Performance of sheep grazing sulla (*Hedysarum coronarium*) based pastures in southern Australia

Carolyn de Koning[1], Peter Schutz[1] and **Alan Humphries[2]**

[1]SARDI, Turretfield Research Centre, Rosedale, South Australia, 5350, Email Carolyn.dekoning@sa.gov.au; peter.schutz@sa.gov.au
[2]SARDI, Waite Institute Precint, PO Box 397 Adelaide, South Australia, 5001. Email Alan.humphries@sa.gov.au

Abstract

Sulla is relatively new to Australian agriculture. Livestock production data from sulla-based pastures is required to enable farmers to make informed decisions about the potential benefits of sulla to their livestock enterprise. Sulla-based paddocks and control pasture paddocks (barley grass/subterranean clover) were established at Rosedale in South Australia during 2007 to compare the production of sheep grazing the two different pasture types. A winter grazing trial was conducted in 2008 and a spring grazing trial in 2009. In 2008, live-weight gain, wool growth, soiling of wool around the breech area and nutritive value of the pastures were measured. Live-weight gain and nutritive value of the pastures were measured in 2009. Both grazing trials demonstrated the increased live-weight gains of ewe hoggets that had grazed the sulla-based pasture compared to the control pasture. Ewe hoggets grazing sulla-based pastures also showed increased wool growth and less soiling in the breech area. Nutritive value of the two pasture types was similar in winter; however the sulla-based pasture had superior nutritive quality in spring.

Key Words

Hedysarum coronarium, sulla, Hordeum leporinum, Trifolium subterraneum, ewe hoggets

Introduction

Sulla (*Hedysarum coronarium*) has the capacity to produce large quantities of high quality feed without the risk of bloating. Moderate levels of condensed tannins in sulla forage has been implicated for enhanced animal production due to bypass protein protection in the rumen and anthelmintic properties. Overseas studies have reported sheep grazing sulla to have increased ovulation rates (Charlton 2001), live-weight gains, wool production (Burke et al. 2002) and reduced worm burdens (Niezen et al. 1995, 1998). However, there is a lack of animal production information from sulla-based pastures in Australia. Information on animal productivity is needed so farmers can start to make informed decisions. This paper reports the results from two grazing trials that measured the animal performance of sheep grazing sulla based pastures in winter and spring in southern Australia.

Methods

A comparison was made between two types of pasture; sulla-based (46% sulla), the balance consisted of annual ryegrass (*Lolium rigidum*), capeweed (*Arctotheca calendula*) and Paterson's curse (*Echium plantagineum*), and a control pasture (grass/clover) comprised of barley grass (*Hordeum leporinum* = 74%) and regenerated subterranean clover (*Trifolium subterraneum* = 26%). Four paddocks (i.e. 4 replicates) of each pasture type (total 8 paddocks) were set-up in 2007 and each paddock measured 1 hectare. Sulla paddocks were sown with sulla and control paddocks were regenerating pasture paddocks. Full details on paddock establishment can be found in the paper by de Koning et al. (2008).

Winter grazing trial 2008

Merino ewe hoggets were used in order to measure animal growth rather than just change in animal condition. In addition, wool growth was measured using dye-bands. As a simple guide to possible anthelmintic properties of sulla, faecal egg counts (FEC) were recorded for sheep grazing both pastures

prior to grazing and then again at the end of the grazing period. A total of 192 sheep were used, these were weighed at the start of grazing (average live-weight 37 kg/head). Sheep were allocated at random to one of eight paddocks (i.e. each treatment paddock had 24 sheep). Twelve sheep in each treatment group were selected at random for dye-banding prior to grazing and for the collection of FEC. Sheep commenced grazing on the 26 June 2008 and were removed eight weeks later on the 21 August 2008. All sheep were weighed fortnightly. At week six, dag scores (soiling around the breech) were made. Pasture was assessed fortnightly for growth, dry matter availability and nutritive value.

Spring grazing trial 2009

During winter 2009, all 8 paddocks were lightly grazed for 3 weeks with 10 lambing ewes/paddock as part of another unrelated project. In spring 2009 sulla paddocks had volunteer annual ryegrass (*Lolium rigidum*) that was producing flower heads and beginning to lodge, while the grass/clover paddocks had a mixture of subterranean clover, annual medics (*Medicago* species) and barley grass. Barley grass was green and going to head, therefore control pasture paddocks were topped with a mower/mulcher to reduce grass seed problems for grazing livestock. Dual purpose (meat/wool) Merino ewe hoggets from the 2008 lambing were weighed and randomly drafted into two groups, sulla or grass/clover. Rotational grazing was used with 4 paddocks in the rotation. Ninety-five sheep were allocated to the sulla-based pasture treatment with an average live-weight of 64.5 kg/head and 96 sheep were allocated to the grass/clover treatment (average live-weight 63.1 kg/head). They commenced grazing on the 12 October 2009. Sheep grazed all four paddocks within their rotation and were removed from the trial and weighed on the 9 November 2009. No dags were found on any sheep. Faecal egg counts were not made because the sheep used in the trial had previously been drenched and had low FEC. The most important measurement in this trial was live-weight change of sheep grazing each pasture type.

Pasture dry matter (DM) and nutritive value were measured before sheep commenced grazing each new paddock in the rotation. Sheep grazed their allotted paddock until green matter had been trampled (usually 7 days), at this point they were moved to the next paddock in the rotation and the number of sheep grazing days recorded per paddock. Both groups of sheep were moved at the same time. In total sheep grazed the trial for 28 days.

Results

Winter grazing trial 2008

The sheep that had grazed the sulla based pasture were significantly heavier than those that grazed the control pasture (45.7 and 43.0 kg/hd respectively, P = 0.018, Figure 1). The average growth rate for sulla sheep was 144.2 g/hd/day vs. pasture sheep at 103.6 g/hd/day. Pasture grazed sheep were more variable in their weight as shown by the standard deviation bars Figure 1. Day 14 live-weights were abnormally high due to persistent rain and wet sheep. Sheep that grazed the sulla-based pasture also grew significantly more wool in 56 days, 2.12 mm longer in dye-band sections (20.82 mm sulla and 18.71 mm pasture, P = 0.007). Faecal egg counts before and after grazing was inconclusive due to relatively low counts at the start (average 130 eggs/g faeces). On average FEC in all sheep fell during the trial period. Both the sulla-based and pasture paddocks had low larval counts at the start of grazing. Sulla sheep were significantly less daggy (scored at day 42) with only 4% of sheep on sulla paddocks with dags vs. 25% sheep on pasture (P = 0.012).

Sulla grazed sheep remained significantly heavier than their grass/clover pasture grazed counterparts well after the experiment was finished even though all sheep were returned to grass/clover type pastures. On 13 November 2008, sulla sheep were 1.55 kg/hd heavier, (i.e. 51.55 kg/hd live-weight, P=0.022) and on 7 January 2009 sulla sheep were 1 kg/hd heavier (49.73 kg/hd live-weight, P= 0.033).

It was noted that the sheep selectively grazed sulla and as a result sulla will need to be rotationally grazed and not set stocked. For example, over the eight weeks that this trial was set-stocked the average sulla content declined from 46% to 18%. Nutritive value of both sulla-based and control pastures were similar at the start and finish of the grazing trial. The sulla component had higher digestibility (78% vs.

74.6%, sulla and control pasture respectively) with lower neutral detergent fibre content (data not shown). The metabolisable energy of both pasture types was similar at the end of the trial (12 MJ/kg DM). Total dry matter of sulla-based pastures was lower, this was mostly due to the selective spraying of resistant annual ryegrass in the sulla paddocks in autumn before the commencement of grazing. Pasture growth was similar for both pasture types except in the later stages when the sulla-based paddocks had a surge of growth in late winter leading into spring. Growth of sulla did appear to be more restricted by the frosty conditions in the middle of the experimental period.

Spring grazing trial 2009

On average, sulla-based paddocks were more productive (6.4 t DM/ha) than the grass/clover paddocks (4.9 t DM/ha). But similar amounts were eaten (average 1.3 t DM/ha/week and 1.5 t DM/ha/week for grass/clover and sulla based pasture respectively). The biggest difference was the nutritive value of the pasture on offer, with sulla-based paddocks being superior to grass/clover pastures (Table 1). Sulla grazed sheep gained live-weight (Table 2) while those grazing the grass/clover pasture lost weight. This resulted in an average difference of 7.58 kg/hd between the two groups of sheep. Only two sheep out of 95 in the sulla paddocks had lost weight, while only 4 sheep out of 96 in the grass/clover paddocks gained weight.

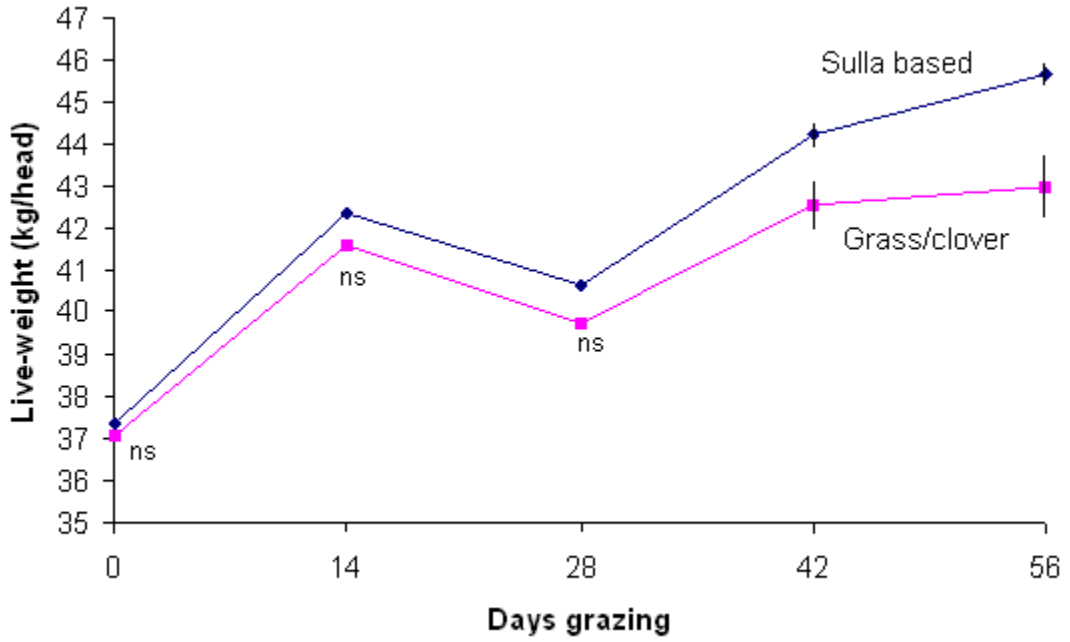

Figure 1: Live-weight gain of sheep grazing sulla-based pasture and grass/clover pasture during winter (26 June 2008 – 21 August 2008) at Turretfield Research Centre, Rosedale, South Australia. Standard deviation bars shown where significant, ns = not significant.

Table 1: Average nutritive value of sulla and other species (predominantly annual ryegrass) in the sulla-based pasture and grass/clover pasture on offer to sheep grazing from 12 October 2009 – 9 November 2009, Turretfield Research Centre, Rosedale, South Australia.

	Sulla	Sulla –other	Grass/clover

Crude protein (% of DM)	16.5	13.0	14.6
Digestibility (DMD) (% of DM)	68.0	63.6	61.5
DM (%)	20.1	30.4	31.8
Metabolisable energy (Calculated) (MJ/kg DM)	10.1	9.3	9.0
Moisture (%)	80.0	69.6	68.2
Neutral detergent fibre (% of DM)	42.8	53.2	55.6

Source: FEEDTEST, Werribee, Victoria.

Table 2: Average live-weights and growth rates of sheep that had rotational grazed the sulla-based and grass/clover pastures at Turretfield Research Centre, Rosedale, South Australia during mid spring 2009 for 28 days.

	Sulla-based pasture	Grass/clover based pasture
Before grazing live-weight (kg/hd)	64.51	63.07
After grazing live-weight (kg/hd)	69.45	60.43
Gain/Loss (kg/head)	+ 4.94	- 2.64
Growth rate (g/day/hd)	+ 176.33	- 94.42

Discussion

Sheep grazing sulla-based pasture in winter had higher growth rates, heavier live-weights and longer wool. In addition, sheep that had grazed sulla had minimal scouring. Sulla is highly palatable and of high nutritional value. A sulla-based pasture will need to be rotationally grazed allowing a longer recovery phase than lucerne, particularly mid-winter when growth rates are slow due to cold/frosty conditions.

Superior feed quality and quantity was produced by sulla based pastures in mid-spring when grass/clover pastures were rapidly losing nutritive value. Sheep grazing sulla based pastures mid-spring gained weight when at the same time sheep grazing grass/clover pastures lost weight. The observations indicate the sheep had selectively grazed the sulla. Some of the weight gain can be attributed to the annual ryegrass component in sulla paddocks. The ryegrass had reasonable quality for the first 2 weeks of the trial. In paddocks where sulla had comprised over half the dry matter on offer, most of the herbage consumed was sulla, whereas in paddocks where sulla was less than 15% of the sward, sheep had still actively sought the sulla, but also ate more of the “other” component. It was estimated that sulla comprised 65% of the diet during the 4 weeks of grazing.

Sulla has great potential to enhance animal production, it could be used to finish prime lambs by growing them to market size quickly and provide high quality feed for animals requiring a high nutrition diet (eg.

pregnant ewes and lactating ewes). More research is required to examine animal production benefits for cattle (beef and dairy) and goats (meat and dairy). Also the anthelmintic properties of sulla need to be demonstrated under Australian conditions and the by-pass protein protection effect confirmed.

Acknowledgements

Thankyou to Pastures Australia (A collaboration between AWI, GRDC, MLA, RIRDC & Dairy Australia) for providing funding for this work.

References

Burke JL, Waghorn GC and Brookes IM (2002). An evaluation of sulla (*Hedysarum coronarium*) with pasture, white clover and lucerne for lambs. Proceedings of the New Zealand Society of Animal Production 62, 152-156.

Charlton D (2001). Pasture – Condensed tannins a livestock tonic. Australian Farm Journal, December 2001, 45-48.

De Koning CT, Crocker G, Schutz P and Edwards N (2008). Developing production systems for the newly released varieties of the biennial forage legume sulla (*Hedysarum coronarium* L.). Proceedings of the 14th Australian Agronomy Conference, Adelaide, SA. Australian Society of Agronomy. www.regional.org.au/au/asa/2008/concurrent/pasture-production/5787dekoningct.htm. Accessed 22 June 2010.

Niezen JH, Waghorn TS, Charleston WAG and Waghorn GC (1995). Growth and gastrointestinal nematode parasitism in lambs grazing either lucerne (*Medicago sativa*) or sulla (*Hedysarum coronarium*) which contains condensed tannins. Journal of Agricultural Science 125, 281-289.

Niezen JH, Robertson HA, Waghorn GC and Charleston WAG (1998). Production, faecal egg counts and worm burdens of ewe lambs which grazed six contrasting forages. Veterinary Parasitology 80, 15-27.