Wheat and Barley on Medic

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Summary: The yield of wheat (Frame and Ouyen) and barley (Galleon) was double on cultivated fallow (October 96) compared to chemical fallow medic pasture. Frame and Galleon yielded about 20% more than Ouyen regardless of the cultivation practice. These results can be attributed to the effects of *Pratylenchus neglectus*, root lesion nematode. Frame and Galleon are relatively tolerant to the nematodes and yielded quite well, whereas Ouyen is not tolerant and yielded poorly. Cultivation is also known to reduce the numbers of nematodes.

Background: Root lesion nematodes (or Pratylenchus)are known to be wide-spread in Mallee and Wimmera soils and can cause significant yield loss in a wide range of crop types (and medic pastures). The two main species of these nematodes are *Pratylenchus neglectus* and *P. thornei*, with the more common type in the Mallee being P. neglectus, and in the Wimmera P. thornei. Wheat crops following medic pasture are known to be badly affected, especially if the medic is not fallowed. The Birchip Group in collaboration with VIDA and SARDI, are trying to work out a nematode management program based around crop and variety selection, cultivation and fertiliser use, to reduce the negative effects of Pratylenchus.

Aim: To identify cultivation and fertiliser practices which reduce the incidence and damage caused by Pratylenchus.

Methods: Three cereals (Galleon barley, Ouyen and Frame wheat), four cultivation practices (October '96, dry cultivation in March '97, wet cultivation following the first rain in May '97, and direct drill), and three fertiliser regimes (normal P and N, high P normal N, normal P and high N) were compared for yield. Some of the treatments were analysed for Pratylenchus numbers in the soil at the soft dough stage of the crop (early November '97). All treatments were replicated five times.

Results:

Yield

Cultivation #	P fertiliser (kg/ha)	N fertiliser (kg/ha)	Yield (t/ha)		
			Galleon	Frame	Ouyen
LC	16	6	1.98	1.85	1.37
DC	16	6	0.45	0.52	0.37
MC	16	6	0.84	0.62	0.57
DD	16	6	0.96	1.01	0.92
LC	41	6	2.27	2.00	1.80
DC	41	6	0.49	0.42	0.24
MC	41	6	0.79	0.69	0.41
DD	41	6	1.14	0.97	0.67
LC	16	43	2.04	2.01	1.68
DC	16	43	0.48	0.54	0.34
MC	16	43	0.79	0.71	0.59
DD	16	43	1.06	0.89	0.91
Significant differences:		**Variety**	**P<0.001 LSD=0.07**		
		Cultivation	**P<0.001 LSD=0.08**		
		P fertiliser	**NS**		

N fertiliser	NS

LC=long cultivation, DC=dry cultivation, MC=May cultivation, DD=direct drill

Pratylenchus numbers

The soil was tested prior to sowing in May and was found to contain 1.5 nematodes/gram of dry soil (low to moderate level). The nematodes were pre-dominantly P. neglectus.

Soil and root material was tested again just after a good rain in early November.

Crop Type/Variety	Pratylenchus numbers (nematodes/ gram dry soil) (Nov '97)		
	Direct Drill	May Cultivation	Long Cultivation
Galleon barley	3.9	3.2	1.0
Frame wheat	7.1	5.2	3.6
Ouyen wheat	9.4	6.4	5.3

There was a significant difference in nematode numbers counted in November by variety ($P<0.01$, LSD=2.3) and also by cultivation technique ($P<0.01$, LSD=1.4).

Interpretation: Yields were significantly higher for Frame and Galleon compared to Ouyen. The effects of the cultivation practice was also highly significant with the long fallow plots (cultivated in October '96) having double the yield compared to crops which were sown on the chemical fallow. The direct drill practice yielded significantly better compared to the dry cultivation and May cultivation practices. This result was not expected. The whole site had been chemically fallowed when the plots were mechanically worked for the October fallow, so it is unlikely that soil water differences would have been significant enough to cause such large differences in yield.

The Birchip Manual in 1997 reported on Pratylenchus work undertaken in SA by Taylor and Vanstone. The preliminary ratings for both types of nematode, for the three varieties in our trials, according to SARDI and VIDA, are (note the Birchip trial only had P. neglectus):

Crop type / variety	Pratylenchus neglectus		Pratylenchus thornei	
	Resistance#	Tolerance*	Resistance#	Tolerance*
Galleon barley	MR	MT	?	?
Frame wheat	MS	T	S	MI
Ouyen wheat	S	MI	S	T

Resistance to nematodes refers to the ability of the nematode to multiply on the variety, ie. Resistance means the nematode will not multiply, whereas susceptible means the nematode will multiply
(MR=moderately resistant, MS=moderately susceptible, S=susceptible)

* Tolerance to nematodes refers to the ability of the variety to withstand the nematode without yield loss, ie. Tolerance means that the variety does not suffer even in the presence of the nematode, whereas Intolerance means that the variety will suffer a yield loss in the presence of the nematode
(T=Tolerant, MT=moderately tolerant, MI=moderately intolerant)

In terms of the yield achieved, the ratings reported in the above table are pretty good. Ouyen suffered a yield loss in the presence of high numbers of P. neglectus because it is Moderately Intolerant, and Galleon and Frame had good yields because they are relatively Tolerant. In terms of the P. neglectus numbers counted in November the resistance table was also accurate. Galleon barley which is Moderately Resistant had low numbers of nematodes, whereas Frame and Ouyen which are Susceptible had higher numbers of nematodes.

However, the overriding difference was in the cultivation practice, the results clearly showed that the long cultivation had lower nematode numbers and higher yields compared to the Direct Drilling or the May Cultivation. The depth at which the nematodes reside in the soil also needs to be determined, primarily because if they are deeper in the subsoil then it is unlikely that cultivation practices will have much of an impact in controlling numbers.

The Birchip Cropping Group will be undertaking more work with Pratylenchus in order to find the best management practices, either through mechanical means or crop choice, to reduce the negative effects of this nematode.

Commercial Practice: wheat on mechanical fallow coming out of medic pasture yields better compared to chemical fallow or not fallowing at all. This in part could be due to greater soil water storage under fallow. However, we know that the root lesion nematode (Pratylenchus) also plays a role, and that long fallowing greatly reduces the incidence of the nematode. It is also apparent that Frame is more tolerant to P. neglectus compared to Ouyen wheat, and that Galleon barley is similar in tolerance to Frame. In the southern Mallee on paddocks coming out of medic it would be advisable to fallow them over summer to reduce nematode numbers. Frame wheat would be a better choice for wheat compared to Ouyen, if P. neglectus was the primary nematode in the paddock. It is not known where Silverstar fits in this picture, but it is expected that Silverstar is intolerant to P. neglectus (discussion with SARDI staff).

NOTE: the information above relates primarily to P. neglectus not to P. thornei. Crops and varieties are different to their tolerance and resistance ratings to both these nematodes. Nematode species and number can be tested by VIDA.

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