

Lambs grazing a choice of biserrula and subterranean clover have higher growth rates in spring than lambs grazing a biserrula monoculture

SR McGrath^{AC}, GA Sandral^{BC}, L Sundermann^{AC} and MA Friend^{AC}

^A Charles Sturt University, Boorooma Street, North Wagga 2678, NSW

^B Department of Primary Industries, Pine Gully Road, Wagga Wagga 2650, NSW

^C Graham Centre for Agricultural Innovation, Pugsley Place, Wagga Wagga 2650, NSW

Abstract: White Dorper (Dorper) and White Suffolk x Merino (WSM) lambs grazed replicated pastures at Wagga Wagga sown to either lucerne, subterranean clover, biserrula or a treatment with half the plot sown to subterranean clover and half to biserrula, from 17 October to 17 December 2013. Lambs grazing lucerne had significantly higher ($P < 0.001$) final weights compared to lambs grazing subterranean clover. The higher weight gain of lambs grazing lucerne was predominantly achieved in the last 20 days of the experiment during a period when subterranean clover declined in quality. The growth rate of lambs grazing biserrula slowed after the first 8 days of grazing and the mean liveweight of lambs grazing lucerne, subterranean clover and the subterranean clover plus biserrula mixture were higher than lambs grazing the biserrula monoculture from 1 November, 14 November and 7 November respectively for Dorper lambs and from 7 November for WSM lambs. The final weight of WSM lambs grazing the subterranean clover plus biserrula mixture did not differ significantly from lambs grazing the subterranean clover monoculture (47.3 v. 47.2 kg; $P > 0.05$).

Introduction

Biserrula (*Biserrula pelecinus*) is suited to low rainfall acidic soils (Howieson *et al.* 1995). *In vitro* analysis suggests this species has a high nutritive value (Loi *et al.* 2010) and may also reduce methane gas production compared with other pasture species (Banik *et al.* 2013). The deep root system of biserrula (Loi *et al.* 2005) may allow this pasture species to stay green for up to four weeks longer than subterranean clover, and therefore may be advantageous for finishing lambs (Hogg *et al.* 2010). Modelling predictions also suggest that the potential for much higher livestock production in late-spring and summer from grazing biserrula compared with subterranean clover (Hackney *et al.* 2015).

Despite these apparent advantages, it is also reported that biserrula causes photosensitisation in grazing livestock at certain times of the year (Hogg *et al.* 2010; Kessell *et al.* 2015), and livestock may have an aversion to grazing the species (Thomas *et al.* 2015). Animals grazing on pure swards of biserrula or ryegrass had low growth rates relative to crimson clover (*Trifolium incarnatum*), but if given a choice of biserrula and ryegrass the animals had

growth rates equivalent to crimson clover (Thomas *et al.* 2015). The associative effects of this combination could be due to a number of factors, and are an area that has the potential to be further investigated. Furthermore, given there are differences between sheep genotypes in their degree of selectivity (Brand 2000), it is possible that there could be a difference between sheep genotypes in their growth rates when grazing such a pasture or where a choice of pasture species is provided.

The current study investigated the suitability of biserrula for finishing two lamb breeds during spring compared with lucerne (*Medicago sativa*) and subterranean clover (*Trifolium subterraneum*). Given evidence that sheep may develop an aversion to grazing biserrula, a treatment where lambs had the choice of both biserrula and subterranean clover was also included to determine whether this provided any additional benefit for livestock production compared with a biserrula or subterranean clover monoculture.

Methods

Lambs grazed replicated plots (0.7 ha) sown to either lucerne, biserrula, subterranean clover, or a treatment with half the plot sown to subterranean clover and half to biserrula, from

17 October to 17 December 2013 (61 days). Stocking rate was varied to maintain similar feed on offer across treatments. Feed availability was maintained above the level that would limit livestock intake. Due to the exceptional hot and dry conditions pastures were irrigated to maintain the green phase later in the season before allowing pastures to senesce. A core group of five White Dorper (Dorper) and five White Suffolk x Merino (WSM) lambs were weighed each week during the experiment after an overnight curfew. Pluck samples were collected on five occasions to estimate likely diet quality and dried samples were tested using NIR spectroscopy.

Results

Nutritive value of pastures

The interaction of pasture species and date was highly significant ($P < 0.001$) for in vitro digestible organic matter digestibility (DOMD) and crude protein (CP) content of pastures. DOMD of lucerne was significantly higher than subterranean clover from 28 October and biserrula from 15 November; DOMD of biserrula was significantly higher than subterranean clover at the end of the experiment (61 v. 54%). CP content of lucerne was significantly higher than other pastures from 28 October; CP content of biserrula was significantly higher than subterranean clover at the end of the experiment (15.5 v. 12.1%).

White Dorper lamb weights

Mean liveweights of Dorper lambs from lucerne plots were significantly higher than lamb liveweights achieved from grazing biserrula (1 November to 17 December), subterranean clover (28 November to 17 December) and subterranean clover plus biserrula (11 December to 17 December). Mean liveweights of Dorper lambs grazing the subterranean clover plus biserrula pasture were higher than those grazing the biserrula monoculture from 7 November and subterranean clover from 14 November. Lamb liveweights from subterranean clover pastures were higher than those grazing the biserrula monoculture from 21 November (Fig. 1).

White Suffolk x Merino lamb weights

Mean liveweights of WSM lambs were significantly higher when grazing lucerne compared with subterranean clover or the subterranean clover plus biserrula pasture from 11 to 17 December (Fig. 1). Lambs grazing biserrula pasture had lower liveweights than lambs grazing other pastures from 7 November to 17 December.

Mean liveweight of WSM lambs was significantly higher than Dorper lambs from 1 November onwards in the subterranean clover treatment, 21 November onwards in the lucerne treatment and 28 November onwards in the mixed treatment. Final lamb liveweights did not differ

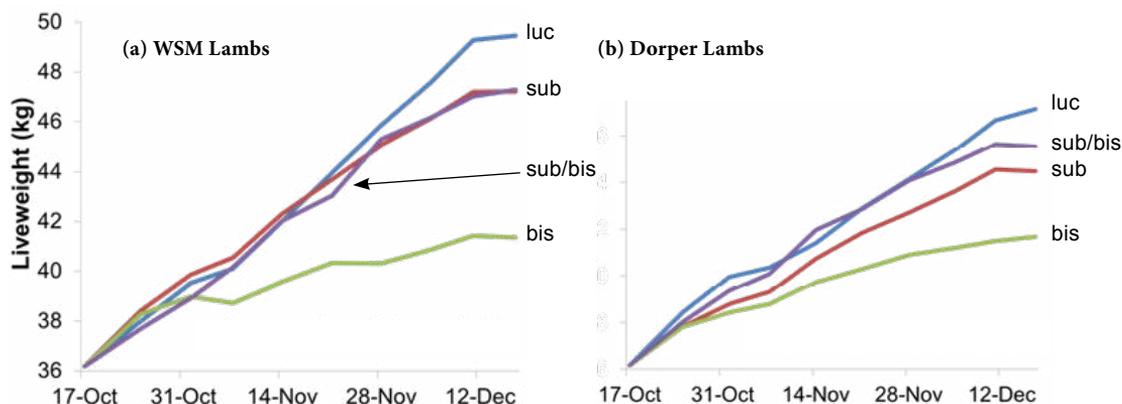


Figure 1. Changes in liveweight of (a) White Suffolk x Merino and (b) White Dorper lambs grazing legumes during the spring and early summer (l.s.d.=1.1 kg).

significantly between lamb genotypes in the biserrula treatment. Mean carcass weights of Dorper lambs were significantly higher than WSM lambs (22.4 v. 21.2 kg; $P=0.043$).

Conclusion

Final liveweights of WSM and Dorper lambs grazing lucerne were higher than those grazing subterranean clover or those with the choice of subterranean clover plus biserrula. The *in vitro* DOMD and CP content of the pasture species suggested lambs grazing biserrula should have achieved growth rates at least as high as lambs grazing subterranean clover; however lambs grazing biserrula as a monoculture had the lowest final liveweights.

It is speculated that low growth rates of lambs grazing a monoculture of biserrula during spring may be due to lower preference for biserrula, an aversion to biserrula developed early in the grazing period, or suppressed rumen fermentation of biserrula restricting intake. Of particular interest in this study was the subterranean clover plus biserrula mixture which produced lamb growth rates either comparable to the subterranean clover monoculture when grazed by WSM and sometimes higher lamb growth rates when grazed by Dorper lambs. It is therefore recommended to include a companion species when grazing biserrula during late-spring to avoid possible slower lamb growth rates over this period. WSM lambs had higher final liveweights than Dorper lambs, however, the Dorper lambs had higher carcass weights.

Acknowledgements

This work was funded by Meat & Livestock Australia. The technical assistance of Shane Hildebrand, Andrew Price, Chris Fuller, Sue Street and Laura Kemmis was greatly appreciated.

References

- Banik BK, Durmic Z, Erskine W, Ghamkhar K, Revell C (2013) In vitro ruminal fermentation characteristics and methane production differ in selected key pasture species in Australia. *Crop and Pasture Science* **64**, 935–942.
- Brand TS (2000) Grazing behaviour and diet selection by Dorper sheep. *Small Ruminant Research* **36**, 147–158.
- Hackney B, Rodham C, Piltz J (2015) Using biserrula to increase crop and livestock production. Available at <http://www.mla.com.au/News-and-resources/Publication-details?pubid=6125>
- Haydock KP, Shaw NH (1975) The comparative yield method for estimating dry matter yield of pasture. *Australian Journal of Experimental Agriculture* **15**, 663–670.
- Hogg N, Allen J, Butler R, Revell C (2010) Photosensitisation in sheep grazing biserrula. *Western Australian Department of Agriculture and Food Farm note* 396.
- Howieson, J, Loi, A, Carr, S (1995) *Biserrula pelecinus* L. – a legume pasture species with potential for acid, duplex soils which is nodulated by unique root-nodule bacteria. *Australian Journal of Agricultural Research* **46**, 99–1009.
- Loi, A, Howieson, JG, Nutt, BJ, Carr, SJ (2005) A second generation of annual pasture legumes and their potential for inclusion in Mediterranean-type farming systems. *Australian Journal of Experimental Agriculture* **45**, 289–299. Available at <http://www.publish.csiro.au/paper/EA03134>
- Thomas DT, Milton JTB, Revell CK, Ewing MA, Lindsay DR (2015) Individual and socially learned preferences for biserrula (*Biserrula pelecinus* L.) in sheep. *Grass and Forage Science* **70**, 374–380.