long	short	direct drill
Sep '97 spray	2.3	3.9	4.3
Nov '97 spray	3.3	4.0	6.0
significant difference:			
Spray timing	**P<0.05, LSD=0.8**		
Cultivation length	**P<0.05, LSD=1.0**		

The nematicide Counter® significantly ($p < 0.05$) reduced the population of *P. neglectus* in the soil
(Table 4.10).

Table 4.10 Effect of nematicide on nematode population (*P. neglectus* / *g* soil)
(counts not replicated)

	Cultivated fallow length					
	Long		short		direct drill	
medic	**no Counter**	**+Counter**	**no Counter**	**+Counter**	**no Counter**	**+Counter**
Sep '97 spray	2.3	1.5	3.9	3.5	4.3	1.6
Nov '97 spray	3.3	2.8	4.0	2.0	6.0	2.2

Grain Yield

The largest yield effect in the early sprayed treatment was from the length of cultivated fallow (Table 4.11). In all cases the lowest yield was from direct drill and the highest from the cultivation in September '97. Barque barley had a significantly higher yield compared to Frame wheat which had a higher yield than Silverstar. The addition of the nematicide Counter® resulted in a small but significant improvement in yield.

Table 4.11 Crop yield (t/ha) on medic sprayed out in September 1997. Treatments: three cereal varieties; long cultivation, short cultivation and direct drill; and nematicide (Counter®)

cultivated fallow length	**Barque barley**		**Frame wheat**		**Silverstar wheat**	
	no Counter	**+Counter**	**no Counter**	**+Counter**	**no Counter**	**+Counter**
long cultivation	2.26	2.35	1.73	1.91	1.60	1.66
short cultivation	1.62	1.81	1.30	1.66	1.07	1.19
direct drill	0.85	0.97	0.73	0.72	0.41	0.59
Significant difference:						
variety	**P<0.01 LSD=0.19**					
cultivation	**P<0.01 LSD=0.19**					
Counter®	**P<0.05 LSD=0.15**					

Yield differences were not as significant for the late sprayed treatment (Table 4.12). There was no differences in yield between the three cereal varieties. Differences in yield were found between cultivation length treatments. Counter did not increase grain yield.

Table 4.12 Crop yield on medic sprayed out in November 1997. Treatments: three cereal varieties; long cultivation, short cultivation and direct drill; and nematicide (Counter)

cultivated fallow length	**Barque barley**		**Frame wheat**		**Silverstar wheat**	
	no Counter	**+Counter**	**no Counter**	**+Counter**	**no Counter**	**+Counter**
long cultivation	1.35	1.17	1.06	0.93	1.03	0.93
short cultivation	1.28	1.23	1.07	0.89	0.99	0.70
direct drill	1.13	1.08	1.09	1.19	0.94	0.89
Significant difference:						
variety	**NS**					
cultivation	**P<0.01 LSD=0.12**					
Counter®	**P<0.05 LSD=0.10**					

Interpretation:
Nematode Numbers:
Cultivation in September significantly reduced *Pratylenchus* numbers relative to the other cultivation treatments. Mechanical cultivation has the effect of killing the nematodes. It should however, be remembered that growing a resistant crop can also significantly reduce nematode populations, without cultivation, as was shown at Birchip in 1997 when the nematode population was reduced to 2.7 for barley (a resistant crop) compared with 5.3 nematodes / g for wheat (a susceptible crop).

Based on results of V. Vanstone (University of Adelaide) and S. Taylor (SARDI) reducing the population of *P. neglectus* from 6 nematodes/g in the direct drill treatment to 2 in the long cultivation treatment could be expected to decrease the yield loss of an intolerant cereal from 15-20% to 5% loss.

Spraying the medic in September instead of November had a small but significant effect on reducing nematode numbers. This was most likely due to the earlier removal of the nematodes' host, therefore preventing multiplication of the nematode during Spring. As expected the application of a nematicide decreased nematode numbers.

Grain Yield

In 1998 the plots that were sprayed out early and the cultivated treatments yielded higher compared to all other treatments. The small, but significant response to the application of nematicide suggests that nematodes had an effect on grain yield but were not the major reason for the differences in grain yield recorded in this trial. It should also be remembered that this trial was also infested with CCN which may help to explain some of the yield differences observed. The presence of CCN would partly explain the yield differences between varieties in the September sprayed treatment since Barque is CCN tolerant, Frame, moderately tolerant and Silverstar susceptible. Both Barque and Frame are moderately tolerant of *P. neglectus* while the tolerance of Silverstar is unknown.

This trial has shown that grain yield following a medic pasture was optimised by spraying out the pastures in September and practicing a long cultivation. Root lesion nematode control would account for some of this yield advantage, however other factors such as soil water retention would have contributed to the improved grain yield.

If direct drilling was practiced grain yield was increased by spraying out the pasture late in November.

Commercial Practice

To optimise wheat yields following medic pastures the paddock should be cultivated in the previous spring. Spraying the medic in spring and cultivating over summer was not as successful as cultivating earlier. Direct drilling wheat in sprayed medic pastures is not successful.

Note

It appears from limited data that in the southern Mallee that most of the P. neglectus population is found in the topsoil (80% found in top 10cm - total depth sampled was 70cm). At St Arnaud on a cracking clay, the population of P. thornei was more evenly distributed through the soil profile (only 25% were found in top 10cm of soil profile). This may mean that cultivation may not be as good an option to control nematodes number on the cracking soils because a high proportion of the nematodes are found deeper than 10cm.

A soil test is available to determine the populations of root lesion nematodes present in a paddock (contact: Grant Holloway at VIDA 03 53622111). The test result can be used to identify paddocks at risk and ensure that appropriate management practices are adopted.