

EFFECT OF FEEDING FREQUENCY OF CONCENTRATE TO MILKING COW IN EARLY LACTATION ON pH AND VFA-CONCENTRATION IN RUMEN FLUID AND ON MILK COMPOSITION AND MILK YIELD

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Introduction

It is common for cows in early lactation to be in negative energy balance because their feed and energy intake are insufficient to meet their energy demands for maintenance and production of milk. In general, a large amount of concentrate is usually to be fed to cows in early lactation to increase the supply of energy. Therefore, the abnormality of rumen function is frequently observed. The rumen function is closely related to the fermentation in it and the pH value and the production of volatile fatty acids (VFA) in rumen could be controlled by the alternation of feeding pattern (Bringe and Schultz, 1969). The alternation of feeding frequency of concentrate and roughage will affect not only the dry matter digestibility (DMD) and the productivity of milk (Campbell and Merilan, 1961), but also the weight gain (Schingoethe et al., 1986). In this study, the concentration of VFA in rumen fluid and the milk yield was investigated to know the influence of feeding frequency of concentrate.

Material and Method

Fifteen heads of Holsteins breed in early lactation were completely randomly allotted for 3 treatments, 5 heads in each treatment, of feeding frequency of concentrate, two, four and six times feeding per day, and the cows were fed 12, 6 and 4 hours interval from five o'clock in the morning, respectively. Corn silage and rice straw as a basic roughage were fed 30 kg/day and ad libitum, respectively. After feeding of 60 days, the rumen fluid was sampled in every two hours interval from the fistulated cows to be allotted in each treatment. The pH value was measured and the concentration of VFA in rumen fluid was analysed by GC (Erwin et al., 1961).

Results

The milk yield, milk composition and the nutrient requirement for milk production are shown in table 1.

As the feeding frequency increased, the daily milk yield was increased and the similar trends were also noted in the component of milk. Among

TABLE 1. MEAN DAILY MILK YIELDS, COMPOSITION OF THE MILK AND NUTRIENT REQUIREMENT FOR MILK YIELD

Item	Feeding frequency (Times/day)		
	2	4	6
Milk yield (kg/day)	23.70	24.86	25.69
Fat (%)	3.47	3.54	3.61
Protein (%)	2.84	2.85	2.92
Lactose (%)	4.62	4.66	4.69
Daily DM intake (g/kg live weight)	32.29	32.62	33.05
Requirement (g/4% FCM kg)			
Crude protein	94.4 ^a	91.9 ^{ab}	87.3 ^b
TDN	407.0 ^a	393.0 ^{ab}	376.0 ^b

^{a,b}Values within the same rows with unlike superscripts differ ($P < 0.05$).

them, the increase was the greatest in milk fat. DM intake per live weight in the daily feeding frequency of two, four and six times was 32.29 g, 32.62 g and 33.05 g, respectively and it was increased as the feeding frequency increased. The requirement of CP and TDN for the production of kg milk (4% FCM) was decreased as the feeding frequency increased, but the significant difference ($P < 0.05$) was noted only between 2 and 6 times feeding. The average pH in the rumen fluid of the feeding times 2, 4 and 6 was 6.08, 6.18 and 6.31, respectively (figure 1). The pH value of the feeding times 2, 4 and 6 was 5.56-6.40, 5.90-6.35 and 6.10-6.55, respectively and high feeding times per

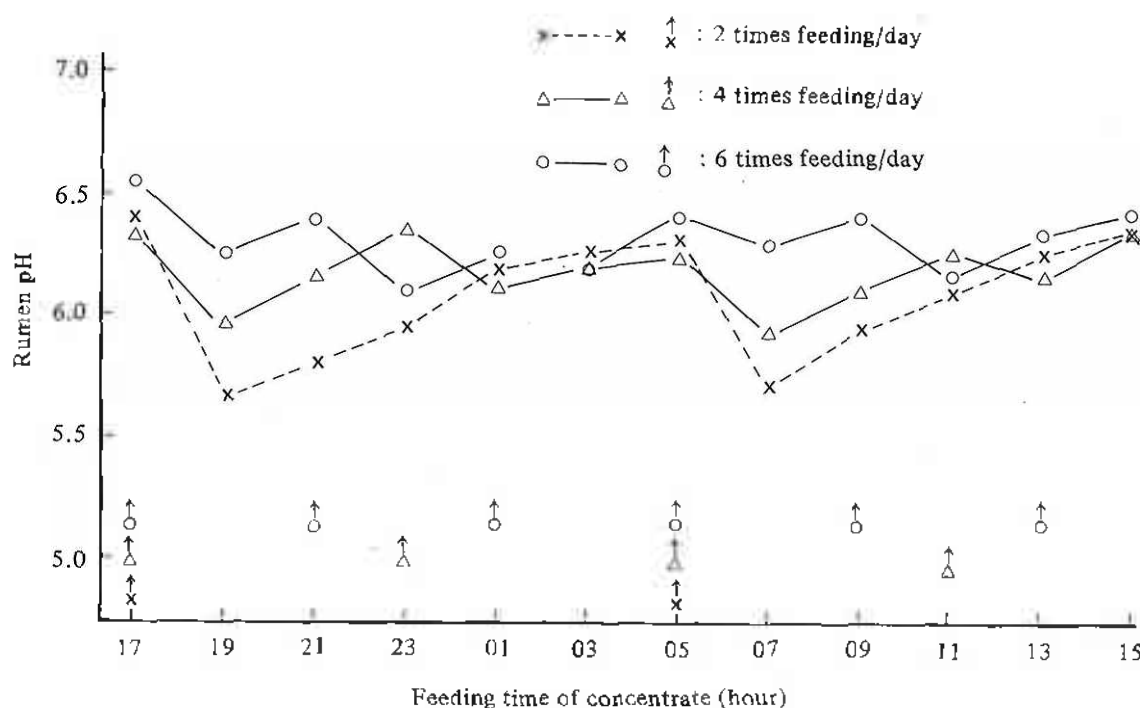


Figure 1. Effect of feeding frequency on the pH value of rumen fluid.

TABLE 2. INFLUENCE OF FEEDING FREQUENCY OF CONCENTRATE ON THE CONTENT OF VFA IN RUMEN FLUID.

Item	Feeding frequency (Times/day)		
	2	4	6
Total VFA. (mM/L)	104.36	117.98	113.00
VFA. (molar %)			
Acetate	50.9 ^a	55.5 ^b	60.0 ^c
Propionate	27.6 ^a	22.5 ^b	17.8 ^c
Butyrate	16.7	17.3	17.1
Isovalerate	2.8	2.6	2.8
Valerate	1.9	2.2	2.3
Acetate: Propionate	1.8 ^a	2.5 ^b	3.4 ^c

a,b,c Values within the same rows with unlike superscripts differ ($P < 0.05$).

day showed low variation of pH value.

The concentration of total VFA in the rumen fluid was significant low with decreasing the feeding frequency of concentrate (table 2). It was 104.36 mM/L and 117.98 mM/L by 2 and 4 times feeding, respectively. As the feeding frequency in-

creased, the proportion of acetate in VFA was increased and vice versa in propionate. And the ratio of acetate to propionate was increased from 1.8 of 2 times to 3.4 of 6 times feeding.

Discussion

Although the milk yield of cows fed 4 and 6 times per day was increased by 5-8% in comparison to that of 2 times feeding, there was no significant difference among feeding frequencies as reported by Johnson (1979) and Martz et al. (1971).

The content of fat, lactose and protein in milk was increased due to the increase of feeding frequency, but not significantly, which agreed with those of Stanley and Morita (1967). In this experiment, the frequent feeding of concentrate caused also the increase of total DM intake and the rate of DM intake per body weight and the similar results were obtained by Gill and Castle (1983) and Rohr and Daenicke (1973). The variation of pH in rumen fluid was reduced in case of increased feeding frequency as the previous reports by Bragg et al. (1986) and French and Kennelly (1985) and the ratio of acetate to propionate was also in-

fluenced by the feeding frequency. The results could be summarized as follows:

1. The cows to be fed frequently produced 5-8% more milk than that of 2 times feeding.
2. Increase of feeding frequency influenced positively on the content of milk component (fat, lactose and protein) and DM intake.
3. Frequent feeding of concentrate showed a low variation in pH value of rumen fluid and the high ratio of acetate to propionate.

(Key Words: Feeding Frequency, Milk Yield, pH Value, VFA)

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