



Carcass characteristics of yearling male borana goats supplemented with protein and energy feed resources.

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Abstract

The experiment was conducted at Yabello Pastoral and Dry land Agriculture Research Center with the objectives to evaluate the effect of supplementation of browses species mixed with wheat bran on carcass characteristics of Borana goats fed a basal diet of native pasture hay. The experiment was conducted using Twenty five (25) intact male yearling Borana goats with an average live weight of 15.22±0.17kg (mean and standard deviation). The experimental design was randomized complete block design five treatments with five replications. Experimental goats were blocked into five blocks of five goats based on their initial body weight (BW) and randomly assigned to one of the five treatment diets within a block. Goats were acclimatized to the treatment feeds for fifteen days. The experiment consisted of 90 days of feeding trial and 10 days of digestibility trial followed by evaluation of carcass parameters at the end of the digestion trial. Five dietary supplement treatments were, T1, (63:37%) wheat bran (WB) and noug seed cake (NSC) +hay ad libitum. T2,50% of VTP (Acacia tortil pod) + 50% of wheat bran + hay ad libitum, T3,50% of VN (*Vechilla nilotica* leaf) + 50% of wheat bran + hay ad libitum, T4,50% of VBL (*Vechilla brevispica* leaf) + 50% of wheat bran. T5,50% MBS (mixture of three browses species) + 50% Wheat bran+ hay ad libitum. Carcass weight were recorded T1 (9.67kg), T2 (9.52 kg), T3 (9.15kg), T4 (9.10kg) and T5 (8.60kg) respectively. Dressing percentage based on empty body weight (55.10-53.92%) and slaughter based (44.95-43.66%) and rib eye muscle area were not significant (P>0.05) among the dietary treatments.

Keywords: Borana Goats, browses, Carcass Characteristics, Native Pasture, Ad libitum

1. Introduction

The value of farm animals for meat production is partly determined by the rate of growth and carcass yield. Meat producing potential of animals is reflected mainly by their rate of gain, weight at slaughter, dressing percentage and prolificacy (Payne, 1990). Moreover, Carcass quality is best described in terms of its composition and palatability based on its weight and dressing percentage. However, nutrition has much

influence on growth rate and body composition. Carcass quality is the best describe in terms of its composition and palatability. Goat meat contains 71% moisture, 18.7% protein, 9.4% fat, 11% calcium and 2.2% iron (Ensiminger, 2002). The value of carcass depends on the proportion of lean meat, fat, bone and connective tissue as well as on the quality of fat and lean meat (Wilson, 1992). Dressing percentage and which is the ratio of dressed carcass weight to live weight of animals or empty body weight is an

important trait in carcass quality consideration. Edible and non edible offal should take into consideration. Dressing percentages of goats ranges from 37-55 % (Ensimineger, 2002). It is affected by breed, age, and castration (Kirton, 1970, Owen and Norman, 1977). Therefore, this study was conducted to evaluate carcass characteristics of intact male Borana goats supplemented with three selected browses species mixed with wheat bran.

2. Specific objectives

✓ To study the effect of supplementing browses species mixing with wheat bran on carcass characteristics of intact male Borana goats fed a basal diet of natural pasture hay.

3. Materials and Methods

3.1. Study Area Description.

The experiment was conducted at Yabello Pastoral and Dry land Agriculture Research Center (YPDARC) which is located at 564 km from Addis Ababa in Southern Borana Zone of Oromia Regional State. Yabello is located at 1350- 1800 meter above sea level(m.a.s.l.) and it is located between latitude 4°30'55.81 and 5° 24'36.39 N and longitude 7° 44'14.70 and 38° 36'05.35 E. The district covers a total area of 5426km². Generally, the altitude of the Borana rangelands is within the range of 1000–1500m above sea level (m.a.s.l) with few hills up to 2000 m.a.s.l (Coppock 1994).

3.2 Carcass Evaluation

Following the digestibility trial, all experimental bucks from each feeding treatment were deprived off feed and water overnight and weighed before slaughter. The non-edible offal components (NEOC) are, head without tongue, skin and feet, spleen, genital organ, lung, trachea, gall bladder, pancreas, bladder and the gut fill. Whereas, the edible offal components (EOC) are, kidney fat, testes, genital fat, heart fat, liver, heart, kidney, esophagus), blood, abdominal fat, tongue, stomach and intestine, both small and large intestine.

EBW: was recorded as the difference between slaughter weight and gut contents. HCW: was estimated after removal of weight of head, skin, thoracic, abdominal and pelvic cavity contents as well as legs below the hock and knee joints. Whereas calculation of ribs eye muscle was accomplished by

tracing and drawing the 11th and 13th cross section using transparent paper. The value for rib-eye area is the average of the right and left sides on 12th rib (Torell and Suverly, 2004). Dressing percentage as proportions of hot carcass weight to slaughter weight and empty body weight was computed as follows:

DP (Based on Empty Body Weight)

$$= \left(\frac{\text{Hot Carcass weight (kg)}}{\text{Empty Body Weight (kg)}} \right) \times 100$$

DP (Based on slaughter weight)

$$= \left(\frac{\text{Hot Carcass weight (kg)}}{\text{Slaughter weight (kg)}} \right) \times 100$$

4. Results and Discussion

4.1 Carcass Characteristics

4.1.1. Hot Carcass Weight and Dressing Percentages

Mean of slaughter body weight(SBW), Carcass parameters of experimental goats are summarized in table 5. The mean values of the slaughter weight (SW) and empty body weight (EBW) were significantly ($p < 0.001$) higher for goat supplemented with T1 and T2, medium weight was recorded between T3 and T4 and lowest weight recorded goats supplemented with treatment T₅. Hot Carcass weights of slaughtered goats were significantly different ($P < 0.001$) among treatment and it was range from 8.60 to 10.08kg. There were no significance difference ($p > 0.05$) hot carcass weight between goats supplemented T1 (9.67kg) and T2 (9.52kg), T3 (9.15kg) respectively. The absence of significant difference among goats in T1 and T2, T3 and T4 indicates that variation among basal diet intakes had no effect on these carcass parameters. Whereas, the lowest hot carcass weight was observed in goats supplemented T₅ (8.6kg). This was due to the fact that there is a difference on slaughter body weight and final body weight of experimental goats after digestion trial was conducted.

The value of hot carcass weight in the present study was in the range of 6.9-11.9 reported by Simret (2005) for Somali goat and 6.2-10.6kg reported by Matiwas (2008) for Sidama goat. The hot carcass on current study was lower than a comparative study conducted between Borana and Arsi-Bale goat under different

duration of feedlot management regimes indicated that Borana goats have heavier carcass weight (11-14kg) and carcass length (73-78cm) than Arsi-Bale goats (6-8kg and 65-69cm) due to their superior growth rate (Hailu *et al.*,2005). The carcass weight recorded in the

present study was higher than the value of 6-8kg reported for Arsi-Bale goats (Hailu *et al.* 2005). But, it was similar with the finding of Dereje (2014) within the values of 10.8-11.3kg for the same breed.

Table 1: Hot Carcass, Empty body weight, ribs eye muscle area and killing out percentages of Borana goat supplemented browses species mixed with wheat bran.

Parameter	Treatments					SEM	SL
	T1	T2	T3	T4	T5		
PSW(kg)	22.12 ^a	22.28 ^a	21.12 ^{ab}	21.00 ^{ab}	20.24 ^b	0.56	***
SBW(kg)	21.50 ^a	21.78 ^a	20.40 ^{ab}	20.70 ^{ab}	19.60 ^b	0.59	***
EBW(kg)	17.54 ^a	17.64 ^a	16.71 ^{ab}	16.80 ^{ab}	15.86 ^b	0.51	***
HOCW(kg)	9.67 ^a	9.52 ^a	9.15 ^{ab}	9.10 ^{ab}	8.60 ^b	0.31	***
DPEBW	55.10	53.92	54.84	54.17	54.20	0.64	ns
DPSBW	44.95	43.66	44.90	43.95	43.87	0.61	ns
REA(cm ²)	10.08	9.75	9.58	9.95	9.03	0.40	ns

^{a,b} means with different superscripts in the same row differ significantly ***= $p < 0.001$ ns=not significant, SBW=slaughter weight, HOCW=hot carcass weight, DPSBW=dressing percentage based on slaughter body weight, DPEBW=dressing percentages empty based on body weight, REA=Ribs eye muscle area, EBW=empty body weight, T1=37% of noug cake + 63% wheat bran + hay ad libitum, T2=50% of APT + 50% of wheat bran + hay ad libitum, T3=50% of AN + 50% of wheat bran + hay ad libitum, T4=50% of ABL + 50% of wheat bran + hay ad libitum, T5=50% MBS + 50% Wheat bran+ hay ad libitum.

Dressing percentage based on slaughter weight and empty body weight were similar ($P > 0.05$) among the dietary treatments with over all mean of 44.27 and 54.45%, respectively. The overall mean of dressing percentages of Borana goats are 44.27%.which similar with the Afar goats (44.5%) reported by Abera *et al.* (2002). Similarly, carcass dressing percentage of Afar, Central Highland and Long-eared Somali goat breeds fed under intensive management system was reported 44.6, 42.5 and 43.7% respectively, which is similar with the present finding (Ameha *et al.*, 2007). However, this result was found lower than the DP of 48.5% reported for Somali goat breeds, kept under intensive management system, that were supplemented with concentrate mixture of different proportion of peanut seed cake and wheat bran (Melaku and Betsha, 2008).

Dressing percentage on the basis of empty body weight were 55.10%, 53.92%, 54.84%, 54.17 and 54.20%, for T₁, T₂, T₃, T₄, and T₅ respectively. In the current study dressing percentage of yearling Borana goats based on SBW and EBW similar with Arsi Bale goat 45.5-46.2 and 51.8-53% reported by Dereje (2014). Dressing percentage values on the empty body

weight basis were obviously higher than on slaughter weight basis. Devendra and Burns (1983) reported that dressing percentage can be influenced by many factors such as age, sex and plane of nutrition. However, carcass of dressing percentage did not show significant difference among the supplement in present study. Because of no greater difference in slaughter body weight, empty body weight of goats of experimental animals. .

4.5.2. Ribs Eye muscle Area

The ribs eye muscle area ranged from 9.03-10.08cm². The supplemented diets did not bring the significance difference on ribs eye muscle area (table 5). This study similar with finding of Dereje (2014) for Hararghe high land and short eared Somali goats with the value of 9.8cm² and 8.8cm² respectively and Greater than Niguse (2014) reported on Abergelle goats supplemented chopped *euphorbia tirucalli* twigs and dry *Acacia albida* Pods with hay as basal diet which ranges from 5.1 to 8.5cm². Chestnut (1994) repoted that plane of nutrition had no effect on rib eye muscle area.

There are different reports that indicated rib eye muscle area to increase with increasing level of concentrate supplementation. Simret (2005) reported values of rib eye muscle area 4.8, 6.88, 7.88 and 7.16 cm² for Somali goat fed on grass hay and supplemented with graded level of peanut cake and wheat bran mixture of 0, 200, 300 and 400g, respectively, which are lower than the values in this study.

4.1.2. Non carcass component

Non carcass components are given in Table 6 and 7. Non carcass components are categorized into edible and non edible based upon the tradition of the people and their preference in the study area. Due to differences in taste and in eating habits, what are saleable and edible proportions of the carcass in one area of the country may not be the same for another (Seid, 2010 cited in Dereje, 2014).

4.1.3. Edible Carcass Component

Non carcass edible offal obtained from the slaughter Borana goat supplemented browses species mixed with wheat bran and hay as basal diet is indicated in table 6. In the present study, heart, kidney, blood and total edible offal Component were significantly (p<0.05) affected by supplementation (Table 6). Total

edible offal of supplemented goats ranges from 3.93-4.51 kg from the current finding. The value of heart, kidney, blood and total edible offal significantly different (P<0.05) among the dietary treatments in which T1 has the largest value followed by treatment two. In line with the present study Michael Yirdaw and Mainsheet Tesfay (2014) reported the significance difference on heart, liver with gallbladder, total fat, tail, kidney and total edible offal Component for Tigray highland sheep fed wheat straw supplemented with mixtures of wheat bran and cotton seed cake.

The total edible offal components were significantly higher in treatment one (p<0.05) 4.51kg It is higher than the finding of Niguse (2014) which is ranges from 1.1-1.5kg for Abergelle goat supplemented *chopped euphorbia tirucalli twigs and dry acacia albida pods*. This may be due to weight of slaughtering and age of animals. However, the total edible offal (2.8-3.2 kg) reported for Hararghe highland goats (Asnakew and Berhan, 2007) and Sidama goats (Tadesse *et al.*, 2013) which are lower than the present study. However, there was no significant difference (p>0.05) on the combined weight of liver, empty gut, tongue, testicles due to supplementation. The percentage of total edible offal component based on slaughter body weight was not significant and more usable product obtained within the current study.

Table 2: Overall mean and SEM of edible carcass offal of borana goats supplemented browses species mixed with wheat bran fed native hay basal diet.

Parameters	Treatment					SEM	SL
	T ₁	T ₂	T ₃	T ₄	T ₅		
Liver(g)	484.9	463.9	424.1	467	436.9	11.92	ns
Heart(g)	98.7 ^a	91.5 ^{ab}	81.02 ^b	83.1 ^b	88.8 ^{ab}	2.23	***
Kidney(g)	81.8 ^a	74.4 ^{ab}	67.74 ^b	72.7 ^b	67.7 ^b	2.85	***
EG(g)	1709.1	1576.2	1553.9	1606.9	1598.6	25.26	ns
Blood(g)	1444.1 ^a	1345.3 ^{ab}	1219.3 ^b	1180.3 ^b	1165.4 ^b	37.26	***
Tongue(g)	81.9	78.5	70.2	73.6	72.7	1.84	ns
Total fat(g)	309.9	281.3	338.6	260.2	235	16.81	ns
Testicles(g)	208.9	210.3	202.8	213.4	163.9	9.37	ns
Tail(g)	93.8	88.1	72.6	77.9	79	3.73	ns
TEO(kg)	4.51 ^a	4.26 ^{ab}	4.05 ^{ab}	4.06 ^{ab}	3.93 ^b	0.08	***
TEOSW (%)	20.7	19.79	19.84	19.6	20.07	0.18	ns

^{a,b}, Means with different superscripts in the same row differ significantly, * = p < 0.001, ns = non significant, CV = coefficient of variation, SEM = standard error of the mean, SD = standard deviation, EG = empty gut, TEO = total edible offal, SL = significance of the level, T1 = 37% of noug cake + 63% wheat bran + hay ad libitum, T2 = 50% of APT + 50% of wheat bran + hay ad libitum, T3 = 50% of AN + 50% of wheat bran + hay ad libitum, T4 = 50% of ABL + 50% of wheat bran, T5 = 50% MBS + 50% Wheat bran + hay ad libitum.

On average, about 0.285 kg total non-carcass fat was recorded in the present study, which is lower than 0.32 kg and 0.57 kg reported for other Ethiopian indigenous goats (Dereje, 2014 and Ameha et al., 2007) respectively.

4.1.4. Non Edible Carcass Component.

Lung, trachea with esophagus and spleen, ahead without tongue, skin, feet, gut fill and urinary bladder are considered as non-edible offal. Excluding Lung, gut fill, feet and total non edible offal components were not affected (P>0.05) by treatments and indicating that variation in basal diet intake and nutrient in supplementation have no influence on non-carcass parameters. Gut fill differ significantly between treatments (P<0.05) and this showed feeding level had an effect on the weight of gut. The highest

gut fill (4.14kg) was recorded in Treatment two and lowest gut fill (3.67 kg) was recorded in treatment three. In the present experiment the average gut fill ranged from 18.40– 19.04% of live weight in different dietary groups and it was within the ranges of 14.95-23.58% reported by Simret (2005) on Somali goat. However, it was lower than the value of 20.1- 22.3% of live weight reported by Shahjal (2000).

Some non- edible offal, were not significantly impacted by treatments (P>0.05) because, most of these non edible offal are related with activities of the body and are early maturing and as such might not be greatly impacted by dietary treatment. Weight of skin goats supplemented with the concentrate and browses species mixed with wheat bran mixture were not significantly affected by (p>0.05) by the treatment diets.

Table 3: Non-carcass non-edible carcass characteristics of yearling borana goat supplemented with different level of browses species mixed with wheat bran hay as basal diet.

Parameters	Treatment					SEM	SL
	T ₁	T ₂	T ₃	T ₄	T ₅		
Lung(kg)	0.212 ^{ab}	0.228 ^a	0.192 ^{bc}	0.202 ^{abc}	0.174 ^c	0.006	*
Twe (kg)	0.162	0.156	0.142	0.144	0.144	0.006	ns
Pan(g)	0.030	0.036	0.040	0.032	0.040	0.002	ns
Hwt(kg)	1.260	1.234	1.230	1.258	1.182	0.015	ns
Skin(kg)	1.268	1.292	1.278	1.440	1.210	0.036	ns
Feet(kg)	0.604 ^a	0.596 ^a	0.568 ^a	0.504 ^b	0.514 ^b	0.011	ns
Gut fill(kg)	3.960 ^{ab}	4.140 ^a	3.690 ^b	3.904 ^{ab}	3.738 ^b	0.057	*
Ubl(g)	0.014	0.012	0.012	0.012	0.012	0.001	ns
Pen (g)	0.056	0.050	0.048	0.046	0.058	0.003	ns
Tneo(kg)	7.572 ^{ab}	7.754 ^a	7.198 ^{ab}	7.542 ^{ab}	7.068 ^b	0.103	*
Tneo(SW)	0.352	0.356	0.354	0.366	0.362	0.002	ns

^{a,b} Means with different superscripts in the same row differ significantly, SEM=standard error of the mean, Tneo =total non edible offal, Ub=urinary bladder, Hwt=head without tongue, Twe=trachea with esophagus, Pan=pancreases, T1=37% of noug cake + 63% wheat bran + hay adlibitum, T2=50% of VPT + 50% of wheat bran + hay adlibitum, T3=50% of VN + 50% of wheat bran + hay adlibitum, T4=50% of VBL + 50% of wheat bran + hay adlibitum, T5=50% MBS+50% Wheatbran+hay adlibitum

5. Conclusion

In the present study, carcass components measured were significantly influenced by the treatment diets. Bucks fed diets in T1 and T2 had performed better in most of the components measured such as SW, EBW and HCW. However, bucks in T3, T4 and T5 had intermediate value in these parameters. Ribs eye muscle area has no significance difference. Similar value of dressing percentage on EBW basis with T1

and T5 bucks, dressing percentage as a proportion of SW and EBW basis was obtained higher by bucks fed diets in T1 and T2 than the rest treatment groups. Likewise, except few parameters like blood, heart, kidney, total edible and most of the edible offal components were significantly varied among treatments, bucks in T1 and T2 had performed better than the other treatment compared. However, most of the non-edible offal components were not significantly affected by the treatment diets.

6. Recommendation

Based on the current study the following recommendation were generated

- ✓ Supplementation of feed during dry season were improved the carcass weight of the experimental animals.
- ✓ Feeding animals can increase live weight and carcass weight of animals which satisfy the need of market demand during dry season

Pastoralists/Agro-pastoralists should be collect browses species which locally available during its availability and feeding with concentrate during shortage of feed increase the carcass parameter.

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