

Comparison of soil with leaf analysis for predicting the response of pasture to superphosphate

J.W.D. Cayley, K.N. Cumming and P.C. Flinn

Pastoral Research Institute, Hamilton, Vic. 3300

Decisions about applications of superphosphate to pastures are often partly based on the level of available phosphorus (P) in the soil. This experiment compared a leaf test for the P status of subterranean clover (1,2) with a soil test (3) as a means of predicting the response of pastures to superphosphate applied the following year.

Methods

The comparisons were made during 1985 on a series of 18 grazed plots of perennial ryegrass/subterranean clover that had been fertilized with superphosphate at six widely differing rates for a number of years. At each level of fertilizer the plots were stocked at 10, 14 or 18 wethers/ha.

Both leaf tests on subterranean clover (2) and soil tests were carried out in spring from two areas within each plot. In late summer these areas were fenced to exclude sheep, dry herbage removed and P (as superphosphate) applied to six 4.5m-long strips at rates of 0, 2.4, 9.6, 21.6, 38.4 and 60.0 kg/ha. The strips were mown 12 weeks after the opening rains and twice more after further intervals of 12 weeks. The relative production (PR) of fertilized strips was calculated for each enclosure as the total production of the fertilized strip (PF) expressed in terms of the production of the unfertilized strip (PO) as follows:- $PR = PF \times 100 / PO$.

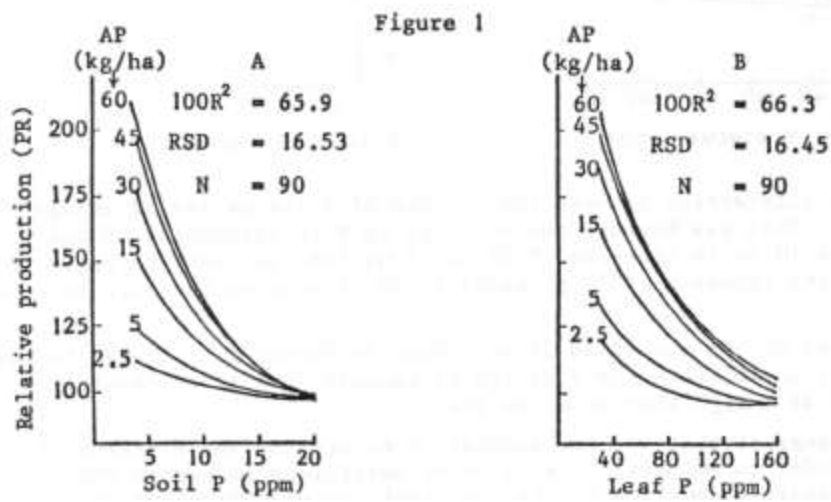
The mean PR for the five rates of applied P (AP) within each of the 18 main plots was calculated and the effects on PR of leaf (LP) or soil P (SP) and AP were assessed by stepwise multiple regression operating at $p=0.05$.

Results and Discussion

The usefulness of SP or LP in predicting response to various levels of AP is given by equations A and B respectively)

$$PR = 61.3 - 1.52SP - 0.30\sqrt{AP} + 13.9\sqrt{SP} + 49\sqrt{AP} + 2.01SP\sqrt{AT} - 19.5\sqrt{APSP}$$
$$PR = 116 + 0.573LP - 1.50AP - 8.88\sqrt{LP} + 44.1\sqrt{AP} - 0.0105APLP - 3.49\sqrt{APLP}$$

Both assessments of P status were equally useful in predicting the response to fertilizer (Fig. 1). The test for P status of clover was useful even when clover was a minor component of the sward.



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3. Olsen, S.R., Cole, C.V., Watanabe, F.S. and Dean, L.A. 1954. Circ. US Dept. Agric. No. 939.