Yield and seasonal production of a subterranean clover-based pasture growing in an acid soil

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Acidification of soils beneath clover-based pastures is a continuing and widespread occurrence in southern Australia and is believed to have reduced the productivity of pastures. The ultimate solution to this problem will in many cases be through the application of lime. However, the high cost of broad acre applications on Australian farms means that the potential benefits must be clearly defined before they will be accepted. This paper reports yield responses over three years after application of lime to a pasture growing in a very acid soil in East Gippsland, Victoria.

Methods

A field trial was established on an acid loamy sand (pH 4.3), near Stratford, East Gippsland. The soil had a moderate to high level of exchangeable aluminium (up to 60 ppm), but soil and plant analysis indicated that manganese was unlikely to be toxic for plant growth. Six treatments (randomised complete block design) were established during 1984, including existing pasture, surface-application of lime, pasture established by removing existing herbage with herbicide followed by sod-seeding with subterranean clover (25 kg/ha) with and without surface lime and pasture established by sowing the clover into soil cultivated with and without the incorporation of lime. Lime was applied at 10 t/ha, determined previously to raise the soil pH above pH 5.0, the pH below which exchangeable aluminium levels increased markedly. Subsequent experiments have established that lower rates of lime (3 to5 t/ha) would probably be as effective as the high rate of application used in this trial.

Results and discussion

Surface application of lime only affected pH in the top few cm of the soil and had no effect on pasture yield or composition. In the year that the trial was established (1984), incorporation of lime (to a depth of 12 cm) did not result in improved pasture yields. Where subterranean clover had been sown into cultivated soil with the incorporation of lime, or where it had been sod-seeded into an undisturbed soil profile, total pasture yields in the second year (1985) were increased by 16% to 21%. The yield increases were due to greater clover growth in sod-seeded treatments and where plots cultivated with incorporation of lime are compared with those cultivated without lime, yield increases were due to improved growth of both clovers and grasses. The incidence of weeds (mainly capeweed) was much reduced where lime had been incorporated. Incorporation of lime did not significantly improve total pasture yield over that of the existing pasture. 1986 was a very dry year and the pasture contained very little clover or weed, but the trends in the yields were maintained.

Of particular interest was the observation that liming improved the growth of the pasture mainly during autumn, winter and early spring and less so during late spring. This was presumed to reflect the inevitable confinement of roots and nodules to the most acidic regions of the soil profile early in the season and was observed in 1985 and 1986 for both the control pasture growing in undisturbed acid soil and pasture sown without incorporation of lime. Soil acidity thus accentuated the problem of low feed supply in the winter months at this location.