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Secretion rate of milk constituents in *B. taurus* x *B. indicus* cattle at five milking intervals*

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ABSTRACT

Eight multiparous cows, calved within a 1.5 week interval, grazing star grass (*Cynodon nlemflensis*), were milked at 3, 6, 9, 15 and 24 h time intervals. Secretion rate was measured four times at two-weeks intervals. Milk protein content was not affected, but fat and lactose decreased ($P<0.0001$) from 9 h onwards. Secretion rate and udder efficiency for all milk components started to reduce between 9 and 15 h onwards.

KEY WORDS: milk secretion rate, udder efficiency, tropical cattle

INTRODUCTION

Bos taurus x *B. indicus* cows are commonly used in tropical dairy systems based mainly on grazing tropical pastures and variable amounts of supplements. Cross breed cattle in the tropics presents variable udder volume, and this might influence milk production. However, limited reports were found in relation to this subject (Magaña Sevilla and Sandoval Castro, 2003). The objective of the present work was to obtain biological indicators of milk production and udder efficiency in tropical dairy systems.

MATERIAL AND METHODS

Eight multiparous cows, calved within a 1.5 week interval, grazing star grass (*Cynodon nlemflensis*), were milked at 3, 6, 9, 15 and 24 h time intervals.

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Secretion rate was measured four times at two-week intervals in a two 4×4 Latin square design. At the beginning of the experiment, ~45 days of lactation, cows had an average milk yield of 16±4 kg/d. Cows were fed above their nutrient requirements. During the second week milk yield was recorded with a flow meter (Waikato, Inc.) and samples were taken for protein, fat and lactose analysis. Oxytocin was used to achieve complete udder emptiness in both current and previous milkings. Udder volume was measured as described by Magaña and Sandoval (2003). Data was analysed according to the experimental design using the GLM procedure of Minitab 12 (Minitab, 1997).

RESULTS AND DISCUSSION

Cows used in the present experiment are those from Magaña Sevilla and Sandoval Castro (2004). However, due to space constraints only average data from all four dietary treatments is presented in the present report.

Table 1. Milk composition, secretion rate and udder efficiency at 5 milking intervals in *B. taurus* × *B. indicus* cows

Time interval	Protein	Fat	Lactose
g/100 g milk			
3 h	3.21	4.28^{a}	5.03^{bc}
6 h	3.26	3.34^{b}	5.14^{c}
9 h	3.24	3.44^{b}	4.88^{bc}
15 h	3.34	3.23^{b}	4.95^{bc}
24 h	3.29	3.22^{b}	4.61^{a}
EE	3.889	0.210	0.103
P	0.363	0.0001	0.0001
mg/ min			
3 h	20.85^{a}	28.68^{a}	32.95^{bc}
6 h	21.97^{ab}	23.21^{abc}	34.71^{c}
9 h	23.98^{a}	25.92^{bc}	36.76^{a}
15 h	20.53^{cb}	19.84^{bc}	30.85^{bc}
24 h	17.91^{c}	17.03^{c}	25.41^{c}
EE	0.755	1.008	1.252
P	0.0001	0.0001	0.0001
μg *milk/cm^{3} udder*			
3 h	3.989^{ab}	5.487^{a}	6.278^{ab}
6 h	3.997^{ba}	4.706^{ac}	6.281^{ab}
9 h	4.403^{a}	4.161^{bc}	6.693^{a}
15 h	3.758^{bc}	3.678^{bc}	5.580^{b}
24 h	3.298^{c}	3.255^{c}	4.565^{c}
EE	0.0006	0.0029	0.0002
P	0.0001	0.0001	0.0001

Milk protein content was not influenced by milk interval ($P>0.05$). Fat was higher at the 3 h interval ($P<0.0001$) but, remained constant ($P>0.05$) thereafter. In general, secretion rate (mg/min) and udder efficiency (μg milk/cm^3 udder) decreased in time, and it was significantly lower ($P<0.0001$) from the 15 h interval it was (Table 1).

Milk production and lactation curve shape is influenced by the number of epithelial cells in the mammary gland and their secretory activity (Capuco et al., 2001). Thus, intrinsic and extrinsic factors influencing milk production will affect the cell number and its differentiation, possible influenced from milking routines management and also associated with the Feedback Inhibitor of Lactation (FIL) (Dewhurst and Knigth, 1994).

Although milk composition it is not severely affected. It is clear that the FIL mechanism was operating upon milk secretion as expected (Wilde and Peaker, 1990). From the companion report (Magaña Sevilla and Sandoval Castro, 2004) and the present work it was assessed that the udder efficiency was similar to that measured in specialized dairy systems (Knight and Dewhurst, 1994). Thus, milking intervals longer than 15 h, as the once a day milking are commonly used in tropical dairy system are clearly limiting the productivity of the cows in those production systems.

An udder efficiency similar to those from dairy breeds has the implication that the short and rapidly decreasing type of curve observed in crossbred cows might be due to a lower number of actually differentiated secretory cells in the mammary tissue. This hypothesis is supported by the biological model analysis of the lactation curve reported by Magaña-Sevilla and Sandoval-Castro (2002) using the model described by Pollot (2000) and it is also supported by the finding of Akers (2000) that non dairy breeds had lower number of secretory cells per alveoli and their cells are less differentiated.

CONCLUSIONS

In *B. taurus* x *B. indicus* cow, milk protein content is not affected by milking interval, and milk fat and lactose content is not further reduced after milking intervals larger than 3 h. Secretion rate and udder efficiency are reduced after a 9-15 h milking intervals.

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