

Effects of simulated high-sugar forages on grazing behaviour of sheep

G.P. Cosgrove and A.J. Parsons

AgResearch Grasslands, PB 11008, Palmerston North, New Zealand, Email: gerald.cosgrove@agresearch.co.nz

Keywords: grazing behaviour, ryegrass, water soluble carbohydrate, white clover

Introduction Sustaining an optimum composition in mixed-species pasture and in the diet of grazing animals is constrained by many factors. Altering the concentration of water soluble carbohydrate (WSC) of one species to improve its nutritional value for animals may not deliver the benefits in the assumed manner if it also affects preference and the balance of species in the pasture. Furthermore, associated changes in other constituents (e.g. fibre, protein) make it difficult to attribute animal responses solely to the manipulated trait (e.g. Lee et al. 2000). The objective of this study was to simulate changes in the concentration of water soluble carbohydrates in ryegrass or white clover, independently of changes in other plant constituents, and determine the effect of this trait alone on grazing behaviour.

Materials and methods Twelve, 2-year old rumen-fistulated Romney sheep were stocked on either perennial ryegrass (*Lolium perenne*, cv. Yatsyn) or white clover (*Trifolium repens* cv. Pitau) pastures maintained at 7 cm sward surface height. Each sheep received an infusion directly into the rumen of either water (control) or sugar solution (250 g/l sucrose) at the rate of 1 ml/min grazing ryegrass or 1.6 ml/min grazing clover. The rates of delivery and concentration were calculated to simulate ingestion of a 'high' sugar ryegrass or white clover nominally containing an additional 100 g WSC/kg DM. A remote control switch, operated by an observer, synchronised the infusion with each grazing bout between dawn (05:00 hrs) and dusk (21:00 hrs) for 3 consecutive days. The total time spent grazing each day and the number and duration of bouts was recorded to describe the animal response. The experimental unit was a group of 3 sheep treated for 3 days, and treatments were replicated 3 times by repeating the procedure with sheep re-randomised among treatments.

Results There were no significant interactions between forage species and infusion treatment and only the infusion treatment main effect is shown. Sugar infused sheep received 90 g sucrose/day. The total WSC concentration in the diet was 130 g/kg DM and 215 g/kg DM for the control and infused sheep, respectively. Sheep eating the simulated high-sugar forages grazed for less time in total per day, and they grazed in shorter but more frequent bouts (Table 1).

Table 1 Effect of high sugar forage on some aspects of grazing behaviour

	Total grazing time (mins/day)	Duration of bouts (mins/bout)	Number of bouts (per day)
Control	325	48	6.8
'High' sugar	295	39	7.6
<i>Signif.</i>	P<0.01	P<0.05	P<0.05

Conclusions Synchronising the infusion of sugar with eating allowed the sheep to regulate the total intake of WSC (dietary and infusion sources) from the simulated high sugar forages (the infusion stopped whenever sheep ceased grazing). They responded to the higher concentration of WSC in ryegrass and white clover by altering the duration and frequency of grazing bouts. These changes reflect the animals attempt to balance the inflow and metabolism of the higher dietary WSC concentration. These behavioural attempts to control or even limit their intake to maximise fitness (Newman et al. 1995) rather than maximising daily intake create a challenge for delivering nutritional (or other) traits to grazing animals via manipulating the forage. The reduction in the total duration of eating each day provides an early indication that manipulating WSC in one species might affect the proportion in the diet of the species containing that trait and over time, the composition of the sward.

References

- Lee, M.R.F., E.L. Jones, J.M. Moorby, M.O. Humphreys, M.K. Theodorou, J.C. MacRae, & N.D. Scollan (2000). Production responses from lambs grazing on *Lolium perenne* selected for high water soluble carbohydrate. In: A.J. Rook & P.D. Penning (eds) Grazing Management. British Grassland Society Occasional Symposium No. 34, 45-50.
- Newman, J.A., A.J. Parsons, J.H.M. Thornley, P.D. Penning, & J.A. Krebs (1995). Optimal diet selection by a generalist grazing herbivore. *Functional Ecology*, 9, 255-268.