Comparison of Carcass Composition of Iranian Fat-tailed Sheep

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ABSTRACT : Most breeds of sheep in Iran are adapted to their agro ecological niches where it is likely that they were also artificially selected by their owners. In general, most of sheep breeds are multipurpose producing lambs, wool and milk. To compare the physical and chemical composition of the carcasses of ten Iranian native fat-tailed sheep breeds, 243 male lambs (6-7 months of age) of ten fat-tailed, Iranian breeds of sheep, Sanjabi (S), Ghezel (G), Afshari (A), Mehrabani (M), Lori (L), Lori Bakhtiari (LB), Kordi Khorasan (K), Sangesari (Sa), Baluchi (B) and Chal (C) were studied. Lamb breed group had a significant ($p<0.05$) effect on all the carcass traits measured. The LB and C lambs showed the same live weight which was significantly ($p<0.05$) higher than the other breeds. Carcass dressing- out percentage in S lambs was lowest ($p<0.05$), but not different from G lambs. K and Sa breeds showed the highest ($p<0.05$) carcass dressing-out percentage. The S lambs had the highest ($p<0.05$) lean meat percent. Lean meat percentage was not significantly ($p>0.05$) different in the G, A, M and C breeds. The Sa and K breeds showed the lowest lean meat percent. The S lambs showed the lowest ($p<0.05$) fat percent in their carcass, while K and Sa showed the highest ($p<0.05$). Subcutaneous fat in K, Sa and B was higher ($p<0.05$) than the other breeds. Lambs of S, G, A and M breeds had the lowest subcutaneous fat in their carcasses ($p>0.05$). Intramascular fat was significantly ($p<0.05$) lower in M, S and C despite the fact that this values were highest in B and K lambs. The K and Sa breeds had highest fat-tail percentage ($p<0.05$) in their carcass, whereas S and G showed lowest. Lambs of G, S and A breeds had higher bone percent than other breeds ($p<0.05$). Lowest bone percent ($p<0.05$) was seen in K and Sa lambs. The carcass moisture percent was not significantly ($p>0.05$) different in S, G, A, M, L and C breeds. M lambs showed the lowest crude protein percentage and S breed the highest ($p<0.05$). There were no significant ($p>0.05$) differences among other lamb breeds for this trait. Chemical fat percentage was the same in S, G, A, C and M breeds, but significantly ($p<0.05$) lower from LB, K, Sa and B. Ash percent in S, G and A had no significant ($p>0.05$) difference. According to higher lean meat and lower fat percentages in the carcass, the ranking of breeds would be S, G, A, M and C. ***(Asian-Aust. J. Anim. Sci. 2005. Vol 18, No. 9 : 1348-1352)***

Key Words : Iranian Sheep, Lambs, Fat-tailed, Live Weight, Carcass Composition

INTRODUCTION

In Iran, red meat is a common source of protein. The average red meat consumption per capita is 14 kg. The main sources of red meat are cattle, buffalo, sheep and goat. The sheep population in Iran is 50 million, comprising 26 genetic groups. Meat production by sheep and goat amounts to 57% of the total red meat production in the country. Sheep are kept for meat, wool, milk and pelt (Osfoori and Fesus, 1996; FAO, 1998; Kiyanzad et al., 2003). Most breeds of sheep in Iran are adapted to their agro ecological niches where it is likely that they were also artificially selected by their owners. In general, most of sheep breeds are multipurpose producing lambs, wool and milk. The breeds are named in relation to their place of origin or the tribe of the owner. Almost all sheep breeds of Iran are indigenous and have not yet been registered in formal breeding programs. Iran possesses 20 breeds of sheep and 5 breeds of goats. Approximately 65% of the total sheep population is considered pure and 35% crossbred.

More than 96% of Iranian sheep are fat-tailed and the remaining 4% are thin-tailed and semi fat-tailed. Zel is the only thin-tailed sheep rising in the country (Kiyanzad et al., 2003). The proportions of lean meat, fat and bone in the carcass determines the relative merit of different breeds for meat production (Farid, 1991). Breeds of sheep have been shown to differ significantly in proportions of carcass muscle, fat and bone and in their distribution (Taylor et al., 1989; Emamjomeh, 1993; Bourden, 2000). Information on the carcass composition of the native sheep breeds in Iran is very scarce and such information is essential in planning breeding programs. This report compares the physical and chemical composition of the carcasses of ten Iranian native fat-tailed sheep breeds.

MATERIALS AND METHODS

Animals

Two hundred and forty three male lambs (6-7 months of age) of ten fat-tailed, Iranian breeds of sheep, Sanjabi (S), Ghezel (G), Afshari (A), Mehrabani (M), Lori (L), Lori Bakhtiari (LB), Kordi Khorasan (K), Sangesari (Sa), Baluchi (B) and Chal (C) were studied. In brief, S, G, M, L, LB, Sa and B are range sheep and are managed mainly under migratory systems with almost no supplemental feeding but, in fall and winter, they are fed forage and post harvest cereals. A, K and C are more intensively farmed breeds. The A, K, LB and C are big in size (mature male average 70-90 kg) whereas G, S and L are medium (mature

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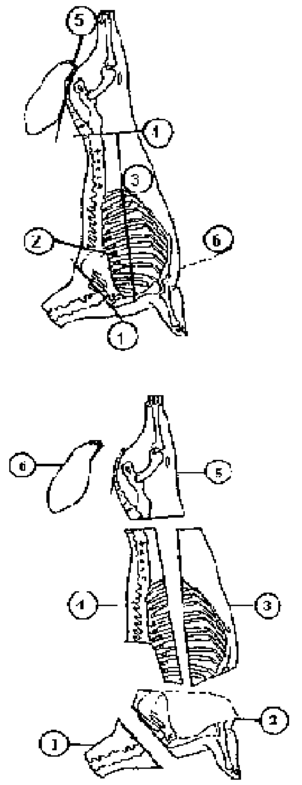

Cutting sites:

1-Between the 7th vertebra of neck and 1th vertebra of loin
2-Joint of shoulder blade
3-Longituanal cut from the first rib along the loin and back to the leg cutting point
4-Cut through the last vertebra of loin (lumbar) and the first tail bone (through the slip joint)
5-Joint of the first tail bone to the carcass
6-Cut between the shoulder blade bone (sternum) and breast bone to separate the shoulder

Parts produced:

1-Neck
2-Shoulder
3-Breast & Flank
4-Loin & Back
5-Leg
6-Fat-tail

Figure 1. Sites of cutting of lamb carcass and the parts produced.

male average 60-70 kg) and B, M and Sa are small (mature male average 50-60 kg). Lambs were selected and purchased from the Ram Pivot Project (RPP) in their breeding area (separated in different parts of Country). Selection was based on their health (according to inspection test by veterinarian) and age (5-7 months). Lambs were weaned at 3 to 4 months of age in all breeds. After weaning the lambs of all breeds were fed and managed mainly under range system with no supplemental feeding. The animals were transferred to the Animal Science Research Institute in Karaj.

Carcass analysis

Tow weeks after transferring animals of each breed were weighed and slaughtered. Head, feet (including metacarpals and metatarsals), skin, digestive tract (empty and full), liver, lungs, heart, kidneys, pelvic, kidney and omental fats, spleen, diaphragm, and genital organs, were removed and weighed during dressing. The remainder was weighed as hot carcass weight and stored in a cool room at a 4°C for 24 h. The carcasses were then split longitudinally and the right side was used for carcass measurements. The left side was cut according to the traditional method into six different joints (neck, shoulder, brisket and flank, loin, legs and fat-tail) (Figure 1) which was weighed (Kiyanzad, 2004). Each joint was dissected into lean meat, intramuscular and subcutaneous fat, and bones. After separating all carcass tissues, total soft tissues were ground two times through plates with 4 mm holes. Grab samples (approximately 150 g) were taken for determining moisture (using drying under vacuum at 95-100°C), crude protein (determining nitrogen in Kjeldahl method (N×6.25)), ash (by incineration at 600°C) and chemical fat (by Soxhlet extraction) according to the AOAC, 1995.

Data analysis

The data were analyzed by SPSS for Windows (SPSS, 1999). The data on composition of each half carcass, and the composition of each wholesale cut as a percentage of the same component in the half carcass were analyzed. The effect of breed on the traits under study was determined by using F ratio test. Means, variances and standard deviations of each trait were calculated. The significance of the differences between means of the various breeds was tested with Duncan's new multiple range tests (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Lamb breed had a significant ($p<0.05$) effect on all the carcass traits measured (Table 1). Lower live weights were seen in M, L, S and G ($p>0.05$) breeds. The K lambs had significantly ($p<0.05$) higher live weight than the other breed groups. The LB and C lambs showed the same live

Table 1. Means (±standard error) of traits measured in male lambs of ten Iranian fat-tailed breeds (ranked according live weight)

Traits	Breed									
	K	LB	C	A	SA	B	L	G	S	M
Number of lambs	25	24	32	19	23	26	25	24	25	20
Live weight (kg)	46.0^{d}	41.5^{c}	39.2^{c}	36.1^{b}	34.4^{b}	34.2^{b}	30.4^{a}	31.2^{a}	31.0^{a}	28.8^{a}
	(3.5)	(0.7)	(8.3)	(5.5)	(5.5)	(4.0)	(3.4)	(4.4)	(4.0)	(3.3)
Hot carcass weight (kg)	23.0^{d}	19.1^{c}	18.9^{c}	16.5^{b}	17.1^{b}	15.8^{b}	13.3^{a}	12.6^{a}	12.3^{a}	12.6^{a}
	(1.1)	(1.9)	(1.4)	(0.7)	(1.5)	(1.1)	(0.8)	(0.7)	(0.6)	(0.5)
Lean meat (kg)	10.6^{c}	9.4^{b}	10.3^{c}	9.1^{b}	7.7^{a}	7.8^{a}	6.9^{a}	7.5^{a}	7.7^{a}	6.9^{a}
	(1.0)	(1.6)	(2.7)	(1.6)	(1.2)	(1.3)	(1.0)	(1.2)	(1.2)	(1.0)
Total fat* (kg)	7.1^{f}	4.8^{E}	3.7^{d}	2.9^{c}	5.1^{e}	3.9^{d}	2.8^{c}	1.9^{ab}	1.5^{a}	2.3^{bc}
	(1.1)	(1.9)	(1.2)	(0.7)	(1.4)	(0.8)	(0.8)	(0.7)	(0.6)	(0.5)
Subcutaneous fat (kg)	2.9^{e}	1.8^{d}	1.3^{c}	0.8^{ab}	2.0^{d}	1.8^{d}	1.0^{b}	0.7^{ab}	0.6^{a}	0.7^{a}
	(0.6)	(0.8)	(0.5)	(0.2)	(0.6)	(0.4)	(0.4)	(0.2)	(0.2)	(0.2)
Intramuscular fat (kg)	1.2^{d}	0.8^{c}	0.6^{b}	0.5^{ab}	0.9^{c}	0.9^{c}	0.5^{ab}	0.4^{a}	0.3^{a}	0.3^{a}
	(0.3)	(0.3)	(0.2)	(0.2)	(0.3)	(0.3)	(0.2)	(0.1)	(0.2)	(0.1)
Fat-tail (kg)	1.7^{d}	1.2^{c}	0.9^{b}	0.8^{b}	1.3^{c}	0.7^{b}	0.7^{b}	0.4^{a}	0.3^{a}	0.7^{b}
	(0.3)	(0.6)	(0.4)	(0.3)	(0.4)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)
Bone (kg)	3.6^{c}	3.4^{c}	3.6^{c}	3.4^{c}	2.7^{ab}	2.8^{ab}	2.4^{a}	2.9^{b}	2.7^{b}	2.4^{a}
	(0.3)	(0.5)	(0.8)	(0.5)	(0.4)	(0.3)	(0.2)	(0.4)	(0.3)	(0.4)
Dressing-out % [1]	50.1^{d}	45.9^{c}	47.0^{c}	45.8^{c}	49.5^{d}	46.2^{c}	43.8^{b}	43.6^{ab}	42.1^{a}	43.9^{b}
	(1.9)	(3.5)	(3.3)	(2.5)	(2.9)	(2.2)	(2.4)	(2.4)	(3.1)	(2.5)
Lean meat % [2]	47.0^{a}	52.3^{bc}	55.9^{d}	56.6^{d}	46.8^{a}	50.3^{b}	53.7^{c}	57.6^{d}	61.2^{e}	56.5^{d}
	(2.8)	(7.6)	(2.7)	(2.6)	(3.3)	(3.2)	(3.0)	(2.8)	(2.5)	(3.7)
Total fat % [2, *]	31.1^{f}	25.4^{e}	19.0^{cd}	17.8^{c}	30.2^{f}	25.4^{e}	20.9^{d}	14.4^{b}	11.5^{a}	18.6^{cd}
	(3.2)	(8.0)	(2.8)	(3.5)	(5.1)	(3.5)	(3.8)	(3.6)	(3.2)	(3.4)
Subcutaneous fat % [2]	12.7^{d}	9.8^{c}	6.9^{b}	5.0^{a}	11.7^{d}	11.8^{d}	7.6^{b}	5.6^{a}	4.7^{a}	5.8^{a}
	(2.0)	(3.5)	(1.6)	(1.0)	(2.3)	(1.8)	(2.2)	(1.2)	(1.1)	(1.6)
Intramuscular fat % [2]	5.5^{de}	4.4^{c}	3.0^{ab}	2.8^{ab}	5.2^{d}	6.0^{e}	3.4^{b}	3.1^{ab}	2.7^{a}	2.6^{a}
	(1.1)	(1.2)	(0.9)	(1.2)	(1.4)	(1.4)	(1.1)	(0.8)	(1.0)	(0.6)
Fat-tail % [2]	14.8^{d}	12.6^{c}	9.4^{b}	10.4^{b}	15.1^{d}	9.2^{b}	10.8^{bc}	6.1^{a}	4.5^{a}	11.1^{bc}
	(2.2)	(5.1)	(2.5)	(2.8)	(4.0)	(2.3)	(2.4)	(2.9)	(2.4)	(3.2)
Bone % [2]	15.8^{a}	19.1^{bc}	19.8^{c}	21.5^{d}	16.3^{a}	17.9^{b}	19.1^{bc}	22.6^{d}	21.8^{d}	20.1^{c}
	(1.7)	(3.5)	(2.0)	(2.3)	(1.8)	(1.3)	(2.2)	(2.1)	(2.1)	(3.2)
Moisture % [3]	53.3^{a}	57.8^{ab}	67.1^{cd}	64.9^{bc}	58.5^{ab}	60.4^{ab}	63.7^{bc}	69.4^{d}	68.5^{d}	70.5^{cd}
	(7.9)	(11.7)	(12.3)	(3.8)	(17.4)	(18.7)	(10.4)	(7.9)	(4.8)	(15.6)
Crude protein % [3]	16.9^{bc}	15.1^{ab}	15.3^{ab}	16.9^{bc}	14.6^{ab}	14.8^{ab}	16.5^{ab}	16.1^{ab}	18^{bc}	13.4^{a}
	(3.2)	(4.1)	(5.4)	(1.4)	(6.4)	(7.1)	(4.0)	(4.0)	(1.7)	(7.0)
Chemical fat % [3]	28.2^{d}	25.8^{d}	16.4^{ab}	16.8^{ab}	25.7^{d}	23.5^{d}	18.3^{c}	12.9^{a}	11.9^{a}	14.8^{ab}
	(7.6)	(9.6)	(8.0)	(3.8)	(12.6)	(11.8)	(8.0)	(5.4)	(4.6)	(8.6)
Ash % [3]	0.8^{ab}	0.8^{ab}	0.7^{a}	0.9^{bc}	0.7^{a}	0.7^{a}	0.8^{ab}	0.9^{bc}	1.0^{c}	0.7^{a}
	(0.1)	(0.2)	(0.3)	(0.2)	(0.3)	(0.4)	(0.3)	(0.3)	(0.2)	(0.4)

* Including subcutaneous fat, Intramuscular fat and fat-tail.

[1] Based on live weight. [2] Based on cold carcass weight. [3] As a percent of soft tissue.

Means within a row that do not share any superscript letters are significantly different at the 5 percent probability level.

weight which was significantly ($p<0.05$) higher than the other breeds except K. Live weight mentioned by Hall (2000) at slaughter of Suffolk (36.26 kg), Texel (35.67 kg), Shropshire (36.13 kg), Dorset Down (35 kg) and Ryeland (34.10 kg) weaned lambs tally with A, Sa and B breeds, while LB, K and C are heavier. The B lambs in this study were heavier than the lambs of the same breeds used by Farid (1991); however, the M lambs he studied, were heavier than M lambs used in the present study. The difference may be related to the different age and system of breeding of lambs (the lambs were feedlot in his study). Kirton (1995) reported hot carcass weights of 15 lamb breeds range 12-14.9 kg for feedlot lambs that is tally with S, G, M and L, breeds in this study. Carcass dressing-out percentage in S lambs was the lowest ($p<0.05$), but was not different from G breeds (Figure 2). K and Sa breeds showed the highest ($p<0.05$) carcass dressing-out percentage. Same carcass percentage had seen for C, B, LB and A ($p>0.05$). Live weight (34.41 kg) reported by Mahgoub and Early (2000) for Omani male lambs tally with S, G, L, Sa and B breeds in present study. However, hot carcass percent (53.53) in his report is higher than breeds mentioned above and this may be due to using empty body weight to calculate dressing-out percent instead of using full live weight. The S lambs had the highest ($p<0.05$) lean meat percent (Figure 3). Lean meat percentage was not

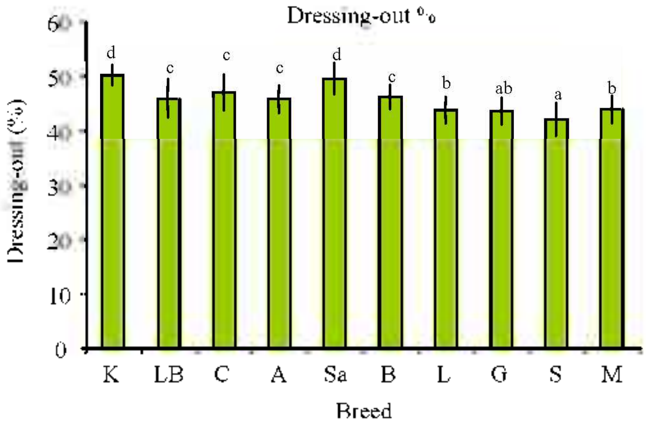

Figure 2. Means of carcass percentages for the ten lamb breeds. Kordi Khorasan (K), Lori Bakhtiari (LB), Chal (C), Afshari (A), Sangesari (Sa), Baluchi (B), Lori (L), Ghezel (G), Sanjabi (S) and Mehrabani (M).

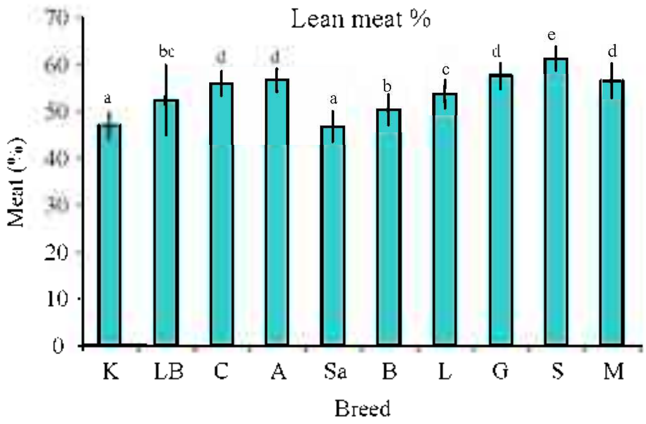

Figure 3. Means of carcass lean meat percentages for the ten lamb breeds. Kordi Khorasan (K), Lori Bakhtiari (LB), Chal (C), Afshari (A), Sangesari (Sa), Baluchi (B), Lori (L), Ghezel (G), Sanjabi (S) and Mehrabani (M).

significantly ($p>0.05$) different in G, A, M and C breeds. The Sa and K breeds showed the lowest lean meat percent. The S lambs showed the lowest ($p<0.05$) fat percent in their carcass, while K and Sa showed the highest ($p<0.05$) (Figure 4). Subcutaneous fat in K, Sa and B was higher ($p<0.05$) than the other breeds. Lambs of S, G, A and M breeds had lowest subcutaneous fat in their carcass ($p>0.05$). Intramascular fat was significantly ($p<0.05$) lower in M, S and C breeds was highest in B and K lambs. The K and Sa breeds had the highest (14.8 and 15.1% respectively) fat-tail percentage ($p<0.05$) in their carcass, whereas S and G showed the lowest (4.5 and 6.1% respectively).

Lambs of G, S and A breeds had higher bone percentages than other breeds ($p<0.05$) (Figure 5). Lowest bone percentages ($p<0.05$) were seen in the K and Sa lambs. Emamjomeh (1993) reported lesser lean meat and bone percentage, but higher fat percent in the C breed ram lambs. The different may be related to the age of feedlot ram lambs use in his study, whereas in this study lambs were not

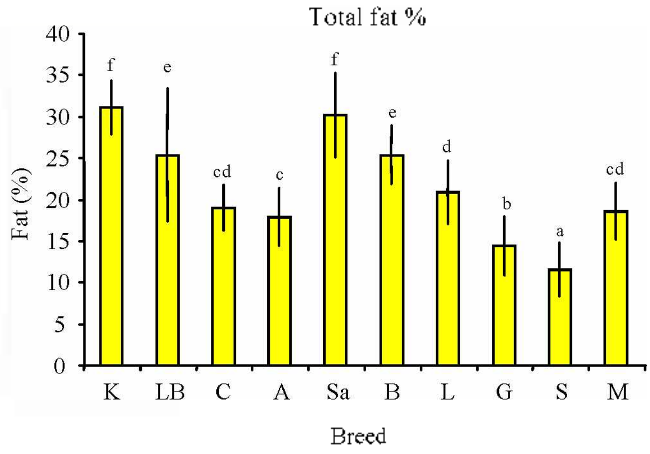

Figure 4. Means of carcass fat percentages for the ten lamb breeds. Kordi Khorasan (K), Lori Bakhtiari (LB), Chal (C), Afshari (A), Sangesari (Sa), Baluchi (B), Lori (L), Ghezel (G), Sanjabi (S) and Mehrabani (M).

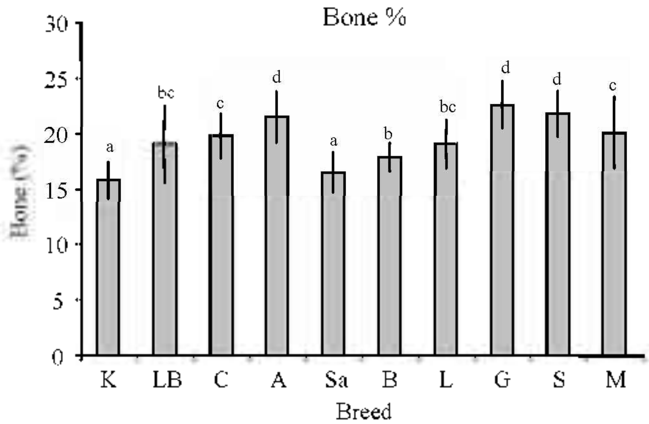

Figure 5. Means of carcass bone percentage for the ten lamb breeds. Kordi Khorasan (K), Lori Bakhtiari (LB), Chal (C), Afshari (A), Sangesari (Sa), Baluchi (B), Lori (L), Ghezel (G), Sanjabi (S) and Mehrabani (M).

feedlot. Kiyanzad, (2002) reported lesser lean meat and bone percentages (44 and 14.7% respectively), but higher fat percent (36.6%) in C lambs breed. Difference would be related to that the lambs in his study were feedlot.

The moisture percentage in soft tissues of carcass was not significantly ($p>0.05$) different in S, G, A, M, L and C breeds. However, LB, K, Sa and B showed significantly less ($p<0.05$) moisture percent in the soft tissues of their carcass. M lambs showed the lowest crude protein percentage and the S breed the highest ($p<0.05$). There was no significant ($p>0.05$) differences among other breeds for this trait. Chemical fat percentage was the same in S, G, A, C and M, but significantly ($p<0.05$) different from LB, K, Sa and B. Ash percent in S, G and A had no significant ($p>0.05$) difference. Farid (1991) reported lower moisture and crude protein percentages, but higher chemical fat percentage for M and B lambs. This difference was probably due to higher fat percent in the carcass of the feedlot lambs in his study.

Kiyanzad, (2002) reported lesser moisture and crude protein percentages (47.3 and 13.1% respectively), but higher chemical fat percentages (37.2%) in C lambs breed. Kirton (1995) reported moisture percentage of 15 non fat-tail breeds range 51.3-53.9 that is lesser than breeds in this study. The different could be related to that the lambs in his study were feedlot and effect of breed. The crude protein reported by him in different breeds (range 14.8-15.9) tally with LB, Sa, B and C breeds in present study.

CONCLUSION

When the live weights of the lambs were compared, they ranked K, LB, C, A, Sa, L, B, G, S, L, LB and C. However, K and Sa lambs showed the highest carcass percentage, they had lower lean meat percent and higher fat percent in their carcass. The S breed had highest lean meat and lowest fat percentages. Lowest bone percent was seen in K and Sa lambs, while the highest values were found for G, S, and A lamb breeds. According to higher lean meat and lower fat percentages in the carcass, the ranking of breeds would be S, G, A, M and C.

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