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Effects of solidified urea molasses multi-nutrient block on productive performances of indigenous cows and calves under village condition of Bangladesh

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ABSTRACT

The present piece of research work was conducted to find out the effect of solidified urea molasses multi-nutrient block (UMMB) on productive performances of indigenous cows and calves. The UMMB may be used as a catalytic feeding to straw based diet of indigenous cows for improving milk production and fertility. About 250 g/h/d solidified UMMB were supplied to 36 indigenous cows. On the contrary, 27 cows were in control group and 27 cows in cake UMMB groups in same village. Data was analyzed of variance in single Randomized Block Design (RBD). The DMRT was used to find out the difference among the mean values. The productive performances of cows *viz.* live weight changes of cows, calves and condition score of cows were measured monthly. The results of productive performance in control, cake UMMB and solidified UMMB groups showed that live weight changes of cows -34, -3.29 and -51.5 g/d; calves weight gain 55, 90 and 84 g/d ($p>0.05$), respectively, milk yield (kg/d/cows) 1.34, 1.83 and 1.65 ($p>0.05$), condition score of cows (1-5 points ranks) 2.30, 2.50 and 2.51 ($P>0.05$), respectively. So, solidified UMMB may be used for more milk yield, better calf weight gain and better condition score for indigenous cows of village level farming condition of Bangladesh.

INTRODUCTION

Livestock plays a vital role in Agriculture as well as in national economy of Bangladesh. Dairying is a biological efficient system that converts large quantities of inedible roughage to milk, the most nutritious food known to man (Hossain et al., 2016). Milk is renowned as an "almost complete" as well as natural nutritious food for all mammals including human being (Debnath et al. 2014). It is a more efficient and intensive system in term of nutrient and protein production for human consumption (Hossain et al., 2017). Dairy cattle are exposed to stressful climatic condition in tropical regions, which influence their productivity and welfare. The indigenous zebu (*Bos indicus*) cattle are adapted and tolerance to the hot environments because of low metabolic rate and great sweating capacity (Hansen, 2004; Hossain et al., 2017), but generally they exhibit low productive performance. The contribution of animal farming has remained largely stagnant with a share of around 13 per cent of agricultural GDP over the last two decades. Livestock Department's available statistics show that the domestic production of milk, and meat are 9.92 and 75.14 million metric tons in the financial year 2019 against the demand of 15.20 and 72.97 million metric tons, respectively (DLS, 2019). It has been reported that in the Year 2007-08, it is evident that there is a deficit of (80%) in milk, 82% in meat and 63% in eggs in Bangladesh (FAO, 2008).

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Cattle of Bangladesh can be classified into two categories like indigenous and cross bred. Average live weight of indigenous cow is about 123 kg and cross bred is about 137 kg (Islam et al., 2010). Hossain et al. (2016) found average body weight of indigenous cows was 173kg. Average birth weight of calves was 14.43 kg and one month age of calf weight was 18.29 kg, respectively. The dairy cattle are mainly fed cereal straws that are highly lignified and contain low content of both fermentable protein and carbohydrates. Poor performance of dairy cattle mainly due to irregular and inadequate availability of quality feed stuff and imbalance feeding (Hossain et al. 2018). To increase the productivity of cows, supplementation of nutrients can improve the utilization of poor quality roughages and fulfill the deficiency of nutrients. The feed utilization can be increased by supplementation of critical nutrient in ration. The supplementation of urea molasses multi-nutrient block (UMMB) to cows fed straw based diet has increased the growth and supported moderate milk production (Sahoo et al., 2004). Feeding of UMMB has shown promising results in improving the nutrients utilization and also the productivity of animals in laboratory trials and a number of on station trials have been conducted in India on the animal response and economic benefits of using UMMB (Patel et al., 2002). Misra and Reddy, (2004) revealed that 30 to 40% concentrate allowances could be reduced by feeding UMMB without any loss of milk production. The livestock sector has received little priority in overall government development plans. Less attention has been placed by the policy makers to livestock sector compared to the crop sector, primarily because of the poor state of knowledge about methods and problems of production and utilization of livestock in the country (Hossain et al, 2016). Our local cows are the main resources of Bangladesh. Their milk quality is very good and nutritious. Their hides and skin quality is better than that of exotic breeds. Local cows are easy to handle, easy to management; feed cost is low, more resistant to disease and more economic than exotic cattle. The UMMB may be used as supplementation for straw based diet in dairy cattle production under village condition. Urea from UMMB furnishes readily available nitrogen to the rumen microbes, in the form of protein for their proper growth and molasses form UMMB supplies available energy and sulphur to rumen microflora. The supply of ruminal fermentable nitrogen, energy and sulphur from UMMB are needed to optimize the rate of degradation of fibrous substance of rice straw. Recent nutritional research has demonstrated the possibility of substantial increase in the productivity of milk producing animal fed of poor quality roughage's through small alteration to the feed base. Molasses is one of the few potential cattle feeds that remain under utilized. It is a by-product which can be obtained easily and cheaply from sugar mills and can provide energy, sulphur and vitamin very quickly. However, recent research has produced a urea molasses block as a supplement for ruminants with straw based diets. Feeding of urea molasses mineral block (UMMB) has shown promising results of improving the nutrients utilization and also the productivity of animals in laboratory trials (Tanwar et al. 2013). Actually, many researchers have been done on various performances of dairy cows and calves, but a few researchers have been reported on the performances of indigenous cows by using solidified UMMB. In the previous work cake UMMB were used on the performance of cows and calves and positive responses were observed due to the presence of more nitrogen in the rumen for certain period. Brick UMMB may have some better effects on dairy cattle production. Because cows lick brick UMMB but will not eat it. Ultimately this will ensure prolonged supply of nitrogen to the animals for better degradation of roughages, mainly straw. Our farmers have very little knowledge about the scientific methods of rearing cattle. In order to improve the livestock production at first we have to know the details of our dairy cattle. We have very limited information on the production performance of different types of indigenous cows of Bangladesh. Hence, the research work had been undertaken to justify the effect of supplementing solidified UMMB with straw based diet on productive performances, live weight changes of indigenous cow and calves.

MATERIALS AND METHODS

Layout of the experiment

Dairy cattle production constraints were studied of control group cows for one year with 27 cows.

Three production constraints were identified where intervention are to be needed, those are: (i) Nutritional constraints in general mainly protein. (ii) Lack of knowledge of estrous detection by the farmers during the early part of lactation (iii) Parasitic infestation, especially liver fluke (*Fasciola gigantica).*

Experimental site and no. of animals

A typical village named Boira, which is about 2 km away from Bangladesh Agricultural University (BAU) campus, was selected for this study for improving milk production and fertility of indigenous cows by solidified UMMB. Ninety (90) individual resource poor village farmers were selected. Most of the selected animals were being used for both dairy and draught purpose farmers. The calves were tied up at night and allowed to free access or suckling to the dams during whole day. The cows were milked once a day preferably in the morning. The individual weight of the cows was recorded before starting the experiment. The body weights of the animals were ranges from 106 to 252 kg.

Management of the animals

All the cows were mainly stall fed and sometimes tethered during the whole experimental period. Attempts were made to keep all the animals under same management condition. Rice straw was the staple feed for the cows. Green grasses were available depending on the season. Wheat bran, oil cake, rich bran etc. were supplied to the cows. Veterinary treatments were given to the experimental cows at the time of any eventualities.

Collection of ingredients for UMMB

For making UMMB molasses, wheat bran, rich polish, urea, iodine salt and lime were used. These ingredients were purchased from local market of Mymensingh town.

Preparation of solidified UMMB

Solidified UMMB were prepared by cold method according to Sansoucy (1995). The molasses was placed in a dish and then mixed with salt and urea at previous night. Next day, wheat bran, rice polish and lime powder and salt mixed vigorously by an electrically operated concentrate mixture machine to give a thick pest with a sticky consistency. The mixture was then transferred to a dice of ball press then compressed with weight of suitable size to make it more compact. Blocks were removed from the dice and were placed on the floor for about 15 hours for more compactness and it was a cold method for the preparation of UMMB.

Composition of UMMB

The compositions of UMMB were molasses-39, rice polish-21, wheat bran-21, lime- 6, urea-8 and salt-5%, respectively. Urea in the block is a non protein nitrogenous substance which provides fermentable nitrogen. Wheat bran and rice polish have multiple purpose in the block. They provide some important nutrients including fat, protein and phosphorus. Moreover, they act as absorbent of moisture contained in molasses and give structure to the block. Lime was used as a solidifying agent as well as it is a main element for the formation of strong bone structure of the animals. Common salt is generally added because this is often deficient in the diet.

Size, weight and storage of UMMB

The size and weight of each block was 9" X 5.5" X 3" and 2.5 kg, respectively. To protect from fungus, soil dust particles and the blocks were covered with polyethylene after 15 hours of preparation and was stored in the store room at atmospheric temperature for future use. By spraying of propionic acid solution on UMMB may be preserved for long time. This propionic acid inhibits the growth of fungus.

Methods of feeding

Urea Molasses Block was fed all the experimental dairy cows thrice a day. It was supplied to the animal separately directly within the wooden box. The cows licked it. Approximately consumption of UMMB was 250 g/h/d. All the cows in solidified UMMB group had free access to normal feed and *ad labitum* pure drinking water.

Chemical composition of village level feed

Rice straw was the staple feed for the experimental cows. Green grasses and other tree leaves were

available depending upon the season of the year. Sometimes, wheat bran, rice polish, different types of oil cakes and other vegetable by-products etc. were supplied to the cows by comparatively rich farmers. DM and Ash analysis of feed were done at the Animal Science Laboratory of BAU. The RDP, UDP, Dg and CP were calculated according to SAC (1984).

Record keeping

Record keeping is one of the important works for successful research. The following animal factors were recorded routinely under following headline in record keeping schedule.

Identification the experimental animals

It is the first step in a record keeping system and that was done by animal owner's name or cow code number. Age, parity, condition score (Number of 62 deshi cows) were calculated from beginning to ending of the experiment

Amount of UMMB supplied to the cows

Amount of UMMB supplied to the experimental animals per day per head was also recorded. The amount of UMMB supplied to each cow was approximately 250 g/d per cow.

Live weight of cows, calves and daily milk yield

The weights of all experimental animals were taken at the beginning. Therefore, the weights were taken once a month till the end of the experiment, with the help of weigh band by applying 5 kg tension. The weights were taken in the morning before feeding. The initial body weight was subtracted from final body weight to calculate the weight gain or loss by the cows. Initial weight of each calf was taken just after calving or parturition. During the whole experimental period each calf was weighed once per month preferably in the morning to observe the body weight changes. Milk yield of individual cow was recorded daily.

Chemical analyses of UMMB

The UMMB were periodically analyzed in animal nutrition laboratory of Bangladesh Agricultural University, Mymensingh for the assessment of the chemical composition. Crude protein (CP) was determined according to AOAC (1995). The percentage of nitrogen content was then multiplied by 6.25 to estimate percentage of CP in the sample. The chemical composition of UMMB was DM 81.57, CP 18.75, CF 3, EE 2.2 and Ash 16.62%. Besides this, CP was estimated once a month from the start to end the experiment.

Statistical analyses

Statistical analyses of collected and calculated data were carried out to analyse of variance in single Factor Randomized Block Design (RBD) and test was carried out to find out the significant difference between means. The DMRT was used to find out the difference among the mean values.

RESULTS AND DISCUSION

Body weight changes of cows

The average daily body weight gain or losses are given in Table 1. The average body weight gain of control, cake and solidified UMMB groups were -34, - 3.29 and -51.5, respectively. The weight gain of cows of control, cake and solidified groups were -2.163, -0.737 and 102.38 % and this result was not supported by Alam et al. (2009). The weight gain of cows of control, cake and solidified UMMB groups was not significant but it bears importance, because from figure 1 it was observed that body weight loss of control (-34 g/d) and solidified UMMB group (-51.5 g/d) was much higher than that of cake UMMB (-3.29) group (Table 1). On the contrary, from figure 1, it showed that live weight changes (lactation month wise) of cake UMMB group was much greater than that of control group, but in case of solidified UMMB group it was very much fluctuative in compare to cake UMMB group. It was assumed that brick or solidified UMMB could play a vital role for the better solvent of feeding constraints. Body weight gain of cows was not satisfactory because the cow owners used their cows for various draught purposes and otherwise the effect of solidified UMMB would have been higher.

Table 1: The performances of cows in control, cake UMMB and solidified UMMB groups

Parameter	Control Mean ± SD (No.)	Cake UMMB Mean ± SD (No.)	Solidified UMMB Mean ± SD (No.)	Level of Significance
Average Live wt. changes of cows (g/d)	-34 ± 129 (27)	-3.29 ± 116.35 (27)	-51.5 ± 110.63 (36)	NS
Milk Yield (Kg/day)	1.34 ± 0.64 (27)	1.83 ± 0.94 (27)	1.65 ± 0.50 (35)	NS
Condition Score of cows	2.30 [a] ± 0.64 (27)	2.50 [b] ± 0.27 (27)	2.51 [b] ± 0.19 (36)	*
Calf weight gain (g/d)	55 ± 36 (27)	90 ± 49 (27)	84 ± 39 (36)	NS

Mean value in a row with different superscripts differ significantly
NS = Non Significant,* = Significant (p<0.05), ** = Significant (p<0.01)

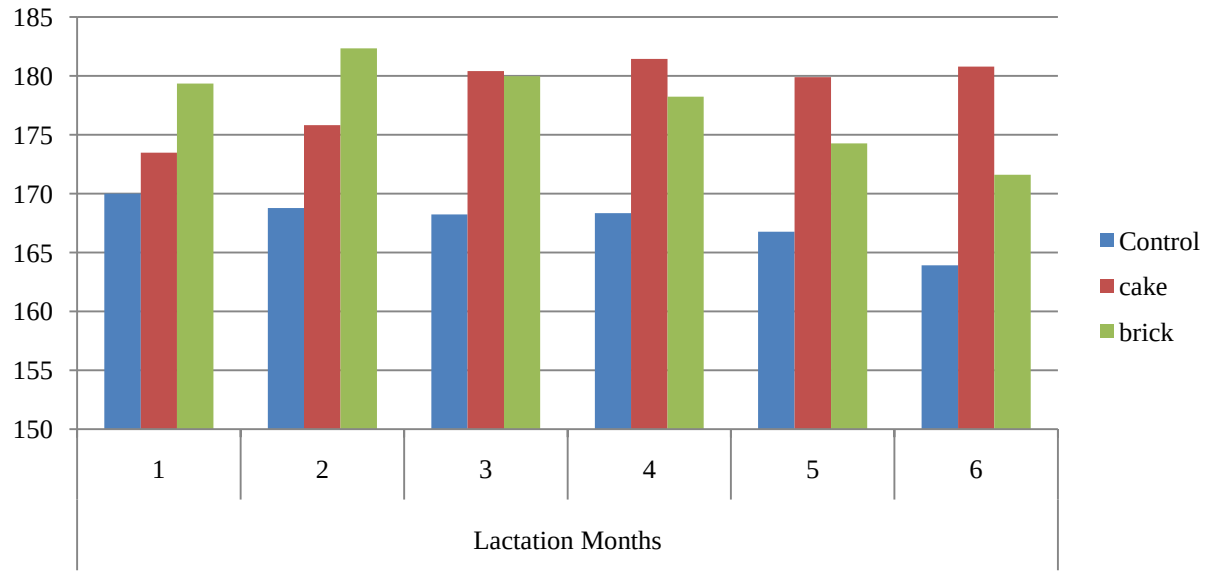

Figure 1: Average body weight changes of control, cake and brick UMMB groups of indigenous cows at different lactation months.

Milk yield

During the experimental period the average milk yield per day for control, cake and solidified UMMB groups were 1.34, 1.83 and 1.65_kg, respectively (Table 1 and figure 2). The present study did not agree with the findings of Hossain et al. (2016) and Alam et al. 2009). There were no significant differences in milk production among the three groups. Obviously, milk yield of UMMB group was better than that of control group. Uddin et al. (2008) reported that the milk yield and lactation period of indigenous, Friesian cross, Sahiwal cross and Sindhi cross were 2.35, 7.36, 4.78 and 4.03 litre/day and 218.22, 284.69, 251.77 and 259.77 days respectively. It reveals that the Friesian cross is the best performer in relation to milk production and lactation length. The milk yield of indigenous cattle of their result was more than the present study. The performance of solidified UMMB group was as same as cake UMMB group. The results of solidified UMMB would have been better but practically it was not possible due to cows were used for other working purposes. The UMMB supplementation improved (p<0.01) milk yield in buffaloes (35.97%) and cows (33.8%) (Singh and Singh, 2003). No significant changes in body weight were recorded.

The results revealed that the UMMB has a positive effect on milk production of cows due to supply of nitrogen to the cows from UMMB that resulted more intake and utilization of straw. It was observed that during the three months of lactation milk yield per day of solidified UMMB group increased than that of control and cake UMMB groups. We could not measure actual milk yield of our indigenous cows because we measured only morning milk yield, but the cows sucked by calves in a day time which was out of measurement. This is caused by the existing management system in our country. Dairy cows often used in heavy draught purpose of which had an adverse effect on milk production. There were several factors which influenced milk production of cows such as quality and quantity of feed, ambient temperature, humidity, season, area and care of the herd (Hossain et al, 2016).

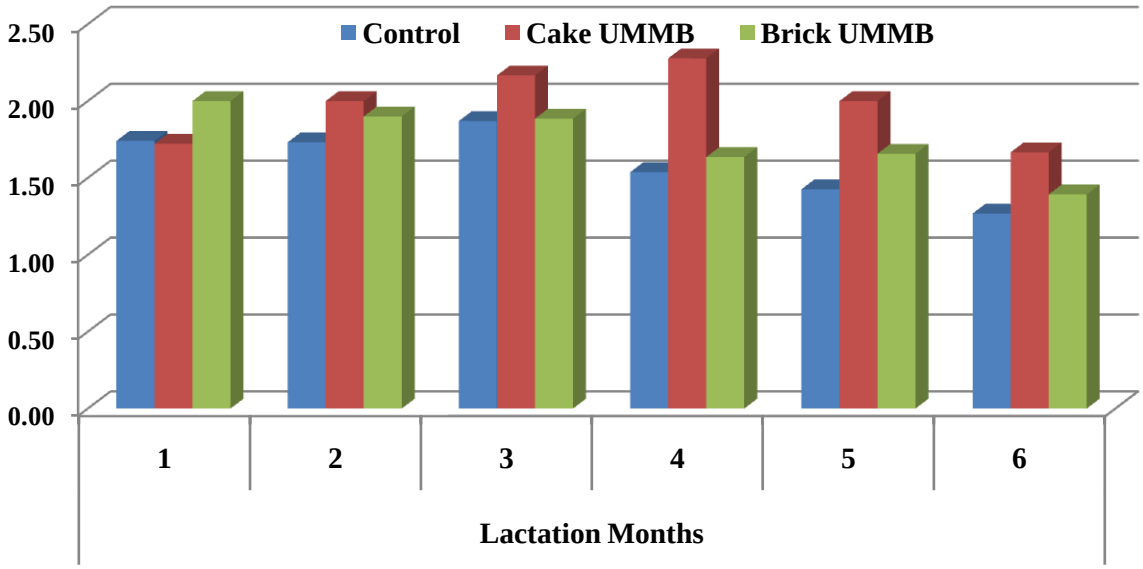

Figure 2: Average milk yield of control, cake and brick UMMB groups of indigenous cows at different lactation months.

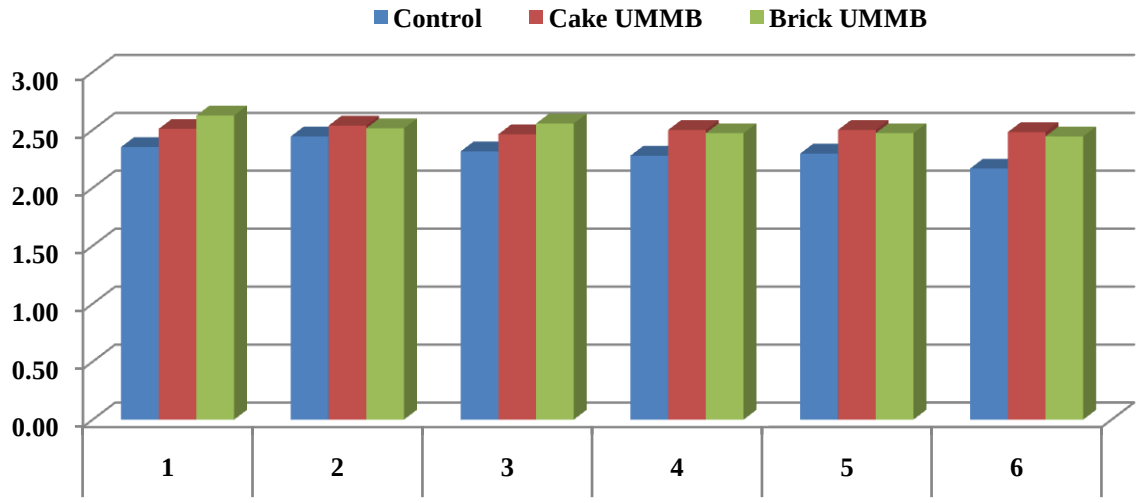

Figure 3: Average Condition score of control, cake and brick UMMB groups of indigenous cows at different lactation months.

Condition score of cows

Average condition score of control, cake and brick solidified UMMB groups of cows were 2.30, 2.50 and 2.51 respectively (Table 3). Hossain et al. (2016) found that the condition score of indigenous cattle was 2.55. This finding was higher than that of the present study. There were significant difference ($p>0.05$) between control and treated groups. Upreti et al. (2011) showed that body condition score was improved from 3.5 to 4 due to the effect of UMMB supplementation. Therse results were not in accordance with the present study. Figure 3 revealed that the condition score of cake and solidified UMMB of cows were more or less similar but in case of control group it decreased with the increases of lactation month.

Calf weight gain

Daily body weight gains per calf were 55±36, 90±49 and 48.39 g/d of control, cake and brick solidified UMMB group, respectively (Table 1). It was calculated from difference between final and initial weight. The percentage of calves weight gain of control, cake and brick solidified UMMB groups were 47.7, 76.29 and 70.23%, respectively. Figure 4 showed that the weight gain (g/d) of calves of control and treated groups in different lactation months were fluctuated and it increased with the increase of lactation months. It was observed in figure 4 that treated UMMB groups of animal performed better in calves weight gain than that of control group, which may be due to suckling of better quality milk in respect of more milk fat and protein in the UMMB groups by the calves during day time. Kaswarjono et al. (2018) found that UMMB supplementation had no significantly influenced of average weight gain ($p>0.05$). These findings were agreed with the present study. The average weight gain in the control group, UMMB A and UMMB B during the four weeks of the study period was 8.22±2.6 kg, 9.50±1.3 kg and 9.40±0.8 kg, respectively (Yanuartono et al., 2018). These findings were in agreement with those of (Abutani et al., 2010), who observed that UMMB can increase body weight between 0.2 and 0.45 kg/day. Zhang reported that the average daily gain was 0.4867±0.0732 kg in the experiment group and 0.3468 kg in the control group during the period feeding of UMMB (Salem et al., 2007).

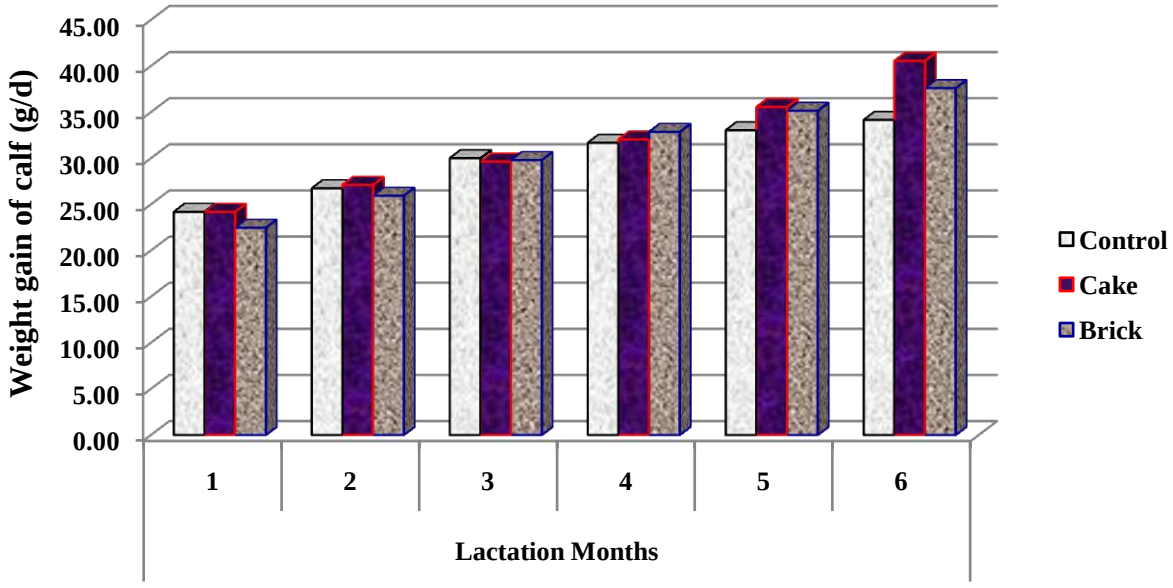

Figure 4: Average calves weight change (kg) of control, cake and brick UMMB groups at different lactation months.

CONCLUSIONS

The study revealed that solidified UMMB had a positive effect mainly in the productive performance of cows. So, from the accounting point of view UMMB supplementation in straw based diet in Bangladesh has a positive economic feasibility. Finally, it is concluded that solidified UMMB may be used for improving milk production, condition score and live weight gain of calves in straw based diet of indigenous cows under the village condition of Bangladesh.

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