Long-term lime effect on pasture and sheep performance: 1. Pasture botanical composition changes.

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Introduction

MASTER (Managing Acid Soils Through Efficient Rotations) is a long-term experiment that commenced in 1992 (Li *et al.* 2001). In autumn 2004 at the commencement of the third 6-year cycle, both perennial and annual pastures were re-established with original mixtures. This paper reports the long-term lime effect on the pasture botanical composition 14 years after initial liming.

Materials and methods

The experiment consisted of two pasture types with and without lime. The perennial pastures were sown to phalaris (*Phalaris aquatica*) cv. Australian (1.0 kg/ha) and cv. Holdfast (1.0 kg/ha), cocksfoot (*Dactylis glomerata*) cv. Currie (1.0 kg/ha), lucerne (*Medicago sativa*) cv. Aurora (3.0 kg/ha) and subterranean clover (*Trifolium subterraneum*) cvv. Riverina and Goulburn (3.0 kg/ha each) while the annual pastures were sown to annual ryegrass cv. Wimmera (2.0 kg/ha) and subterranean clover cvv. Riverina and Goulburn (4.0 kg/ha each). Over the past 14 years, about 7.5 t/ha of lime were applied on three occasions. The pH_{CaCl2} at 0–10 cm soil was maintained at 5.5 on the limed treatment and fluctuated around 4.0 on the unlimed treatments. See Li *et al.* (2001) for more details for the site description and experimental design. Botanical composition was measured in spring 2005, 18 months after establishment, using an improved dry-weight-rank method (Jones and Hargreaves 1979). Data were analysed using Genstat Release 8.1 (Lawes Agricultural 2005).

Results and discussion

On the perennial pastures, lime increased the proportions of lucerne, subterranean clover and barley grass (*Hordeum leporinum*), and kept silvergrass (*Vulpia* spp.) at a low proportion and eliminated sorrel (*Rumex acetosella*), but had no effect on the proportions of phalaris and cocksfoot (Figure 1). The increased survival of lucerne on the limed treatment indicated that the subsoil acidity has been gradually ameliorated as lucerne is highly sensitive to low pH and high aluminium (Al). Conyers and Li (2006) showed that the exchangeable Al on the limed treatments decreased from 42% to below 10% over 14 years by maintaining pH_{CaCl2} 5.5 at 0-10 cm at the MASTER site. The higher proportions of subterranean clover and barley grass, and lower proportion of silvergrass and sorrel indicated that the limed perennial pastures, particularly while barley grass was in the vegetative growth stage, provided higher quality feed compared with the unlimed pastures.

On the annual pastures liming increased the proportion of barley grass, silvergrass decreased while sorrel was eliminated. But there was no difference in the proportion of ryegrass between limed and unlimed treatments. Averaged across pasture types, the proportion of silvergrass decreased from 33% to 11% and the proportion of barley grass increased from 6% to 29% due to liming, indicating an appropriate liming regime can manipulate weed proportion in a sward.

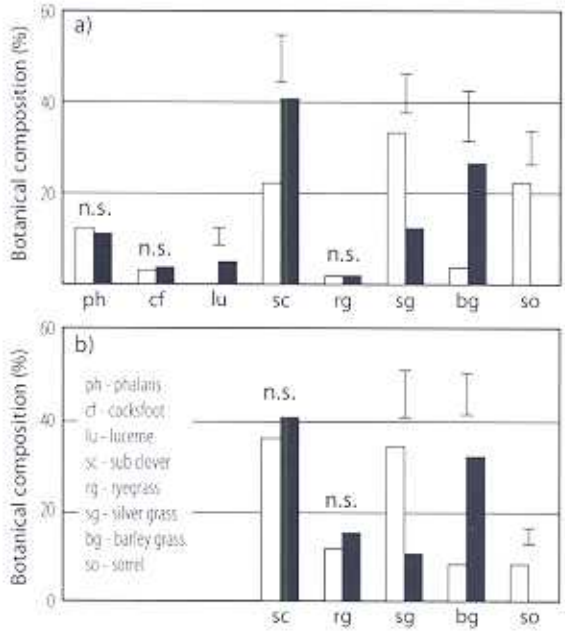

Figure 1 Pasture botanical composition (%) in spring 2005 on (a) perennial pastures and (b) annual pastures. Open bar, unlimed treatments; solid bar, limed treatments. Vertical bars for LSD 0.05; n.s., not significant.

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