Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.4, No.20, 2014
www.iiste.org

Comparison of Supplementing Urea-Molasses Block and Urea-Atela Blocks on Body Weight Change and Carcass Characteristics of Male Blackhead Ogaden Sheep Fed Natural Pasture Hay

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Abstract
The experiment consisted of ninety days of feeding trial, followed by evaluation of carcass parameters at the end of the experiment with the objectives of the study were (a) to evaluate body weight change and carcass0 characteristics of male black head ogaden sheep fed natural pasture hay (b) economic feasibility of supplementing block made from molasses versus block made from atela were also compared. the treatments consisted feeding of urea-molasses block ad libitum (50% of molasses: 23% wheat bran: 9% urea: 12% cement: 6% salt, T1), urea-atela block adlibitum (30% atela: 43% wheat bran: 9% urea: 12% cement: 6% salt, T2), urea-atela block ad libitum (40% atela: 33% wheat bran: 9% urea: 12% cement: 6% salt, T3) urea-atela block ad libitum (50% atela:23% wheat bran:9% urea:12% cement :6% salt, T4). Two kg block per week per head was given to each experimental animal.
Supplementation with urea-atela block, consisting higher amount of wheat bran (T2) had significantly ($P<0.001$) higher daily weight gain (55.5±2.2), DM (600.45 ± 8.7) g and nutrient intakes (CP=104.2 ± 3.2) than Urea-molasses block.
Keywords: black head ogaden sheep, body-weight gain, carcass characteristics, urea-atela block, urea-molasses block.

Introduction

Ethiopia has huge populations of sheep, which are used as source of food, hair (wool), manure and the short generation interval; the ability to give multiple births and their smaller size make them adaptable to smallholder and mixed crop livestock production systems, whereby they contribute up to 22-63% of cash income (FAO, 2004).

However, productivity of sheep is very low and mortality rate is very high particularly in the remote area such as pastoralists and agro-pastoralists. One of the major causes of low productivity and death of animals is scarcity of feed. Livestock feeding in most part of Ethiopia is based almost entirely on fibrous feeds such as native pastures and crop residues, the quality and quantity of which is subject to great seasonal variation (ILCA, 1988).

Supplementation with urea-atela or urea- molasses blocks can increase digestibility of fibrous feeds, the nutrients the animal receives, and feed intake and provide opportunity to sustain body weight of animals during the dry period and under harsh environment when access to conventional sources of supplements are difficult. Blocks are a convenient way to make, store, transport and feed to animals. They can easily be made and used in villages. A person may make and sell blocks to farmers as a source of income. Since molasses is intensively used for production of ethanol, availability of molasses as animal feed and molasses based block preparation in the future is of great concern. Therefore, it is important to look for other alternatives, such as atela. Urea-atela block has also the potential of increasing viability of livestock production, increasing dry season body weight gain and enhancing household income, particularly during drought in pastoral and agro-pastoral areas as compared to other sources of supplements. Supplementation of atela to sheep fed a basal diet of hay with atela improved feed intake, body weight change, digestibility and carcass characteristics (Yoseph, 1999).

Urea-atela block technology is a cost effective approach to maximize the utilization of locally available feed resources for better animal productivity during the dry season and may perhaps constitute an innovative feeding strategy for other species of livestock as well, where concentrate feeding is not a common feature, particularly in remote area, such as pastoralists and agro-pastoralists. But urea-atela block is currently not effectively utilized by small holder farmers for feeding to animal, mainly due to lack of information and experience about their potential as supplement to small ruminant. Accordingly, the objectives of this study were: (a) to evaluate body weight change and carcass characteristics of male blackhead ogaden sheep fed natural pasture hay supplemented with urea-molasses block and urea-atela block (b) to assess the economics of supplementing block made from molasses versus atela

Materials and methods

Description of the study area

The experiment was conducted at Haramaya-University. The university is located 515 km east of Addis Ababa at 9° N and 42° E. The site is situated at 1950 m above sea level and has a mean annual rainfall of 790 mm and a mean annual temperature of 16 °C (Mishira *et al*., 2004).

Experimental animals and management

Twenty four yearling intact male Blackhead Ogaden sheep with initial live weight of 12.79 ± 1.4 (mean ±SD) were purchased from Babile. The age of the animal were determined by dentition. The animals were quarantined for 21 days and during this period all sheep were ear tagged for identification. The sheep were dewormed and sprayed against internal (flat and round worms) and external (tick and mange mite) parasites, and they were vaccinated against common diseases like pasturolosis, anthrax and blackleg based on the recommendation of the veterinarian at the end of the quarantine period. Then all sheep were placed in to individual pen and offered the basal diet and supplemented with urea-molasses block and urea-atela blocks according to the treatment for another 15 days to adapt the animal to the feed and experiment procedure prior to the beginning of the actual data collection.

Experimental design and treatments

The design of the experiment was randomized complete block design (RCBD). The experimental sheep were grouped in to six blocks with four male sheep in each block based on the initial body weight. The four treatment diets were randomly assigned to sheep in each block, which resulted in to six animals per treatment and the animal within a block had equal chance to receive one of the treatment diets.

The treatments were:

T1= Urea-molasses block *ad libitum* (50% of Molasses: 23% Wheat bran: 9% Urea: 12% Cement: 6% Salt).
T2= urea-atela block *ad libitum* (30% Atela: 43% Wheat bran: 9% Urea: 12% Cement: 6% Salt).
T3= urea-atela block *ad libitum* (40% Atela: 33% Wheat bran: 9% Urea: 12% Cement: 6% Salt).
T4= urea-atela block *ad libitum* (50% Atela: 23% Wheat bran: 9% Urea: 12% Cement: 6% Salt).

Urea-atela blocks were made by varying the proportion of atela to wheat bran, other ingredients being constant.

Experimental feed preparation, block physical quality and feeding

Procedure of block preparation

The procedure for preparing the blocks required the following steps.

1. Equipment was used. Simple blocket (mould) making equipment can be used for making blocks. In preparing the blocks used in the present experiment, we constructed the block maker from metal sheet, which was designed and made at Guarage.
2. Atela and urea were mixed in the same container (step-1).
3. Cement, salt and water (40ml per 2kg block) were mixed in a separate container (step2).
4. The mixture in step-1 was mixed with the solution in step-2 and stirred by hand until the ingredients are fully dissolved and mixed = (step 3)
5. Wheat bran was added to the solution in step-3 and thoroughly mixed (step 4).
6. Then the mixture was put in to rectangular mould by several pressing (step 5).
7. The pressed block was removed and put on plastic sheet spread on floor in the house and left to mature/harden for 2 days (step 6), after which it was fed to the animals. The block weighed about 2 kg.

Duration of block remained consumable

Duration of block remained consumable was identified by observing consumable of the block. That means animals refused licking after the block was dried and lick too match before it was dried.

Measurements and observations

Body weight measurement

Body weight measurement was taken every 10 days after overnight feed withdrawal. Daily body weight gain was determined as a difference between the final and the initial weight divided by the feeding days.

Digestibility

Carcass characteristics

After completion of ninety days feeding trial, each sheep were deprived of feed and water for 12 hours. Pre-slaughter weights were recorded and then the animals were slaughtered. The blood was collected in plastic container and its weight measured. Then skin was flayed and weighed and the leg at fetlock as well as the head was cut and weighed. The alimentary canal consisting of esophagus, reticulo-rumen, omasum-abomasum, small and large intestine were weighed with and without content. The weight of offals such as head without tongue, skin and feet and internal organs namely, liver, heart, trachea, lungs, kidneys, spleen gall bladder, testicles, penis and kidney were also recorded. The cross sectional area of rib eye muscle between the tenth and eleventh rib were traced on transparency paper and measured. Dressing percentage was computed as a proportion of hot carcass weight to slaughter weight and empty body weight.

Statistical analysis

The data obtained for body weight change and carcass were subjected to analysis of variance (ANOVA) using the general linear model procedure of SAS (2006).

The model for the experiment was:

$Y_{ij}= \mu +\alpha_i +b_j +e_{ij}$

Where:

Y_{ij}= response variable
μ= over all mean
α_i = i^{th} treatment effect
b_j= j^{th} block effect
e_{ij}= random error

Results and discussions

Body weight change

The body weight changes and average body weight gain of blackhead ogaden sheep fed natural pasture hay and supplemented with urea-molasses block and urea-atela blocks is given in Table 1. The higher daily body weight gain obtained by all sheep group in this study indicated that both CP and energy were adequate in the feed satisfying their maintenance nutrient requirements. The daily body weight change of sheep supplemented with urea-atela block containing high level of wheat bran (T2) was significantly higher (P<0.001) as compared to the sheep supplemented with urea-atela blocks having low level of wheat bran (T3, T4) and UMB (T1). Moreover, T3 (urea-atela block with 33% wheat bran) gained significantly higher weight. The result of the current study therefore, revealed that as the level of wheat bran in the block increased, daily body weight changes of sheep also increased. Therefore, the blocks supplied required nutrients to the rumen microorganisms and enhanced feed digestibility and intake, as a result of which animals performance improved, although the rate of growth depends upon the level of nutrients supplied by a given block. The result of the current study was agreed with that reported by Salim *et al*. (2003) who noted that supplementation with concentrate diet could increase the growth and productivity of goats and sheep under grazing conditions.

Table 1. Body weight change of blackhead ogaden sheep fed hay and supplemented with urea molasses block and urea-atela blocks.

Parameter	T1	T2	T3	T4	SEM	SL
Initial weight (kg)	13	12.9	12.5	12.8	0.29	ns
Final weight (kg)	16.5^{b}	17.9^{a}	16.5^{b}	15.5^{b}	0.33	**
Body weight gain (kg)	3.5^{c}	5^{a}	4^{b}	2.8^{d}	0.2	***
Daily Weight gain (g/day)	38.9^{c}	55.5^{a}	44.4^{b}	31.0^{d}	2.27	***
FCR	0.07^{b}	0.09^{a}	0.08^{ab}	0.05^{b}	0.004	***

^{abcd}; Means with different superscripts in the same row are significantly different at P < 0.001; ns: not significant; SEM: standard error of mean; SL: significance level.

All sheep loss weight during the adaptation period, since they did not easily accustom to the block feed and the cold (end of August) environment in the study area during this period. However, block intake increased slowly during the adaptation period and early stage of the trial after which animals showed a steady growth rate throughout the experimental period (Figure 2).

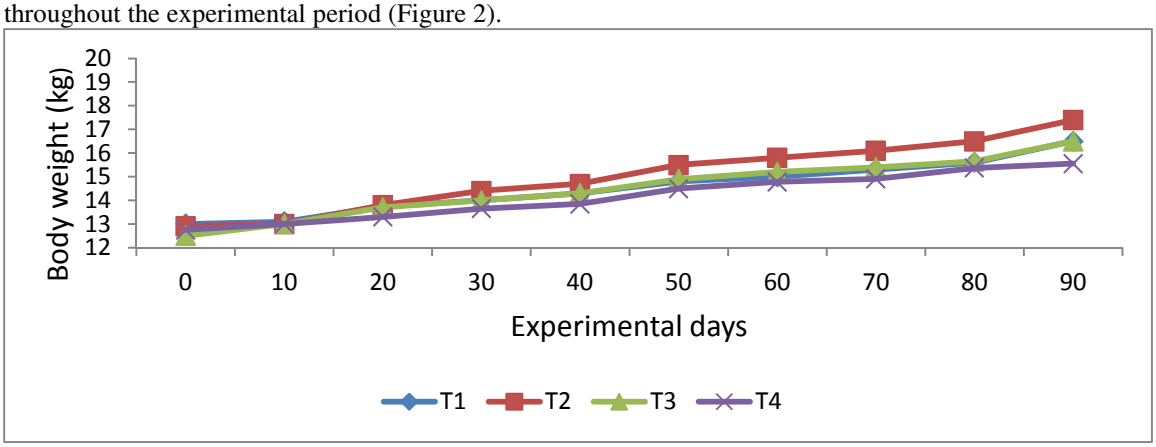

Figure 1. Weekly body weight change of blackhead ogaden sheep fed hay supplemented with urea-molasses block and urea-atela blocks.

Carcass components

The values for pre slaughter weight, empty body weight, and hot carcass weight, dressing percentage and rib-eye area of experimental sheep were given in Table 2. Pre-slaughter weight ($P< 0.01$), hot carcass weight, dressing percentage/slaughter and empty body weight and rib eye area ($P< 0.001$), follows the same trend, and are higher in T2 as compared to the other treatment groups. Tsegay (2011) reported higher hot carcass weight and dressing percentage in blackhead ogaden sheep than in the present experiment, which is due to the higher slaughter weight in these previous studies.

Rib-eye muscle area

Rib-eye muscle area is an indirect estimate of body musculature and amount of lean meat in the carcass (Wolf *et al*., 1980) . Larger ($P<0.001$) rib-eye muscle area was obtained in T2 as compared to the other treatments. This might be due to the efficient utilization of feeds offered for growth of useful muscle component in the former group. There were no difference in REA between the urea-molasses block, T3 and T4 urea-atela blocks.

Table 2. Carcass characteristics of blackhead ogaden sheep fed hay and supplemented with urea molasses block or urea-atela blocks

Carcass characteristics	T1	T2	T3	T4	SEM	SL
Slaughter weight (kg)	16.7^{b}	17.3^{a}	16.4^{b}	15.6^{b}	0.34	**
Empty body weight (kg)	13.4^{b}	14.7^{a}	13.0^{b}	12.6^{b}	0.33	*
Hot carcass weight (kg)	5.3^{b}	7.1^{a}	5.5^{b}	5.2^{b}	0.25	***
Dressing percentage						
Slaughter weight base (%)	31.8^{b}	41^{a}	33.4^{b}	32.9^{b}	0.74	***
Empty body weight base (%)	39.6^{c}	45.3^{a}	42.2^{b}	39.4^{c}	0.84	***
Rib eye area (cm^2)	6.9^{b}	7.3^{a}	6.9^{b}	6.7^{b}	0.09	***

^{abcd} Means with different superscripts in the same row are significantly different at $P < 0.001$; ns: not significant; SEM: standard error of mean; SL: significance level.

Partial Budget Analysis

The partial budget analysis is presented in Table 3. The result of the partial budget analysis indicated that the gross financial margin or total return obtained in this trial was 70, 90, 80 and 73 Birr/sheep for sheep fed T1, T2, T3 and T4 diets, respectively. As shown by partial budget analysis, sheep fed atela block with higher level of wheat bran (T2) returned higher net income (11.6 Birr/sheep) as compared to the other supplemented groups.

Table 3. Partial budget and marginal rate of return analysis for the experimental treatments

Variables	Treatments			
	T1	T2	T3	T4
Purchase price of sheep,birr/sheep	310	310	310	310
Feed consumed (kg/sheep)				
Hay consumed (kg/sheep)	47.86	51.66	48.2	49.04
Block consumed (kg/sheep)	9.81	10.79	9.77	8.96
Cost for hay (Birr/sheep)	53.20	57.40	55.58	54.40
Cost for block (Birr/sheep)	16.46	21	17	17
Total feed cost (Birr/sheep)	69.66	78.4	72.58	71.4
Gross income, Birr/sheep	380	400	390	383
Total returns, Birr/sheep	70	90	80	73
Net returns, Birr/sheep	0.34	11.6	7.42	1.6
ΔNI	-	11.26	7.08	1.26
ΔTVC	-	8.74	2.92	1.74
MRR %(Δ NI/ΔTVC)	-	129	242	72

Birr = Ethiopian currency; ΔNI = change in net income; ΔTVC = change of total variable cost; MRR = marginal rate of return; NR = net return; TR = total return.

Conclusions

Average daily gain of animals fed with T1, T2, T3, and T4 blocks were 38.9 ± 2.27 , 55.5 ± 2.27, 44.4 ± 2.27, and 31 ± 2.27, respectively. The body weight gain was significantly (P<0.001) higher in sheep fed with T2 urea-atela block. Hot carcass weight of animals fed with T1, T2, T3, and T4 blocks were 5.3 ± 0.25, 7.1 ± *0.*25, 5.5 ± 0.25, and 5.2 ± 0.25 (mean ± SE) respectively and carcass weight of T2 urea-atela block was significantly higher than other treatments. In agreement with growth and carcass performance, urea-atela blocks supplemented sheep promoted economical gain. The result showed that atela can replace molasses as a block ingredient. We observed that feeding the blocks beyond seven days is less consumable by the animals, since it becomes hard. We suggest smaller block size that is consumable within seven to eight days.

The net return from the supplemented treatments was 0.34, 11.6, 7.42 and 1.6 Birr /head with marginal rate of return (MRR) of 129, 242, and 72% for T2, T3 and T4, respectively.

Acknowledgements

I am very much indebted to my advisors Dr. Mengistu Urge and Dr. Kefelegn Kebede for their encouragement, sincere guidance, supervision, useful comments and excellent cooperation starting from the research idea generation up to the last minute of this thesis preparation and i sincerely acknowledge the Ministry of Education for complete funding, smooth and fast financial release for research work. I also acknowledge and appreciate Haramaya University for the financial management and allowing me to use facilities required for my study.

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