

RATE OF BITING BY JERSEY COWS AS INFLUENCED BY THE YIELD AND MATURITY OF PASTURE SWARDS

T. H. STOBBS*

ABSTRACT

Rate of biting by non-lactating Jersey cows grazing contrasting pasture swards was determined. Cows extended grazing periods and increased rate of biting in an attempt to satisfy feed intake requirements on mature pasture swards and swards which contained a high proportion of dead material. Measurement of grazing bites during the early morning period provided a means of identifying the relative ease with which pastures can be harvested by grazing animals.

INTRODUCTION

Animals grazing some tropical pastures are only able to harvest small bites of leafy material and can have difficulty satisfying their intake requirements (Stobbs 1973a, 1973b). Under conditions where feed is difficult to harvest cows compensate for the small size of bite eaten by increasing the time spent grazing (Stobbs 1970) and thus the number of bites is increased (Stobbs 1974). Although many studies of biting and chewing patterns have been reported for animals receiving various feeds indoors in pens (Kirk and Gerlaugh 1936, Freer, Campling and Balch 1962, Campling and Freer 1966, Welshe and Smith 1969 and Balch 1971) only four animals have been recorded over a 24-hour period whilst grazing a single temperate pasture (Hancock 1950). Recent studies (Stobbs 1974) emphasise the need to measure feeding behaviour under grazing conditions rather than indoors in stalls.

Studies of grazing times (Stobbs 1970) have shown that cows consistently have an intensive period of grazing at dawn each day. It is likely that variation in the relative ease with which herbage can be harvested from a sward could be identified by measuring biting behaviour in this grazing period. Two experiments were therefore conducted to measure rate of biting on contrasting tropical pasture swards.

MATERIALS AND METHODS

Two experiments were conducted at the CSIRO Samford Pasture Research Station, south-east Queensland (lat. 28° 22', long. 102° 33', alt. 50 m) during the 1972-73 season. The first experiment measured variation in rate of biting on various pasture swards within the early morning grazing period and the second measured rate of biting on two contrasting grass swards.

Biting frequency and length of grazing on various pasture swards—Experiment 1

Three non-lactating Jersey cows were collected from a *Chloris gayana* cv. Pioneer pasture at dawn each day and held in concrete pens. Water but no feed was provided. Counters for measuring jaw movements during grazing (Stobbs and Cowper 1972) were attached to cows and at 0900 h cows commenced grazing one of the seven pastures listed in Figure 1. The number of grazing bites taken by each of the 3 cows was recorded at 5-minute intervals until animals stopped grazing. All animals were accustomed to recorders. Measurements of biting rate were made on one of the pastures on alternate days with animals returning to a constant diet of *Chloris gayana* between samplings. Records from the three cows were therefore obtained from one day's measurement on each pasture species.

*C.S.I.R.O., Division of Tropical Agronomy, Cunningham Laboratory, Mill Road, St. Lucia, Q. 4067

Three herbage samples, each 1 m², were cut in each pasture and after oven drying (70°C) herbage yield was estimated. Bulked herbage samples, together with plucked leaf samples representing the diet being selected by cows, were analysed for *in vitro* digestibility (Minson and McLeod 1972).

Rate of biting on two contrasting grass swards—Experiment 2

Rate of biting on a 6-week-old Abyssinian barley (*Hordeum vulgare*) sward was compared with rate of biting on an adjacent *Setaria anceps* cv. Nandi sward. The barley was broadcast at 40 kg ha⁻¹ and received 50 kg N ha⁻¹ 2 weeks after emergence whereas the setaria sward had been established 5 years previously and in spring 1973 (August) contained a considerable quantity of previous season's mature growth with new growth in the base of the sward. By contrast the barley sward consisted predominately of actively growing leaf material.

Because of individual animal variation and possible confounding effects of climate, the biting rate of 6 non-lactating Jersey cows grazing these pastures was compared using a double reversal design (Brandt 1938). Balanced groups of 3 animals communally grazed a *Chloris gayana* pasture for 2 days without recording. On the third day cows were not permitted to graze between dawn and 0900 h when they were released to pasture treatments and the number of grazing bites was measured continuously at 5-minute intervals for a period of 380 minutes. This procedure was adopted on all three sampling days. Excess feed was always available for grazing.

Dry matter yields and *in vitro* digestibility of the pastures were measured as in the previous experiment.

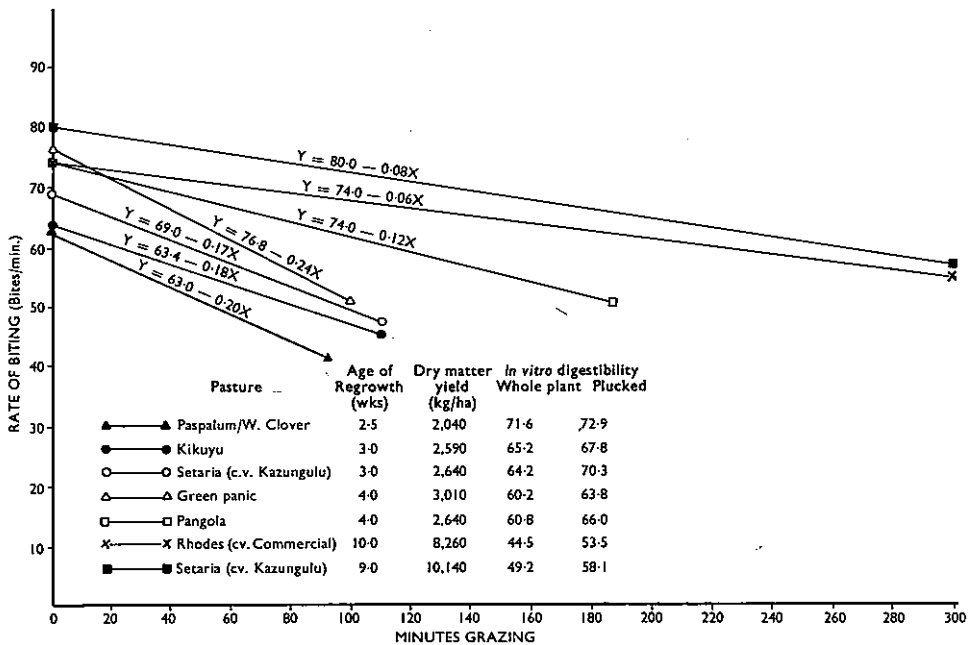


FIGURE 1
Mean biting rate of 3 non-lactating Jersey cows when grazing tropical pastures of varying ages and quality during morning grazing.

RESULTS

Biting frequency and length of grazing on various pasture swards

Climatic conditions remained similar during the recording period with no rain being recorded and maximum temperature averaging 26.3°C (range 24.4°C-27.7°C) and minimum temperature averaging 19.1°C (range 18.5°C-19.3°C).

The mean rate of biting declined linearly on all swards throughout grazing periods (Fig. 1). Cows grazing the mature rhodes and setaria swards commenced grazing at a faster rate and continued to graze at a higher rate of biting for a considerably longer period (300 mins) than when these cows grazed the paspalum/white clover, kikuyu and immature setaria swards (80-100 mins). The rate of decline in biting was slower ($P < 0.001$) on the two mature swards compared with paspalum/white clover, kikuyu and immature setaria and pangola swards ($P < 0.05$), (assuming that errors in calculating regressions were not correlated).

Figure 1 shows the yield and *in vitro* digestibility of both cut and plucked herbage samples from each of the 7 pastures.

Rate of biting on two contrasting swards

The barley swards averaged 1690 kg D.M. ha⁻¹ compared with a mean yield of 3360 kg D.M. ha⁻¹ on the setaria swards. However setaria herbage contained 1980 kg D.M. ha⁻¹ of previous seasons mature growth; edible dried green material therefore averaged 1380 kg D.M. ha⁻¹. *In vitro* digestibility of plucked-leaf material averaged 63.7% and 64.5% for the barley and setaria swards respectively.

Throughout the 380 minutes of recording there were 2-3 periods of grazing separated by periods of resting and ruminating. The sum total of bites from all periods of grazing was higher ($P < 0.001$) when cows grazed setaria swards, averaging 24,830 bites compared with a mean of 14,820 bites on barley swards (Figure 2).

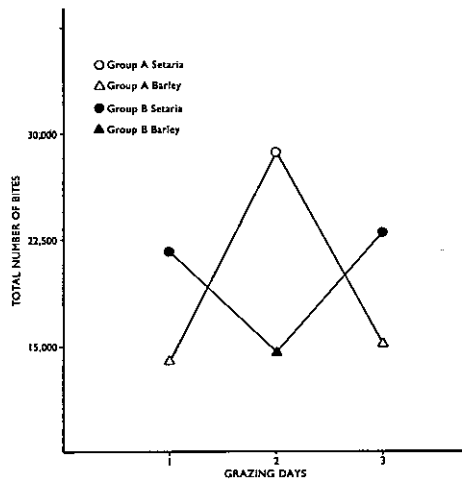


FIGURE 2

Total number of bites by non-lactating cows on barley and setaria pastures during 380 minutes of grazing.

The first period of grazing after cows were released was of the longest duration, averaging 222 minutes for cows grazing setaria compared with 165 minutes when these cows grazed barley swards. These differences were significant at the $P < 0.05$ level. During this period mean biting rate was higher ($P < 0.001$, Figure 3) and

declined more slowly on the setaria swards ($Y = 85.1 - 0.125X$, $Y =$ rate of biting per minute and $X =$ grazing time in minutes) compared with a slower rate of biting and a more rapid decline ($P < 0.001$) on the barley swards ($Y = 71.40 - 0.29X$). Biting rate was similar ($P > 0.05$) within all grazing periods throughout the 380 minutes of recording.

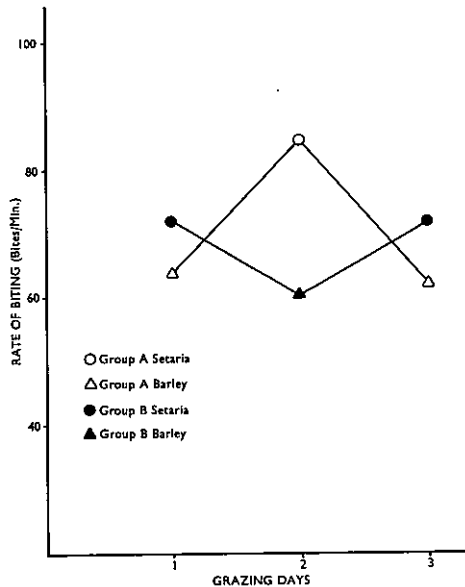


FIGURE 3

Mean biting rate of non-lactating Jersey cows grazing barley and setaria during the first grazing period after dawn.

DISCUSSION

Rate of biting during grazing provided a valuable guide to the relative ease with which herbage is harvested from tropical pasture swards. The length of the first grazing period after dawn gave some measure of an animal's ability to satisfy intake requirements on a particular sward but biting rate varied within each grazing period and grazing time measurements are therefore less precise than biting rate.

Bites recorded during grazing consist of harvesting bites and mastication bites. Cows grazing on mature tropical pastures take small amounts of herbage, often single leaves, and mastication bites account for less than 5 per cent of the total grazing bites (Chacon and Stobbs, unpublished). Conversely cows grazing immature barley swards were observed to collect large mouthfuls of feed with each sweep of the tongue and continue to chew this feed several times prior to swallowing. Thus the process of prehending feed and masticating this harvested material prior to ingestion was confounded on this treatment and true harvesting bites were overestimated.

The major finding of the experiments was the large number of bites required to satisfy intake requirements when grazing mature swards where dead material made leaf inaccessible. This was particularly the case where the potential for selection was greatest, as measured by the difference in *in vitro* digestibility between cut and plucked herbage samples (see Figure 1). This is in agreement with previous findings which showed that cows harvest small bites when grazing these mature swards (Stobbs 1973a). If animals are able to extend grazing over a longer period

to meet intake requirements animal production will not be affected. However the results of experiment 2 show that over the 380 minutes of recording cows grazing setaria took over 24,000 bites and previous results (Stobbs 1974) show that cows rarely exceed 36,000 prehension bites in any 24-hour period. It is therefore suggested that the cows were not harvesting leafy material sufficiently rapidly to satisfy their requirements. A two-fold advantage is therefore to be gained from grazing pastures before they mature; a higher intake of herbage is possible and this material is of higher nutritive value (Minson 1971). This is particularly the case with dairy cows which have a high nutrient requirement to produce good milk yields.

In practice it is difficult to prevent the accumulation of stemmy and dead material in swards, although there is considerable variation between species. Although the removal of inedible stem and dead material from mature grass pastures by burning can have some deleterious effects (Tothill 1971) the results of these experiments support the commonly held belief that the removal of top hamper can greatly increase the accessibility to new season's growth and thus improve animal productivity. Such a practice is however not generally advocated for sown grass/legume tropical pastures because of the deleterious effect upon some legumes, but under some circumstances mowing could be advantageous. Highest animal production is obtained from swards with large quantities of leafy herbage available and accessible for grazing.

It is concluded that cows increase their rate of biting and extend periods of grazing in an attempt to satisfy intake requirements. Measurement of grazing bites during the early morning grazing period provides a useful means for identifying the relative ease with which pastures can be harvested by grazing animals.

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