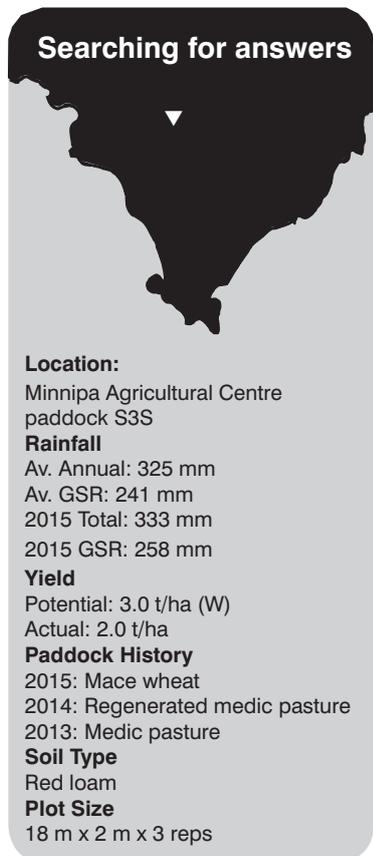


Grass weed management in pasture

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RESEARCH

Searching for answers



productivity in 2014 and lowered wheat grain protein in 2015.

Why do the trial?

The GRDC project 'Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula' aims to produce sustainable management guidelines to control pests, weeds and diseases while retaining stubble to maintain or improve soil health, and reduce exposure to wind erosion. The major outcome to be achieved is increased knowledge and skills allowing farmers and advisers to improve farm profitability while retaining stubble in farming systems on upper Eyre Peninsula (EP).

The Minnipa Agricultural Centre S3S pasture trial was established in 2013 to assess barley grass weed management with a two year medic pasture break. The trial had different grass weed management and tillage treatments imposed in 2013 and in 2014. The trial was then sown with wheat in 2015.

How was it done?

The replicated trial was established in 2013 by Roy Latta in MAC S3S paddock. The pasture treatments imposed in 2013 were:

- selective grass control,
- selective grass control and mowing/haycut and
- selective grass control and pasture topping.

Broadstrike @ 25 g/ha and 100 ml/100L of Chemwet was applied to the paddock on 23 May 2013 for broadleaved weed control. Selective grass control was also applied to the whole paddock on 5 June with 250 ml/ha of Targa Bolt and Hasten @ 1 L/100L. The pasture topping treatment was imposed by boomspray on 20 August with 200 ml/ha of Roundup

Attack. The mowing treatment was imposed on 22 September when the rest of paddock was cut for medic hay.

In 2014 the 3 blocks were each split into worked (a light tillage with an off-set disc) or unworked areas on 1 March. The trial area was sprayed on 9 June with 425 ml/ha Select, 25 g/ha Broadstrike and 1 L/100L Hasten for grasses and broadleaved weeds. Early dry matter and weed counts were taken on 18 June before the paddock was grazed. Powdery mildew and aphid damage was scored on 25 August.

In 2015 pre-sowing treatments imposed were:

- harrowing to remove medic stubble,
- disc/light tillage,
- full cut tillage and
- direct drill were imposed across the worked and unworked split plots.

The plots were worked with an off-set disc on 15 April, the harrowing treatment on 28 April and the full cut working was on 8 May.

What happened?

The trial was sown with Mace wheat @ 60 kg/ha and base fertiliser of 18:20:0:0 @ 60 kg/ha in drying conditions on 20 May. The trial was sprayed on 20 May with a knockdown of 1.5 L/ha of Treflan, 1 L/ha of Roundup Powermax and 80 ml/ha of Nail. The trial was also sprayed with 750 ml/ha Tigrex and 100 ml/ha Lontrel on 23 July and harvested on 12 November.

Measurements taken during the season were dry matter medic pasture residues and seed production, soil moisture, emergence count, grass weed counts (at establishment, in crop and at harvest), grain yield and grain quality.

Key messages

- **Following two years of grass free medic pasture soil mineral nitrogen levels averaged 158 kg N/ha and all disease inoculum levels were low.**
- **Cutting the medic pasture for hay lowered dry matter production and medic pod set in the following season.**
- **An early light tickle resulted in higher weed germination and lower powdery mildew damage in spring.**
- **Full cut tillage following two years of grass free medic resulted in the highest wheat yields while a discing prior to seeding resulted in the lowest yield.**
- **Working medic residues in the year prior reduced the following wheat yield but grain protein was higher.**
- **Cutting a medic pasture for hay in 2013 reduced medic**

Table 1 Soil analysis of direct drilled treatments after two years of medic pasture (average of 9 samples) in 2015.

Depth (cm)	pH (CaCl)	Cowwell P (mg/kg)	PBI	EC (1:5)	ECe (dS/m)	Total soil N (kg/ha)		Volumetric soil moisture April 2015 (mm)	
						unworked	worked	unworked	worked
0-10	8	35	122	0.144	1.44	39	29	9	9
10-30	8	5	159	0.143	1.43	47	44	18	15
30-60						18	21	21	18
60-100						57	61	25	23
Total reserves (0-100)						162	154	73	65

Table 2 Medic growth and weed numbers in 2013 and 2014.

2013 Treatment*	2013 Sept	2013 Dec	2014 treatment	2014 June	2014 Aug	2014 Sept				2015 Feb
						Barley grass (plants/m ²)	Rye grass (plants/m ²)	Wild oats (plants/m ²)	Broad leaf weeds# (plants/m ²)	
	Early dry matter (t/ha)	Medic pod yield (t/ha)		Early dry matter (t/ha)	Powdery mildew patches (%)					Medic pod yield (t/ha)
Selective grass only	4.59	0.34	worked	4.16	10	20	20	140	160	1.20
			unworked	3.27	40	0	40	0	210	1.69
Mowing haycut	1.16	0.16	worked	3.15	15	0	30	0	720	0.57
			unworked	2.79	35	0	0	0	250	0.47
Pasture topped	5.10	0.33	worked	3.08	20	110	20	10	250	1.10
			unworked	3.53	50	0	0	20	180	1.60

Milk thistle, Lincoln weed, marshmallow, wild turnip, buck bush, capeweed

What happened?

The 2015 soil data (Table 1) shows the trial site is alkaline in pH, with adequate phosphorus and high mineral nitrogen reserves, a moderate phosphorus buffering index (PBI) and salinity within the low range. There were no differences between initial soil moistures in 2013 or 2014 (data not presented). Predicta B inoculum levels predicted all diseases were at low risk after two years of medic pasture.

In 2013 the mown/haycut treatment had much lower late dry matter and medic pod set than the chemical treatments. In March 2014 tillage treatments were imposed across the grass control treatments. The worked areas had

a higher early medic dry matter with the best being 4.16 t/ha with selective grass control compared to the unworked with 3.27 t/ha (Table 2). In 2014 powdery mildew was an issue in this trial, as it was on many pastures in that spring. Damage was lower on the worked treatments possibly due to reduced inoculum levels from partly burying infected medic residues from the previous season.

The worked treatments generally had more grass and broadleaf weeds during the 2014 season (Table 2). The mowing/hay cutting treatment had impacts on 2014 seed production with fewer medic pods harvested from these treatments compared to the chemical treatments. Both

unworked chemical treatments had higher medic pod yield than the worked treatments.

Wheat establishment in dry seeding conditions were similar in the direct drilled and harrowed treatments and these were both higher than in the full cut and disced treatments (Table 3).

The 2015 grain yield was higher in the mowing/haycut and pasture topped treatment than the grass free treatment imposed in 2013. In all tillage treatments the worked plots yielded lower than unworked (Table 3). The 2015 grain yield was lowest in the disced treatment and highest with the full cut imposed before seeding (Table 3).

Table 3 Establishment, grain yield and grain quality of wheat in 2015 as affected by previous medic pasture management.

2013 treatment*	2014 treatment	2015 treatment	Establishment (plants/m ²)	Yield (t/ha)	Protein (%)	Test weight (kg/hL)	1000 Grain weight (g)
Pasture topped	unworked	Disc	114	2.00	14.9	74.3	24.4
	worked	Disc	101	1.84	15.5	73.0	23.1
Mowing/haycut	unworked	Disc	118	2.25	14.3	75.4	25.3
	worked	Disc	126	2.07	14.9	73.7	24.2
Selective grass only	unworked	Disc	106	1.77	15.6	76.1	24.6
	worked	Disc	116	1.55	16.2	74.3	23.2
		Average	113	1.91	15.2	74.4	24.1
Pasture topped	unworked	Full cut	125	2.30	14.5	74.6	24.7
	worked	Full cut	120	2.17	14.9	73.2	23.5
Mowing/haycut	unworked	Full cut	112	2.33	13.8	76.2	25.9
	worked	Full cut	112	2.15	14.7	73.8	23.9
Selective grass only	unworked	Full cut	120	1.98	14.1	77.2	26.4
	worked	Full cut	117	1.77	15.5	74.0	23.5
		Average	118	2.12	14.6	74.8	24.6
Pasture topped	unworked	Harrowed	126	2.21	15.0	73.5	24.2
	worked	Harrowed	136	2.14	15.2	72.7	23.2
Mowing/haycut	unworked	Harrowed	119	2.27	14.0	75.8	26.0
	worked	Harrowed	124	2.20	14.8	73.8	24.1
Selective grass only	unworked	Harrowed	141	1.93	15.1	75.7	24.6
	worked	Harrowed	132	1.77	15.7	74.4	24.6
		Average	129	2.09	15.0	74.3	24.2
Pasture topped	unworked	Direct drilled	129	2.15	14.6	74.2	24.8
	worked	Direct drilled	140	1.95	15.3	73.2	23.2
Mowing/haycut	unworked	Direct drilled	116	2.31	13.9	76.0	26.2
	worked	Direct drilled	132	2.28	14.6	73.7	24.5
Selective grass only	unworked	Direct drilled	134	1.78	15.4	75.3	24.4
	worked	Direct drilled	130	1.60	16.2	73.1	22.9
		Average	130	2.01	15.0	74.2	24.3
<i>LSD (P=0.05) Individual treatments</i>			17	0.12	0.54	1.11	1.1
<i>2015 tillage averages</i>			7	0.05	0.22	0.5	0.4

*In 2013 all treatments had selective grass control on 5 June

Table 4 Main effect of tillage treatments on grain yield and quality in 2015.

2015 tillage treatment	Protein (%) 2014 tillage treatment		Screenings (%) 2014 tillage treatment	
	unworked	worked	unworked	worked
Disc	14.9	15.5	22.2	27.2
Full cut	14.1	15.0	18.8	24.2
Harrowed	14.7	15.3	20.9	25.2
Direct drilled	14.6	15.4	21.1	25.7
LSD (<i>P</i> =0.05)	0.3		2.7	

Overall the grain samples had very good protein levels after the two years of pasture break due to high 2015 initial soil nitrogen. The unworked treatments had lower grain protein across all tillage treatments compared to the worked treatment (Table 4). The 2013 treatment of hay cut medic pasture resulted in lower protein than the other two grass control treatments.

Screenings in the trial were very high, with the worked treatments being higher than the unworked (Table 4). The mowing/haycut treatment in 2013 had lower screenings levels possibly due to lower nitrogen mineralisation, but the levels were still above the maximum delivery standard of 10%.

Pre-seeding grass weed counts taken on 20 May 2015 were very low and averaged zero barley grass/m², 0.06 rye grass/m² and 0.21 wild oats/m² (data not presented). Barley grass germination was generally lower than expected at the start of the 2015 season due to the dry conditions which suppressed early weed germination. The 2013 and 2014 pasture management and 2015 tillage systems had no effect on the final grass weed numbers taken in October 2015, and levels

were very low with less than 1 plant/m² for barley grass, ryegrass and wild oats in all treatments (data not presented).

What does this mean?

Two years of medic pasture with different grass weed management regimes resulted in high soil nitrogen levels and lowered disease inoculum to minimum levels, including *Rhizoctonia solani*. The mown/hay cut medic pasture treatment had impacts in 2014 and early 2015 with lower medic production and lower pod set in both years which also followed through to lower grain protein in wheat grown in 2015.

The 2014 light tillage with an off-set disc in the medic pasture resulted in higher germination of both grass and broadleaved weeds. The worked treatment had less damage and browning off due to powdery mildew in spring on the medic pastures.

The tillage treatments in 2015 impacted on wheat yield with the full cut tillage yielding highest and discing the lowest. In all tillage treatments the worked plots in 2014 yielded lower than unworked and had higher protein levels, which may have been due to the greater number of weeds in 2014.

The impact of two years of medic pasture with selective grass control in both years reduced grassy weed populations to very low levels, even without spray topping or hay cutting, with the light tillage resulting in greater weed germination during the 2014 season.

This research will be ongoing and resown to cereal this season to determine the impact of tillage in a second year of cereal on grass weed numbers and crop production.

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Registered products: see chemical trademark list.