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Assessment of best feeding pattern for dairy buffalo in Bangladesh

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Abstract

The present study was undertaken to compare three feeding patterns on dairy buffalo for investigating the effect of a balanced diet on milk production along with cost-benefit analysis. A total of 21 milking buffaloes were selected and feded according to three feeding patterns, one was existing feeding pattern (T_0), another was a balanced feeding pattern (T_1) where concentrate mixture was provided according to the nutrient requirement of milking buffalo and the third one was UMS based feeding pattern (T_3) where the combination of concentrate mixture and urea molasses straw (UMS) were used according to the nutrient requirement of buffalo. Each group has a similar number of animals of the same parity and lactation stage. After completion of the experiment, it was found that there were significant variations ($P<0.01$) of nutrient intake among treatment groups. Higher DM intake was observed in the T1 group whereas higher CP and ADF intake were observed in the T_2 groups. However, the highest NDF intake was observed in the control group which indicates dietary improvement. Dietary Improvement influence milk yield significantly ($P<0.01$) however milk composition was not changed. After simple economic analysis, it was observed that among three feeding patterns value of the Benefit-cost ratio (BCR) was higher than 1 and the highest value was observed in the T_2 feeding pattern. In the existing system, buffalo farmers were making a profit and they can make the highest profit if they practiced UMS based feeding pattern. Hence, the UMS based feeding system may more profitable feeding pattern for river buffalo in Bangladesh.

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Introduction

Buffaloes are a promising source of animal protein in Asia. It has two subspecies known as the Riverine and Swamp types. Riverine buffaloes, mostly familiar with milk production, found in India, Pakistan, and Bangladesh along with some countries of western Asia(Sarwar *et al.,* 2009). Buffalo milk is more nutritious than cow milk as it contains a higher amount of total solids, crude prude protein, fat, calcium and phosphorus compared to cow milk (Tong *et al.,* 2013). Consequently, South Asian countries produce about 93.19 % of world buffalo milk whereas India and Pakistan contribute about 67.99% and 23.96 % of world buffalo milk respectively (Hamid *et al.,* 2016). Though Bangladesh has a homologous climatic condition contribution for buffalo, total milk production in Bangladesh is negligible.

Buffaloes in Bangladesh can perform very well under adverse climatic conditions especially in coastal reason. This is because, it can survive under poor husbandry as well as have a better capacity than cattle of utilizing highly lignified feed, that contain low contents of fermentable protein and carbohydrates (Sarwar *et al.,* 2009) (Manjari *et al.,* 2016).

In Bangladesh, buffaloes are raised under three production systems such as household subsystem which is homologs to intensive system, semi-intensive and extensive system (Hamid *et al.,* 2016). Among the three production systems, most of the buffaloes were reared in an extensive system followed by grazing with a little amount of concentrate (Uddin *et al.,* 2002). Furthermore, the milk production of indigenous buffalo is very poor, about 2 litter per animal per day, which contributing only 2.0% of the total milk production of Bangladesh (Hamid *et al.,* 2016). Hence, there is a chance to increase milk production of buffalo through modification of dietary pattern as well as urea treated straw as it has a significant effect on milk production in cattle (Gunun *et al.,* 2013). Considering these facts present study was designed to investigate the effect of a balanced diet on milk production along with cost-benefit analysis.

Materials and methods

Site of the experiment

The experiment was conducted at Sirajgong district for three months from 7th February 2017 to 17th May 2017. Before commencing the study, a field survey was coordinated by a pretested questioner to know the existing practice of feeding system and production efficiency of buffaloes in that selected District.

Selection of the experimental animal

Based on the survey result a total of 21 milking buffalo were selected from fourteen farmers. The average body weight, milk production and milk fat % of selected animals were around 450 kg, 2.4 kg per day, and 7 % respectively. All selected animals were Second parity and mid-lactation stage.

Preparation of the experimental animal

All the selected animals were ear-tagged and dewormed by using Niloxin injection @5ml/100 kg body weight. There was a seven days adaptation period before starting the experiment.

The ration of the experiment

Three feeding systems were used for native buffalo and tested their effects on milk production, milk composition and benefit-cost ratio. One feeding system was representing the existing practice that was considered as the control (T_0), and the remaining two were iso-protein (T_1) and balanced with incorporating urea-molasses straw (UMS) (T_2) (Table 1). So, there were three treatments and in each treatment, there were seven replications. The nutrient requirement was calculated according to (Paul and Lal, 2010) and for 450 kg body weight 2.4 kg per day milk production containing 7 % milkfat, DM requirement was 7.68 % energy requirement was 68.32 MJME/kg/DM and CP requirement was 649 gm/kg/DM feed.

Preparation of Urea-Molasses-Straw (UMS) and concentrate mixture

Required amounts of urea (3%), molasses (15%) and straw (82%) were weighed out separately. A polythene sheet was spread on the ground and a small amount of chopped straw was spread on the sheet. Urea was dissolved with water (half of the weight of straw) and molasses were added and mixed thoroughly. Urea molasses solution was sprayed over the straw and mixed properly by hand, left for half an hour and then fed to the animals. The concentrate mix was prepared by the required amount of wheat bran, broken rice, mustard oil cake and DCP at the desired level. At first, the micro feed ingredient (DCP) with a small amount of other concentrate was fed to the animal. Then the total amount of concentrate was given to the animal in the feed container. The total concentrate was divided into two parts. The first half was given in the morning and the remaining part in the afternoon. Fresh clean water was made available to the animals all the time.

Sample and data collection

Feed and milk samples were collected every 15 days interval. Milk production and feed leftover were recorded regularly. Milk composition was analysed using milkotester, Master Eco, Ultrasonic milk analyzer, Europe.

Economic analysis

Buffalo farmers in Bangladesh rear their buffalo in the semi-intensive system or extensive system. For milking buffalo rearing cost items involved in the production chain are human labour, feed cost, medicine, vaccination, insemination, various equipment and housing, etc. Among these costing in this experiment fixed costs such as housing, repairing and equipment were similar (300 BDT/ animal/ lactation) among the treatment group. (Islam *et al.,* 2007) reported that labour and feed cost represent 98% of the total rearing cost for milking buffalo in Bangladesh. In Sirajgong most of the buffalo farmers rear their animals by themselves and they do not hire any labour. Hence in the thesis study, a simple economic analysis was conducted considering feed cost and milk production of buffalo to determine benefit-cost return using the following formula. Benefite cost ratio/ day/ animal (Undiscounted) = Tr /Tc.

Where, Tr= Avarage income from Milk (BDT/day/ animal) and TC = Avarage feed cost (BDT /day/ animal)

Data analysis

All the data are analyzed by Analysis of variance (ANOVA) using a complete randomized design (CRD) in SPSS 20 software. Duncan's Multiple Range Test (DMRT) of the same software, was used to compare means that were found to be statistically different (Duncan, 2013). The significant difference was tested at 5% probability level.

Results and discussion

Nutrient intake

After data analysis, it was observed DM intake, Crude protein, ADF and NDF intake was significantly increased ($P<0.01$) in T_1 and T_2 group and the highest value of CP (0.75 kg/ animal/day) and ADF intake (2.93kg/ animal/day) was observed in T_2 group (Table 2). Moreover, the highest value of DM intake was observed in the T_1 group.

Table 1. Dietary composition of the three feeding system.

	Feeding System		
Ingredients	T_0	T_1	T_2
Straw (kg)	9	5	-
UMS (kg)	-	-	8
Wheat Bran(kg)	1	1	1
Broken Rice (kg)	0.5	1	1
MOC (kg)	0.1	1.5	0.1
DCP (kg)	-	0.050	0.050
DM	9.51	7.75	7.21
Metabolic energy (MJ/kg/DM)	64.09	69.66	69.12
Crud protein (gm/kg/DM))	484	730	763
Grazing time (h)	4	4	4

* S, straw; MC, Modified concentrate; G, greasing; UMS, Urea molasses straw; MOC, Mustard oil cake; DCP, Di-calcium phosphate.

This is because in T_1 group comparatively lower amount of NDF was provided through using a lower amount of straw than the control and T_2 group. NDF concentration of feed harms DM intake which may influence DM intake on T_0 and T_2 group (Bulbul, 2010; Gunun *et al.,* 2013). Moreover, Biswas *et al.,* (2010) reported that Urea molasses treated straw increase DM intake due to increase palatability as well as reduction of the mastication load.

Consequently, the value of DMI in the T_2 group was higher than T_0 group. Furthermore, in T_1 and T_2 feeding system amount of ME and CP was higher than the control feeding system as inT_0 group CP and ME were under the nutritional requirement. Which may result in an increased value of CP intake in T_1 and T_2 groups. Moreover, in the T_2 feeding system, rumen un-degradable protein was provided which not only increase the value of CP intake but also subsequently maintenance ammonia (NH_3) in the rumen which may be leading to an improved ruminant environment for microorganisms, affecting lignin, hemicelluloses, and cellulose along with increased surface for rumen microbial attack resulting increasing ADF and NDF digestibility which may influence dietary intake (Prasad *et al.*, 1998).

Table 2. Nutrient intake of different treatment group**.**

Parameter	Treatment group			SEM	P-Value
	T_0	T_1	T_2		
DMI (Kg)	7.65a	7.82b	7.75a	0.14	<0.001
CPI (Kg)	0.54[c]	0.61[b]	0.75[a]	0.01	<0.001
ADFI (Kg)	2.88[a]	2.49[b]	2.93[a]	0.06	<0.001
NDFI(Kg)	5.09[a]	4.75[b]	5.08[a]	0.10	<0.001

a–c Within a row, means without common superscripts differ ($P<0.05$).

Milk production and composition

From Table 3 it was observed that milk production of lactating river-type buffaloes increased significantly (<0.01). This is because in the existing system animals were under a nutritional diet. However, in T_1 and T_2 group balance nutrition was provided which may increase milk volume. On the other hand, though milk volume increases significantly, milk composition was not changed significantly (<0.05) (Table 3). Among the treatment group daily average milk production increased in theT_1 group compared to the control group, however, the highest daily average milk yield was found in the T_2 group with higher Fat, SNF and protein value.

Table 3. Daily and total milk yield of the buffalo cow.

	Treatment groups				
Parameter	T_0	T_1	T_2	SEM	P-Value
Daily average milk yield (Kg/d)	2.4[a]	2.9[b]	3.8[c]	0.20	<0.01
SNF (%)	10.22	10.26	10.56	0.29	NS
Fat (%)	7.07	7.25	7.65	0.63	NS
Protein (%)	3.72	3.73	3.84	0.11	NS
Lactose (%)	5.58	5.58	5.76	0.17	NS

a–c Within a row, means without common superscripts differ ($P<0.05$).

In T_1 group comparatively higher energy and protein were provided which may affect increasing milk production and milk yield. Moreover, in T2 group energy and protein were provided in the form of propionic acid and microbial protein in the rumen, which may result in the highest milk production among the treatment group. UMS based diet increase milk production in buffalo (Prasad *et al.*, 1998).

Moreover in dairy cow, it increases milk production around 1 litter /day/cow (Islam and Huque, 1995; Uddin *et al.,* 2002). In this experiment, milk composition was not changed significantly. Glucose is an important factor influencing milk synthesis (Rigout *et al.,* 2003) but in our study, we do not observe any effect of glucose on ration. Dutta *et al.,* (2004) also reported that milk composition is not affected by urea treatment of wheat straw.

Table 4. Daily feed cost among treatment group.

	T_0			T_1			T_2		
Ingredient	Amount /day/animal	Price /kg feed	Cost	Amount /day/animal	Price /kg feed	Cost	Amount /day/animal	Price /kg feed	Cost
Straw (kg)	9	6	54	5	6	30	-	-	-
UMS (kg)	-	-	-	-	-		8	8.40	67.2
Wheat Bran(kg)	1	20	20	1	20	20	1	20	20
Broken Rice (kg)	0.5	24	12	1	24	24	1	24	24
MOC (kg)	0.1	27	2.7	1.5	27	40.5	0.1	27	2.7
DCP (kg)	-	-	-	0.05	60	3	0.050	60	3
Total cost (BDT) /animal/day	88.70			117.5			116.9		

Economic analysis

The market price of feed ingredients such as straw, molasses, urea, wheat bran, broken rice, mustard oil cake and DCP during the experimental period were 6, 20, 16, 20, 24, 27, 60 BDT/kg respectively. Along with the price of fresh buffalo milk was 60 BDT/Litter as buffalo contain a high amount of milk fat. Hence, in the existing system farmer spend 88.70 BDT whereas in T_1 and T_2 feeding system spend 117.50 and 116.90 BDT respectively (Table 4). From Table 5, it was observed that among the three feeding systems BCR was highest in the T_2 feeding system and the lowest value was observed in the existing feeding system.

Which indicate that in existing system buffalo farmer were making a profit.

Table 5. Economic analysis of different treatments.

	Treatment groups		
Ingredients	T_0	T_1	T_2
Avarage feed cost (BDT /day/ animal)	88.70	117.50	116.90
Avarage income from Milk (BDT/day/ animal)	144	174	228
Net profit (BDT/day)(Income-Feed cost)	25.30	56.5	112
Benefit cost ratio / animal/day	1.29	1.48	1.95

Moreover, they can be made the highest amount of profit if they provide urea treated straw to their animals. Uddin *et al.,* (2002) also experimented on Hashkhali, Bangladesh and observed that UMS is cheaper as well as an economic supplement diet than the existing feeding system for dairy buffalo during the green rough's scarcity period.

However, In this study, BCR was calculated by considering only feed cost and income from milk. However, labour cost and other variable costs have to consider more appropriate calculations.

Further research will have to conduct to determine BCR including all parameters.

Conclusion

Based on this study we can conclude that UMS may play a vital role in improving milk production as well as making more profit than exiting and balanced feeding patterns. Though in the existing feeding system buffalo rearing is profitable in Bangladesh.

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Conflict of interests

There is no conflict of interest.

References

Biswas MAA, Hoque MN, Kibria MG, Rashid MH, Akther MM. 2010. Field trial and demonstration of urea molasses straw technology of feeding lactating animals. Bangladesh research publication journal. **3(4),** 1129-1132.

Bulbul T. 2010. Energy and Nutrient requirements of Buffaloes, Review. Kocatepe veterinary journal **3(2),** 55-64.

Duncan DB. 2013. Multiple range and multiple F-tests.Biometrics. 1955; **11,** 1-42. Geo-Positioning System (GPS), Garmin extres 12 channel Garmin. https://doi.org/10.2307/3001478

Dutta N, Sharma K, Naulia U. 2004. Nutritional evaluation of lentil (Lens culinaris) straw and urea treated wheat straw in goats and lactating buffaloes. Asian-Australasian Journal of Animal Sciences **17,** 1529-1534. https://doi.org/10.5713/ajas.2004.1529

Gunun P, Wanapat M, Anantasook N. 2013. Rumen Fermentation and Performance of Lactating Dairy Cows Affected by Physical Forms and Urea Treatment of Rice Straw. Asian Australasian Journal of Animal Science **26(9),** 1295-1303. https://doi.org/10.5713/ajas.2013.13094

Hamid MA, Ahmed S, Rahman MA, Hossain KM. 2016. Status of Buffalo Production in Bangladesh Compared to SAARC Countries. Asian journal of animal science **10(6)** 313-329. https://doi.org/10.3923/ajas.2016.313.329

Islam M, Huque KS. 1995. On Farm evaluation of urea molassesed straw (UMS) feeding to lactating cow. Asian Journal of Animal Science **8(5),** 523-527. https://doi.org/10.5713/ajas.1995.523

Islam S, Nahar TN, Begum J, Deb GK, Khatun M, Mustafa A. 2007. Economic Evaluation of Buffalo Production in Selected Regions of Bangladesh. Journal of Stock & Forex Trading **6(1),** 1-8. https://doi.org/10.4172/2168-9458.1000177

Manjari P, Hyder I, Uniyal S, Houzha R, Rastogi SK. 2016. Adaptation of trrai buffaloes to seasonal variation as indicated by haematological profile. Buffalo Bulletin **35(2),** 165-171.

Paul SS, Lal. 2010. Nutrient Requirements of Buffaloes.Satish serial publishing house. India. p. 97-99.

Prasad RDD, Reddy MR, Reddy GVN. 1998. Effect of feeding baled and stacked urea treated rice straw on the performance of crossbred cows. Animal Feed Science and Technology **73(3-4),** 347-352. https://doi.org/10.1016/S0377-8401(98)00140-0

Rigout S, Hurtaud C, Lemosquet S, Bach A, Rulquin H. 2003. Lactational effect of propionic acid and duodenal glucose in cows. Journal of Dairy Science. **86,** 243-253. https://doi.org/10.3168/jds.S0022-0302(03)73603-0

Sarwar M, Khan MA, Nisa M, Bhatti SA, Shahzad MA.2009. Nutritional Management for Buffalo Production. Asian-Australation Journal of Animal Science **22(7),** 1060 – 1068. https://doi.org/10.5713/ajas.2009.r.0.9

Tong XY, Fang W, Hong Li, Qing SL, Quan YL. 2013. The Nutrition of Buffalo Milk: A Comparison with Cow Milk. Advances in Chemcal Engineering III, Advanced Materials Research. **781-784,** 1460-1463. https://doi.org/10.4028/www.scientific.net/AMR.781-784.1460.

Uddin MJ, Shahjalal M, Kabir F, Khan MH, Chowdhury SA. 2002. Beneficiary effect of feeding urea molasses treated straw on buffalo cow in Bangladesh. Online Journal of Biological Science. **2(6),** 384-385. https://doi.org/10.5713/ajas.2009.r.0.910.3923/jbs.2002.384.385