Effect of lime on mineral nutrition of subterranean clover on acid soils

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Lime, when applied to acid soils, changes many soil factors which either alone or in combination, may improve the growth of subterranean clover. On 2 soils in North-East Victoria, subterranean clover grew consistently better with applied lime. Glasshouse and field studies, together with chemical analyses of herbage, were used to elucidate the soil factors contributing to these responses.

Methods

Soil, collected from the above 2 sites, was potted, limed and sown with inoculated subterranean clover seed (cv. Woogenellup). Nitrogen was applied at weekly intervals to evaluate the interaction between nitrogen and lime on these 2 soils in the glasshouse. Herbage from the field sites and the glasshouse experiment was analysed for N, Mo and Mn.

Results and Discussion

Lime improved the N levels of clover herbage grown at both field sites. At the Lilliput site, lime increased *N* concentrations by *22* to 29%, and 5 to 12%, in the winters of 1981 and 1982 respectively. In autumn 1983, the N content (kg/ha) of herbage increased by 7 to 17%. Similar improvements occurred at the Rutherglen site for the same periods. Lime similarly increased the N concentrations of clover grown in the glasshouse (Fig. 1), with the biggest increase occurring at 0.5 t/ha lime. Although clover fertilized with N consistently contained more N, there was no associated growth increase on the unlimed Rutherglen soil. On this soil, some lime was needed before the clover plants responded to the added N. The high Mn concentrations (mean 1860 wg/g) in plants grown on the unlimed Rutherglen soil suggests that the soil contained toxic levels of available Mn.

The improved clover growth corresponds with increased herbage levels of N. Lime can improve the N status of plants by increasing the mineralization rate of soil organic N. Lime also favours legumes by modifying acid soil conditions and increasing plant-available Mo, thereby improving nodulation and N-fixation. Wheat grown with lime (2.5 t/ha) at the Lilliput site contained more N (13.7 c/f 9.1 kg/ha), the result of increased root growth due to less soil Al, and presumably increased mineralization. Lime had little or no effect on the Mo levels of clover herbage grown at the 2 field sites, suggesting it has not affected the availability of soil Mo. Fertilizer Mo, on the other hand, consistently improved the N levels of clover at both sites in the absence of Lime, and in the presence of lime at the Rutherglen site.

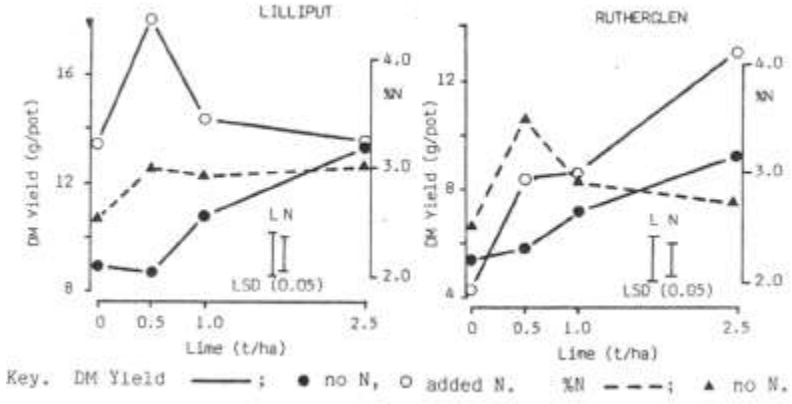

Figure 1 Clover growth and N content with lime and added N