DRYLAND LEGUME PASTURE SYSTEMS: PASTURE FEED VALUE

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TAKE HOME MESSAGES

- On a sandy acidic soil, Margurita French serradella was the standout alternative pasture legume for biomass production, followed by Bartolo bladder clover, SARDI rose clover, PM250 strand medic and Studenica vetch.
- The nutritional contents of the more recently developed pasture legumes were high and offer a valuable contribution to a pasture mix.
- The ability to header-harvest aerial seeded serradella and sow dry as pods in late summer reduces pasture establishment costs and can improve early season production.

BACKGROUND

Traditional annual legumes pastures have served us well and continue to do so. Due to intensified cropping rotations, less reliable seasons, and a changing climate however, conditions for persistence of those legumes can be less than optimal. In addition, harvesting some legumes can be a slow and laborious task, especially if they require suction harvesting like sub clover and medics often do.

Similarly, legume pastures are typically sown later, after crops. This limits biomass production in the year of establishment. These factors, coupled with periods of drought, have resulted in significantly eroded seedbanks of legume pastures on many farms. Despite a continuing positive outlook for livestock and legume pasture benefits, pasture renovation rates remain low.

The opportunity exists to improve the quality of the pasture base on many low to medium rainfall mixed farms across southern Australia. The Dryland Legume Pasture Systems (DLPS) project is evaluating the regional performance of commonly grown legumes including medics and vetch as well as recently developed pasture legumes such as serradella, biserrula and bladder clover.

A pasture legume variety trial was sown at Jil Jil in 2019. The site was managed conventionally over summer 2020 using three knockdown summer weed sprays to manage the high weed pressure. It was then oversown by the owner with Scepter wheat in 2020. Reported here is the nutritional analysis of 2019 pasture legume biomass.

AIM

To evaluate the establishment, production and persistence of a range of pasture legumes grown on sandy southern Mallee soils.

PADDOCK DETAILS

Location:	Jil Jil
Crop year rainfall (Nov-Oct): 376mm	
GSR (Apr-Oct):	181mm
Soil type:	Sand
pH:	0-10cm: 6.8, 10-40cm: 8.0, 40-70cm: 8.5, 70-100cm: 8.6
Paddock history:	Cereal

TRIAL DETAILS

Crop type/s:	Legume pastures
Treatments:	See Table 1
Seeding equipment:	Knife points, press wheels, 30cm row spacing
Sowing date:	17 May 2019
Replicates:	Three

TRIAL INPUTS

Fertiliser:	Granulock® Z + Impact @ 60kg/ha at sowing
Herbicide:	17 May 2019 – Roundup® @ 2L/ha applied IBS
	20 June 2019 – Liase @ 2% + Haloxyfop @ 0.075L/ha + Clethodim @ 0.3L/ha + Uptake @ 0.5%
	26 July 2019 – Liase @ 2% + Haloxyfop @ 0.075L/ha + Clethodim @ 0.3L/ha + Uptake @ 0.5%

The trial was kept pest and disease free.

Table 1. DLPS Trial treatment outline, Jil Jil, 2019.

Variety	Description notes*	Sowing rate (kg/ha)
SARDI rose clover	Developed in upper mid-north SA, not widely sown in Mallee but reports of good performance	7.5
Bartolo bladder clover	WA cultivar, aerial seeded, limited testing in the southern region	7.5
Cefalu arrowleaf clover	Deep rooted, adapted to deep well-drained soils	5.0
PM250 strand medic	Powdery mildew resistant, tolerant of SU herbicide residues, developed for SA Mallee regions. Scheduled for release 2021	7.5
Sultan SU barrel medic	Tolerant of SU herbicide residues	10.0, 5.0, 2.5 (3 treatments)
Toreador hybrid disc medic	Developed for sandy soils	7.5
Boron burr medic	Boron tolerant breeding line, spineless	7.5
Astragalus	Australian Pasture Genebank selection, new rhizobia	10.0
Casbah biserrula	WA cultivar, limited testing in the southern region	5.0
Margurita French serradella	WA cultivar, suited to acid soils	7.5
Trigonella balansae 5045	New species, aerial seeded	5.0
Studenica common vetch	New vetch, specifically developed for drier areas	40.0
Morava common vetch	Old cultivar	40.0

*Notes adapted from Tomney F. et al., 2019

METHOD

A replicated field trial was sown in 2019 using a complete randomised block design on a deep sandy soil with a pH of 6.8. Biomass production and nutritional analysis was assessed at flowering.

RESULTS AND INTERPRETATION

The 2019 site had deep subsoil moisture at sowing and legume pasture lines established well in their 30cm sowing rows. Average rainfall was received in winter however the spring finish was dry.

The paddock around the trial was sown to canola, making the lower legume pastures attractive to grazing by wildlife later in the season as it dried off. Although some grazing by wildlife was observed, significant differences in biomass and seed production were measured between the different pasture species.

Final biomass production ranged between 0.4 and 2.1t/ha (Table 2). Biomass at flowering was highest for Margurita French serradella (2.1t/ha), followed by SARDI rose clover, Bartolo bladder clover, PM250 strand medic and Studenica vetch producing between 1.0 to 1.3t/ha (Table 2).

Most legumes produced a large number of seeds (>5000/m^2) indicating flowering time was early enough for the environment and that a good seedbank had been established.

At peak biomass in October, the nutritional value of the forages was still adequate for most sheep production (Table 2).

Digestibility ranged between 62 to 70%: highest for Casbah biserrula and lowest for Sultan-SU medic. Quality declines as plants mature. Pasture quality was measured at flowering. Given medics flower earlier than the alternative species in the trial, this may be why Sultan-SU medic was the lowest.

Crude protein ranged from 11 to 17%; highest for Morava vetch, Casbah biserrula, Margurita French serradella and Cefalu arrowleaf clover (all above 15%) and lowest again for Sultan-SU medic.

Metabolisable energy for all legumes ranged from 9 to 10 MJ ME/kg DM and exceeded maintenance requirements.

Neutral detergent fibre was adequate for all pasture legumes except Casbah biserrula which was below 30%. In a pasture situation however, this would not be an issue as the biserrula would be part of a mix and the high protein and energy would bring feed value to the mix.

Table 2. Average flowering biomass and biomass nutrition of pasture legumes at Jil Jil, 5 October 2019*.

Pasture legume	2019 flowering biomass (t/ha)	Dry matter digestibility (%)	Crude protein (%)	Metabolisable energy (MJ ME/kg)	Neutral detergent fibre (%)
SARDI rose clover	1.09^{ab}	64.1^{e}	11.3^{cd}	9.3^{e}	36.7^{b}
Bartolo bladder clover	1.30^{ab}	67.7^{b}	11.8^{cd}	10.0^{b}	32.8^{d}
Cefalu arrowleaf clover	0.80^{ab}	67.1^{bc}	15.2^{ab}	9.8^{bc}	27.7^{e}
PM250 strand medic	1.04^{ab}	65.2^{cde}	12.8^{cd}	9.5^{cde}	35.7^{bc}
Sultan-SU barrel medic	0.65^{a}	61.9^{f}	11.0^{d}	9.0^{f}	40.9^{a}
Toreador disc medic	0.55^{a}	64.0^{e}	12.8^{cd}	9.3^{ef}	37.1^{b}
Astragalus	0.50^{a}	67.0^{bcd}	13.3^{bc}	9.8^{bc}	33.3^{cd}
Casbah biserrula	0.78^{ab}	70.0^{a}	16.6^{a}	10.3^{a}	28.1^{e}
Margurita French serradella	2.09^{b}	63.5^{ef}	15.4^{ab}	9.2^{ef}	37.0^{b}
Trigonella balansae 5045	0.40^{a}	68.0^{ab}	12.2^{cd}	10.0^{ab}	30.9^{d}
Studenica common vetch	1.25^{ab}	65.0^{de}	12.3^{cd}	9.5^{de}	36.1^{b}
Morava common vetch	0.68^{ab}	66.6^{bcd}	17.1^{a}	9.8^{bcd}	36.4^{b}
Maintenance of dry ewe		***>55***	***8***	***8***	***>30, up to 50***
Lactating ewe and lambs		***75***	***16***	***11***	***>30***
Sig. diff.	**0.007**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
LSD(P=0.05)	**0.73**	**2.04**	**2.27**	**0.36**	**2.6**
CV%	**49.5**	**1.8**	**9.9**	**2.2**	**4.5**

*Letters indicate significant differences. Sheep requirements are in bold italics.

The site will be allowed to regenerate as a pasture again in 2021. This will allow assessment of hardseed breakdown, persistence and performance of these pastures within a cropping rotation.

COMMERCIAL PRACTICE

The pasture legumes established well and grew successfully, creating new seedbanks, although biomass was limited by weed pressure and grazing by wildlife. The site has now gone through a cereal crop phase. This will have put pressure on those seedbanks for future persistence, particularly after the site received good 2020 summer-autumn rainfall that required several herbicide knockdowns to manage summer weed issues. This will have affected the remaining seedbanks.

The nutritional information which is being collected across multiple sites for the DLPS program is being considered in concert with biomass to identify the best legumes for livestock production. At this site, where digestibility and biomass are considered (i.e. digestible dry matter calculated) the legumes varied 4.8-fold: from 1327kg (serradella) to 272kg (trigonella) for digestible DM production.

The forages maintained good levels of nutrition into October, when other sown cereals for pasture would have matured earlier and been at flowering to early grain fill and declined to maintenance levels of nutrition. On farm, most ewes are dry at that time of year, with lambs weaned between August and October. The forages exceeded requirements of dry ewes and would contribute considerably towards rising nutritional needs of young lambs (Table 2). Of course, earlier in the season the forages would have higher levels of nutrition meeting requirements of all classes of sheep but with less biomass available for grazing.

Grower experience – Alan Bennett, Lawloit

Alan began sowing Margurita French serradella in 2015 after hearing the summer sowing experiences of Colin and Anna Butcher, Brookton WA, at a GRDC update. Alan couldn't get sub clover suited to his farm's white non-wetting sands; in fact, it was hard to get anything to grow on it.

Serradella has provided a hard-seeded pasture legume option suited to acid to neutral deep sands that is aerial seeded and can be easily harvested on farm. In the first year, serradella grew very well but heliothis decimated it and therefore it couldn't be harvested. Alan bought fresh seed the following year that had harvest success and it's been part of his mixed farming program since.

Late summer sowing of pod harvested on farm enables the pasture to be sown at a time of year when growers are not busy with other operations and allows the hard seed to soften before the break of the season. Breakdown of hardseedness is a two step process: step 1 requires the heat of summer and step 2 is fluctating temperature. For cv. Margurita breakdown is inhibited by light and hence breakdown is much faster when sown at 0.5-1cm.

Alan continues to trial sowing systems with harvested pods, trialling different sowing times and with different pasture mixes such as lucerne, balansa clover, Saia oats, cereal rye and Fathom barley. Alan says once established, the serradella will hang on and being indeterminate means that it will respond to spring rains after a drier winter when vetch has turned off.

REFERENCES

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