



Soilborne disease following the pasture legume, Sothis

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Key messages

- In 2018 and 2019 Sothis increased soil levels of the root lesion nematode *P.neglectus* when compared to chemical fallow trial strips.
- During the 2020 season Rhizoctonia levels increased from zero to high risk levels in oats with Sothis germinating underneath.
- Monitoring of soilborne diseases through different rotations and seasons helps increase understanding of the impact on our farming systems

Aims

To monitor the presence of soilborne disease levels in the system following the legume pasture, Sothis.

Background

A Chapman Valley grower was interested in alternative pasture species to benefit his livestock and cropping operation. Other local cropping farmers were also interested in how to add legume diversity to the farming system, especially as an alternative to chemical fallow. This paddock was selected to observe the potential benefits of a pasture legume in the farming system.

In 2017, the paddock was sown to Sothis, a cultivar of eastern star clover (*Trifolium dasyurum*) and in 2018, Hydra wheat. In 2018 a nitrogen rate response trial was conducted in a section of the paddock, comparing the rotational benefits to wheat of Sothis pasture compared to fallow. No significant difference in yield or gross margin was found between wheat after Sothis and wheat after fallow (refer to Rossi, 2018 <https://www.farmtrials.com.au/trial/31482>). However, Predicta B testing of soil in the trial strips revealed significantly higher *P.neglectus* in the wheat after Sothis compared to wheat after fallow. Therefore, monitoring of these trial strips was continued in 2019 when the paddock was left to regenerate to Sothis pasture to use for seed production. In 2020 the paddock was sown to oats and, because the trial strips were difficult to locate, random paddock sampling was conducted instead to determine soil borne disease levels by Predicta B testing.

Method

Site details

Year	Treatment
2017	<p>Sothis pasture (i.e. Eastern star clover pasture) – sown</p> <p>Trial site established in the paddock with strips of Sothis and ‘fallow’.</p> <p>14 July and 21 September - ‘fallow’ strips established by spraying with glyphosate. Second spray was to remove late emerging Sothis.</p> <p>Soils samples collected for Predicta B testing</p>
2018	<p>Wheat (variety Hydra)</p> <p>In a section of the paddock, a nitrogen rate trial was conducted across the strips of Sothis and ‘fallow’ to investigate the nitrogen benefits of Sothis to the subsequent season’s wheat crop.</p> <p>May (pre-seeding) and September - soil samples were collected from both Sothis and fallow strips for Predicta B testing</p>
2019	<p>Regenerating Sothis pasture for seed collection.</p> <p>27 May - 2018 trial strips not visible so soil sampled across whole paddock for Predicta B testing (15x3 cores, 10cm depth)</p> <p>23 July – 2018 trial strip locations became visible as the Sothis emerged so soil was sampled from the ‘fallow’ and Sothis strips for Predicta B testing. Samples (15x3 cores, 10cm depth) were collected from the area of the 2018 trial site corresponding to the 25 kg/ha N rate plots within the 2018 ‘fallow’ and Sothis strips.</p>
2020	<p>Oats (variety William); paddock grazed prior to seeding. The chemical regime used enabled Sothis to germinate under the oats.</p> <p>16 June - knockdown of 1.5L/ha of Weedmaster DST</p> <p>18 June - Williams oats sown at 95kg/ha with 55kg/ha MAPSCZ, 50L UAN and 10L.</p> <p>22 June - 0.5L/ha Chaser S and 0.3kg/ha Diuron 900DF was applied PSPE.</p> <p>27 May and 24 September – soil and roots sampled across paddock for Predicta B testing. Random sampling, (15x3 cores, 10cm depth) in rows of standing oat crop.</p>

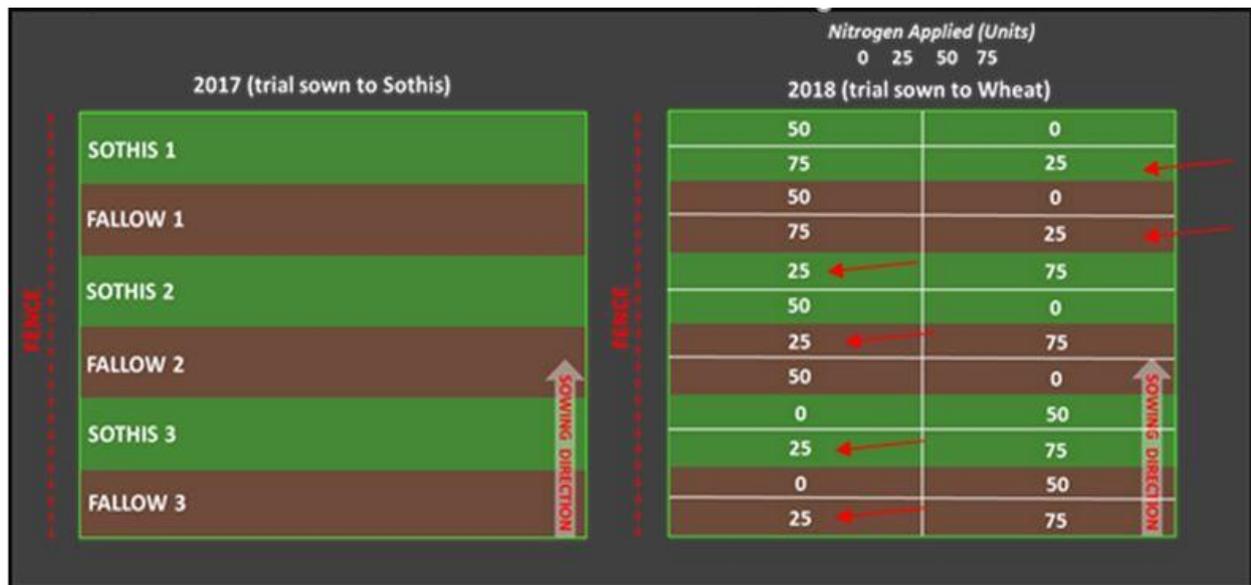


Figure 1. Trial layout showing 2017 pasture and fallow strips and 2018 plot trial testing nitrogen rates. Red arrows indicate the plots where soil was sampled for Predicta B testing in July 2019.

Results and Discussion

Table 1. *P. neglectus* levels (average number/g soil) in 'fallow' and Sothis strips from Predicta B testing conducted in 2018 and 2019.

Sampling location	2018 Post-seeding N kg/ha)	2018 May (Pre-seeding) <i>P. neglectus</i>	2018 mid-September <i>P. neglectus</i>	2019 May <i>P. neglectus</i>	2019 July <i>P. neglectus</i>
Fallow strips from 2018 trial	0	2.0	12	-	-
	25	-	6	-	4
	50	-	15	-	-
	75	-	9	-	-
Sothis strips from 2018 trial	0	5.3	21	-	-
	25	-	37	-	16
	50	-	50	-	-
	75	-	39	-	-
Whole paddock	-	-	-	7	-

Table 2. Soil borne disease levels across whole paddock from Predicta B testing conducted in 2020

Organism	2020 July	2020 September (post- harvest)
Rhizoctonia - <i>R. solani</i> AG8 (pgDNA/g)	0	390
Yellow leaf spot - <i>Pyrenophora tritici-repentis</i> (kDNA copies/g)	4	2
Common root rot - <i>Bipolaris</i> (pgDNA/g)	7	0
Pythium root rot - <i>Pythium clade f</i> (pgDNA/g)	74	51
Root lesion nematode N - <i>Pratylenchus neglectus</i> (nematodes /g)	7	11
Root lesion nematode Q - <i>Pratylenchus thornei</i> (nematodes /g)	2	0
Charcoal rot - <i>Macrophomina phaseolina</i> (kDNA copies/g)	93	54

2018-2019

In 2018 Predicta B test results revealed an increase in root lesion nematode *P. neglectus* levels during the season. In September there was a higher nematode load (21–50 RLN/g) in the Sothis strips than the fallow (6–15 RLN/g) (Table 1). It appeared that Sothis may increase nematode numbers, a similar effect to that observed for Dalkeith subclover (Swift *et al* 2019). Legume species and even varieties within the species, vary in the effect they have on nematode populations. Although Collins *et al* (2018) found Sothis to be moderately resistant to *P. neglectus* in glasshouse trials, previous trials found it was susceptible (Vanstone *et al* 2008).

The presence of nematodes may have damaged the root system of the pasture phase reducing its capacity to contribute nitrogen and other nutrients to the subsequent wheat crop, thereby affecting the results of the 2018 trial where there were no observed significant differences in yield, protein and gross margins between Sothis and fallow for each nitrogen rate.

In 2019 when the paddock was left to regenerate to Sothis, Predicta B testing confirmed four-fold higher *P. neglectus* levels in soil where the 2018 Sothis strips were located (16 nematodes/g) as compared to the fallow (4 nematodes/g) (Table 1). These levels were lower than measured in the same plots in 2018 (Sothis – 37 nematodes/g; fallow – 6 nematodes/g) when the paddock was in wheat.

2020

In 2020 samples were submitted for the full suite of Predicta B tests. Several organisms were present (table 2) with the results of interest being rhizoctonia, root lesion nematode (RLN) and charcoal rot. During the season rhizoctonia levels increased from zero to 390, which is high risk. Such an increase has been commonly seen in DPIRD trials with a susceptible crop (S. Collins, DPIRD; pers comm). In contrast RLN levels remained fairly stable during the season, even though oats is a susceptible crop, although Williams is one of the more resistant varieties tested (Collins *et al* 2018). It suggests that either season and/or soil biology has kept the RLN levels in check. Charcoal rot (*Macrophomina phaseolina*) was detected but this test is under development and little is known on whether these levels are significant or will impact the Sothis or subsequent crops. Traditionally charcoal rot is considered a broadleaf issue in more tropical growing areas, for example it is thought to cause lodging in sorghum (Adorada *et al* 2019), but is starting to be detected in the WA wheatbelt. Pythium root rot organisms were present and relatively stable during the season

Conclusion

The paddock was initially selected to observe the potential rotational benefits of the legume pasture Sothis in the farming system. When higher *P. neglectus* levels were detected in wheat after Sothis compared to wheat after fallow the focus changed to monitoring soil RLN.

P. neglectus appeared to increase under Sothis in the trial in this paddock, suggesting it is a susceptible species, whereas previous studies had conflicting results finding it both susceptible and moderately resistant. In 2020 *P. neglectus* was again present but

remained stable throughout the season despite oats being a susceptible crop and Sothis, which has appeared susceptible in this focus paddock, regenerating underneath.

Continued monitoring of RLN and other soilborne diseases is important to help understand the changes in risk to crop and pasture species and potential impacts on production. The soil monitoring in this study has provided some additional knowledge to the DPIRD nematology group's research programme.

References

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Acknowledgments

Thanks to grower Jason Stokes for his time and support in hosting this ongoing activity and Sarah Collins, DPIRD, for her interpretation of Predicta B results.

This work was part of the Regional Agronomy project (DAW00256) supported by investment from DPIRD and GRDC.

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