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Carcass Traits of Arsi-bale Sheep and Goat Reared under Farmers Management System in Sidama Region of Southern Ethiopia

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Abstract: The study pertains to carcass traits of Arsi-Bale sheep and goats of <1 year and > 1 year but < 2 years reared by the small holder farmers in Southern region of Ethiopia. The results indicate that the average body weight of the slaughtered animals were lower than those reported earlier by several authors. The average weight of the skin, liver, lungs, kidneys for both Arsi-Bale sheep and goat are comparable to the earlier reported works on tropical sheep and goat breeds. The average dressing percentage for sheep varied between 43.7 and 45.98% while the same varied between 47.9 and 51% for goats. The dressing percentage too was comparable with several sheep and goat breeds raised in Ethiopia. It can be concluded that Arsi Bale sheep and goats are potential breeds which can be improved for mutton and chevon production if they are provided with better nutrition and management.

Key words: Arsi-Bale · Sheep · Goats · Carcass traits

INTRODUCTION

The present study was conducted on some Arsi Bale sheep and goat breeds that were reared under natural pasture under extensive management system. Arsi Bale sheep and goats are predominantly found in the southern region of Ethiopia and are reared for meat and social functions. The sheep and goats sheep and goats are mostly raised by the small holder farmers, who are often exploited by the middlemen when it comes to the whole of value chains. It has been assessed that there is a rising demand for chevon and mutton within Ethiopia and there are chances of the same being exported to the neighboring countries. However, it has been assessed that there is a need for improving the productivity of the small ruminants in order to meet the international carcass standards, the carcass traits are fallout of several factors which are both genetic and non genetic in nature Casey *et al*. [1] 2003 and Dhanda *et al*. [2] (2003). Majority of the animals depend upon natural pasture besides crop residues to meet their nutritional requirements, it has been observed that the quality and quantity of the pasture fluctuates seasonally thereby affecting the growth and carcass quality and quantity of the animals, the present manuscript assesses the carcass qualities of Arsi Bale sheep and goats of different ages which were raised under farmers management conditions.

MATERIALS AND METHODS

The study pertains to 101 (rams and ewes) and 56 (bucks and does) of age groups <1 year and > 1 year but < 2 years. The age of the sheep and goats were determined using the dentition method as suggested by Charray *et al*. [3]. Animals were procured for slaughter from the regional markets and were rested for 48 hours and fasted overnight prior to the slaughter. The sheep and goats were weighed prior to the slaughter on a spring balance with ± 100 grams error. The slaughtering was carried out by severing the jugular vein and the carotid arteries to ensure proper bleeding. The traits estimated were weight of the head, weight of the skin and trotters, weights of the heart, lungs and liver, weight of the spleen, kidneys and testis in case of the males. The stomach and intestine were not cleared of the ingesta and the dressing percentage was calculated according to the method suggested by, BIS [4]. The data was analyzed statistically using descriptive statistics. The weight of the carcass traits were compared between the sexes across an age group using one way ANOVA, using SPSS V12. (2003) for Windows.

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RESULTS AND DISCUSSION

The average body weight and the weight of the different carcass parameters are presented in Table 1. It transpires from the table that the average weight at slaughter for the rams aged < 1year and >1 year but < 2years (was similar to the observations of Abebe *et al*. [5] For yearling sheep. The values also indicate that the average slaughter weight of the ewes is higher than the rams though not significant. The values pertaining to the weight of the head (on percentage of the live weight) did not vary much between the sexes and the age groups, the values as obtained in the study are lower than the values reported by [5] for black head Ogaden and Washera sheep respectively. Similarly higher values for Arsi Bale rams have also been reported by Tafa *et al*. [6] (2009). The low body weight values for as obtained in the study may be attributed to the effect of raising the sheep on the natural pasture without supplementation as is practiced among the small holder farmers in the region. Due to poor nutrition and parasitic load the true genetic potential of the animals cannot be expressed. The observations are in consonance with the reports of Seyoum and Zinash [7] (1995) and Tsige [8] (1999). The results obtained by [6] (2009) further indicate there is a decrease in body weight of Arsi Bale sheep raised on natural pasture alone vis-α-vis those who were raised on concentrate diet, the findings being in agreement with the observations of this study. The average weight of the head as obtained in the present study is lower than the values reported by [5]. The values when compared on percentage basis agree well with the observations of [5]. The weight of the head (on percentage of the lives weight) as assessed in this study is higher than those reported by Banerjee [9] (2011) and Mousa [10] (2011). The weight of the skin is dependent on the breed of sheep and the coat type the short coated being lighter than those with wool or hairs. Skin of small ruminants is important in the Ethiopian context (Abadi, [11] 2000; Mahmud, [12] 2000 and Abebe *at al*. [5] 2010),

Table 1: Carcass traits of Arsi Bale sheep (Mean± SD) breed at different age and sex groups

Trait*	Ram <1 N=29	Ewe < 1 year N=29	Ram > 1year but< 2 Year N=24	Ewe > 1year but< 2 year N=19
Slaughter weight (WBS)	10922.8±1176.5	11071.3±1188.4	11562.9±975.8^{A}	11364.2±1105.4^{B}
Weight of the head (WHD)	1075.9±268.1	1079.3±250.9	1029.2±135.9	1110.5±199.0
	(9.8)^{a}, (21.75)^{b}	(9.89)^{a}, (21.99)^{b}	(8.9)^{a}, (19.35)^{b}	(9.7)^{a}, (22.32)^{b}
Weight of skin and trotters (WSk)	1831.0±240.7	1872.4±296.0	1929.2±264.1^{A}	1876.3±203.0^{B}
	(16.7)^{a}, (37.01)^{b}	(16.9)^{a}, (38.16)^{b}	(16.6)^{a}, (36.28)^{b}	(16.5)^{a}, (37.72)^{b}
Weight of heart	82.9±4.5	83.6±4.8	85.0±8.8	84.2±5.1
	(0.75)^{a}, (1.67)^{b}	(0.75)^{a}, (1.7)^{b}	(0.73)^{a}, (1.6)^{b}	(0.74)^{a}, (1.7)^{b}
Weight of lungs and trachea	325.9±73.9	322.8±72.4	335.4±42.9	354.2±85.7
	(2.98)^{a}, (6.58)^{b}	(2.91)^{a},(6.78)^{b}	(2.9)^{a},(6.3)^{b}	(3.1)^{a}, (7.1)^{b}
Weight of liver	317.2±98.5	336.2±99.9	329.2±91.9	323.7±78.9
	(2.9)^{a}, (6.41)^{b}	(3.0)^{a}, (6.85)^{b}	(2.84)^{a},(6.19)^{b}	(2.84)^{a},(6.5)^{b}
Weight of stomach**	870.0±126.6	869.0±158.3	1014.6±174.1^{A}	940.0± 176.4^{B}
	(7.96)^{a},(17.58)^{b}	(7.8)^{a},(17.71)^{b}	(8.7)^{a},(19.08)^{b}	(8.27)^{a},(18.89)^{b}
Weight of intestine**	724.1±118.5	734.5±110.6	737.9±122.8	799.0±132.6
	(6.6)^{a},(14.6)^{b}	(6.6)^{a}, (14.97)^{b}	(6.3)^{a},(13.87)^{b}	(7.03)^{a}, (16.06)^{b}
Weight of spleen	25.9±5.0	26.9±6.6	25.4±5.1	26.3±4.9
	(0.23)^{a},(.52)^{b}	(0.24)^{a}(.54)^{b}	(0.21)^{a}(.47)^{b}	(0.23)^{a}(.53)^{b}
Weight of testis	110.2±20.5		122.4± 26.2	
	(1)^{a}(2.22)^{b}		(1.05)^{a}(2.3)^{b}	
Weight of kidneys	76.3±5.5	82.4±2.2(0.74)^{a}	85.7±4.5	82.2±5.4
	(0.69)^{a}(1.54)^{b}	(1.67)^{b}	(0.74)^{a}(1.6)^{b}	(0.72)^{a}(1.65)^{b}
Hot carcass weight	4946.6±587.8	4906.4±784.0	5317.5±565.2	4973.9±443.6
Dressing percentage	45.28±2.8	44.31±3.2	45.98±2.7	43.7±3.2

*Unit of measurement for all traits is gram.

**the weight of stomach and intestine includes stomach and intestine content, respectively.

^{a} Percentage with respect to live weight, ^{b} Percentage with respect to eviscerated weight

^{A,B} values across columns of each age category differ $p<0.05$

the weight of the skin as observed in this study finds a close agreement with that of Abebe *at al*. [5] (2010) Weight of the heart, liver and spleen (on percentage basis) as obtained in the study is in close agreement with the observations of Abebe *et al*. [5] (2010) while the value as assessed in the study is higher than those reported by Mioè *et al*. [13] (2007). The weight of the lungs and heart as assessed by Mousa [10] (2011) was higher than those obtained in the present study but was lower if the values were taken as a proportion to the live weight of the animals studied. The higher values as reported by [10] may be attributed to the difference in breed. The weight of the stomach, intestines (including ingesta) as assessed in the study is lower than those reported by Mioè *et al*. [13] and also Sultana *et al*. [14] (2010), the lower values may be attributed to partial fasting of the sheep prior to slaughter. This may also be attributed to the adaptability of the sheep to the low maintenance ration as most of the small holder farmers are unable to provide concentrates to the livestock they own, these observations are in consonance with the observations of Johnson *et al*. [15] and NRC[16] The dressing percentage of rams and ewes of different age groups as assessed in the present study is lower than the values reported by Snowder *et al*. [17] 1994 (for Rambouillet, Targhee, Columbia and Polypay sheep breeds), Mioè *et al*. [13] (2007) and Abd El-aal and Suliman[18] (2008), the values as assessed in the study are however comparable with the Katahdin breed of sheep but lower than Dorper and Sufflok (Burke and Apple, [19]2007). The dressing percentage results as assessed in the present study are comparable with the reports of Abdul Aziz *et al*. [20] (1999) for sheep reared on silage, similar results were also obtained by Bhat *et al*. [21] (1978) for Chokla sheep Gopalkrishnan and Morleymohanlal[22] (1985) for Madras red sheep, Roque *et al*. [23] (1999) for Romanov sheep, Banerjee[24] (2004) for Garole sheep and Banerjee, [9] (2011) for Sahabadi sheep of Eastern India. As observed by Dani *et al*. [25] (1985) the dressing percentage of sheep can vary between 35 and 45 percent and depends largely on slaughter weight of the animals. Banerjee [9] (2011) was in opinion that the dressing percentages of different breeds differ and can be improved by some extent by both feeding and management. The sheep in the present study were raised solely on grazing with lack of veterinary care and balanced feeding which can depress growth and thereby

Table 2: Carcass traits of Arsi-Bale goats (Mean± SD) breed at different age and sex groups

Trait *	Buck <1 year N=17	Doe <1 year N=13	Buck > 1year but< 2 Year N=14	Doe> 1year but< 2 years N=12
Slaughter weight (WBS)	10408.8±1252.1^{B}	12416.0±1545.0^{A}	12355.0±2388.0^{B}	13409.2±2275.8^{A}
Weight of the head (WHD)	888.2±112.5^{B}	1063.3±163.1^{A}	1214.3±312.8^{A}	1108.3±182.0^{B}
	(8.5)^{a}(16.69)^{b}	(8.56)^{a}(18.04)^{b}	(9.8)^{a}(20.15)^{b}	(8.2)^{a}(18.4)^{b}
Weight of skin and trotters (WSk)	1664.7±190.2^{B}	1806.7±201.7^{A}	1932.1±336.0^{A}	1829.2±435.1^{B}
	(15.9)^{a}(31.28)^{b}	(14.5)^{a}(30.65)^{b}	(15.6)^{a}(32.06)^{b}	(13.6)^{a}(30.36)^{b}
Weight of heart	80.0±5.0	74.3±8.2	76.4±8.4	84.2±5.1
	(0.76)^{a}(1.5)^{b}	(0.59)^{a}(1.26)^{b}	(0.61)^{a}(1.26)^{b}	(0.6)^{a}(1.4)^{b}
Weight of lungs and trachea	291.2±50.7^{B}	336.7±64.0^{A}	321.4±67.1	333.3±68.5
	(2.79)^{a}(5.47)^{b}	(2.71)^{a}(5.7)^{b}	(2.6)^{a}(5.3)^{b}	(2.5)^{a}(5.5)^{b}
Weight of liver	288.2±51.6^{B}	323.3±67.8^{A}	332.1±72.3	337.5±56.9
	(2.76)^{a}(5.41)^{b}	(2.6)^{a}(5.5)^{b}	(2.7)^{a}(5.5)^{b}	(2.5)^{a}(5.6)^{b}
Weight of stomach**	723.5±160.2^{B}	982.6±283.9^{A}	997.9±479.3^{B}	1101.7±279.7^{A}
	(6.95)^{a}(13.59)^{b}	(7.9)^{a}(16.7)^{b}	(8.0)^{a}(16.6)^{b}	(8.21)^{a}(18.3)^{b}
Weight of intestine**	691.2±110.7^{B}	830.0±199.8^{A}	750.0±198.1^{B}	891.7±235.3^{A}
	(6.6)^{a}(12.99)^{b}	(6.68)^{a}(14.08)^{b}	(6.07)^{a}(12.44)^{b}	(6.6)^{a}(14.8)^{b}
Weight of spleen	26.5±4.9	26.0±5.1	25.7±5.1	25.0±5.2
	(0.25)^{a}(.48)^{b}	(0.21)^{a}(.44)^{b}	(0.21)^{a}(.42)^{b}	(0.18)^{a}(.41)^{b}
Weight of the testis	94.5± 22.5		110.7±23.4	
	(0.9)^{a}(1.77)^{b}		(0.89)^{a}(1.83)^{b}	
Weight of kidneys	82.4±3.7	75.8±5.2	85.6±3.4	88.4±3.9
	(0.79)^{a}(1.54)^{b}	(0.61)^{a}(1.3)^{b}	(0.69)^{a}(1.4)^{b}	(0.65)^{a}(1.46)^{b}
Hot carcass weight	5320.6±712.4	5893.3±568.8	6025.0±1218.4	6429.2±1138.3
Dressing percentage	51.11±2.7^{A}	47.46±3.2^{B}	48.76±1.7	47.94±2.1

*Unit of measurement for all traits is gram.

**the weight of stomach and intestine includes stomach and intestine content, respectively.

^{a} Percentage with respect to live weight, ^{b} Percentage with respect to eviscerated weight

^{A,B} values across columns of each age category differ $p<0.05$

affect the dressing yield of the animals. The results further indicate that there is no significant variation (P<0.05) between the two sexes when it comes to age < 1 year while variations in some traits were observed in the animals > 1 year but < 2year category, where the weight of the skin and trotters and stomach were higher in the rams. The weight of the skin along with trotters may be ascribed to larger size of the rams in comparison to that of the ewes which also resulted in larger stomach weight, however the values cannot be considered as conclusive as the stomach was weighed along with the gut contents and the rams being larger are usually able to consume more feed than the ewes.

The results from Table 2 indicate some carcass attributes of Arsi Bale goats (bucks and does), the results of the study indicate that the average slaughter weight of the goats were lower than the values reported by Hailu *et al*. [26] (2005), Mieso *et al*. [27](2008) and Abebe *et al*. [5] (2010) for Arsi Bale goats reared on supplement feed. The low weight at slaughter can be attributed to both the management and the nutrition status of raising the goats on usually degraded pasture areas, Ameha *et al*. [28] (2007) also observed differences in slaughter weights of goats from Ethiopia raised on diets containing different levels of concentrates and roughages, they reported that the goats raised on diets having higher roughages had lower body weight than those raised on concentrates. The weight of the head (as a percent of live weight) as assessed in this study is lower than the values reported by Abebe *et al*. [5] (2010), the observations are however comparable with the findings of Ameha *et al*. [28] (2007) for central highland, long eared Somali and Afar goats.

The average weight of the skins as assessed in the present study finds similarity (on percentage basis) with the observations of Abebe *et al*. [5] (2010), however the values are higher than those reported by Ameha *et al*. [28] (2007).The average weight of the heart, liver and kidneys as assessed in this study finds consonance with the observation of Ameha *et al*. [28] (2007) and Abebe *et al*. [5] (2010) in some goat breeds from Ethiopia. Similar results were also reported by Alexandre *et al*. [29] (2009),in Creole breed of goat. The weight of the lungs (including trachea) values as assessed in the present study is higher than those reported by Ameha *et al*. [28] (2007) for goat breeds from Ethiopia, the differences as observed in the study may be attributed to differences in breed and also method of rearing besides the nutrition provided to the animals, similar observations were also reported by El Hag and El Shargi [30] (1996) and Kadim *et al*. [31] (2003). The weight of the stomach and intestines (gut content) as indicated in the study are in consonance with the observations of Abebe *et al*. [5] (2010). The values as assessed in the study was however lower than the results obtained by Legesse and Abebe[32] (2007) in Arsi Bale goats raised under extensive system but comparable to those raised under semi intensive management system. However higher values were observed by Ameha *et al*. [28] (2007), the values are higher than those reported by Gaili *et al*. [33] (1972) from Sudan but are well within the range of values reported by Hatendi *et al.* [34] (1992) from Zimbabwe and Owen and Norman[35] (1977) from Malawi. The results as obtained for the dressing percentage as observed in the study are within the range reported by Ameha *et al*. [28] (2007), for different goat breeds from Ethiopia, Mesfin [36] (2008) for Arsi Bale goats, El Waziry *et al*. [37] (2011) from Saudi Arabia, Koyunchu *et al*. [38] (2007) and Johnson *et al*.[39] (2010) however the results are higher than the values reported by Abebe *et al*. [5] (2010). The higher values for most the traits were observed to be higher in the does, this might be ascribed to the fact that the farmers tend to sell off surplus bucks before the does at an early age and retain the does which they sell only under dire circumstances.

The trend was also observed in does >1 year but < 2 years of age, where the stomach and the intestines (along with the contents) were higher in the does, this be ascribed to compensatory growth of the stomach and intestines when the animal consumes poor quality roughages as the rams are frame of the rams are larger (observed by larger size of the skin and trotters) than the ewes and they are able to obtain the better part of the forage. The average dressing percentage was observed to be higher in the rams, being P<0.05 in, <1 year category, which can also be ascribed to better skeletal structure and muscularity vis-α-vis the ewes, the values being non significant in the higher (>1 but <2 years) age category.

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