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Kiran Attri
[1]Animal Nutrition Division, ICAR-National Dairy Research Institute, Karnal, Haryana, India
[2]ANFT Division, ICAR-Central Research Institute for Research on Buffaloes, Hisar, Haryana, India

Avijit Dey
ANFT Division, ICAR-Central Research Institute for Research on Buffaloes, Hisar, Haryana, India

Corresponding Author
Kiran Attri
[1]Animal Nutrition Division, ICAR-National Dairy Research Institute, Karnal, Haryana, India
[2]ANFT Division, ICAR-Central Research Institute for Research on Buffaloes, Hisar, Haryana, India

Lactose and milk urea relationship in milk of buffaloes fed on composite feed additive diets and their fluctuations

Kiran Attri and Avijit Dey

Abstract
18 Murrah lactating buffaloes (*Bubalus bubalis*) (avg. milk yield 10.83± 1.56 kg) and (avg. live weight, 507.24 ± 44.18 kg) at early stage (30 days) of lactation were selected and divided into two groups of 8 animals each to study the relationship and fluctuations in milk urea and lactose in milk in feed additive fed diets. They were allocated into two dietary groups, control and treatment containing basal feed without or with composite feed additives, respectively. Composite feed additive (CFA) was fed @ 2.5% of total dry matter intake in the CFA fed group along with concentrate mixture. The urea conc. (mg dl^{-1}), lactose and milk protein in milk of experimental buffaloes at weekly interval was recorded. In the initial stages of lactation MU concentration and lactose were 35.71±7.81 and 35.23±4.7, 4.51±0.23 and 4.52±0.22 respectively in control and treatment group. The concentration of MU and lactose in weekly milk samples throughout the experiment remained variable among the buffaloes. However, overall mean concentration of MU (mg dl^{-1}) irrespective of periods remained lower ($p = 0.01$) in CFA fed buffaloes in comparison to control.

Keywords: Milk urea, lactose, composite feed additive, buffaloes

Introduction

Milk urea and lactose concentrations in milk may vary from herd to herd, between cows of the same herd, and along the course of cow's lactation. It is important to determine how both metabolites fluctuate as well as their influence on other milk fractions because concentrate feed is an important component of the cost structure of dairy farms and excessive dietary nitrogen can affect the reproductive efficiency of cows and cause negative environmental impacts (Rajala-Schultz and Saville, 2003) [9]. The water content in milk largely determines milk fat and protein concentrations. Furthermore, the rate of water secretion depends on lactose synthesis, and lactose determines milk osmolarity (Miglior *et al*., 2006) [7]. Lactose levels, in turn, can change according to variations in glucose concentration, somatic cell count, and energy availability for physiological processes. Urea concentration in milk and blood has been comprehended as a valuable farm managmental tool to monitor the protein and energy feeding efficiency in dairy animals. (Baker *et al*., 1995; Jonker *et al*., 2002) [3, 6]. Milk urea (MU) concentration is of more practical use because, milk is not only easy to collect, it also avoids stress due to blood collection. Objectives of the current study were to study the effect of composite feed additive on MU and lactose in milk of lactating Murrah buffaloes.

Material and Methods

Animals and management

The study was conducted on Lactating buffaloes maintained at Institute dairy farm, ICAR-Central Research Institute for Research on Buffaloes, Hisar, and Haryana, India. Only healthy animals) (avg. milk yield 10.83± 1.56 kg) and (avg. live weight, 507.24 ± 44.18 kg; parity, 2-5) at early stage (30 days) of lactation were selected and divided into two groups of 8 each. Farm grown green sorghum (about 25 kg) was offered at 11:00 am, after ensuring complete consumption of concentrates by buffaloes. Wheat straw was offered *ad libitum*. Water was freely available throughout the day. Milk was collected for analysis.

Collection of samples

Animals were milked twice a day by full hand milking technique and milk samples (100 ml each) were collected on the test days.

During the study of three months feeding 220 individual milk samples were collected from 18 lactating buffaloes and analysed weekly for milk urea (MU) concentration and lactose. Samples were collected from milk weighing bucket after complete milking and through mixing and stored at 4°C until processed and analysed on same day. Milk samples were analysed for urea content, lactose concentration using Lacto-scan and a calorimetric p-dimethylaminobenzaldehyde (DMAB) procedure (Bector *et al*., 1998) [4].

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) using SPSS 17.0 software and treatment means were ranked using Duncan's multiple range tests according to Snedecor and Cochran (1994).The data are expressed as mean ± SD with significance level $p<0.05$.

Results and Discussion

The urea concentration (mg dl^{-1}) in milk of experimental buffaloes at weekly interval is presented in Fig.1. Initial milk urea (MU) concentration was comparable ($p>0.05$) between the both groups *viz*. CON (control) and CFA (treatment).

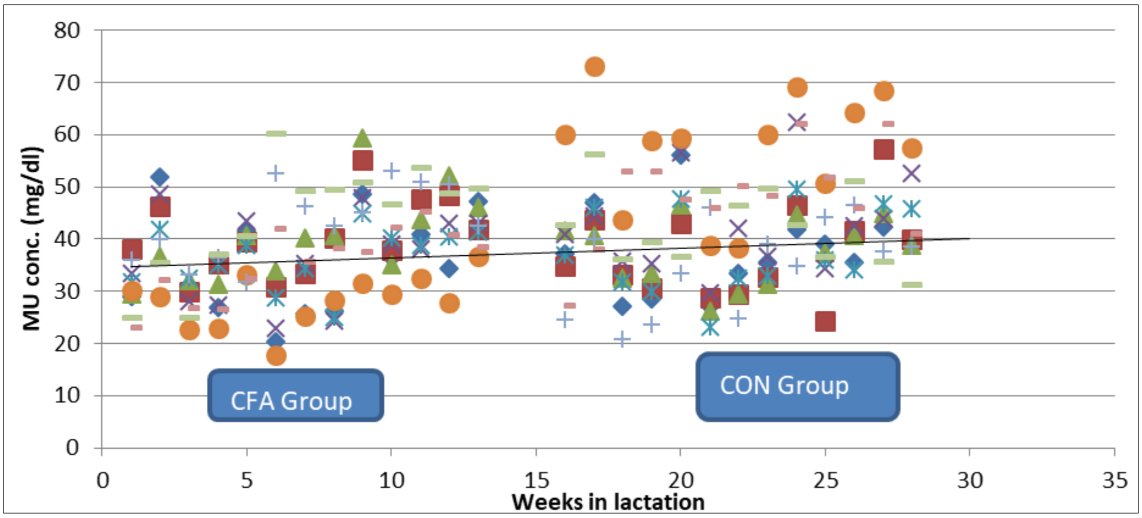

Fig 1: Fluctuations of milk urea concentrations in CFA & CON group

The concentration of MU in weekly milk samples throughout the experiment remained variable among the buffaloes. However, overall mean concentration of MU (mg dl^{-1}) irrespective of periods remained lower ($p = 0.01$) in CFA fed buffaloes in comparison to control. Decrease in milk urea concentration in CFA supplemented buffaloes could be due to reduced protein degradation in the rumen which was supposed to be utilized at latter part of digestive tract. CFA which contain an ideal combination of methane inhibitors, alternate hydrogen sinks and some rumen stimulating agents might have some role in modulation of rumen environment. Roy *et al.* (2005) [8] conducted a study to examine the effect of different feeding regimens on milk urea and milk protein concentration in Murrah buffaloes and concluded that feeding of ber-seem increased milk urea (MU) concentration due to more degradation of protein in rumen. The mean MU concentration in treatment group is significantly lower than the control group ($p<0.05$). The CFA might have some role in reducing hyper ammonia producing bacteria (HAB) in rumen resulting lowered ammonia production, thereby lowered urea concentration in milk. However, no significant change in milk urea nitrogen of Holstein cows was observed in the experiment conducted by supplementation with a blend of essential oils, chitosan or monensin (Vendramini *et al*., 2016) [11]. Initial milk lactose concentration was 4.51±0.23 and 4.52±0.22 in CON & CFA group. Fluctuations of lactose concentration in milk is depicted in Fig 2. Lactose concentration varies throughout the study in both group but the difference was not significantly high ($p<0.05$) in treatment group than control group.

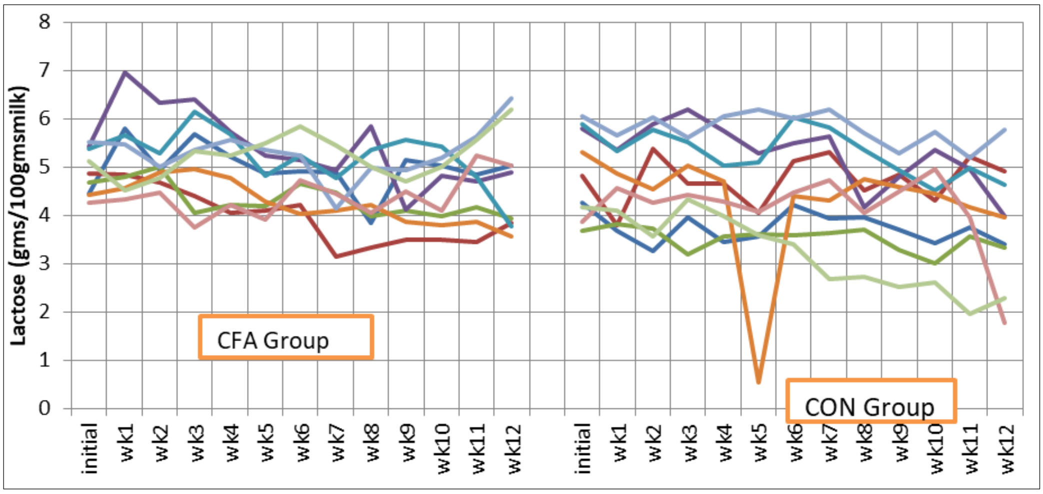

Fig 2: Fluctuations of Lactose in milk of CFA and CON group

It was observed that MU and Lactose was negatively correlated. Cao *et al*. (2010) found a statistically significant association between MUN and lactose. Relationship of MU & lactose in both the group are present in Fig.3.

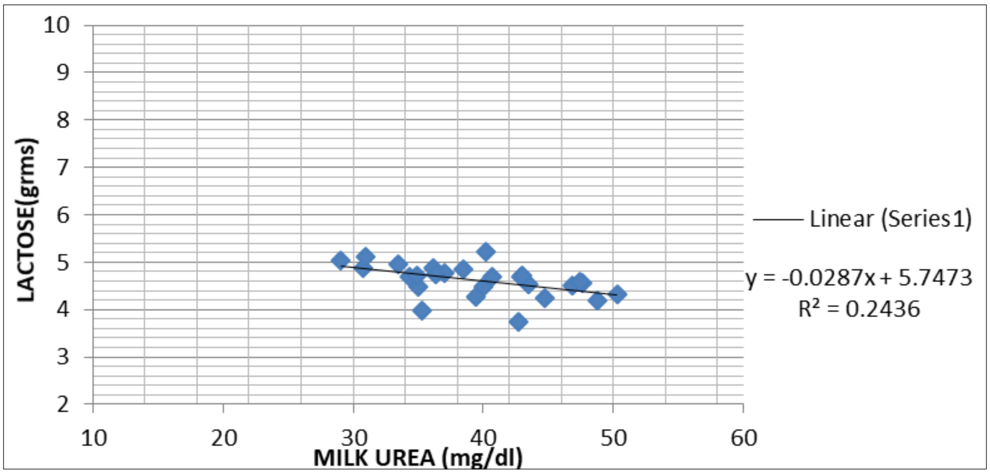

Fig 3: Relationship between Lactose and MU concentration in CFA & CON group

Conclusion

Composite feed additive have a positive effect on protein utilization by animals and decreases protein degradation in rumen and concentration of urea in milk when fed @ 2.5% of feed intake in lactating buffaloes. Further a negative correlation was observed in between milk urea and lactose concentration in CFA fed buffaloes. Long term studies can done to study the effect of CFA on protein utilization in growing animals and heifers and effect on other milk components can be studied in lactating animals.

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