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Growth Performance and Carcass Characteristics of Arsi-Bale Sheep Fed Various Levels of Sugarcane Bagasse Contained Ration

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Abstract

This experiment was conducted to compare growth performance and carcass yield of Arsi-Bale sheep fed various levels of sugarcane bagasse contained diets to determine optimum level of sugarcane bagasse inclusion. The bagasse inclusion levels were 0, 10, 20 and 30% of commonly used diet in T_1, T_2, T_3 and T_4, respectively. Thirty-two yearling intact lambs with an initial live weight of 19.8 ± 2.4 kg (mean ± SE) were randomly assigned to four treatments in randomized complete block design. The effect of bagasse inclusion levels was non-significant ($P > 0.05$) on feed intake, body weight gain, feed conversion ratio and measured carcass parameters. Feed cost incurred per unit of body weight gain was higher ($P \leq 0.001$) for lambs consuming on the commonly used diet (T_1) than all bagasse contained diets. In conclusion, 30% bagasse inclusion was identified as the best level in this study to maintain high growth rates in the growing yearling Arsi-Bale lambs. However, it could be better to examine growth and carcass yield potential and the least feed cost advantage of Arsi-Bale yearling sheep maintained on higher bagasse inclusion level.

Introduction

Increasing demand for animal origin source food is a driving force to undertake various sheep production related businesses. However, in Ethiopia sheep production is mainly characterized by low-input and low-output system. The tradition sheep husbandry practice has led to under genetic potential performances. Lack of technology and information on improved sheep production and wise utilization of available resources are the main causes for low sheep production and productivity. Moreover, feed shortage is increasing due to degradation of the grazing lands by human interventions and recurrent droughts, which result in reduced feed production and ending with low production and productivity. The feed shortage problem calls for a breakthrough solution by looking in to available alternative feed resources of industrial by-products origin like sugarcane bagasse.

Sugar industries seem to be increasing and the storage facilities capable to absorb the sugar cane bagasse could be a problem in the future. Previous research reports [1], showed as processing every ton of sugarcane can yield as much as to 0.3 ton of bagasse, which can be used as cheap roughage for cattle production. Therefore, this could be an opportunity for ruminant livestock producers to use this by-product as a source of alternative roughage source. However, the high indigestible fiber (38%), and low crude protein (1.5%) content in bagasse requires supplementation with other roughages, oil seed cakes and sugar cane molasses to enhance rumen fermentation and release of nutrients from the bagasse [2].

According to Van Soest et al.[3] report, lamb fattening diet containing bagasse from 15 - 30% levels made rapid and economical gains during the first 70 days, However, the rate of gain decreased in the group of lambs fed on more than 25% bagasse in the diet. Crossbred lactating dairy cows fed on 30% sugarcane bagasse and 70% concentrate showed equal production performance with cows fed on conventional diet [2]. The study indicated that sugarcane bagasse can be used as a sole roughage source when there is no other roughage source like in the urban and peri-urban areas and when roughage is in scarce during drought season.

Testing, developing, adapting and promoting of sheep production technologies and information are among the research mandate areas of Ethiopian Institute of Agricultural Research (EIAR). To this different improved sheep feeding packages should be developed and tested first and for most under controlled environment on research station in order to verify, recommend and scale-up the package for use by sheep producers. Experiments conducted so far on the proper utilization of bagasse are not enough to recommend the proper amount to be included in the diet of sheep. On the other hand, increasing production and availability of sugarcane bagasse need urgent respond from the research side on the best efficient way of utilizing this by product. Therefore, it was imperative to evaluate the effect of various levels of bagasse inclusion in feed on growth performances and carcass characteristics of yearling Arsi-Bale sheep. The specific objectives of this research were: to evaluate sugarcane bagasse contained diet on total DMI, body weight change and carcass characteristics of yearling Arsi-Bale sheep; to determine the best bagasse inclusion level in sheep diet to the best production performance and; to estimate feed cost- benefit of bagasse inclusion in sheep diet.

Materials and methods

Description of the study area

The experiment was conducted from May-September, 2020 at sheep research station of Debre Zeit Agricultural Research Centre, located at 45 km South East of Addis Ababa (08°44'N 38°,58'E; average altitude of 1900 m a.s.l). The area is known for bimodal rainfall pattern with average annual rainfall of 845 mm and annual minimum and maximum temperature of 10 and 22^{o}C, respectively. The area is characterized by mixed-crop livestock production system with major crops grown include *Tef* (Eragrostis Teff), wheat, chick pea and lentil.

Experimental animals and diets preparations

Thirty-two yearling male Arsi-Bale lambs were purchased from local market, ear tagged and injected with Ivermitin and Oxyteteracycline. The selection criteria used to buy sheep included animals in uniform body weight, at yearling age and healthy. Sheep barn was cleaned and disinfected to a hygienic standard before three days of the experimental sheep arrival. The animals were also vaccinated against Sheep Pox and Ovine pasteurellosis. After adaptation period of 21 days, the animals were blocked in to 8 groups of four animals each based on their initial body weight, which was determined by weighing after overnight fasting. Then, the lambs were randomly assigned to the treatments (eight animals per treatment). The average initial body weight of experimental animals was 19.8±2.4 kg (mean ± SE).

The feed ingredients were purchased from local market and stored appropriately. Molasses and bagasse at the fresh stage were purchased from Wonji Suger factory and transported to DZARC. Bagasse was sun-dried for days and stored under shade until used. The DM content of bagasse was 55% at the time of purchasing from the factory and then dried until it contained 89% DM. The concentrate feed was formulated from 50% wheat middling, 49% noug seed cake, 1% common salt on DM basis and contained 26% CP.

At the begging of feeding experiment, total mixed diet was prepared from concentrate, bagasse, molasses, and urea and water with different proportion among the treatments as indicated in Table 1. The amount of daily total feed intake (930g as fed) from previous experiment conducted on the same sheep breed was used as a guideline to fix the proportion. Bagasse and *tef* straw amounts were varying through time based on total daily feed intake of the animals. In the total mixed feed, the amount of concentrate was fixed (400g) and the proportion of bagasse was 10, 20 and 30% of the total amount of daily offered feed in T_2, T_3 and T_4, respectively. Molasses (10% amount of the total feed) was diluted in the water (1kg Molasses in 2 and half letter water) and sprayed on the total daily feed and then thoroughly mixed then packed in the suck overnight. Animals in T_1 were fed *tef* straw and 400g concentrate supplement separately. All animal fed *ad libtum* with 20% refusal, based on three days average daily feed intake. Tap water was given free access.

Table 1: Experimental feeds and the proportion (%) in the ration.

Sample	T_1	T_2	T_3	T_4
Tef straw	*Add libtum* (~57%)	47	37	27
Sugarcane Bagasse	0	10	20	30
Concentrate	400g (~43%)	43	43	43
Total	100	100	100	100

Experimental treatments and design

Randomized Complete Block Design (RCBD) was used to undertake feeding experiment with four dietary treatments, which were set as:

T_1 = 400g DM concentrate + *tef* straw ad libtum;

T_2 = Bagasse 10% of total feed mixed with *tef* straw and 400g concentrate;

T_3 = Bagasse 20% of total feed mixed with *tef* straw and 400g concentrate and

T_4 = Bagasse 30% total feed mixed with *tef* straw and 400g concentrate

Experimental lambs were allotted to each of the four treatments replicated on eight lambs per treatment in individual pens.

Feed intake, live weight change and feed conversion ratio

Once the feeding trial was commenced, data on feed offer and refusal was taken daily for 84 days and the feed intake was calculated as the difference between feed offered and refused. While live weight was measured at fourteen days interval after overnight fasting, using a 100 kg movable weighing scales. The average daily body weight gain was calculated as the difference between the initial and final live weight of the lambs divided by the number of experimental days. Feed Conversion Ratio (FCR) of the lambs was determined as average daily DM intake divided by average daily live weight gain.

Carcass evaluation

At the end of the feeding trial, animals were kept in fasting overnight then slaughtered for carcass evaluation. Hot carcass weight and non-offal components were measured immediately after slaughter. The full reticulo-rumen and offal was weighed using plastic bag. The carcass was chilled at 4°C for 24 hours for proper cutting and weighing and then the main carcass cuts (neck, shoulder, rib/rack, loan, forelimb and front limb) were measured. Area of the rib-eye muscle was measured between the 12th and 13th ribs. To do so, the light transparent paper was placed on the area of rib-eye muscle first then sketch by pencil and the area traced from transparency paper on 0.25 cm^2 gridded paper, then the number of squares counted in the area of REMA multiplied by 0.25 cm^2 and the value taken as rib eye muscle area. Dressing percentage was calculated as the hot carcass weight divide by slaughter body weight and multiplied by 100.

Feed cost analysis

The feed cost per unit live weight gain was determined using the feed ingredients cost for each respective treatment feed divided by live weight gain.

Analysis of samples dry matter and CP content

Laboratory analysis of experimental feeds for dry matter, Ash, Nitrogen, Neutral detergent fiber, acid detergent fiber and acid detergent lignin contents were determined using AOAC official methods [4]. DM for feed offered and refusal samples was determined by oven drying of the samples at 105 0C to constant weigh. Nitrogen was determined using kjeldhal`s procedure then N was multiplied by 6.25 to find crude protein content.

Data analysis

Data was analyzed using SAS software program [5]. Mean comparison was done using Duncan's multiple range test and significant differences between the treatment groups were declared at P ≤ 0.05.

The model fitted to calculate the different parameters was: $Y_{ij} = \mu + a_i + + B_j + e_{ij}$

Where: Y_i = Response variables, µ = Over all mean, a_i = ith effect of bagasse level, B_j= jth body weight effect, E_{ij} = Effect of the ijth random error

Results & discussion

Nutrient composition of feed ingredients and the diets

Crude Protein content (CP%) of feed ingredients, feed offered and refusals are presented in Table 2. In the current study the DM content of sugarcane bagasse was 55, 85 and 89% at time of purchasing from the factory, after air dried and as fed, respectively. Laboratory chemical analysis result shows that sugarcane bagasse contained almost similar amount of CP with *tef* straw. In the previous report [6] sugarcane bagasse dry matter content (41.2%) was less than observed in current study.

Table 2: Feed ingredients, diets and refusals nutrient contents.

Content	Straw	Bagasse	Concentrate	Molasses	Feed offer				Feed refusal			
					T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
DM%	87.5	88 .9	91.3	76.8	87.5	66.9	68.1	69.7	83.7	81.1	76.7	80.3
CP%	4.1	3.7	26	0.5	4.1	2.1	7.5	5.6	4.1	5.2	9.6	10.2

Note: DM: Dry Matter; CP: Crude Protein.

Crude protein content value (3.4%) of sugarcane bagasse observed in the current experiment was also higher than 1.82%, stated in Almeida et al.[6] report. Fekede et al. [7] reported 4.04% CP of *tef* straw, which was equal with 4.1% reported in the current study, whereas the DM content of *tef*f straw was lower (87.5%) than the reported 91.6% DM. The DM content of sugarcane molasses found in the current analysis (76.8%) was within the range of 67.8-79% reported by FAO [8]. However, the CP content of sugarcane molasses was lower (0.5%) as compared with 2.1-9.3% stated by FAO [8] reports. The differences in DM and CP contents among the feeds used in the current study and previous reports might be because of environment, temperature, soil type, storage duration, processing methods and variety differences.

Feed intake and body weight change

Sugarcane bagasse inclusion effect on the average daily feed Dry Matter Intake (DMI) and live body weight change of experimental animals is presented in Table 3. The effect of sugarcane bagasse inclusion levels was similar (P≥ 0.05) on total feed DM intake. Numerically, the highest DM intake was recorded for lambs in T_3 than in T_4 and T_1 followed by T_2 group. The observed similarity in DM intake of lambs in all treatment groups could probably indicated that the feed value of sugarcane bagasse mixed with molasses was similar with *tef* straw. The total CP intake was higher (P≤0.001) in T_1 than the other treatment groups.

The effect of various sugarcane inclusion levels on body weight change and feed conversion ratio (FCR) of experimental lambs was statistically similar (P≥ 0.05). Average daily body weight gain of the animals was slightly higher for those animals assigned in T3 than T4, T2 and T1 categories. Feed conversion ratio was a bit higher in T1 and T2 than T3 and T4 animal groups.

Table 3: Average daily dry matter intake and body weight change of Arsi-Bale sheep.

Treatment	TDMI	IBW	FBW	ADG	FCR	TCPI	
						(g)	(%)
T_1	685.4	19.6	23.4	45.2	16.5	119[a]	17[a]
T_2	656.6	19.5	23.4	46.4	17.4	67[c]	10[b]
T_3	733.4	20.1	25.7	66.7	11.6	83[b]	11[b]
T_4	729.5	20.2	25.5	63.1	12.9	83[b]	11[b]
Mean	701±74	20 ± 2.4	25 ± 3	55.4 ± 19	14.4 ± 5	88±9	13 ± 0.6
P-value	0.3266	0.9541	0.3775	0.2203	0.2319	0.0001	0.0001
Sig.	ns	ns	ns	ns	ns	ns	ns

Note: TDMI: Total Dry Matter Intake; IBW: Initial Body Weight; FBW: Final Body Weight; ADG: Average Daily Gain; FCR: Feed Conversion Ratio; TCPI: Total Crude Protein Intake; P-value: Probability Values; Sig: Significance Level; ns: Non-Significant (P > 0.05).

Experimental lambs showed various DM intake trends during the experimental period (Figure 1). The dry matter intake of lambs in T_2, T_3 and T_4 was increasing until 56 days of feeding and more or less constant till the end of experiment. Lambs in T_4 and T_3 groups ate the highest dry mater (~800g) around 56 days feeding time. The trend of DM intake for lambs in T_1 groups was decreasing all the time. The reduction in feed intake trend of lambs in T_1 was unexplained, while the increasing trend in T_2, T_3 and T_4 groups could be because of increased rumen fermentation and feed digestibility with molasses addition.

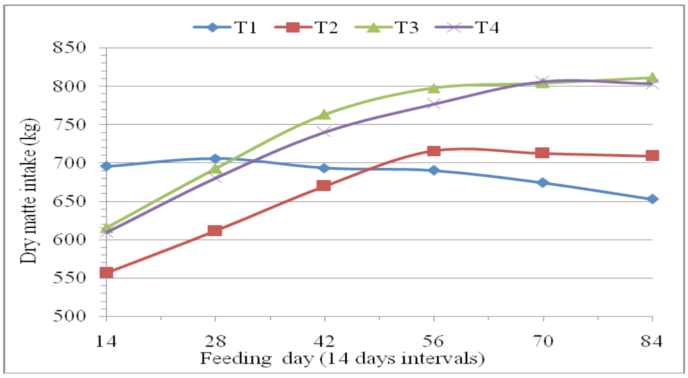

Figure 1: Trends of experimental animals' dry matter intake as affected by feeding period.

The effect of various sugarcane inclusion levels on body weight change and Feed Conversion Ratio (FCR) of experimental lambs was statistically similar (P≥ 0.05). Average daily body weight gain of the animals was slightly higher for those animals assigned in T_3 than T_4, T_2 and T_1 categories. Feed conversion ratio was a bit higher in T_1 and T_2 than T_3 and T_4 animal groups.

Experimental lambs showed various DM intake trends during the experimental period (Figure 1). The dry matter intake of lambs in T_2, T_3 and T_4 was increasing until 56 days of feeding and more or less constant till the end of experiment. Lambs in T_4 and T_3 groups ate the highest dry mater (~800g) around 56 days feeding time. The trend of DM intake for lambs in T_1 groups was decreasing all the time. The reduction in feed intake trend of lambs in T_1 was unexplained, while the increasing trend in T_2, T_3 and T_4 groups could be because of increased rumen fermentation and feed digestibility with molasses addition.

Similar DM intake of lambs between the control and bagasse contained diet groups indicated that molasses contained sugarcane bagasse has similar feed value with *tef* straw. The dry matter intake observed from lambs fed 20 and 30% bagasse contained diet in the current study was within the range (704-843g) reported for yearling Arsi-bale sheep fed on grass hay and sugarcane top hay or silage supplemented with 350g concentrate [9]. The mean voluntary feed intake of wether sheep was 3.7 % of live weight on diet containing 50% sugarcane bagasse, 5% urea, 10% fresh cattle manure and 35% water fermented for 30- 60 days at ambient temperatures [10]. In the current study the DM intake of lambs on various sugarcane bagasses was 3.4-3.6% of the lambs' initial live weight, which was lower than previous report, 4% of initial body weight [9]. This could be due to variation in feed ingredients, the way the sugar factory process, breed and age of sheep, and climatic factors.

The tendency in body weight change of the experimental lambs during the feeding trial is as indicated in Figure 2. Lambs allocated to T_1 showed increasing body weight gain for the first 28 days and then showed flat trend for the next 14 days followed by incremental changes for the other next 14 days then weight gain stopped till final days. The trend of body weight growth in T_2 was faster in the first 42 days then became zero gain for 14 days and slightly increased for the next 14 days and live weight gain stopped when the experiment ending. The body weight gain in T_3 was improved with regular pattern for 56 days and stopped increasing, then, the live weight in this group was increasing again till end of feeding days.

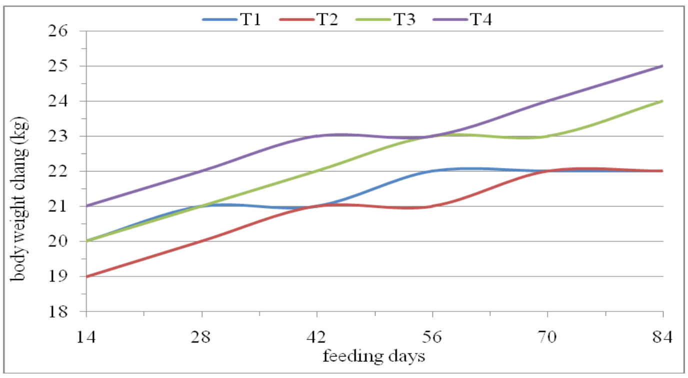

Figure 2: Trends of experimental animals' body weight change over the feeding period.

Experimental animals in T_4 showed an increasing trend in live weigh during six weeks of feeding and did not increase until it achieved the highest gains for the last days, similar to that observed in T_3. The improving live weight at the end (in September) in T_3 and T_4 groups could be because of better ambient temperature condition than been in the former month (August).

Most of the indigenous Ethiopian sheep fed on various types of feed attain 18-26 kg live weight with 16-126 g gain/day at yearling age [11]. Specifically, Arsi-Bale sheep fed grass hay basal and supplemented concentrate at 2% of initial body weight increased 69-104 g live weight daily [12]. Getahun et al. [9] reported that yearling Arsi-Bale sheep fed on grass hay and sugarcane top silage or hay supplemented with 350g concentrate had an ADG of 80-90g. The average final body weight attained (23-25 kg) and the daily live weight gain (45-66 g) observed from the present study was lower than the previous reports for the same breed [9,12]. These observed differences between the past and the current studies indicated that how the feed type and its form and the weather affect the growth performance of yearling lambs.

Carcass and non-carcass parameter

The effect of sugarcane bagasse contained feed on carcass yield is presented in Table 4. Sugarcane bagasse inclusion level effect was not significant (P ≥ 0.05) on Slaughter Weight (SW), carcass yield, Dressing Percentage (DP) and Rib Eye Area Muscle (REA) of yearling ram lambs. However, the average carcass yield (9.2±1.2 kg) and dressing percentage (37.5±2.4%) found in this study were in the range of 7-18 kg and 31-52% reported for Ethiopian indigenous sheep breeds [9]. Abebe and Yoseph [13] reported a dressing percentage of 36 to 38% for Arsi-Bale sheep fed on urea treated barley straw and 300-400 g concentrate supplement, which was similar to the result of the current study.

Higher rib-eye muscle area (21.6±3.2) was observed in this study than previous report (16.7±2.7 cm^2) (DZARC, 2020 unpublished data) from the same sheep breed fed on lentil straw *ad libtum* and that supplemented with different levels of concentrate. The higher REA muscle observed from the current study could be because of bagasse, molasses and concentrate feed ingredient, which are different from the past study. Otonie et al.[14] reported that rib-eye area of the *longissimus dorsi* muscle is varied with breed and feeding management, and directly related to the amount of muscle in the carcass in animal studies as an indicator of muscle development and yield of high valuable cuts.

Table 5: Carcass characteristic of Arsi-Bale sheep as affected by bagasse inclusion levels.

Parameters	Treatment means				Mean ± SE	P-value	Sig
	T_1	T_2	T_3	T_4			
SW (kg)	23.3	23.3	26.1	25.7	24.6 ± 2.6	0.2194	ns
HCW (kg)	9.1	8.9	9.5	9.3	9.2 ± 1.2	0.9188	ns
CCW (kg)	9.0	8.6	9.5	9.1	9.1 ± 1.3	0.7658	ns
DP (%)	39.1	38.4	36.2	36.2	37.5 ± 2.4	0.1391	ns
REA (cm^2)	21.0	22.7	21.8	21.1	21.6 ± 3.2	0.8148	ns

Note: SW: Slaughter Weight; HCW: Hot Carcass Weight; CCW: Cold Carcass Weight; CP: Dressing Percentage; REA: Rib Eye Muscle Area; P-value: Probability Values; Sig: Significance Level; ns: Non-significant (P > 0.05).

The main carcass cuts (hind leg, shank front, loan, belly, ribs, shoulder and neck) of yearling Arsi-Bale sheep were similar (P > 0.05) for all treatment groups (Table 5). Hind leg is the highest cut and the next higher is shank followed by ribs, neck, shoulder and belly meat.

Table 5: Main carcass cuts of Arsi-Bale sheep as affected by bagasse inclusion levels.

Parameters	Treatment means				Mean ± SE	P-value	Sig
	T_1	T_2	T_3	T_4			
Hind leg	3.23	3.05	3.24	3.17	3.1 ± 0.4	0.9147	ns
Shank	1.75	1.79	1.81	1.79	1.8 ± 1.2	0.9852	ns
Loan	0.6	0.5	0.7	0.6	0.6 ± 0.2	0.5398	ns
Belly	0.3	0.2	0.3	0.4	0.3 ± 0.1	0.3883	ns
Ribs	1.7	1.4	1.8	1.7	1.6 ± 0.3	0.2182	ns
Shoulder	0.5	0.5	0.5	0.4	0.5 ± 0.1	0.3831	ns
Neck	0.7	0.8	0.8	0.8	0.8 ± 0.1	0.5547	ns

Note: SE: Standard Error of Mean; P-value: Probability Values; Sig: Significance Level; ns: Non-Significant (P > 0.05).

The effect of bagasse inclusion levels was not significant (P ≥ 0.05) on all non-carcass component parameters. However, numerically, the weight of full gastro intestinal tract and heart were higher in the group of lambs fed on diet containing 30% bagasse. The weight of kidney fat, liver and tail fat weight of sheep fed on 20% bagasse contained diet were numerically higher than the other groups. The skin weight of Arsi bale sheep reported in the present study was similar to 2.7 kg skin weight reported for Menze sheep fed on 352 g concentrate supplement and grass hay basal diet Wude et al. [15]. The overall mean of head, heart and liver weight of sheep in this study was almost similar with previous report for yearling Arsi-Bale sheep fed natural pasture [16].

Table 6: Non-Carcass characteristic of sheep as affected by bagasse inclusion levels.

Parameters	Treatment means				Mean	P-value	Sig
	T_1	T_2	T_3	T_4			
Skin (kg)	2.6	2.6	2.7	2.8	2.7 ± 0.3	0.533	ns
Head (kg)	1.6	1.5	1.6	1.6	1.6 ± 0.2	0.7018	ns
FGIT (kg)	6.8	7.0	7.4	8.3	7.4 ± 0.9	0.1161	ns
EGIT (kg)	1.8	1.9	2.2	2.1	2.0 ± 1.2	0.3655	ns
Kidney	76.4	71.4	73.9	73.1	73.7 ± 7.5	0.7702	ns
Kidney fat	55.3	40.9	64.2	54.6	53.8 ± 20.9.1	0.3921	ns
Lung#	353.3	301.7	353.5	303.6	328.0 ± 63.9	0.3966	ns
Heart	96.6	92.5	98.6	123.5	102.8 ± 29.5	0.367	ns
Liver	305.9	314.1	371.5	368	339.8 ± 50.7	0.1117	ns
Pancreas	42.3	35.1	39.5	37.5	38.6 ± 7.7	0.5182	ns
Testicles	314.2	299.7	322.4	299.7	309 ± 53	0.8768	ns
penis@	42.8	45.7	44.4	43.4	44±8	0.945	ns
Tail fat	448.5	390.1	603.4	514.3	489 ± 169	0.2586	ns

Note: SE: Standard Error of Mean; P-value: Probability Values; Sig: Significance Level; ns: Non-Significant (P > 0.05); @: Penis with Urethra; #: Lung with Trachea.

Feed cost per live weight gain

Effect of sugarcane inclusion on total feed costs and cost per kg weight gain is presented on Table 7. The feed cost components and cost incurred per unit kg live weight gain were different ($P \leq 0.001$) among treatments. *Tef* straw cost was lower in all bagasse contained treatments with the lowest cost incurred in T_4 (30% bagasse contained diet). Cost of concentrate in all treatment groups and molasses among bagasse contained diets were the same. The total feed cost was highest in 0% bagasse contained feed. Feed cost incurred per unit of body weight gain (58 birr/kg weight) was highest for sheep fed without bagasse (T_1) than fed on 20-30% (17-23 birr/kg weight) contained diets. This study showed that sugarcane bagasse inclusion can potentially reduces cost of required to produce a unit of meat.

Table 7: Feed cost per day per sheep and per kg live weight gain as affected by bagasse level.

Treatment	Cost per day per sheep (Birr)					Per kg gain
	Tef straw	Bagasse	Conc.	Molasses	All feeds	
T_1	1.9[a]	0.0[d]	0.5	0.0[b]	2.4[a]	58.3[a]
T_2	0.8[b]	0.04[c]	0.5	0.2[a]	1.5[b]	40.0[ab]
T_3	0.8[b]	0.1[b]	0.5	0.2[a]	1.5[b]	23.3[bc]
T_4	0.3[c]	0.15[a]	0.5	0.2[a]	1.1[b]	17.3[c]
Grand mean	1.0 ± 0.38	0.1 ± 0.1	0.5 ± 0	0.14 ± 0.02	1.6 ± 0.4	34.7 ± 14.7
P-value	<.0001	<.0001	.	<.0001	0.0007	0.002
CV	ns	ns	ns	ns	ns	ns

Note: P-value: Probability Values; Sig: Significance Level; ns: Non-Significant (P > 0.05).

Conclusion & recommendations

Shortage of feed is ever increasing in the country due to various factors, calling for enhanced use of available alternative feed resources. In this study, an experiment was conducted to determine the effect of sugarcane bagasse inclusion in the diet of Arsi-Bale sheep on feed intake, growth performance, carcass yield and economic importance. The DM intake, body weight gain, feed conversion ratio and carcass yield were similar between lambs fed on conventional and bagasse contained diets The lowest feed cost per unit of body weight gain was obtained at the highest portion of bagasse. Based on the present finding, it can be concluded that up to 30% bagasse can be added in the diet of growing Arsi-Bale sheep to reduce feed cost at no adverse effect on performances. Moreover, conducting further research at higher inclusion levels of bagasse in the diets of sheep is warranted.

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