

# INFLUENCE OF ACCURACY AND FREQUENCY OF SUPPLEMENT FEEDING ON RUMEN FERMENTATION, DIGESTION AND PERFORMANCE OF GROWING CATTLE FED GRASS SILAGE AD LIBITUM

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## Introduction

Increased frequency of feeding usually results in more stable rumen fermentation and improved animal performance, especially if the proportion of concentrates in the diet is high (Gibson, 1981).

The accuracy requirements of feeding, at least from biological point of view, are poorly defined. The present experiment was conducted to assess the influence of accuracy and frequency of supplement feeding on rumen fermentation, digestion and performance of growing cattle fed grass silage *ad libitum*.

## Materials and Methods

Forty-eight Finnish Ayrshire bull calves, within two replicates, were randomly allotted into eight, 2<sup>3</sup> factorially arranged treatments. The factors were concentrate supplementation once (1x) or twice (2x) daily, accurately (A) or inaccurately (I) with a  $\pm$  30% controlled variation and barley (B) or barley-rapeseed meal supplementation (BRSM). The experiment, starting at the average age of 101 days, lasted for 28 weeks. Apparent digestibility of the diets was determined at the end of the feeding trial using acid insoluble ash (AIA, Van Keulen and Young, 1977) as a natural marker.

Rumen fermentation parameters were estimated with four fistulated Finnish Ayrshire bulls. Excluding accuracy, the factors were the same as in the feeding experiment.

In both experiments, grass silage (*ad libitum*) was fed once daily at 09:00 and concentrates, depending on treatment, either once daily at 07:00 or twice daily at 07:00 and 19:00. Concentrate feeding level was 45 g/kg W<sup>0.75</sup>. On BRSM-supplementation, 400 g of the concentrates consisted of rapeseed meal. A-fed and I-fed animals received, on the average, equal amount of concentrates.

## Results and Discussion

In common with many other reported works (Roth and Kirchgessner, 1976; Bragg et al., 1986; McAllan et al., 1987) increased feeding frequency reduced diurnal fluctuation in rumen parameters.

### pH.

On 1x-feeding, a sharp decrease followed by a gradual increase to initial level was found for pH in rumen fluid. The initial pH, measured at 07:00, was higher on 1x-feeding than on 2x-feeding ( $P < 0.001$ ). On 2x-feeding, a decreased rumen fluid pH was observed after the evening feed. However, the mean ruminal pH, calculated by integration of the pH-curve was not affected by the supplement feeding frequency. BRSM caused an increasing trend in the rumen pH, resulting in a significantly higher pH value compared to B-fed animals 3 hours after morning feeding.

### NH<sub>3</sub>-N.

An elevated ( $P < 0.10$ ) NH<sub>3</sub>-N concentration in the rumen fluid after the morning feed on 2x-feeding can be explained by increased silage intake compensating the smaller portion of concentrates. On the other hand, lower level of NH<sub>3</sub>-N on 1x-feeding may be explained by a more efficient ammonia incorporation into microbial protein due to availability of larger amount of soluble carbohydrates.

### Volatile fatty acids.

After the evening feeding total concentration of volatile fatty acids (VFA, mmol/l) in the rumen fluid for animals on 2x-feeding was elevated. BRSM supplementation tended ( $P < 0.10$ ) to decrease total VFA measured at 07:00 and 10:00. This can be interpreted as a result of lesser amount of substrate producing VFA. However, the mean concentration of total VFA was not affected by

feeding frequency.

#### Digestion.

Except for CP, frequency of supplement feeding or type of supplement had no significant effect on the apparent digestibility of dietary constituents (table 1). Better crude protein digestion on 2x-feeding might be due to a more stable rumen fermentation, while response to BRSM supplementation probably reflected better digestibility of RSM protein.

Inaccurate supplement feeding did not significantly effect the diet digestibility in this experiment, but it tended to impair ( $P=0.10$ ) apparent crude protein digestibility.

#### Animal performance

Increased feeding frequency only tended to increase liveweight gain (LWG) in the present experiment. This relatively small effect may be, at least partly, due to the *ad libitum* grass silage feeding. Recorded LWG (g/d) for 1x, 2x, A, 1, B and BRSM was 1136, 1167, 1160, 1142, 1139 and 1163, respectively.

More detailed discussion of the role of free access to grass silage and its effects on diet digestion and animal performance will be possible as soon as data of feed intake is available.

It is concluded, that though the effects on the rumen parameters were clear, the effect of frequency of supplement feeding on diet digestion

TABLE 1. INFLUENCE OF ACCURACY AND FREQUENCY OF SUPPLEMENT FEEDING AND OF TYPE OF SUPPLEMENT ON APPARENT DIGESTIBILITY (%) OF DIETARY CONSTITUENTS IN THE TOTAL RATIONS.

	Accuracy		Frequency supplement				SFM	Statistical significance of the main effects		
	A	1	1x	2x	B	BRSM		38d.f.	Accuracy	Frequency
DM	74.8	74.0	74.0	74.7	74.2	74.5	0.49	NS	NS	NS
Ash	56.2	55.8	56.0	55.9	55.5	56.4	0.74	NS	NS	NS
CP	71.8	70.5	70.1	72.2	70.3	72.0	0.55	NS	*	*
EE	69.3	68.4	69.4	68.3	68.4	69.3	0.68	NS	NS	NS
CF	71.9	71.7	71.9	71.7	71.9	71.7	0.52	NS	NS	NS
NFE	79.0	78.0	77.9	79.0	78.3	78.7	0.53	NS	NS	NS

Statistical significance: NS (non-significant), \* ( $P < 0.05$ ); no statistically significant interactions.

and further, to animal performance was little on *ad libitum* grass silage feeding. Also the effect of accuracy of supplement feeding on animal performance seemed to be minimal.

(Key Words: Accuracy, Frequency, Cattle)

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