

Long term trends associated with superphosphate use on pasture, III. response of clover to potassium after prolonged treatment.

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The potassium status of soils under pasture fertilized with superphosphate and grazed lightly with sheep has been shown to improve significantly over time through increased organic matter exchange capacity and from K raised from subsoil sources (1). However, sheep move large quantities of K to camps via excreta, leaving some 70% of the paddock impoverished (2). Signs of K deficiency (low clover yields and exchange K, < 65 ppm - treatment differences NS) were noted in the non-camp area of a long-term superphosphate experiment grazed only by sheep and never cropped or cut for hay.

Methods

Three small plot experiments were superimposed on uniform areas of pasture in the middle non-camp zone of the 10 superphosphate pasture plots described in Parts I and II (3). In experiments 1 and 2, K (0, 50, 100 kg ha⁻¹) as KC1 and N (0, 25, 100 kg) as urea were applied to pretrimmed plots on different areas in 1962 and 1973 and production was measured by cutting 42 days later. In experiment 3 seven rates (0, 25, 50, 75, 100, 125, 150 kg K ha⁻¹) were applied in spring of 1974 and reapplied a year later. The pasture yields presented were measured 6 months after the second application and 3 months after pretrimming (1976).

Results and Discussion

Yields of clover, the most responsive fraction, are presented in Fig. 1a, 1b and 1c.

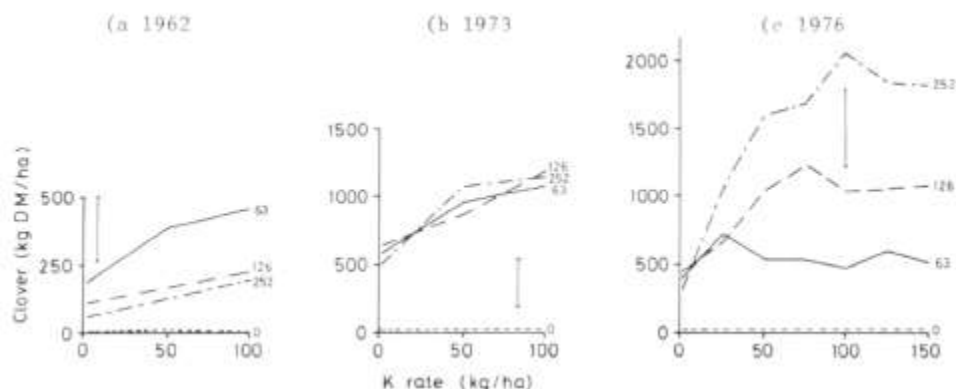


Fig. 1 Effects of K on clover yields after four rates of superphosphate application.

In 1962 with < 10% clover there were highly significant positive effects on clover yield (Fig. 1a) but in 1973 (25% mean clover) there was also a significant superphosphate x K interaction ($P < 0.01$). The superiority of 63 kg superphosphate treatment in 1962 was probably due to better prior clover survival. In the autumn of 1976 increasing K tended to reassert the linear response to superphosphate characteristic of the early pasture years (Part I). The superphosphate x K interaction was highly significant, with > 6-fold increase in yield from 0 to 100 kg K at 252 kg superphosphate ha⁻¹. The increased clover responses were almost certainly due to greater clover content (mean 40%) after the repeat application. Thus the long term use of superphosphate on a grazed pasture has decreased K availability, not increased it as shown elsewhere (1).

1. Williams, C.H. & Donald, C.M. 1957 Aust. J. Agric. Res. 8: 179-189.

2. Hilder, E.J. 1966. Proc. X Internat. Grassld Congr. 977-981.

3. Hilder, E.J. 1982. These Proceedings Parts I and II.