THE EFFECT OF HERBAGE ALLOWANCE ON THE DRY MATTER INTAKE AND MILK PRODUCTION OF DAIRY COWS

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SUMMARY

Three groups of six cows were offered daily herbage allowances of 52.7, 33.2, and 13.5 kg DM/cow for a 5-week period in early lactation. These allowances resulted in apparent intakes of 16.3, 14.3 and 9.6 kg DM/cow, and residual yields after grazing of 1850, 1550 and 750 kg DM/ha. The cows offered the higher allowance had greater liveweight gains ($P < 0.1$) than those on the moderate allowance, but there was no significant difference in components of milk production. The low allowance cows produced significantly less milk and lost liveweight and body condition. There were no significant differences in milkfat production among the three groups during the 29-week period from the end of the experiment until the end of the lactation.

INTRODUCTION

The effect of daily herbage allowance on the performance of lactating dairy cows has not previously been examined on ryegrass-white clover pastures typical of the Manawatu and many other New Zealand dairying districts. A grazing experiment using such pastures was designed to examine the effects of three herbage allowances offered to cows in early lactation on their dry matter intake, and performance in the short and longer term.

EXPERIMENTAL

Three groups each of six cows, of mixed dairy breeds, calved on average 46 days prior to the start of the experiment. Each group received a daily herbage allowance intended to provide 55, 35 or 15 kg DM/cow (16, 10 and 4 kg DM/100 kg liveweight) for a period of 32 days (September 12 to October 12, 1978). These allowances will be referred to as the high, moderate and low allowances, respectively. The three allowances were offered on adjacent areas within the same paddock by use of temporary electric fences. The mean pasture DM yield before grazing was 2700 kg/ha and this was grazed at stock densities of 50, 82 and 182 cows/ha/day for the high, moderate and low allowances, respectively.

On 3 days per week, pasture dry matter yield was measured on the allowance areas both before and after grazing. For each allowance area, 10 quadrats (60 × 30 cm) were cut to ground level with a shearing hand piece, the cut material being washed, oven-dried and weighed. Dry mattter intake per cow was estimated as the difference between the pasture dry matter offered and the pasture dry matter remaining, divided by the number of cows grazing that area. The cut herbage samples were stored and analysed for nitrogen content.

During the experimental period, milk yields were recorded for each cow on four consecutive days per week, and daily milk samples were analysed for fat and protein percentages. For 3 weeks before the experiment the milk yield and milk composition of each cow were recorded. The mean values obtained in this period were used as covariates in the analysis of the effects of herbage allowance on milk production.

Cows were weighed at weekly intervals between 8 and 9 a.m., and cow body condition was assessed before and after the experiment on a 1 to 10 scale by three assessors working independently. The cows had a mean condition score of 4.0 at the start of the experiment.

Milk and milkfat yields were also recorded once per week from the end of the experiment until January, and fortnightly from January until the cows were dried off in May 1979.

RESULTS

The mean daily herbage allowances offered over the 32-day period, the resulting dry matter intakes and residual dry matter yields after grazing are shown in Table 1.

TABLE 1: MEAN HERBAGE ALLOWANCES, INTAKES AND RESIDUAL HERBAGE YIELDS

	High	*Moderate*	*Low*
Herbage allowance (kg DM/cow/day ± SE)	52.7 ± 2.09	33.2 ± 1.68	13.5 ± 0.57
Herbage consumed (kg DM/cow/day ± SE)	16.3 ± 2.06	14.3 ± 1.44	9.6 ± 0.55
(kg DM/100 kg LW)	4.8	4.0	2.6
Residual herbage (kg DM/ha ± SE)	1 850 ± 69	1 550 ± 64	750 ± 41

The relationship between herbage allowance (x) and the herbage utilization (y/x) over the range of herbage allowances studied was described by the following equation:

$y/x = 0.977–0.252x + 0.00024x^2$ ($P<0.001$), RSD = ± 0.14

where y = herbage consumed (kg DM/cow/day)

and x = daily herbage allowance (kg DM/cow)

The nitrogen concentration of the herbage which was apparently eaten by the cows was calculated using the method described by van der Kley (1956), and increased from 3.5% N on the lowest allowance to 4.3% N on the highest allowance.

The mean daily milk, milkfat and milk protein yields of each group of cows are shown in Table 2, together with the changes in liveweight and condition score. The data for daily milk production during the first 7 days in which the different allowances were offered were discarded from the analysis. There were no significant differences in any component of milk production between the cows offered the high and moderate allowances, despite the additional feed offered at the highest allowance. Liveweight change was greater ($P < 0.10$) for the cows offered the high allowance compared with the cows offered the moderate allowance, and the changes observed in body condition score support the liveweight data. The cows offered the lowest allowance produced significantly less milk, milkfat and milk protein than the cows offered the other allowances, and also lost significant amounts of liveweight and condition score.

TABLE 2: MILK PRODUCTION AND LIVEWEIGHT CHANGE OF COWS OFFERED ONE OF THREE DAILY HERBAGE ALLOWANCES

	High	*Moderate*	*Low*	*Sig.*
Milk yield (litres/cow/day)	16.7	16.2	12.8	H,M > L**
Milkfat yield (kg/cow/day)	0.73	0.70	0.58	H,M > L**
Milk protein yield (kg/cow/day)	0.62	0.59	0.43	H > L** M > L*
Liveweight change (kg/cow/day)	+0.70	+0.34	–0.30	H > M† M > L**
Condition score change	+0.80	+0.40	–0.40	H,M > L*

*$P < 0.05$; **$P < 0.01$; †$P < 0.10$.

TABLE 3: THE MILKFAT YIELDS (kg/cow ± SE) OF COWS OFFERED ONE OF THREE HERBAGE ALLOWANCS IN EARLY LACTATION

	High	*Moderate*	*Low*	*LSD (P = 0.05)*	*Sig.*
Weeks 1–4[1]	17.5 ± 0.9	16.7 ± 1.6	14.0 ± 1.2	1.7	H,M > L**
Weeks 5–34	104.5 ± 6.5	109.6 ± 17.3	104.1 ± 9.7	28.2	n.s.
Weeks 1–34	122.0	126.3	118.0	—	n.s.

[1] Week 1 was the first week from which milk production data were recorded (*i.e.*, the second week of offering the different herbage allowances).

Table 3 shows the mean milkfat yields (kg/cow) for each group of cows over the experimental period and for the remainder of the lactation.There were almost no differences among the three groups in their milkfat production in the 29 weeks from the end of the experiment until the end of the lactation. The cows offered the moderate allowance produced 5.5 kg more milkfat per cow in these 29 weeks than the group offered the low allowance, but this difference was not statistically significant. A difference between treatments of 28 kg milkfat per cow produced in weeks 5 to 34 would have been required for statistical significance using this number of cows.

DISCUSSION

Offering daily herbage allowances of 53 rather than 33 kg DM/cow in early lactation resulted in:

(1) An apparent increase in herbage consumed of 2.0 kg DM/cow.

(2) An increase in the N concentration of the herbage consumed.

(3) No significant difference in milk, milkfat and milk protein yields in the short term, nor the longer term.

(4) An increase in liveweight gain and body condition score.

The costs of offering this higher daily allowance were:

(1) A higher residual herbage mass after grazing. This could lead to a deterioration in pasture quality for subsequent grazings, and losses in herbage as a result of plant death. The effects on pasture production of lax grazing in early spring have been discussed by Matthews *et al.* (1979).

(2) A lower stocking density, hence a faster grazing rotation at similar stocking rates.

Pasture management factors could outweigh the advantages in production obtained when offering high daily herbage allowances.

Offering a daily herbage allowance of 13.5 kg DM/cow resulted in significant decreases in milk production and liveweight gain. Despite this, there was no significant difference in the subsequent milkfat production of the three groups. While the number of cows used was small and a very large difference would have been required for a significant residual effect to be found, the actual losses in milkfat production during weeks 5 to 34 were small and not consistent with the levels of feeding imposed earlier. This agrees with the conclusion of Bryant and Trigg (1979) that the losses in production subsequent to underfeeding in early lactation are small and do not persist throughout the remainder of lactation.

In an experiment at Ruakura, Bryant and Cook (1977) offered a similar range of herbage allowances to cows at similar stages of lactation. In contrast to this experiment, there was a linear response in terms of milkfat yield to herbage allowance. An extra 0.05 kg milkfat/cow/day was obtained when cows were offered 52 rather than 40 kg DM/cow. Differences in pasture composition, cow body condition and the milk production potential of the cows may have contributed to the different responses obtained to the extra herbage offered, compared with the results of the present experiment.

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