



Effect of UMMB (Urea Molasses Mineral Block) supplementation on rumen profile in buffaloes

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Abstract

Effect of UMMB supplementation on rumen profile in buffalo calves was undertaken with the objectives to study the effect of UMMB on rumen microbiology and rumen metabolites. Eight apparently healthy male buffalo calves of 10 to 12 months age and weighing between 100 to 150 kg were used as experimental animals. They were divided into control and treatment groups consisting of 4 animals in each group. The animals of group I were kept as control for normal study and the animals of group II were supplemented with UMMB *ad-lib*. Rumen liquor samples were collected before feeding (0 hr) and at 3 hr after feeding for 3 consecutive days after a period of microbial adaptation. The results revealed that there was ($p < 0.05$) increase in total bacterial count, viable bacterial count and total protozoal count in UMMB supplemented group compared to control. Rumen pH, concentration of total volatile fatty acids, molar proportion of propionic acids, total nitrogen and ammonia nitrogen also showed significant increase in group II however molar proportion of acetic acid and butyric acid significantly decreased in group supplemented with UMMB. It can be concluded from the present investigation that oral supplementation of UMMB enhanced the microbial population and improved the concentration of rumen metabolites.

Introduction

To ensure a high rate of milk production, particularly during the dry season, farmers feed large quantities of high-priced concentrates to their animal, which often limits profit margins. Feeding molasses and urea in the form of a block is convenient and economically feasible for small-scale farmers. Urea-molasses mineral block licks can improve the utilization of low quality roughages by satisfying the requirement of the rumen microorganisms, creating a better environment for the fermentation of fibrous material and increasing production of microbial protein and volatile fatty acids. Urea, after hydrolyzing into ammonia in the rumen, provides a nitrogen source for the rumen microflora. Molasses is a source of readily fermentable energy. Therefore keeping in view the importance of rumen

micro-organisms in ruminant digestion, the present investigation was carried out to evaluate the effect of UMMB supplementation on rumen microbiology and metabolites.

Methods

Eight apparently healthy male buffalo calves, 10 to 12 months old and weighing 100 to 120 kg were divided into 2 equal groups. Both the groups were kept on conventional diet consisting of wheat straw, green fodder, concentrate and mineral mixture as per the recommendations of NRC (NRC 2001). Group I served as healthy control and the animals of Group II were subjected to *ad-lib* supplementation of UMMB for 21 days. The animals of both the groups were operated for rumen fistulation on left flank. Rumen liquor samples were collected through rumen fistula from various positions and depths to obtain representative samples with the help of suction pump before and 3 h after feeding. Each animal was sampled for 3 consecutive days after the period of microbial adaptation. Total bacterial count was performed as per the method of Gall *et al* (1949) using nigrosine slide technique. Viable bacterial count was done as per the method of Hobson (1969). Total protozoal count in rumen was made according to Naga and El-Shazly (1969). The pH of rumen liquor was determined with portable digital pH meter immediately after taking samples. Total volatile fatty acids in rumen fluid were calculated by the method of Barnett and Reid (1957). The individual portion of volatile fatty acids, total nitrogen, in SRL, $\text{NH}_3\text{-N}$ and total free amino acids were determined as per (Bernard and Charles 1968), (McKenzie and Wallace 1954), (Conway microdiffusion technique of Conway 1957), and (Lee and Takahashi 1966) respectively. The data were subjected to analysis of variance (ANOVA)- two factor without replication as per (Snedecor and Cochran 1994).

Results

Total bacterial count increased at 0 and 3 h post feeding (Table 1), which was significantly more in UMMB supplemented buffalo calves than the control

group. However viable bacterial count increased significantly at 3 h post feeding and non significantly at 0 h in UMMB supplemented group compared to control. Similarly Srinivas and Gupta (1997) recorded significant higher bacterial pool size and bacterial production rate in cattle supplemented with UMMB. The increase in microbial numbers in UMMB supplemented group could be due to rich source of nitrogen or energy or both. Protozoal count also increased at 3 h post feeding in both the groups. Iqbal *et al* (1993) reported that irrespective of diets, the protozoal count increased 4 h after feeding, thereafter the concentration decreased gradually. This increase in protozoal count at 3 h may be attributed to increased availability of substrate for protozoal growth. The mean total protozoal count at 0 h in rumen liquor was not significantly affected in the treatment group as compared to control. However, there was significant increase in total protozoal count in UMMB supplemented group compared to control group. These results are in agreement with Thu and Uden (2001) who observed significantly higher concentration of protozoa in swamp buffaloes supplemented with urea molasses cake compared to control group kept on rice straw. The rise in total protozoal count on UMMB supplementation could be due to availability of nitrogen or energy or both.

The rumen pH at 0 h was higher than at 3 h post feeding in both the groups (Table 2). This post-prandial decline in pH values might be due to increased microbial fermentation and accumulation of organic acids in the rumen. These results are in accordance with the findings of Singh (2002). There was ($p < 0.05$) rise in pH in UMMB supplemented group compared to control group which could be due to higher levels of ammonia nitrogen. Similar findings were reported by Thu and Uden (2001) who observed significantly higher pH in buffaloes supplemented with urea-molasses cake than control group fed mixed grass *ad-lib*. The mean TVFA's concentrations increased significantly in treatment group as compared to control. Higher values of TVFA's in the rumen liquor could be attributed to the stimulatory effect of feed additive on viable and total bacterial population, which in turn enhanced the fermentation in rumen and resulted in increased production of total volatile fatty acids.

Singh *et al* (1995) advocated that supplementation of urea molasses mineral lick increased the total volatile fatty acids in the rumen liquor by two folds as compared to straw alone diet in cross bred cattle. The mean molar percentage of acetic acid and butyric acid at 0 h and 3 h post prandial was significantly lower in

group 2 as compared to group 1. This decrease is perhaps due to increase in molar percentage of propionate by supplementation of UMMB. There was no significant difference in the molar percentage of isobutyric and isovaleric acid between the two groups.

The mean concentration of total nitrogen and ammonia nitrogen at 0 and 3 h was significantly higher in treatment group as compared to control group. De and Singh (2003) have

also found higher concentration of ammonia nitrogen in crossbred cattle supplemented with UMMB. The mean concentration of total free amino acids at 0 h and 3 h was significantly higher in the treatment group as compared to control.

Conclusion(s)

From the results of present investigation it can be concluded that oral supplementation of Urea molasses mineral block significantly enhanced microbial population and also improved the concentration of rumen metabolites.

Abbreviation(s)

UMMB, TVFA, *ad-lib*,

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Illustrations

Illustration 1

Table 1

Table 1. Effect of UMMB supplementation on microbial population in buffalo rumen liquor

Parameter	Groups	Time Interval	
		(0) h before feeding	(3) h after feeding
Total bacterial count (X 10 ⁹ /ml)	Group 1	9.92±0.48 ^a	13.83±0.55 ^a
	Group 2	15.62±0.79 ^b	18.19±0.82 ^b
Viable bacterial count (X 10 ⁹ /ml)	Group 1	15.67±0.62 ^a	19.33±0.77 ^a
	Group 2	24.67±0.83 ^a	33.92±0.60 ^b
Total protozoal count (X 10 ⁹ /ml)	Group 1	1.82±0.03 ^a	2.93±0.12 ^a
	Group 2	2.99±0.18 ^a	6.08±0.39 ^b

Each value is the mean of 12 observations. The figures having different superscripts within columns, within a particular parameter, differ significantly at P<0.05.

Illustration 2

Effect of UMBB Supplementation on metabolites in buffalo rumen liquor

Parameter	Groups	Time Interval	
		(0) h before feeding	(3) h after feeding
pH	Group 1	7.19±0.04 ^a	6.49±0.02 ^b
	Group 2	7.50±0.05 ^a	6.91±0.04 ^a
Total volatile fatty acids (mEq/L)	Group 1	83.75±3.59 ^a	101.25±2.45 ^a
	Group 2	102.08±2.89 ^b	112.83±3.67 ^b
Acetic acid (molar %)	Group 1	67.79±1.23 ^a	72.12±1.89 ^a
	Group 2	55.82±1.05 ^b	64.53±1.66 ^b
Propionic acid (molar %)	Group 1	17.04±0.89 ^a	19.47±1.00 ^a
	Group 2	21.07±1.47 ^b	23.93±1.63 ^b
Butyric acid (molar %)	Group 1	16.81±1.45 ^a	20.73±1.65 ^a
	Group 2	12.42±0.85 ^b	12.58±1.04 ^b
Isobutyric acid (molar %)	Group 1	2.13±0.07 ^a	2.64±0.05 ^a
	Group 2	2.07±0.02 ^a	2.73±0.06 ^a
Iso valeric acid (molar %)	Group 1	1.31±0.08 ^a	1.53±0.12 ^a
	Group 2	1.09±0.06 ^a	1.09±0.11 ^a
Total nitrogen (mg/dl)	Group 1	62.35±2.73 ^a	83.13±2.69 ^a
	Group 2	79.45±3.47 ^b	113.15±2.71 ^b
Ammonia Nitrogen (mg/dl)	Group 1	9.03±1.48 ^a	14.30±0.63 ^a
	Group 2	19.95±0.49 ^b	36.07±1.65 ^b
Total free amino acid (μ mole/L)	Group 1	420.00±34.99 ^a	680.67±22.01 ^a
	Group 2	480.16±18.40 ^b	689.510±35.10 ^b

Each value is the mean of 12 observations. The figures having different superscripts within columns, within a particular parameter, differ significantly at P<0.05.

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