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Slaughter Component Yield Characteristics of Some Indigenous Goat Types in Ethiopia

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Abstract

Slaughter data from 1547 male indigenous marketable goats (406 Afar, 389 Long-eared Somali, 412 Arsi-Bale and 340 Woyto-Guji,) were analyzed to compare carcass and edible-offal component yields. Dressing percentage (DP) was determined based on slaughter weight (SW). Percentage total edible offal component (PTEOC) was obtained as the sum of weights of blood, lungs (with heart and trachea), liver (with gall bladder), kidneys, omental fat, spleen (with pancreas) and gut empty. Percentage total non-edible offal component (PTNEOC) was obtained as the sum of weights of head (HD), skin (SK), testis with penis (TP) and gut fill total (GFT). Percentage total usable product (PTUP) was calculated as the sum of DP and PTEOC. These variables were computed as proportion of SW. The Afar, Arsi-Bale and Woyto-Guji goat types showed similar ($P > 0.05$) DP values, and they dressed significantly ($P < 0.01$) higher than the Long-eared Somali goat type (45.5 $\pm$ 0.17 %, 45.4 $\pm$ 0.16 %, and 45.2 $\pm$ 0.02 % vs. 43.5 $\pm$ 0.16 %, respectively). However, when PTEOC were considered with the carcass components, and when comparison was made on PTUP basis, the Afar goat type (62 $\pm$ 0.18 %) was superior ($P < 0.01$), followed by Arsi-Bale, Woyto-Guji goats and the Long-eared Somali goat type. Any livestock breed evaluation studies for meat production should emphasize the need to pay attention to the total yield of usable products, rather than the carcass weight and dressing percentages alone, in cultures where edible offal component is traditionally consumed.

Keywords: Dressing percentage, carcass yield, indigenous goats, Ethiopia.

Introduction

Ethiopia has an estimated 16.9 million goats, which ranks 3rd in Africa (next to Sudan and Nigeria) and accounts for 8.3% of the continents goat population (FAO, 1999). Nevertheless, there are only few documented research reports on goats (Workneh, 1992). The available research work on small ruminants mainly focus, on carcass yield and quality and tend not to be concerned with the non-carcass (offal) components (Ewnetu *et al*., 1998), despite the fact that in almost all parts of Ethiopia the offal component yields are important. It is common to find dishes exclusively made from these items (*dulet, milasina-senber, tripa)* in the majority of the restaurants in Addis

Ababa and other big towns of the country (Ewnetu *et al.,* 1998). Moreover, research has shown that the nutritive value of edible offal component items is comparable or even superior to that of the carcass (FAO, 1996).

Singh *et al*. (1985), and Mahgoub and Lu (1998) reported significant breed effect on the yields of carcass and offal components and showed that comparison of carcass characteristics between breeds gives information on the suitability and performance level of these breeds. On account of this background, the present study was carried out to evaluate the slaughter component yields of four Ethiopian indigenous goat types (Afar, Long-eared Somali, Arsi-Bali and Woyto-Guji) using goats slaughtered at the abattoir of the HELIMEX PVT. LTD. Company in Debre Zeit town, Ethiopia.

Materials and Methods

The study location

The study was conducted at Debre Zeit abattoir of HELIMEX (Hashim Ethiopian Livestock and Meat Exporter) Pvt. Ltd. company, Debre Zeit town, which is located about 44 km south east of Addis Ababa, Ethiopia at an altitude of 1800-m. a. s. l. The area receives an annual rainfall of 850 mm in a bimodal distribution. The extended dry season (October to February) has mean minimum and maximum temperatures of 15 and 28°C, respectively and a mean relative humidity of 60 % (HELIMEX, 2000).

Animal source, management and identification

Four Ethiopian indigenous goat types, namely Afar, Long-ear Somali, Arsi-Bale and Woyto-Guji were used in this study. These goat types currently contribute most of the market goats for meat export by the Company (Addisu, 2001). Male goats procured from recognized areas of distribution of these goat types and that fulfil key-identifying features (FARM-Africa, 1996) were selected and identified for the study. These animals are considered to have been maintained under traditional management. Habitually purchased animals are transported on specialized tracks from markets directly to the abattoir with provision of feed and water enroute. They are then maintained at resting pens for about 10 days with ad-libitum provision of feed (grass hay, crop residues) and water. Experimental animals were selected at this stage and transferred for slaughter.

Data collection

Using goat type as the stratifying variable, a total of 1547 male goats, randomly selected from 13670 goats slaughtered during the study period (21 September to 30 December, 2000) were used for this study. By goat type the sampled population consisted of 406 Afar, 389 Long-eared Somali, 412 Arsi-

Bale and 340 Woyto-Guji goats. These animals were properly identified to follow them through the slaughter process. All of these animals were kept without feed and water overnight (about 12 hrs) to have fasted weight for slaughter. Slaughter weight (SW) was taken about 30 minutes before slaughter.

The weight of blood (BLD), skin (SK), head (HD), hot carcass (CAR), liver with gall bladder (LV), lungs with heart & trachea (LU), testis with penis (TP), spleen with pancreas (SPP), omental fat (FAT), kidneys (KID), gut fill total (GFT) and empty gut (EG) were recorded during the slaughter process to the nearest 0.05 kg. Dressing percentage (DP) was based on CAR. Percentage total edible offal component (TPEOC) was taken as the sum of BLD%, LU%, LV%, SPP%, GE%, FAT% and KID%. Percentage total non-edible offal component (PTNEOC) was computed as the sum of HD%, SK%, TP% and GFT%. Percentage total usable product (PTUP) was taken as the sum of DP and PTEOC.

Data analysis

Data were analyzed by the General Linear Model procedures of Statictical Analysis System (SAS, 1999) to compare carcass traits between the goat types.

Results and Discussion

Overall and sub-class least square means by goat type, coefficient of determination and coefficient of variation for some important carcass characteristics are presented in Tables 1 and 2. In addition plots of linear regression of SW on DP, PTEOC and PTUP presented in Figures 1, 2 and 3.

Table 1. Least square means (± SE) for some carcass characteristics of some indigenous goat types in Ethiopia.

Traits	R^2 (%)	Mean (±SE)	CV (%)	Afar	L.E. Somali	Arsi-Bale	Woyto-Guji
SW[1]	88	19.4 ± 0.03	5.6	18.6 ± 0.11[d]	20.3 ± 0.1[b]	21.0 ± 0.10[a]	19.4 ± 0.09[c]
DP	46	44.5 ± 0.04	3.9	45.5 ± 0.17[a]	43.5 ± 0.16[b]	45.4 ± 0.16[a]	45.2 ± 0.15[a]
PTEOC	26	16.1 ± 0.02	4.8	16.5 ± 0.07[a]	16.3 ± 0.07[a]	15 8 ± 0.07[b]	15.9 ±0.06[b]
PTUP	44	60.6 ± 0.05	3.1	62.0 ± 0.18[a]	59.8 ± 0.18[c]	61.2 ± 0.17[b]	61.1 ± 0.16[b]
PTNEOC	44	39.4 ± 0.1	4.7	38.0 ± 0.18[c]	40.2 ± 0.18[a]	38.8 ± 0.17[b]	38.9 ± 0.2[b]

Note: Means within a trait in the same row with different superscripts differ significantly ($p < 0.05$).

[1]=SW (slaughter weight), DP (dressing percentage), PTEOC (percentage total edible offal component), PTUP (percentage total usable product), PTNEOC (percentage total non-edible offal component0, CV, coefficient of variation; R^2, coefficient of determination; SE, standard error of difference;

Even though significant (at least $P < 0.05$) difference exists in SW between types, Afar, Arsi-Bale and Woyto-Guji goat types had no significant difference ($P > 0.05$) in DP values; and they dressed significantly ($P < 0.01$)

higher than the Long-eared Somali goats. However, if PTEOC were also considered with DP, and comparison was made on PTUP basis, then Afar goats become significantly ($P < 0.01$) superior, followed by Arsi-Bale or Woyto-Guji types (Table 1). The value of dressing percentage observed in this study for Afar goats (45.5 ± 0.17 %) was different from the report of Solomon *et al.* (1991), but only 18 samples were used in the latter compared to 406 in the present study.

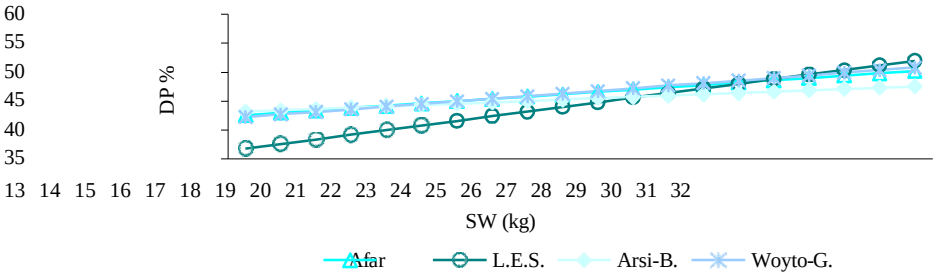
Despite the highest proportionate total non-edible offal component (PTNEOC) in the Long-eared Somali goat breed type, the share of proportionate values of head in the corresponding goat breed type (6.9 ± 0.06
%) was significantly ($P < 0.01$) lower than the values found in the other goat breed types. This could be attributed to the relatively short horns, and hence smaller head size of the Long-eared Somali goat type possesses as compared to the other goat breed types (Table 2). This result is consistent with an earlier report by FARM-Africa (1996), where it was reported that this breed type had the shortest male horn length among Afar, Arsi-Bale and Woyto-Guji. Among the means compared the most varied values were observed in spleen with pancreas and omental fat (FAT) which had coefficient of variation of 29.9 % and 17.4 %, respectively (Table 2).

Table 2. Least square means (± SE) for different carcass variables of indigenous goat types in Ethiopia.

Variables	R^2 (%)	Mean (±SE)	CV (%)	Afar	L.E. Somali	Arsi-Bale	Woyito-Guji
BLD%[1]	42	3.2 ± 0.01	8.5	3.5 ± 0.03^a	3.2 ± 0.03^b	3.0 ± 0.02^c	3.1 ± 0.02^c
LU%	35	1.8 ± 0.004	8.8	1.9 ± 0.02^a	1.7 ± 0.02^c	1.7 ± 0.01^c	1.8 ± 0.01^b
LV%	37	1.9 ± 0.01	9.7	2.0 ± 0.02^a	1.8 ± 0.02^c	1.8 ± 0.02^c	1.9 ± 0.02^b
SPP%	22	0.5 ± 0.004	29.9	0.6 ± 0.01^b	0.7 ± 0.01^a	0.5 ± 0.007^c	0.4 ± 0.01^d
GE%	13	7.7± 0.001	5.5	7.6 ± 0.04^b	7.8 ± 0.04^a	7.9 ± 0.04^a	7.9 ± 0.04^a
FAT%	66	0.7 ± 0.003	17.4	0.6 ± 0.01^c	0.9 ± 0.01^a	0.7 ± 0.01^b	0.6 ± 0.01^c
KID%	51	0.25 ± 0.0004	6.2	0.2 ± 0.002^d	0.2 ± 0.001^d	0.4 ± 0.001^a	0.3 ± 0.001^b
PTEOC	26	16.1 ± 0.02	4.8	16.5 ± 0.07^a	16.3 ± 0.07^a	15.8 ± 0.07^c	15.9 ± 0.06^b
HD%	50	7.6 ± 0.02	7.8	7.8 ± 0.06^a	6.9 ± 0.06^c	7.4 ± 0.05^b	8.0 ± 0.05^a
SK%	17	11.1± 0.03	9.1	10.7 ± 0.1^b	11.1 ± 0.1^a	11.1 ± 0.1^a	11.3 ± 0.1^a
TP%	95	1.3 ± 0.002	5.6	1.1 ± 0.006^b	1.0 ± 0.01^c	1.1 ± 0.06^b	1.2 ± 0.01^a
GFT%	20	19.5 ± 0.06	11.9	18.4 ± 0.2^c	21.2 ± 0.2^a	19.2 ± 0.2^b	18.6 ± 0.2^c
PTNEOC	44	39.4 ± 0.1	4.7	38.0 ± 0.18^c	40.2 ± 0.18^a	38.8 ± 0.17^b	38.9 ± 0.2^b

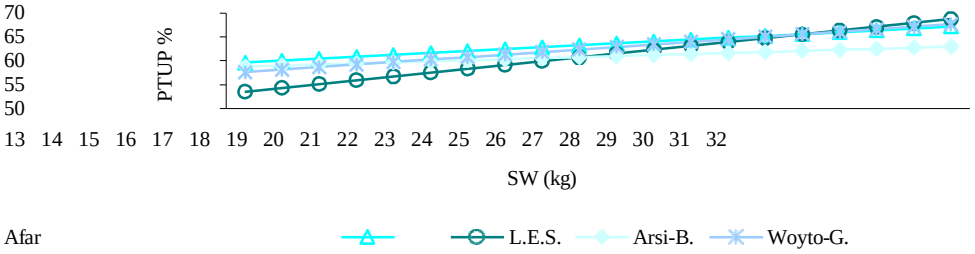
Note: Means within a trait in the same row with different superscripts differ significantly ($p < 0.05$).

[1]BLD (blood), LU (lung with heart), LV (with gall bladder), SPP (spleen with pancreas), GE (gut empty), FAT (omental fat), KID (kidneys), PTEOC (percentage total edible offal component), HD (head), SK (skin), TP (testis with penis), GFT (gut fill total), PTNEOC (percentage total non-edible offal component), CV, coefficient of variation; R^2 coefficient of determination; SE, standard of difference;



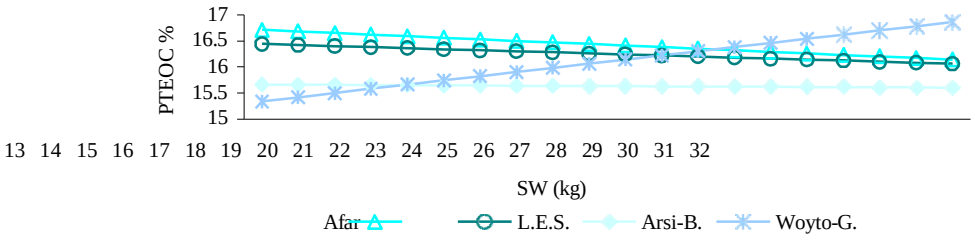
Note: DP, dressing percentage; SW, slaughter weight in kg; Afar, Afar goat type; L.E.S., Long-eared Somali goat type; Arsi-B., Arsi-Bale goat type ; Woyto-G., Woyto-Guji goat type;

Figure 1. Linear regressions comparing dressing percentage increase in relation to slaughter weight in indigenous goat types.



Note: PTUP, percentage total usable products; SW, slaughter weight in kg; Afar, Afar goat type; L.E.S., Long-eared Somali goat type; Arsi-B., Arsi-Bale goat type ; Woyto-G., Woyto-Guji goat type;

Figure 2. Linear regressions, comparing percentage total usable products increase in relative to slaughter weight.



Note: PTEOC, percentage total edible offal component; SW, slaughter weight in kg; Afar, Afar goat type; L.E.S., Long-eared Somali goat type; Arsi-B., Arsi-Bale goat type ; Woyto-G., Woyto-Guji goat type;

Figure 3. Linear regressions, comparing percentage total edible offal component in relative to slaughter weight.

Dressing percentage values were the least for the Long-eared Somali up to 24 kg slaughter weight, and it improved for higher weights. On the other hand, the Arsi-Bale goats had the lowest DP beyond 24 kg slaughter weight (Figure 1).

Because PTEOC appears to follow the same trend as DP, the Long-eared Somali had the lowest PTUP up to 24 kg and thereafter the Arsi-Bale had the lowest value (Figure 2). The explanation for this trend is presented in Figure 3 where the proportion of edible offal is more stable over the observed range of SW for the Arsi-Bale goats whereas it declines for the Long-eared Somali goats. A more striking observation was the continuous rise of PTEOC for the Woyto-Guji goats over the same SW range. These relationships combined with ages of slaughter animals could have provided the relative production potential for meat and edible offal; however, this study does not provide data on age of slaughter animals.

From these results on carcass traits, Arsi-Bale and Woyto-Guji goat breed types were more closely related than with the others, and this observation is consistent with earlier results of Workneh (1992), Alemayehu (1993), on breed similarities.

Conclusion

From the results obtained under the conditions of this study, it can be concluded that, comparatively more proportionate total usable products was obtained in Afar goats up to 24 kg and this was mainly due to their higher values of DP with PTEOC up to 24 kg than the other goat breed types. The value of overall PTNEOC (40.2 ± 0.18 %) was significantly ($P < 0.01$) different and was the highest in Long-eared Somali goat type. The low production of consumable slaughter component from these animals was a result of the greater share of PTNEOC.

Any goat breed evaluation studies for meat production should emphasize the need to pay attention to the total yield of usable products, rather than only to the carcass weight and dressing percentages, in cultures where edible offal components are traditionally consumed. Inclusion of this edible offal with carcass in breed comparison may help understand farmer and consumer preferences for certain breeds.

The data collection methodologies developed and tested in this study could well be used for related exploratory livestock studies in abattoirs.

Because the consumption of the non-carcass component widely differs from place to place, the figures reported in this study should be interpreted with caution. The items included in this work as edible may not be consumed in some parts of the country; and some of them, which were considered non-

edible (e.g. testicles and the head), may be consumed in other parts. Furthermore, since the slaughter was not specifically designed for this purpose, items like tongue were not weighed individually and, thus, were not included in the analysis of edible offal. Additionally, the flesh on the head was not dissected and, thus, not included in the edible offal. On the other hand, because gall bladder and liver were weighed together, gall bladder was considered as edible offal.

Pictures of representative goat breed types used for the study

Afar goat breed type

Long-eared Somali goat breed

Arsi-Bale goat breed type

Woyto-Guji goat breed

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