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EFFECT OF HERBAGE ALLOWANCE ON INTAKE AND UTILIZATION OF PASTURE BY CATTLE OF DIFFERENT AGES

T. E. TRIGG and the late R. MARSH

Ruakura Agricultural Research Centre, Hamilton

SUMMARY

Groups of four Friesian steers of 5-6 or 15-18 months of age were offered one of six daily allowances of pasture DM, ranging from 2 to 12 kg/100 kg liveweight, in each of three periods. Estimated DM intake increased non-linearly with increasing allowance, with no significant effect of age of animal on this relationship.

INTRODUCTION

New Zealand and overseas research has frequently shown a curvilinear relationship, of diminishing returns nature, between animal production or herbage intake and daily herbage allowance per grazing animal (Willoughby, 1959; Greenhalgh, 1970; Hart, 1972; Reardon, 1975). Few quantitative data exist for any one class of animal, and no comparative data are available for animals of the same class but at different stages of their productive life. Quantitative knowledge of the existence of an interaction between age and herbage allowance is an essential requirement for the provision of a scientific basis upon which integrated management systems can be developed.

EXPERIMENTAL

Six different herbage DM allowances above the ground were offered to both 5-6 month old cattle weighing on average 140 to 150 kg and 15-18 month old steers weighing on average 380 to 420 kg. DM allowances ranged from 2 to 12 kg DM/100 kg liveweight in 2 kg increments. Each treatment was repeated for three successive 14-day periods (8 days' preliminary feeding followed by 6 days' recorded feeding). Animals were re-randomized to treatments within their age groups at the start of each period. The trial was run from late January to mid-March

MANAGEMENT

For each period, two 1.62 ha paddocks were used 4 to 5 weeks after grazing to a uniform height (500 kg DM/ha). The areas

providing the appropriate allowance for 14 days were delineated by temporary electric fence on the basis of DM yields, estimated by herbage cuts, and liveweights of the animals. Areas were so allocated that the same allowance for calves and yearlings was offered in adjacent strips, with the six allowances being located in random order. Cattle were offered one-fourteenth of their area each day. On days 9 to 14, inclusive, of each period, three frames of herbage were cut to ground level from each treatment, to give estimates of herbage yield. Herbage DM intake was calculated as the difference between this and similarly measured post-grazing DM yields. Results were averaged over the last 6 days of the trial.

Samples for estimation of *in vitro* digestibility coefficients were taken from bulked samples obtained for pre- and post-grazing yield measurements, cut during the last 6 days of each period.

RESULTS

There was no significant difference in the DM yield or *in vitro* digestibility coefficient (IVD) of the pasture offered to the two age groups of animals. However, a significant difference ($P < 0.001$) was found between periods for both the DM yield and IVD data summarized in Table 1.

Within age groups, liveweight was virtually the same at the start of each period (Table 1).

The data obtained on the relationship between herbage DM allowance/100 kg LW (x) and DM intake/100 kg LW (y) or DM utilization (U) are shown for all periods in Figs 1 and 2, respectively. Mean DM intake varied from 1.51 and 1.56 kg/100 kg LW for calves and yearlings, respectively, on the low allowance

TABLE 1: MEAN YIELD AND *IN VITRO* DIGESTIBILITY OF THE HERBAGE DURING EACH PERIOD AND LIVeweIGHTS AT THE START OF EACH PERIOD

	Period 1	Period 2	Period 3
Pre-grazing yield (kg/DM/ha) (s.e.d. = 158)			
Calves	4650	3230	4340
Yearlings	5110	3430	4340
Pre-grazing IVD (%) (s.e.d. = 0.5)			
Calves	69.5	65.8	66.1
Yearlings	69.7	66.0	65.3
Initial liveweight (kg)			
Calves	140	154	160
Yearlings	389	400	394

to 3.54 and 2.88 (s.e. ± 0.43), respectively, on the highest allowance. Equivalent values for mean utilization of DM were 78.3 and 74.2 for the low allowance, and 28.7 and 19.5 for the high allowances. There was some indication that the relationship obtained during period 3 was less curvilinear than in periods 1 and 2 (Fig. 1).

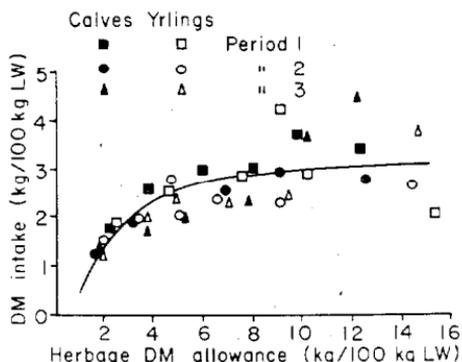


FIG. 1: Effect of herbage allowance on DM intake of calves and yearling cattle.

Statistical analysis was carried out on intake data only, since the utilization function can be calculated consequentially. Analysis based on a reciprocal relationship between x and y in each period indicated that the regression was not significantly affected by age of stock or period.

Individual equations for each age when data for all periods were pooled were:

Calves:

$$y = -4.14 (\pm 0.81)/x + 3.54 (\pm 0.22) \quad (r^2 = 0.79, \text{RSD} = 0.54) \quad (1)$$

Yearlings:

$$y = -3.45 (\pm 0.85)/x + 3.13 (\pm 0.21) \quad (r^2 = 0.71, \text{RSD} = 0.51) \quad (2)$$

Pooling all data produced the following equation:

$$y = -3.80 (\pm 0.59)/x + 3.33 (\pm 0.15) \quad (r^2 = 0.74, \text{RSD} = 0.53) \quad (3)$$

From equation (3) the expression for DM utilization can be calculated as:

$$U = -3.80 (\pm 0.59)/x^2 + 3.33 (\pm 0.15)/x \quad (4)$$

DISCUSSION

The results of this experiment failed to demonstrate any difference between young calves and yearlings in their response in intake to changes in herbage DM allowance.

The yearling data support other work with older beef cattle. For example, Marsh and Murdoch (1974) showed that intake plateaued with increasing DM allowance above 5 kg DM/100 kg LW. In contrast, the results for the younger stock do not agree with earlier work of Marsh (1977), who, with similar type dairy beef cattle of 3 to 4 months of age, imposed allowances of 3.0, 4.5, 6.0 and 7.5 kg DM/100 kg LW and showed the response in daily gains with increasing allowance to be linear.

Evidence is available which suggests that young animals may differ from older animals in their response to pasture variation. Hodgson (1968), for example, demonstrated that herbage intake by young calves responded to increases in OM digestibility up to and above 80%, whereas for mature cows a digestibility coefficient of 70% is sufficient for maximum intake (Hutton, 1961). Differences in herbage intake (as a percentage of body weight) between lactating cows, pregnant heifers and calves at constant herbage DM allowance have been demonstrated (Jamieson and Hodgson, 1974), but this study was confounded by the physiological state of the animals, and the effect of age or weight *per se* could not be determined.

These same authors (Jamieson and Hodgson, 1974) also found with young calves that grazing time and intake decreased when pasture DM allowance was reduced from 9 to 3 kg/100 kg LW; again in contrast to the results reported here.

The cause of the apparent linearity of DMI in period 3 is unknown. It may have been associated with the clover dominance of the sward noted in this period. The effect of clover on increasing OM intake relative to other pasture species is well documented (Joyce and Newth, 1967; Ulyatt, 1969). IVD data do not support the suggestion that differences in digestibility were involved, and adaptation of animals to their conditions does not seem a likely explanation because of the nature of the experimental design.

Figure 2 emphasizes that the young animals in this experiment had the ability to utilize similar amounts of available DM to older and heavier cattle. The effects of such severe grazing at the lower allowances on animal production is beyond the scope of this paper.

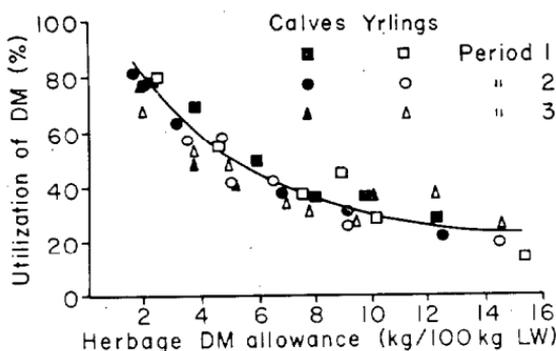


FIG. 2: Effect of herbage allowance on utilization of DM by calves and yearlings.

Under the conditions of the experiment no interaction existed between age of animal and herbage allowance. This information, although not conclusive owing to the vagaries associated with short-term intake studies, is the first of its type unconfounded by physiological state or class of animal. It therefore provides a useful basis from which integration of both ages of stock into a grazing system can be attempted based on feed budgeting.

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