

## Subterranean clover decline and phosphorus nutrition

J.R. Hirth and V.F. Burnett

Rutherglen Research Institute, Rutherglen, Victoria, 3685

Pasture decline on the acidic granite soils of north east Victoria is principally identified by extremely poor subterranean clover growth over the winter months. In July 1987 on this soil type, patches of clover with pale yellow leaves but adequately nodulated roots were observed. A sulphur deficiency was suspected and tested in a glasshouse experiment using a nutrient omission design.

### Methods

Eleven plant nutrients were evaluated by comparing the growth of subterranean clover, cv. Trikkala, at 61 days after sowing. The plants relied on symbiotically-fixed nitrogen. Additional treatments consisted of N (100 mg/pot) and lime (5 g/pot), added prior to sowing.

### Results and discussion

The omission of P reduced clover growth from 2.81 to 2.09 g DM/pot ( $P < 0.001$ ), equalling that of the unfertilized plants (2.08 g DM/pot), and was the only element of the 11 tested to do so. Although the P content of whole tops was reduced to 0.26% ( $P < 0.01$ ), this level far exceeds the deficiency values reported for Dwalganup (1).

**Table 1 Clover growth, nodulation, tissue N and P levels and soil pH as affected by lime and N added to pots under glasshouse conditions**

Nutrient Added	DM Yield (g DM/pot)	Soil pH *	Nodule score (2)	N Uptake (mg/pot)	Herbage P (%)	P Uptake (mg/pot)
A. Where all 11 plant nutrients were added as basals:						
Nil (=ALL)	2.81	4.35	4.0	81.2	0.29	8.1
Lime	2.55	5.46	3.0	80.2	0.26	6.8
N	2.00	4.35	2.6	75.8	0.21	4.2
B. Where all 11 plant nutrients were omitted:						
Nil (=NIL)	2.08	4.27	3.6	69.1	0.26	5.4
Lime	1.54	5.17	1.8	71.8	0.23	3.5
N	1.18	4.16	0.1	77.8	0.17	2.1
LSD 5%	0.29	0.12	0.6	NS	0.02	1.0

\* 1:5 calcium chloride, post-harvest

Field studies on this soil type have shown negligible nitrogen fixation by subterranean clover, as measured by acetylene reduction. In these studies, lime consistently improved clover winter growth, clover nodulation but not nitrogen fixation. Site Olsen P levels remained marginal, despite annual applications of 12 kg P/ha. In the 4th year, a blanket application of 60 kg P/ha improved overall growth so much that the lime response 'disappeared'.

The depression in growth, nodulation and herbage P levels due to added lime (Table 1), whether or not P was supplied as a basal nutrient, only confounds the field findings. N uptake by the tops remained unchanged and the internal colour of the nodules (white) suggests that there was no  $N_2$  fixation under glasshouse conditions. Thus the link(s) between subterranean clover decline, P deficiency and the lack of  $N_2$  fixation remain speculative and await further research studies.

1. Rossiter, R.C. (1955). Aust. J. Agric. Res. 6:1-8.

2. Corbin, E.J., Brockwell, J. and Gault, R.R. (1977). Aust. J. Exp. Agric. Anim. Husb. 17:126-34.