COMPONENTS OF GRAZING BEHAVIOUR OF DAIRY COWS ON SOME TROPICAL AND TEMPERATE PASTURES

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Summary

Grazing behaviour studies with Jersey cows on high yielding tropical pastures showed that they grazed for 540-720 min/d which involved a total of 45-75,000 bites in 24 h of which a maximum of 36,000 bites occurred during grazing. Cows often prehended less than 0.3 g O.M. per bite.

Rate of biting varied between pasture species and within grazing periods. Measurements of biting together with estimates of bite size provide a more accurate measure of feeding behaviour than grazing time. A large difference between the number of bites when stall feeding and grazing the same feed was demonstrated.

It was concluded that dairy cows grazing some tropical swards, with low leaf yields or with inaccessible leaf, can have difficulty harvesting sufficient feed to maintain stable production.

I. INTRODUCTION

Feed intake probably provides the best single index of the reaction of a grazing animal to its environment (Milford and Minson 1965) but it is generally not possible to accurately measure short-term changes in intake in the field (Pigden and Minson 1969). Studies of grazing behaviour can however help to explain variation in feed intake as well as the quality of feed ingested. Intake of herbage (I) by a grazing animal is a function of both the time spent grazing (T) and the rate of grazing; the components of which are rate of biting (B) and size of bite (S), I = T x B x S.

This paper summarises a series of grazing behaviour studies in which grazing time, biting rate and bite size were measured with dairy cattle at the C.S.I.R.O. Pasture Research Station, Samford. Results are used to illustrate behaviour patterns in feeding of cattle grazing tropical pasture swards.

II. MATERIALS AND METHODS

(a) Grazing Time

Grazing time and periodicity of grazing were automatically measured using vibracorders attached to the necks of Jersey cows, as described by Stobbs (1970). Between 1969-73 grazing time was recorded from both lactating and non-lactating cows grazing a limited number of temperate pastures (mainly Avena sativa and Trifolium repens based pastures) and a range of tropical grass (Chloris gayana, Digitaria decumbens, Setaria anceps, S. splendida and Pennisetum clandestinum) and trailing tropical legume (Macroptilium atropurpureum and Desmodium intortum) pastures at different stages of maturity. Animals were accustomed to each of these pastures and an excess of feed (> 1,500 kg leaf D.M./ha), together with clean water, were always available. No supplements were fed.

(b) Biting

Separate counts of the number of bites taken by cattle during grazing and rumination were measured on those tropical grass pastures listed above using the

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### TABLE 1
Mean grazing time, rate of biting and size of bite prehended by Jersey cows grazing pastures of varying age and quality

<table>
<thead>
<tr>
<th>Pasture</th>
<th>Grazing time (min/24 h)</th>
<th>Rate of biting (bites/24 h)</th>
<th>Bite size (g O.M./bite)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cow days recorded</td>
<td>Total</td>
<td>Range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immature* temperate</td>
<td>56</td>
<td>464</td>
<td>410-521</td>
</tr>
<tr>
<td>Immature tropical</td>
<td>346</td>
<td>561</td>
<td>418-595</td>
</tr>
<tr>
<td>Mature tropical grass</td>
<td>438</td>
<td>677</td>
<td>483-734</td>
</tr>
<tr>
<td>Mature tropical legume</td>
<td>209</td>
<td>719</td>
<td>386-788</td>
</tr>
</tbody>
</table>

* < 3 wk-old regrowths  ** >3 wk-old regrowths  + calculated from 3-4 animals each grazing 3-6 pasture replicates.

### TABLE 2
Biting during feeding and rumination of Jersey cows fed Chloris gayana and Avena sativa chopped and fed indoors or when grazed

<table>
<thead>
<tr>
<th>Biting Behaviour</th>
<th>Chloris gayana</th>
<th>Avena sativa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indoors</td>
<td>Field</td>
</tr>
<tr>
<td>Feeding bites (No/24 h)</td>
<td>10,897</td>
<td>26,656</td>
</tr>
<tr>
<td>Rumination bites (No/24 h)</td>
<td>28,507</td>
<td>27,366</td>
</tr>
<tr>
<td>Total bites (No/24 h)</td>
<td>39,403</td>
<td>54,023</td>
</tr>
<tr>
<td>Ratio of rumination to feeding bites</td>
<td>2.62</td>
<td>1.03</td>
</tr>
<tr>
<td>Bite size (g O.M./bite)</td>
<td>0.39</td>
<td>1.03</td>
</tr>
</tbody>
</table>

* analysed as a three period switch-back design.  n.s. = non significant  *= P< 0.05  ** = P < 0.01
equipment described by Stobbs and Cooper (1972). These measurements were taken at a later date than the recordings of grazing time.

Two further experiments were conducted (one with an 8-10 week regrowth of *Chloris gayana* and the other with an 6-8 week old regrowth of *Avena sativa*) which 6 non-lactating Jersey cows were allocated to the 2 groups of a two treatment double reversal trial (Brandt 1938). The two treatments were (1) grazed and (2) the same material cut with a reciprocating mower, chopped (5 cm lengths) and fed in pens. Experiment periods were of 14 d duration and on the last 5 d of each period records were made of biting during grazing and rumination.

(c) Bite Size

Bite size was determined on *A. sativa, D. decumbens, S. anceps* and *C. gayana* pastures using oesophageal fistulated animals. A foam-rubber plug inserted in the lower oesophagus allowed a complete recovery of ingested feed whilst number of bites were automatically recorded (Stobbs 1973). The bite size of cows grazing various pasture swards was measured. To overcome animal and pasture variability 3-4 animals were used to sample 3-6 replicates of each pasture.

III. RESULTS

(a) Grazing Time

Long grazing times were recorded when cows grazed tropical pastures (> 560 min), particularly the mature swards (Table 1).

(b) Biting

The total number of bites (grazing and ruminating) recorded in any 24 h period varied between individual cows from 25,000 when grazing oats (*A. sativa*) to 75,000 on mature *S. anceps* pasture (Table 1). Bites during grazing never exceeded 36,000.

The total number of bites measured from cows fed indoors was significantly lower than the total recorded when cows were grazing, mainly due to a lower (P < 0.01) number of bites taken during feeding (Table 2). Rate of biting by cows grazing *C. gayana* was highest (70-80 bites/min) at the start of each grazing period and declined linearly throughout each grazing period until biting rate fell below a mean of 56 bites/min (range of 47-64 bites/min) when grazing ceased. Biting rate on the *A. sativa* began at a lower level (65-70 bites/min) and declined more rapidly than when cows grazed *C. gayana*. Rate of chewing was fairly constant during rumination on both feeds averaging 48±2 chews/min. The mean ratio of rumination to grazing bites was higher (P < 0.01) for cows fed indoors.

(c) Bite Size

Although bite size varied greatly between cows grazing the same pasture, repeated sampling of 3-4 pasture replicates with a group of cows allowed differences in mean bite size to be determined. Mean bite size varied between 0.05 and 0.50 g O.M./bite on tropical pastures and 0.31 g and 0.71 g O.M./bite on temperate pasture. Fistulae samples indicated that cows preferred to eat leaf rather than stem and the horizontal and vertical distribution of leaf within the sward greatly influenced the size of bite prehended. Cows grazing sparse open swards or tall stemmy mature tropical pasture swards generally ingested less than 0.30 g O.M./bite (Table 1).

IV. DISCUSSION

If a cow is to maintain a stable production despite adverse pasture conditions then her grazing behaviour must be altered to achieve this objective (Hancock 1954). This study suggests that cows grazing some tropical pastures can have difficulty
harvesting leafy material sufficiently rapidly to satisfy their requirements.

The time cows spend grazing tropical pastures is shown to vary between 560-720 min per 24 h period despite an excess of herbage dry matter being available for grazing. The upper limit of grazing time is approximately 720 min and only under conditions of extreme pasture shortage have grazing times in excess of 800 min been recorded (Smith 1959). Cows grazing mature tropical pasture swards approach this limit and were therefore probably having difficulty satisfying their nutritional requirements. Stage of lactation (Stobbs 1970) and climatic conditions (Payne, Laing and Raivoka 1951) can influence the pattern of grazing but excessively long grazing times were recorded by cows grazing tropical pastures during the cooler periods of the year (spring and autumn) and grazing times were markedly lower when cows were transferred from tropical pastures to temperate pastures.

Grazing time provides a less precise measure of feeding behaviour than biting because rate of biting varied between and within grazing periods. The maximum variation in mean daily grazing time recorded from cows grazing diverse pasture types was 150% whereas a 30% variation in biting was measured. Variation in biting behaviour can reflect both the ease of prehension of herbage, grazing bites, (Stobbs 1973) and pasture quality (rumination, Balch 1971). The high number of bites recorded in the field compared with animals fed indoors could be due to a high intake of herbage or a smaller bite size but no estimates of herbage consumption or bite size of grazed herbage were made in this experiment. However studies on bite size summarised in this paper together with previously reported findings (Stobbs 1973) and the lower ratio of rumination to feeding bites recorded in the field would suggest that cows grazing some pastures, in their attempt to select a diet with a high leaf content, often prehend small quantities of herbage with each bite. This could result in a low intake of digestible nutrients. There was a 12-fold difference in the mean bite size eaten on various pasture swards and bite size on a large number of tropical pasture swards was below the theoretical critical level of 0.3 g O.M./bite which Stobbs (1973) calculated for a 400 Kg animal to achieve an adequate dry matter intake. Cows can therefore be undernourished even though adequate dry matter is available. Rumination bites were only slightly lower when pastures were grazed.

It is concluded that grazing behaviour studies can be valuable in assessing the nutritive value of pasture swards and in understanding pasture-animal relationships. Since tropical pastures are usually grazed it is highly desirable to measure feeding and rumination behaviour with grazing animals.

V. REFERENCES