Effects of lime on quality and mineral composition of perennial grasses

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Introduction

Increased animal production from limed pastures has been attributed to a combination of increased pasture growth, a change in pasture species composition, and an improvement in feed quality and/or mineral composition. In 2001, we sampled a range of perennial grasses from two species trials that had been limed or unlimed and tested these for the effect of lime on feed quality and mineral composition.

Methods

The two sites were located at Tumut and Braidwood, New South Wales. Soil pH ($CaCl_2$) was 4.2 at both sites, with 22% aluminium (Al) at Tumut and 10% Al at Braidwood. Lime was incorporated at 2.5 t/ha in February 1996 at the Tumut site, while Braidwood had lime surface-applied (2.5 t/ha) in spring 1998. Both sites were sown to a range of phalaris, cocksfoot, fescue, and perennial ryegrass cultivars in a randomised block design with four replicates. Plots were sampled in winter and spring 2001; and whole leaf samples were analysed for minerals and, from the winter sampling only, for crude protein, metabolisable energy, digestible dry matter, and fibre. Minerals analysed were aluminium, calcium, chlorine, copper, iron, potassium, magnesium, manganese, sodium, phosphorus, sulphur, silicon, and zinc. Differences in soil and plant data were tested by analysis of variance.

Results and discussion

No significant differences were detected for ruminant feed-quality parameters at either site. This is consistent with Bolland *et al.* (2002). However, there were several significant differences in mineral composition due to lime (Table 1). The most consistent lime responses were in plant tissue calcium (increased) and manganese (decreased). Again, this is consistent with the results of Bolland *et al.* (2002). Significant lime effects were also found for silicon (increased by lime) at both sites for winter but not for the spring sampling. Zinc and magnesium were also significantly affected by lime but only for the Braidwood winter sampling.

Table 1. Effect of lime on mineral composition of perennial grasses at Tumut and Braidwood, NSW.

	Winter sampling		Spring sampling	
	Unlimed	Limed	Unlimed	Limed
Braidwood				
Calcium	0.34%	0.39%	0.35%	0.38%
Magnesium	0.23%	0.21%	*not significant*	
Silicon	0.61%	0.70%	*not significant*	
Manganese	274 ppm	163 ppm	*not significant*	
Zinc	32 ppm	27 ppm	*not significant*	
Tumut				
Calcium	*not significant*		0.25%	0.32%
Silicon	0.67%	0.81%	*not significant*	
Manganese	193 ppm	131 ppm	286 ppm	232 ppm

Conclusions

Despite significant differences in some plant minerals, the levels detected were well within animal dietary mineral requirements (SCA, 1990). We conclude that the small changes in pasture mineral composition due to liming, detected at these sites, are unlikely to impact on animal production. If increases in animal production occur due to liming, they are more likely to be due to changes in species composition and/or increases in pasture production than to changes in mineral composition.

References

Bolland, M. D., Allen, D. G., and Rengel, Z. 2002. Response of annual pastures to applications of limestone in the high rainfall areas of south-western Australia. *Aust. J. Exp. Agric.* 42:925–937.

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