A study of factors associated with soil acidity under a legume-based pasture in East Gippsland

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It is widely believed that productivity of subterranean clover-based pasture growing on acid soil has declined. This decline may be associated with a decrease in soil pH under these pastures. Potentially, a very acid soil may exhibit high levels of available aluminium, manganese and deficiencies of other elements and the clover-Rhizobium symbiosis may also he affected. All of these factors may affect pasture productivity. This paper reports experiments in which lime was applied to an acid soil. Factors associated with soil acidity and their alleviation were examined.

Methods

The site examined in this study is situated on the northern shore of Lake Wellington near Stratford, East Gippsland. Victoria. intact cores of soil (9 x 25cm depth) were taken from the field and divided into 5 sections (0-4, 4-9. 9-13. 13-18, 18+ cm) for later analysis of pH (l:5 0.0lM CaC12), exchangeable aluminium (1) and exchangeable manganese (2). The response of soil pH to incorporated and surface-applied lime was examined (randomised block design. 3 replicates. 5 levels of lime from 0-15t/ha).

Estimates of root growth of subterranean clover in limed and/or cultivated soil were determined in intact soil cores taken from the field and placed in a glasshouse.

Results and Discussion

Although the pastures on the acid soil may be composed of a large proportion of legumes. a high proportion of these are less desirable. volunteer legumes (e.g. Trifolium glomeratum and T. cernuum). Similarly, the volunteer grass Vulpia bromoides is often a major component of these pastures. The presence of these volunteer species may limit the potential productivity of the pasture.

Soils in the area under investigation are naturally acidic. At a site where legumes have not been grown. soil pH (CaC12) in the top 10cm ranged between pH 4.7 and pH 5.O. Under clover-based pastures, however. pH was consistently lower. At the soil surface pH was less severe (pH 4.3), but between 4 and 12 cm below the soil surface. p11 values declined below pH 3.8. Associated with declining pH in the profile was an increase in the level of extractable Al. Changes in levels of extractable Mn were less pronounced. The effect of incorporating lime (to a depth of 12 cm @ 10t/ha) into the soil raised pH (CaC12 to about pH 6.2) and reduced the level of extractable Al.

It has been suggested (3) that acid soils may affect the persistence of desirable pasture species through the influence of high levels of aluminium on root growth. Poor penetration into an acid soil profile may restrict the ability of the plants to exploit sub soil moisture which in turn could put the plants at a disadvantage toward the end of the season.

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