Dry season supplementation of urea-molasses block and urea treated straw for milking cows under village conditions of North Shoa

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Abstract

On-farm verification of urea molasses block (UMB) and urea treated straw (UTS) supplementation for crossbred dairy cows were conducted at dairy co-operatives of Kabigizaw, around Debre Birhan, North Shoa. The experiment was conducted in the dry season where the available pasture was not enough to support any production. Milk yield data were taken daily, while milk samples for the constituents were taken before and at the middle of the experimental period. The data were analyzed using SAS (2002) GLM procedure. In terms of milk yield, the control group was significantly lower than ($P < 0.05$) the supplemented groups and no significant difference ($P>0.05$) was obtained among the supplemented groups (UTS, UMB and the commercial concentrate). However, the partial budget analysis revealed that the supplementation was not economically feasible. No significant difference ($P>0.05$) was obtained among the supplemented and un-supplemented dairy cows in any of the considered milk constituents.

Key words: Dairy, milk, supplementation, UMB, UTS.

Introduction

In the central highlands of Ethiopia, natural pasture grazing and crop residues constitute the major portion of ruminant nutrition. However, these feeds are low in crude protein (Seyoum *et al*., 2007) even unable to satisfy the maintenance requirement of the animal. Reduction in milk production and weight losses of animals during the dry season is a common feature of the area, and brings a substantial economic loss to farmers. Studies indicated that when ammonia concentration in the rumen falls below 200 mg/liter, the rumen micro-organisms are inefficient and are likely respond to dietary NPN supplement particularly to urea molasses blocks (Pedrok and Leng, 1989). To attain this N level, a diet should contain 11-14% CP (2% N). Urea treatment improves the CP content of crop residues from 3 to 4% to a level of 7 to 9 % which fulfill the minimum requirement for adequate intake, digestive activity and live weight maintenance (Chriyaa *et al*., 1997).

Result from Selale area showed an increase in milk yield (0.5-2.0 liters) from dairy cows fed urea treated straws (Reherahie, 2001).

Among the many options tested so far to improve the feed value of crop residues, UMB and UTS are used widely in developing countries. The use of UMB for supplementing crop residues based diet has been well documented by (Sansoucy, 1995; Garg *et al*., 1998; Singh and Singh, 2003) and has the potential to increase production (Leng *et al*., 1991; Singh and Singh, 2003; Mirsa and Reddy, 2004), increase dry season milk supplies and increase household income (Garg *et al*., 1998; Patel, 2002; Singh and Singh, 2003). In India, providing of UMB with a concentrate of 30% CP produced 20 - 25 liters of milk per day from Friesian cow fed straw as main diet (Kunju, 1986). Results showed replacement of 40% of concentrates, with UMB and bypass protein maintained milk yield and increased farmers' net income (Leng *et al*., 1991). On-farm experiment conducted in Uttaranchal, India indicated that feeding of UMB increased milk production by 37% in buffaloes and 34% in local cows, without any effect on body weight and animal health (Singh and Singh, 2003). The present study was conducted to verify the response of crossbred dairy cows supplemented with urea molasses blocks and urea treated straws on milk yield and its composition in the dry season.

Materials and methods

Location

The experiment was conducted at Kabigizawu Kebele, Basona-Werana Woreda, North Shewa Zone. Debre Birhan is located 130 km North of Addis Ababa at 9^{o} 36'N and 39^{o}38'E. The study area is located 13 km from Debre-Birhan on the way to Addis Ababa. The area is characterized by mixed crop livestock production system. Barley, wheat, and faba bean are the major crops grown in the area, among livestock cattle and sheep are the dominant species. Due to the intervention made by the governmental and non-governmental organization a good number of Holliston-Freisian cross bred dairy cows are found in the area. There is no taboo that hinders selling of fresh milk and milk products in all villages. Dairy cooperatives of the area collect fresh milk from the members and sell

back to big milk processing plants and any unsold milk will be processed by the cooperatives.

Animals and treatments

A thorough training was given to all volunteered farmers, how to prepare and utilize UMB and UTS. Due to lack of enough number of lactating cows that could be assigned for each treatment in the dry period, the experiment was run in a single 4 X 4 Latin square design in switchover arrangement. Four treatments and four periods were used. The treatments were,

1. Control (farmers practice)
2. UMB
3. UTS
4. Commercial concentrate

Feeds and feeding

Barley straw was treated with urea (4%) and molasses (10%) under airtight conditions for 30 days and aerated overnight before feeding. Six kilogram of UTS was given per cow daily. Concentrate mix which is composed of 43% Noug cake, 55% wheat bran and 2% salt was given daily as a supplement to treatment 3 (UTS) at a rate of 2.5kg for maintenance and 0.5kg for every liter of milk produced. The amount had been adjusted based on the previous week milk yield. The (supplements) UMB and UTS were given to the milking cows in the evening. The control group gets what the farmer usually gives to his cow, and was recorded.

The urea molasses blocks was made according to the recommendation given by Alemu, (2007) and contains 40% fermentable molasses, 25% wheat bran, 10% urea, 10% noug cake, 5% salt and 10% cement. A block with an average weight of 8 kg was made manually and dried under shade. During the adaptation period, the animals were allowed to lick the block for 2-3 hours per day thenafter overnight throughout the experimental period. Every morning each block was weighed to calculate the amount licked in the previous night. Three kilo gram of concentrate mix was provided per cow per day along with UMB.

All cows had access to water once a day and grazed eight hours per day. Commercial concentrate was bought from Kality Feed Processing Plant and had a crude protein and TDN of 17% and 72%, respectively. Animals in treatment 4 received concentrate at the rate of 2.5 kg for maintenance and 0.5kg for every liter of milk produced. The amount had been adjusted based on the previous week milk yield.

Data collection and analysis

The experimental period was divided in to four periods and each cow was randomly assigned to one of the four treatments over these periods. Each period had 15 days adaptation period and 6 days actual data collection period and between periods, there was 5-days gap to avoid any carryover effect. Record on milk yield, feed offered and leftover was taken daily during 6 days of experimental period. Morning and evening milk was summed up to obtain each day milk yield. Milk samples for analysis were also taken from the morning and evening milk. At the end of the experiment, a thorough discussion was made with the participant farmers to assess their perception towards the experiment. Milk constituents were analyzed in collaboration with Ethiopian Dairy and Meat Training Institute. The GLM procedure of SAS (2002) was used to analyze the milk yield and its composition. The economic data for dry period supplementation of UMB and UTS was generated from the record collected in the study areas, on 4 cows for 99 days during dry seasons. Period, cow and treatment were used as a class2 variables and the model used was:

$Y_{ijkl} = \mu + T_i + R_k + C_l + \Sigma_{ijkl}$

Where, Yjikl= observation on subject j with treatment i, period k, column l,

μ = the overall mean

Ti = the fixed effect of treatment *i*

R*k* = the effect of row (period) order k

C*l* = the effect of column *l* (animal)

Σijkl = the random error

Results and discussion

The mean milk yield and major milk constituents (protein, fat and total solid %) are shown on Table 1. A significant (P<0.05) milk yield difference was observed among the treatment groups. The control group had significantly (P<0.05) lower milk yield than the supplemented groups. However no significant (P>0.05) milk yield difference was noted within the supplements (UTS, UMB and commercial concentrate). Milk yield increased by 1.1 liter (30.3%) from feeding of UTS and by 1.25 liters (34.4%) from UMB supplementation which was in agreement with the range 0.5–2 liters reported by Reherahie, (2001). Hossain *et al*. (2002) also reported that cow fed urea treated rice straw as a basal diet gave 0.67 kg more milk yield than the cow fed untreated rice straw as a basal diet.

Table 1. The effect of urea molasses straw treatment and urea molasses block on milk yield and major milk constituent.

Variables	Control	UTS	UMB	Commercial concentrate	N	P-value	SE	R^2	CV%
Milk yield	3.63[b]	4.73[a]	4.88[a]	5.26[a]	4	0.0472	0.632	0.86	13.66
Milk protein, %	3.60	3.36	3.66	3.61	4	0.517	0.292	0.77	8.22
Milk fat, %	2.45	3.32	2.45	3.18	4	0.086	0.492	0.94	17.3
Total solid %	11.09	11.66	11.07	11.65	4	0.461	0.665	0.88	5.85

Superscript with the same letter means no significant difference.

In the current study, the average milk yield, fat %, protein % and % total solid were 4.62, 2.85, 3.56, and 11.37 liters, respectively. No significant (P>0.05) difference was observed among treatments in major milk constituents. The result is in agreement with Rehrahie (2001) who obtained no difference in milk composition either fed with urea treated barley or Teff straw. The participant farmers were eager in using UMB and/or UTS supplement as it increased milk yield. No side effect was reported by any of the farmers' due to UMB feeding; the only problem mentioned was the unavailability and high cost of molasses and cement, respectively. The partial budgeting and sensitivity analysis is indicated on Table 2. Though there is significant increase in milk yield due to supplementation, the partial budgeting and sensitivity analysis shows that supplementation was not economical in this study.

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