New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

You are free to:

Share — copy and redistribute the material in any medium or format

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for commercial purposes.

NoDerivatives — If you remix, transform, or build upon the material, you may not distribute the modified material.

http://creativecommons.org.nz/licences/licences-explained/
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 cur-
vilinear relationship, of diminishing returns nature, between ani-
imal 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 provi-
sion of a scientific basis upon which integrated management sys-
tems 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 suc-
cessive 14-day periods (8 days' preliminary feeding followed by
6 days' recorded feeding). Animals were re-randomized to treat-
ments 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

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-grazing yield (kg/DM/ha)</strong> (s.e.d. = 158)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calves</td>
<td>4,650</td>
<td>3,230</td>
<td>4,340</td>
</tr>
<tr>
<td>Yearlings</td>
<td>5,110</td>
<td>3,430</td>
<td>4,340</td>
</tr>
<tr>
<td><strong>Pre-grazing IVD (%) (s.e.d. = 0.5)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calves</td>
<td>69.5</td>
<td>65.8</td>
<td>66.1</td>
</tr>
<tr>
<td>Yearlings</td>
<td>69.7</td>
<td>66.0</td>
<td>65.3</td>
</tr>
<tr>
<td><strong>Initial liveweight (kg)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calves</td>
<td>140</td>
<td>154</td>
<td>160</td>
</tr>
<tr>
<td>Yearlings</td>
<td>389</td>
<td>400</td>
<td>394</td>
</tr>
</tbody>
</table>
262 TRIGG AND MARSH

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.

ACKNOWLEDGEMENT

The skilled technical assistance provided by J. D. B. Ward and Beef Nutrition staff is acknowledged.

REFERENCES