PASTURE AND HOGGET RESPONSE TO UREA IN SPRING ON A SET-STOCKED PASTURE IN NORTHLAND

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ABSTRACT

Three rates of urea (0, 50 and 200 kg N/ha) were applied to short pasture in late July and the area was stocked at 22.2 hoggets/ha continuously for the following 15 weeks.

Significant pasture and livestock responses to urea occurred by week 3 and week 5 respectively. Over 9 weeks, herbage accumulation increased from 1141 kg DM/ha at N 0 to 2044 and 2594 at N 50 and N 200. Hogget liveweight gains for the corresponding treatments were 5.20, 9.71 and 11.96 kg/hogget. Relationships were given by: herbage accumulation (kg DM/ha) = 1145 + 625 log N, and hogget liveweight gain (kg/hogget) = 5.13 + 2.86 log N. Over 15 weeks, efficiencies of pasture response to 50 and 200 units of N were 24.7 and 10.5 kg DM/kg N respectively.

The quick responses despite continuous grazing was attributed to a high content of annual poa in the pasture and its ability to tiller rapidly in spring while maintaining a good proportion of leaf below grazing height.

Additional Keywords: herbage accumulation, liveweight gain, nitrogen efficiency, Poa annua

INTRODUCTION

In early spring, livestock production is likely to be highly sensitive to pasture supply and pasture growth highly sensitive to soil nitrogen supply. To maximise the efficiency of fertiliser N, spelling from grazing is generally recommended but at high stocking rates or in poor seasons, this option may not be available.

Nitrogen fertiliser as urea was applied to a short pasture on a northern podzol in late July and the responses in pasture and hogget growth were measured under continuous grazing during the following 15 weeks. The objectives were to assess the value of N fertiliser under conditions of high pasture utilisation in early spring and to supplement the few data available on sheep production responses to N.

MATERIALS AND METHODS

The 6.5 ha of Wharekohe silt loam that was used supported a mainly perennial ryegrass, white clover pasture producing 9-12 t DM/ha/year with a fertiliser input of 400 kg/ha/year of 30% K superphosphate. It had carried 19.8 ewes/ha for several years. Pastures were grazed uniformly and hard by ewes up to 9 July 1980, then spelled until urea was applied and hoggets stocked on the area on 23 July.

Trial design was of six 1.2 ha blocks, each subdivided into 0.40 ha fenced plots receiving one of the 3 rates of urea — 0, 50 or 200 kg N/ha. Each plot carried nine 10-month Perendale ewe hoggets (stocking rate 22.2/ha, number/N treatment = 54) continuously from July 23 to September 23 1980. After this, plot fences were removed and within blocks, hoggets ran as one mob. To measure herbage accumulation and composition on each plot, eight 0.2m^2 quadrats were cut with hand shears from movable exclusion cages (pre-trimmed) at 3-week intervals.

Herbage mass above ground was measured on 2 occasions by cutting 1 m long strips adjacent to the cages with electric shears. The hoggets had been shorn in May and received monthly drenchings. At about 4-week intervals they were weighed, after 3 hours yarding and with dry fleeces.

RESULTS

Weather

Readings were made 500 m from the trial and at similar altitude. From July to October 1980, successive mean monthly 10 cm soil temperatures were 9.2 8.6 11.0 13.2 °C, and corresponding mean grass minimum temperatures were 4.5 3.6 6.2 7.6 °C. As is usual on this site, soil was close to saturation in July and August, then had periods of moisture deficit in October.

TABLE 1: Herbage accumulation and composition — kg DM/ha.

Cut	N 0	N 50	N 200	S.E.
14/8/80	332 b	620 a	755 a	64
1/9	305 c	532 b	694 a	39
25/9	504 c	892 b	1145 a	48
14/10	668 c	828 b	1024 a	48
4/11	1129 a	1301 a	1414 a	63
	2938 c	4173 b	5032 a	194
kg DM/kg N		24.7	10.5	
Composition 23/7 - 4/11				
white clover	402 a	359 a	285 a	30
ryegrass	931 b	1302 ab	1658 a	125
annual poa	1047 b	1893 a	2121 a	134
other species	558 b	613 b	968 a	85

For both tables, means within rows with letters in common are not significantly different at $p<0.05$ (LSD).

Pasture

Herbage mass at the start of the trial (23/7/80) was similar across treatments (average 668 kg DM/ha). At week 9, when the hogget comparison ceased (23/9/80), the corresponding figures for N O, N 50 and N 200 were 710, 981 and 1136 kg DM/ha respectively. Herbage accumulation within cages (Table 1) showed a significant response to urea by week 3 and this continued up to week 12. The higher rate of urea outyielded the lower rate between weeks 6 to 12. Annual poa and perennial ryegrass had the greatest positive responses while white clover showed a non-significant trend of declining yield with increasing rates of urea.

Hoggets

Hogget growth (Table 2) responded to both rates of urea by week 4 and the response increased up to week 9 when the comparison concluded. Between weeks 4 to 9, the higher rate of urea produced a higher hogget growth rate. There was some indication of compensatory growth between weeks 9 to 13 in the N 0 treatment hoggets.

The relationships between herbage accumulation and hogget growth with urea input for the initial 9-week period are shown in Fig. 1. Semi log regressions for these curves were: HA = 1145 + 629 log N (***r^2 = 0.60), LWG = 5.13 + 2.86 log N (***r^2 = 0.53).

TABLE 2: Liveweight gain — kg/hogget.

Weighing	N 0	N 50	N 200	S.E.
25/8/80	3.76 b	5.93 a	6.66 a	0.34
23/9	1.44 c	3.78 b	5.30 a	0.21
Total 9 weeks	5.20 c	9.71 b	11.96 a	0.45
20/10	6.83 a	6.06 b	6.19 a	0.24

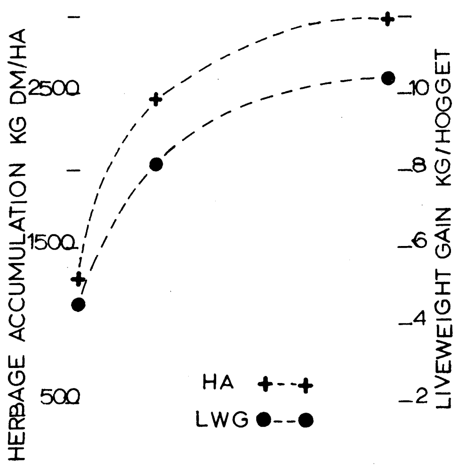

Figure 1: Effects of 3 rates of nitrogen on pasture accumulation and hogget liveweight gain over 9 weeks.

DISCUSSION

Despite the high initial grazing pressure, pasture and hogget growth responded quickly to the urea. Annual poa gave the quickest and largest response, increasing its yield over the first 2 cuts by 148% and 231% for N 50 and N 200, compared to increases of 66% and 76% for ryegrass. This is attributed to the ability of annual poa to tiller rapidly in spring and to maintain a high proportion of green herbage below grazing height. The main ryegrass response was delayed until grazing pressure eased. For the initial 9 weeks at the N 50 rate, pasture and hogget growth increased by 80% and 87% respectively with efficiencies of 18.1 kg DM and 1.90 kg/ha LW increase per unit of N.

On the same soil nearby, Steele (1976) applied 100 units of N in early spring and, over a similar 9-week period, obtained an efficiency of 9 kg DM/kg N with a 55% recovery of N in the herbage. This trial was mown rather than grazed but the efficiency is similar to that estimated for 100 units of N in the present trial (12.6). A lower pasture response with repeated mowing of the same area as opposed to using movable cages under grazing was noted by Ball *et al.* (1976). In this trial and one reported by Luscombe and Fletcher (1982), good sheep production responses in terms of performance and/or stocking rate were recorded to N fertiliser applied in early spring on hard-grazed hill country pastures. Negative effects on clover growth also occurred.

Unsatisfactory livestock production during spring in Northland have been consistently noted for both sheep and dairy cattle, this being attributed to relatively poor pasture growth in this season. The present trial gives support for an efficient sheep production response on dense, low growing pastures in early spring with up to 50 kg N/ha. This offers the management options of using low rates of N fertiliser to cope with unusual feed deficits at that time or having an earlier lambing date and therefore greater flexibility in lamb disposal. Possible longer term adverse effects on pasture legumes were not considered.

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