Grazing balansa clover and puccinellia mixed pastures on saline land

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Key Words

Liveweight gain, condition score, seed passage, seed viability

Introduction

The combination of puccinellia (*Puccinellia ciliata*) and balansa clover (*Trifolium michelianum* cv. Frontier) are seen as the best pasture options for the moderately saline, waterlogging prone areas of the upper south east of South Australia. Puccinellia is well suited to these conditions, having a fine seed head that minimises grass seed problems in livestock (Edwards *et al* 2002). Balansa clover on the other hand is poorly salt tolerant but highly tolerant to water logging and inundation and its inclusion in a pasture mixture increases the nutritive value of the sward and provides a source of nitrogen for the puccinellia. Animal production on puccinellia-balansa clover pastures is highly seasonal, declining over late summer and autumn. This may in part be attributed to the proportion of balansa clover declining, either through preferential grazing and/or shattering due to sheep movement. The current recommended management for puccinellia-balansa clover pastures is to graze heavily from late summer through to the break of the season to promote seed softening of balansa clover. This also results in less dry matter present when seedlings are trying to emerge. Under such systems, sheep may ingest significant quantities of balansa clover seed. In this study, we report on sheep performance on pastures that differ in the proportion of balansa clover, and investigate the effect of passage through the digestive tract of sheep on the viability of balansa clover seed.

Methods

Grazing experiment

The grazing experiment was established in April 2003 at Mount Charles, near Keith in the Upper South East, South Australia, approximately 250 km south east of Adelaide (Furby *et al*. 1998). Two plots of approximately two hectares were used to compare a puccinellia-based pasture (‘puccinellia’) with a puccinellia-balansa clover mixture (‘balansa clover’). The puccinellia treatment was a puccinellia-dominant pasture whereas the balansa clover treatment was a similar puccinellia pasture that had been oversown with balansa clover in early winter 2003. Both plots had been fertilised with 75 kg superphosphate/ha in July 2003. Pasture dry matter on offer was estimated using a rising plate meter calibrated with dry material cut from 20 randomly placed quadrats. Botanical composition was estimated using the dry-weight rank method (BOTANAL; Tothill *et al.* 1978) at monthly intervals (6 January, 10 February, 5 March and 4 April 2003). Merino wethers (1.5-2 years old) that had previously grazed saltland pastures were weighed, condition scored and treated for internal parasites prior to allocation to the plots. The average starting live weight was 45 kg in both groups. The sheep grazed the plots from 7 January 2003 through to the 7 April 2003. Stocking rate was initially 5 DSE/ha (10 total) for the puccinellia plot and 14 DSE/ha (28 total) for the balansa clover plot, based on the respective feed on offer in the two plots at the start of the experiment. Stocking rate on the balansa clover plot was reduced to 7 DSE/ha after the first month on the balansa clover plot. For each plot ten sheep per were randomly selected as the ‘core group’ and monitored at monthly intervals over the experiment for live weight and condition score.

Seed viability following ingestion by sheep

Twelve 1.5 year old Merino wethers (initial live weight of 56.9 ? 0.94 kg) were held in individual pens in an animal house. The animals had free access to water and were initially placed on an ad libitum diet of oaten hay that had an *in vitro* dry matter digestibility of 56% and crude protein of 8%, similar to the nutritive value of the pasture residue on offer to the sheep in the grazing experiment. Balansa clover seed softened by processing, with a hardseededness of 44%, was used to mimic summer softened seed. Introduction of sheep to balansa clover seed in the basal diet, and seed recovery following a single pulse of 30,000 seeds was carried out following the design described by Edwards *et al* (1998). Germination tests on seeds recovered in the faeces were conducted using the method described by Stanton *et al* (2003).

Results

Grazing experiment

At the start of the experiment (6 January 2003) there was 3400 kg DM/ha in the puccinellia plot and 2450 kg DM/ha in the balansa clover plot, and declined steadily during the experiment to about 1400 kg DM/ha in each plot (by 8 April 2003). In the puccinellia plot, 60% (in January) to 66% (in April) of the pasture was puccinellia, with the remainder being mostly annual grasses. The balansa clover plot contained 52% puccinellia and 20% balansa clover in January and 82% puccinellia, but less than 5% balansa clover in April. Sheep gained about 4 kg live weight from January to March on the balansa clover plot (from 44.5 to 48.6 kg) but did not gain further weight during April when most of the balansa clover had been removed. Sheep on the puccinellia plot did not gain weight between January and March (from 45.0 to 45.1 kg), although increased slightly in April to 46.8 kg. The condition score (CS) of all animals increased from 2.30 to 2.83 over the course of the experiment, although the sheep on balansa clover peaked at a CS of 3.1 in March.

Seed viability following ingestion by sheep

The total recovery of seed after providing a single pulse of 30,000 seeds was 16 ? 1.1%, with most of the recovered seed (85%) found in faeces collected over the first two days (Table 2). Small amounts of seed were recovered up to day 5.

Table 1. Recovery of balansa clover seed in the faeces of sheep following consumption of 30,000 seeds as a single pulse, and the germination rates of recovered seed.

Days from pulse feeding	Seed recovery (% of ingested seed)	Germination rate of recovered seed (%)
1	5.8 ? 0.54	1.2 ? 0.28
2	8.9 ? 0.84	8.0 ? 1.82
3	1.8? 0.30	8.8 ? 1.87
4	0.4 ? 0.08	12.7 ? 4.08
5	0.1 ? 0.03	7.8 ? 4.78

Discussion and conclusions

Sheep grazing either the puccinellia or the puccinellia-balansa clover pasture gained live weight and maintained, or slightly increased, condition score. This is a better result than is typically found on autumn

pasture in southern Australia. In March, sheep grazing the puccinellia-balansa clover pasture were nearly 4 kg heavier and about half a condition score higher than their counterparts on the puccinellia-based pasture. By April, there was no difference between the groups, presumably because virtually all of the balansa clover had been removed by this stage of the experiment. Importantly, though, the balansa plot was able to not only support better individual animal performance from January to March, it achieved this at a higher stocking rate than on the puccinellia plot. The data support the view that heavy grazing of pasture containing puccinellia and balansa clover can support satisfactory sheep performance over autumn. Less balansa clover seed was recovered after ingestion than expected based on previous studies (Revell and Nutt 2001), and its germination rate was low. This suggests that after summer, where the hardseededness of balansa clover will be around 50%, very few ingested soft seeds will pass through the digestive tract intact, while many of the hard seeds that are ingested may not be softened sufficiently to germinate. This has important implications to persistence of balansa clover, and suggests that grazing pressure should be reduced when leaf dry matter is low to avoid excessive intake of balansa clover seeds.

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