OnLine Journal of Biological Sciences 2 (5): 329-332, 2002
ISSN 1608-4127

The Effect and Economic Evaluation of Feeding Urea- Molasses and Urea-Molasses Concentrate With Green Grasses on Milk Production in Buffalo Cows of Bangladesh

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Abstract: A trail was conducted to investigate the effect and economic evaluation of feeding urea-molasses and urea-molasses concentrate with green grass on milk yield. Sixteen animals were grouped in to 3 having 5 animals in each of group A and C and 6 animals in group B. Group A was control (farmer practice), B was fed urea-molasses with green grass and C was fed urea-molasses concentrate with green grasses. The average milk yield of group A, B and C were 0.82, 2.67 and 1.87 kg/d and 4% fat corrected milk yield (FCM) of group A, B and C were 2.54, 6.99 and 4.78 kg/d respectively. The both average milk yield and FCM yield of group A was significantly ($P<0.001$) lower than treated groups B and C. Supplemented group B was significantly higher than supplemented group C. Total feed cost in group B (TK.1140) was lower than that of group C (TK.1305). In contrasts , net return from B (TK.5950) was higher than that of group C (TK.3658). In addition, another metabolic trail was carried out to find out the reason of better performance of urea-molasses supplemented group than urea-molasses concentrate group. Four cannulated animals were fed four types of dietary group, A, B, C and D respectively and was observed the ruminal parameters (NH_3, pH) NH_3-N was significantly higher ($P<0.05$) in dietary groups C and D than in dietary groups A and B. Addition of urea increased rumen NH_3 level and maintain rumen pH in normal range. This favorable environment of rumen may recovered the deficit nutrients (energy, protein) of normal local grasses and increased milk production.

Key words: Economic evaluation, urea- molasses, urea- molasses-concentrate, green grass, milk, buffalo

Introduction

Bangladesh is a developing country and its economy largely depends on agriculture. Livestock as one of the four components of agriculture (such as crops, livestock, fisheries and forestry) plays a vital role in national economy, contributing about 6.5% of gross domestic product (GDP) and 13% of total foreign exchange (Anonymous, 1991). The advantages of rearing buffalo in Bangladesh are, the climatic condition is very much favorable, they can be productive on a very poor quality roughage, higher feed conversion ratio than cattle and they are well adapted to adverse climatic conditions (eg. flood, drought, high tidal wave in coastal area) as well as they can thrive well under little or no housing management. The major constrain of buffalo production is the supply of inadequate quantity of good quality feed. Although ruminant has to depend mainly on crop residues (straw) as a major source of ruminants. Seasonally (pre-rain) some grasses are adequately available but deficit in protein energy which are unable to met up the nutritive requirement of the animals. Enriching green grasses with urea-molasses improves the nutritive value and utilization (Haque and Chowdhury, 1995) to a great extent. Most studies on the effect of urea-molasses supplementation on rumen function and productivity have been done with dairy cows and growing cattle or buffaloes while cattle and buffaloes for draught and particularly draught cows have already been reported (Sansoucy, 1995; Chenost and Kayouli, 1997).
So, the objectives of this experiment:

- To study the effect of feeding urea-molasses with green grass to buffalo cows on milk production.
- To estimate the economic return of milk yield and calves live weight gain.
- To investigate the effect of urea molasses supplementation on certain rumen parameters.

Materials and Methods

A feeding trail was conducted during the period from May 16, to August 15, 2000 on farm Kanihari, Trisal, Mymynsingh.
A total of 16 lactating animals were selected and was divided into three groups having 5 animals in each of groups A & C and 6 animals in group B. Dietary treatments fed to the experimental animals as are below:

Dietary treatments	Groups
Control (farmer practice)[x]	A
Green grass +urea-molasses + straw	B
Green grass +urea-molasses + straw + concentrate	C

[x]Farmer practice indicated ad libitum feeding of green grass with straw.

Ingredient composition of experimental diets: The composition of experimental diets fed to buffalo cows in two experimental sites is shown below:

	Dietary treatments		
Ingredients (DM basis)kg/day	A	B	C
Straw	2.0	2.0	2.0
Green grass	8.78	8.78	8.78
Molasses	-	0.75	0.75
Urea	-	0.1	0.1
Concentrate mixture [rice polish: wheat bran: til oil cake (1: 1: 2)]	0.45	-	0.90

The duration of trial was three months. The animals de-wormed except pregnant and allowed 7 days to adopt to the experimental conditions before the start of the trial. After adjustment period the amount of milk produced was recorded. Besides, live weight change of calves were also measured and recorded fortnightly by

Table 1: The dietary treatments and ingredient composition of experimental diet

	Ingredients (DM) kg/day			
Dietary treatment	Green grass	Molasses	Urea	Concentrate
A (Green grass)	4.8	-	-	-
B (Green grass + molasses)	4.8	0.3	-	-
C (Green grass + molasses + urea)	4.8	0.3	0.05	-
D (Green grass + molasses + urea + concentrate)	4.8	0.3	0.05	0.9

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using Shaeffer's formula:

$$\text{Live weight (lbs)} = \frac{L \times G^2}{300}$$

where, L = Length from point of shoulder to pin-bone in inches
G = Heart girth in inches

Then live weight in pounds (lbs) was converted into kg (2.22 lbs = 1 kg)

On- station trial: A metabolic trial was conducted at the Animal Nutrition Field Laboratory, Bangladesh Agricultural University, Mymensingh, using four cannulated bulls of about 4 years old and 174.8 kg (±20.4) live weight. This trial was done to determine NH_3-N concentration and pH at different feeding regimes that was applied to buffaloes on-farm conditions. The dietary treatment and ingredient composition of experimental diets are shown in Table 1.

Initially, animals were allowed, 5 days to adjust with the experimental diets. During this period they were de-wormed with anthelmintic drug. Each experimental period was continued for 7 days. Out of which 4 days was for adjustment to the new diet and the remaining 3 days was used for rumen liquor collection.

After 3 hours of morning meal, rumen liquor was collected from the individual animal in two separate vials. One sample was preserved with 2-3 drops of concentrate (99%purity) sulphuric (H_2SO_4) acid and then stored at -20^0 C until analyzed for NH_3-N. Another sample was used to determine pH immediately after collection.

Chemical analysis

Feed sample: Mixed grass sample and concentrate ingredients was oven dried, ground and kept for chemical analysis. These are subsequently analyzed for the determination of crude protein (CP) following the methods of AOAC (1990).

Rumen liquor sample: Ammonia concentration was determined by distillation of strained rumen liquor with disodium tetraborate. Thus released ammonia was then quantitatively measured against standard H_2SO_4 solution.

Statistical analysis: The data were analyzed by using single variate General Linear Model (GLM) of SPSS-using following statistical model.

On-Farm trial: The data were analyzed by using univariate GLM procedure of SPSS 9.0 for Windows (SPSS) statistical package. The main effect was the effect of diet (treatment) on milk yield, milk composition, lactation length, growth rate, rumen parameters etc. The model used was as follows:

$$Yi = \mu + \alpha i + ei$$

Here, Yi is the observed value for a dependent variable on ith diet (I = 1,2,3..........) with μ is the general mean and ei is the random error.

The experimental data related to economic return from milk yield and calf live weight gain were analyzed following randomized block design (RBD). Moreover, Duncan's new multiple range test (DMRT) was done to identify significant differences among the treatment means.

On-station trial: Data collected and calculated for each parameter (NH3-N level and pH level of rumen liquor) were analyzed statistically in a randomized block design (RBD) in accordance with the principles of Steel and Torrie (1980) using MSTAT statistical program to compute analysis of variance (ANOVA) for a 4x4 Latin square design. Significant differences among the means with separated by Duncan's multiple range test (Duncan, 1955).

Results and Discussion

Chemical composition of green grass: The chemical composition of green grasses, which were fed to the buffaloes during the experimental period (Table 2). The protein percentage of *Pennisetum purpureum, Brachiaria mutica* and *Hymenchne amplexicaulis* grasses are normally 6.2 12 and 7.5%, respectively

Table 2: Chemical composition of the green grasses as obtained during the experiment

Common name (Botanical name)	DM (g/100g sample)	CP (g/100g sample)
Kash (*Saccharum spontneour*)	23.33	9.56
Mutha (*Cyperus rotundus*)	26.66	11.38
Gung palong	16.66	20.90
Durba (*Cynodon*)	37.33	8.05
Sweet potato vines (*Ipomoea batatus*)	13.33	23.34
Bathua (*Chenpodium album*)	16.66	15.07
Khude Shama (*Ehinochloa colonum*)	23.33	12.02
Hycha (*Alteranthera sessilis*)	10.00	13.05
Mecania lata	16.66	10.42
Mixed grass sample	38.51	11.09

CP = crude protein, DM = Dhymathe

(Tareque, 1985). As the grasses contained more CP than *Pennisetum purpureum, brachiaria mutica* and *hymenachne amplexicaulis,* they were rapidly fermented in the rumen. So, there should be a plenty of rumen degradable N, which can be better utilized by adding readily fermentable energy like molasses.

On-Farm trial

Milk yield: The average daily milk yield of the control group A and the treated groups B and C, were 0.82, 2.67 and 1.87 kg/day, respectively (Table 3). The milk yield under conventional farmer practice (control group A) was significantly ($P < 0.001$) lower than that of the treated groups B and C which the conventional diet was supplemented with urea-molasses and urea-molasses-concentrate respectively. Although, milk yield was not significantly different between the groups B and C, till the urea molasses supplemented group had higher milk yield than those that supplemented with the urea-molasses plus concentrate. The reason was not clear. However, these results are in agreement with the report of Kakkar and Makkar (1995), who recorded better milk production from the urea-molasses supplement than that of unsupplemented diet.

The average fat corrected (4% fat) milk yield (FCM, kg/d) is also shown in Table 3. Average FCM yield (kg/d) of groups A, B and C were 2.84, 6.99 and 4.78, respectively. Here, the average FCM yield was significantly ($P < 0.001$) higher in treated groups B and C than the control one. Furthermore, group B had significantly ($P < 0.001$) higher FCM than that of the group C. The result indicated that the supplementation of urea-molasses and urea-molasses-concentrate increased the availability of the rumen nitrogen and fermentable CHO, which had probably increased milk production. Research at the Bangladesh Livestock Research Institute (BLRI, Savar) has also shown that the supplementation of graded levels of unprotected mustard oil cake (Chowdhury, 1999) or cotton seed cake (Chowdhury, 2001) to urea (3%)-molasses (15%) enriched straw diet had no optimistic effect on the growth performance of growing native bulls. Huque and Chowdhury (1995) showed that enriching straw with 3% urea and 15% molasses could provide sufficient fermentable energy and N for optimum rumen fermentation.

Milk yield (kg/d) of buffaloes fed different diets throughout the experimental period: In group A, 1st, 2nd, 3rd and 4th fortnight milk yields (kg) were 1.92, 1.198, 0.932 and 0.694, respectively, which were significantly higher ($P < 0.01$) than that of 5th and 6th fortnight (0.184 and 0) milk yield (Fig. 1). From the result, it is evident that, the treated groups B and C continued their production throughout the experimental period of 90 days. This implies that supplementation of urea-molasses and/or concentrate met up the nutrient deficiencies of the basal feed, which may

Table 3: Average daily milk yield, milk composition and lactation length of buffaloes fed on different diets during the 90 days of experiment

	Group and corresponding Standard Error							
Parameters	A	SE	B	SE	C	SE	SED	Level of significance
Average milk yield (kg/d)	0.82[b]	0.255	2.67[a]	0.233	1.84[ab]	0.255	0.20	**
Average FCM yield (kg/d)	2.84[c]	0.627	6.99[a]	0.474	4.78[b]	0.550	0.44	**

Values in the same row with different superscripts differ significantly at the corresponding level of probability P<0.001, NS= Non-significant

Table 4: Economic return from milk yield and calf live weight changes

	Dietary groups				
Parameter	A	B	C	$LSD_{0.05}$	Level of significance
Total feed cost (Taka)	550[b]	1140[a]	1305[a]	392.0	*
Calf live weight gain (g/d)	108[b]	241[ab]	323[a]	188.0	*
Total return from milk and live weight change of calf	1988[c]	7089[ab]	4962[b]	2869.0	*
Net return	1438[b]	5950[a]	3658[ab]	2625.0	*
Profit Tk/Tk investment	3.8[b]	6[a]	3.7[b]	1.9	* abc

Values with different superscript differ significantly (P<0.05), *P<0.05

Table 5: pH and NH_3-N concentration in the rumen liquor of bullock given different diets

	Groups					
Parameters	A	B	C	D	$LSD_{0.05}$	Level of significance
pH level	6.72	6.74	6.76	6.88	0.865	NS
NH_3-N concentration (mg/litre)	52[b].0	40[b].0	137[a].0	146[a].0	13.0	*

* = Significant at 5% level, NS = Non significant

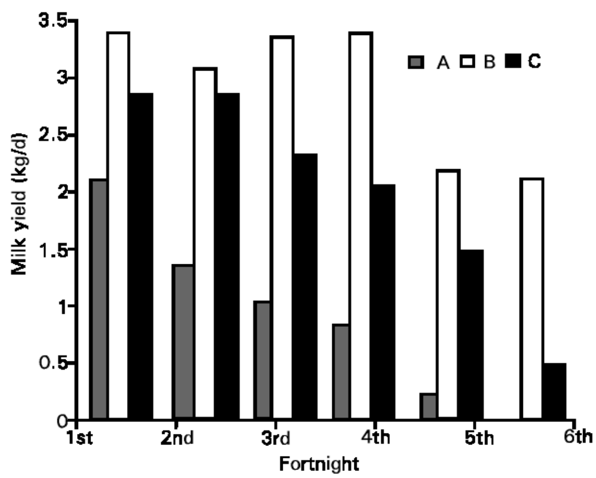

Fig.1: Milk yield (kg/d) of buffaloes fed different diets during the experiment period

increase both the amount of milk yield and lactation length. However, the control group (A) produced lower amount of milk and became dry within 5th fortnight of the experimental period. This was probably due to inefficient rumen fermentation and improper utilization of absorbed nutrients.

Gain in calf live weight (g/d): The average live weight gain of buffalo calves in different dietary groups A, B and C were 108, 241 and 323 g, respectively (Table 4). Live weight gain in group C was significantly better (P<0.05) than that of reported in group A. Although not significant, live weight gain of B was higher than that of A. Previous studies of Prasad *et al*. (1985) and Pachauri *et al*. (1986) indicated that supply of urea supplemented grass increased the live weight gain of calves. Supplementation of concentrate along with urea-molasses had possibly increased the calf live weight gain in group C than those fed on urea-molasses supplemented group B.

Economic return from milk yield and calf live weight gain: The gross economic return was estimated by subtracting the feed cost from the total income as obtained from the milk and calf live weight gain. The prices of roughage (straw), concentrate and milk were considered as Tk. 1.5, 8.0 and 20.0 per kg, respectively. The average cost for each kg live weight gain of calves was considered as Tk. 50. The total feed cost, total return from milk and live weight gain of calves, net return and profit (taka per taka investment) were estimated (Table 4). Total feed costs for the groups A, B and C were Tk. 550, 1140 and 1305, respectively. In the treated groups B and C, total feed costs were significantly higher (P<0.05) than that of the control group A. On the other hand, the total return from milk and calf live weight gains for groups A, B and C were Tk. 1988, 7089 and 4962, respectively. Total return from group B was significantly higher than group C but total feed cost of group B was lower than that of group C. Therefore, net return from B (Tk. 5950) was significantly higher. So, the diet B (urea–molasses) was more economic than the diet C (urea–molasses+concentrate). Net return from the diet B also was significantly (P<0.05) higher than that for the control diet A. For diet C total feed cost was higher and consequently return was significantly (P<0.05) lower than for diet B. However, net return on diet C was not significantly higher than that of diet A. Profit for taka per taka investment in group B was significantly higher than that of groups A and C. Therefore, supplemental diet B was more economic than the diet C.

On-station trial

pH and NH_3-N concentration (mg/litre rumen liquor) for different diets: The level of pH in rumen liquor for dietary groups A, B, C and D were 6.72, 6.74, 6.76 and 6.88, respectively (Table 5). There is no significant effect (P<0.05) of different dietary treatments on pH level. The recorded levels of pH for all diets were in the normal range. However, the pH levels for the diets C and D were slightly higher than that of diets A and B. Sinha and Gupta (1991) reported that pH of rumen liquor increased after two hours of NH_3 treated paddy straw feeding. The results of this experiment are in keeping with those of previous works.

The NH_3-N concentration (mg/litre rumen liquor) for the different dietary groups A (green grass), B (green grass+molasses), C (green grass + molasses + urea) and D (green grass + molasses+urea + concentrate) were 52, 40, 137 and 146, respectively (Table 5). The diet C and D had significantly ($P<0.05$) higher rumen NH_3-N concentration than that of received diets A and B. The result indicated that addition of urea with diet maximized the NH_3-level. Sidhu *et al*. (1966) reported that urea feeding significantly increased rumen NH_3-N content. Similar observation had also been reported by Sinha and Gupta (1991). In addition, effect of rumen fermentation relating to supplementation of green grass with urea and molasses with or without concentrate was determined in a laboratory trial. Rumen NH_3-N concentration and supply of readily fermentable carbohydrate was considered to be the most limiting factors for improving the productivity of animal fed on the low quality roughage diet. Supplementation of green grasses with 15% molasses and 3% urea had improved the rumen NH_3-N concentration to 137 from 52 mg/l (2.54 folds). For optimum rumen fermentation and thereby maximizing the microbial yield, rumen NH_3-N concentration should be between 100-250 mg/l (Leng, 1990; Ørskov, 1992). Additional concentrate had increased the rumen NH_3-N concentration only marginally to 146 mg/l. This is probably the reason why, no significant effect of concentrate supplementation was observed on milk yield of buffalo cows on-farm trial. Practical implication of this is that, unless the supplied concentrate provide the rumen undegradable but potentially digestible protein, there will be little or no beneficiary effect of concentrate supplementation. In this situation, urea-molasses supplementation can alone optimize the rumen environment to maximize nutrient availability to the host animal.

Acknowledgments

Thankful gratitude to the farmers and the staff of the Department of Animal Nutrition, Bangladesh Agricultural University, Mymensingh, Bangladesh, for their kind help.

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