Soil management studies and growth of subterranean clover in north-east Victoria

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A thorough investigation of soil factors affecting the growth of subterranean clover was initiated in response to problems associated with its establishment, growth and persistence. The overall aim of the studies was to improve pasture productivity by modifying the soil environment. The initial work has concentrated on the cropping soils (Red-brown earths) of North East Victoria with treatments that have changed the physical, chemical and biological conditions of the soil.

Methods

Six sites were selected on properties throughout the North East with known clover problems. Lime and dolomite were spread and incorporated into the top 10 cm of soil 2 to 8 months before sowing. In the autumn of 1981, the plots were ripped to depths of between 20 and 40 cm, depending on the site, and drilled with inoculated subterranean clover seed at the break in early May. At one site, seven fertilizer treatments were drilled with the seed; at another site, fungicide treatments were applied to both seed and soil.

Results and Discussion

Insect problems were experienced at two sites and only the findings from the four successfully-established sites are presented in this paper. Significant increases in clover growth were obtained at two sites; the soil pH values (1:5 soil-water) at these two sites were 4.9 and 5.0. Lime (2.5 t/ha) increased herbage production by 30 percent. On these limed plots, the nitrogen concentration of clover tops in mid-winter was higher (4.70% N) than on the unlimed plots (3.93% N). Where fertilizer molybdenum was applied to the unlimed plots, the nitrogen concentration increased to 4.36% N. Molybdenum also improved the early spring growth and colour of clover on unlimed plots, as did 50/50 super/lime fertilizer. Where they were drilled together as super/lime/molybdenum, clover growth on the unlimed plots was equivalent to that on the 1.0 t/ha lime plots. Tissue manganese concentrations were also influenced by lime; manganese was reduced at three sites, from approximately 500 ppm to 200 ppm.

At the two lime-responsive sites, the number of nodules on the clover roots increased linearly with the amount of lime applied, even though the total mass of nodule tissue per plant remained more or less constant. Soil Rhizobium populations, measured at one site (pH 5.0) six months after lime had been applied, had increased from not-detectable levels (less than 10/g soil) to more than 1000/g soil. Correspondingly, clover volunteering on these limed plots after summer rains had ten times as many nodules as the unlimed plants.

On the two sites unresponsive to lime, deep ripping significantly increased herbage production by up to 40 percent, both in winter and spring. The clover on the ripped plots also remained green for up to 10 days longer in late spring and buried significantly more seed.

Over all sites, the incidence of clover root-rot disease was very low, and was unaffected by the fungicide treatments.

The results of this first year have helped to clarify the nature of the problem and have pinpointed two critical soil factors, namely soil acidity and soil compaction, and have better defined the direction and emphasis of our current research.