



Comparative Assessment of Fattening and Meat Sensory Characteristics of Kids and Lambs

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Abstract

This study was undertaken to compare the fattening performance, carcass traits and the organoleptic qualities of the meat of kids and lambs conventionally reared at the Dairy research farm of Çukurova University. Ten Boer kids and ten Assaf lambs were involved in the study. Experimental animals were collectively housed and fed based on hay and concentrate feed for forty days. In order to assess the characteristics of the carcass, four animals from each group were slaughtered. In addition, meat samples were taken for the organoleptic traits evaluation. The results showed that there was no difference in odor and color in raw meat. However, lamb meat was found to have higher values in terms of meat marbling ($p < 0.05$). The meat of lamb was less fatty than those of kid's meat. Additionally, there was no significant difference in fried meat between the two groups, ($P > 0.05$). The quality and quantity of the kids meat was the same as those of the lambs.

Keywords: Meat, fattening, kid, lamb, quality

INTRODUCTION

Meat is the indispensable component of the highest quality of the right and well-balanced human diet [1]. In recent decades, it is highly exploited as a functional ingredient/food wherein meat has either been modified or incorporated into non meat products [2]. In Turkey, red meat is mainly produced from cattle, sheep, goats and buffalos [3]. Sheep are important meat-producing animals worldwide, whereas goats are more important meat animals in the tropics [4]. Sheep and goat meat has a dietary important place in nutrition of Turkish population and play a capital role in the economy of the country. Goat meat is particularly more consumed because it is preferred by low income people, especially in tropical regions. In Turkey as well as in other Mediterranean countries, sheep and goat meat is consumed generally as lamb, kid meat or yearling castrated billy goats. Young goats are usually marketed at four to five months of age. They are cooked according to a classical cuisine in which the traditional method is to grill or roast the light carcass averagely weighting 12-15 Kg. As for, the yearling castrated goats, they are preferred especially in mountainous district [5;6]. Sheep and goats' meat is estimated to account for 22% and 6% of the national meat consumed [6]. This level of meat consumption is yearly increasing with the number of consumers who are increasingly demanding in terms of high quality.

In fact, besides being important sources of proteins, vitamins and minerals, it also provides fat including saturated fatty acids, unsaturated fatty acids, cholesterol, triacylglycerol and phospholipids. Thus, consumers often associate meat with a negative image as a high fat and cancer-promoting food. Some of these negative nutrients can be minimized by selection of lean meat cuts, removal of adipose fat, dietary manipulation to alter fatty acid composition and proper portion control to decrease fat consumption and caloric intake [2].

The definition of meat quality is very complex and can be presented through nutritive, technological and sensory quality of meat [1]. The quality of meat is determined by colour, tenderness, flavour, texture, marbling and water holding and oil binding capacity [7; 8; 9].

These qualitative proprieties of meat are the main criteria strongly influencing the appreciation and decision of

consumers when purchasing and determining the price of meat products. The variation of lamb and goat meat quality is due to several factors linked to species, genetic, management and nutrition. Among factors affecting quality of meat, age at slaughter, sex (female, male, castrated), breed, muscle type, conformation, nutrition (feed intake, feed composition and daily requirement of animals) and rearing and environmental conditions are the most important affecting carcass composition and characteristics [10; 11].

Usually, consumers prefer tender and juicy meat. As large share of consumers are becoming more concerned about the quality of red meat notably lamb and chevon. Sensory quality of the meat includes a range of properties (colour, marbling, tenderness, succulence, odour, taste) and has great impact on consumer satisfaction [1; 12]. Changing consumer demand has influenced the market of meat leading to the development of new market strategies. This study aims to compare the quality with focus on the sensory assessment of kid and lamb meat.

MATERIALS AND METHODS

The experimental procedures used for this study were approved by animal welfare and ethics committee of the Agricultural Faculty of Çukurova University.

Study area

This research study was carried out at the Dairy Goat Research Farm of Çukurova University located in the province of Adana (37° North parallel and 35° East longitude). This region is characterized by the Mediterranean subtropical climate. The mild and wet winter lasts from December to March, whereas, the hot and dry summers occurs from May to August. The lowest and highest ambient temperature which can reach -8.1°C and 45.6°C are recorded in January and August respectively. The average annual precipitation and relative humidity are 450 mm and 66% respectively.

Experimental animal management and data collection

Trials were conducted from June to July 2016 on two group of kids and lambs Group 1 (n= 10) Assaf lamb (3/4 Ost-friz + 1/4 İvesi) and Group 2 (n= 10) Boer kids. Experimental animals were born from single birth and weaned at 2 months old. All animal were subjected to sanitary care (vaccination, deworming, vitamin-minerals treatment etc.) to

keep them healthy. Throughout the experimental period, all animals were fed with the same diet made of alfalfa hay and concentrate feed (12% crude protein and 2300 kcal/kg energy). The ration was calculated based on the average weight of the groups and the daily requirement according to the recommendation of NRC [13]. A week of acclimatization and adaption to environment was observed before the starting of trials and data collection.



Figure 1. Experimental animals

At the end of fattening period, 4 animals with similar live weight were selected from every single group of kids and lambs for slaughter. 24 hours prior the slaughter, the selected animals did not receive feed, but they had free access to water. Then the animals were taken to the slaughterhouse. To avoid transportation-induced stressor factors, they were transported in an air conditioned truck. At the slaughterhouse, the animals were slaughtered and their carcasses were primary processed according to the Mediterranean Carcass Cutting off Method [14], commercial standards and religious precepts (*Halal meat*) (Photo 1.).



Figure 2. Hot carcass of experimental animals visually undergoing some characteristics analysis

In addition, some samples were collected and cooked for sensory and organoleptic analysis. The quality of raw meat, fried and boiled meat were evaluated by trained panellists who noted them based on the scoring scale defined in the following table.



Figure 3. Meat sample collected for the sensory analysis

Table 1. Qualitative characteristics scoring scale

Score	Qualitative description of cooked meat		
	Odour and flavour	Taste and succulence	Tenderness
1	Very bad	Very dry	Very firm
2	Bad	Dry	Firm
3	Fairly Good	Fairly succulent	Fairly soft
4	Good	Succulent	Soft
5	Very good	Very succulent	Very soft

Statistical analysis

The analysis of variance through the one-way ANOVA procedure in SPSS Statistics 20 was used to analyse the collected data. Findings are presented as the mean value \pm standard deviation. The significance tests using t-test at the level of 5% were applied to assess the statistical difference between mean values.

RESULTS AND DISCUSSION

The results of the qualitative and sensory characterization of different types of meat are given in the Table 2.

Table 2. Sensory tests of kid and lamb meat

Characteristics	Mean \pm SE		Sig.
	Kid	Lamb	
Raw meat colour	4.25 \pm 0.25	4.25 \pm 0.25	NS
Raw meat odour	5.00 \pm 0.00	3.75 \pm 0.00	NS
Raw marble	2.75 \pm 0.25 ^b	4.00 \pm 0.00 ^a	*
Fried flavour	5.00 \pm 0.00	5.00 \pm 0.00	NS
Fried taste	5.00 \pm 0.00	4.25 \pm 0.25	NS
Fried tenderness	4.50 \pm 0.28	4.50 \pm 0.28	NS
Boiled flavour	5.00 \pm 0.00 ^a	3.75 \pm 0.00 ^b	*
Boiled taste	4.00 \pm 0.25	4.50 \pm 0.28	NS
Boiled tenderness	3.75 \pm 0.31 ^b	4.50 \pm 0.18 ^a	*

*Significantly different at $P < 0.05$; ns: non significant at $P = 0.05$

The raw meat colour did not significantly differ between meat of lambs and chevon in terms of raw meat colour and odour. These findings contradicted those of Sheridan et al. [15] who found that the fresh meat of lamb tended to have a higher redness than goat. On other hand the results in our study are also not consistent with those reported by Murshed et al. [16], who found that the colour and odour were better in Black Bengal goat meat when compared to the indigenous sheep meat. Babiker et al. [17] reported that lamb meat had significantly high lightness (L) values, less redness (a) and yellowness (b) values than goats. Although, there was no significant difference between the odours of chevon and lamb raw meat, panelists perceived the flavour of kids' meat being more pronounced than lamb meat. These results are in line with the findings of Sheridan et al. [15] who qualified these flavours as 'goaty' flavour and 'muttony' respectively.

The results of this study showed that lamb meat had higher values in terms of marbling ($p < 0.05$). Among all the nutritional contents of meat, the major ones are proteins and fats. The comparison of fat deposit demonstrated that the kids' meat was more fatty than lamb meat. These results agreed with Babiker et al. [17] who found that young goat meat had less fat than lamb. This later is supported by Siham

[18] who stated that goat meat is low in fat and calories. Indeed, Goats, unlike sheep, deposit more fat around the visceral organs than in the carcass [17]. Although fats are considered to be an unfavorable meat component, fat and fatty acids are factors that determine the nutritional quality of the meat and significantly affect the sensory properties of the meat. The fat content of the muscle tissue contributes to the succulence, taste, texture and preferable sensory properties [1]. High yield of muscle (lean), low amount of bones and optimal level of fat deposit are the characteristics of a superior carcass.

The tenderness (texture) and succulence of cooked or roasted meat, and to a certain extent aroma and taste, as reported by Petričević et al. [1], are important parameters of meat quality. The tenderness and taste are the most important attributes that determine the quality of food in Europe [1]. In the present study, there was no significant difference in fried meat between the two groups ($P > 0.05$) for the flavour and tenderness of meat. However, it was found that fried meat of kids is more succulent than lamb meat. These disagreed with those obtained by Sheridan et al. [15] who found that the goat meat tended to be less juicy than lamb. Regarding the flavour and the tenderness of boiled meat, the findings showed that the kid meat and lamb meat were respectively better ($p < 0.05$). The results of the present study are similar to those of who reported that cooked chevon has a pronounced and distinct flavour [19]. As for the meat tenderness, the results are in line with those of Schönfeldt et al. [20] who found out that sheep meat was significantly more tender than the Angora goat cuts, which in turn were significantly more tender than the Boer goat cuts. Authors concluded that chops from goat carcasses could not be substituted for those of lambs of similar age, and that they were generally less tender and less palatable to consumers than meat from sheep (Schönfeldt et al., 1993b). Nevertheless, the organoleptic evaluation is similar in all aspects. The study found that goat meat is more advantageous in terms of taste. Christensen et al. [21] stated that the differences in the sensory properties of the meat can be due to of the different content of intramuscular fat in the meat.

CONCLUSION

This study was conducted to evaluate the meat quality of kids and lamb with emphasis on sensory characteristics considered as the main factor affecting the acceptability of meat. This study revealed that kids and lamb meat presented similar meat qualities. However, it has been shown that chevon is slightly advantageous than lamb meat in terms of quality and quantity. As emphasized earlier, the kid has unique cooking patterns. For this reason, preparation of special recipes for kid's consumption will increase consumption.

These findings give some clues about the cooking techniques of the kid and lamb meat. Goat meat is better when it is fried than steamed. For a sustainable industrial meat production based on small ruminant meat, future studies should focus on the relationship between feeding, especially based on protected nutrient (protein and fat), carcass characteristics and production costs. It should also take into account the physico-chemical parameters notably the fatty acids profiles, as cholesterol constitutes a considerable threaten to consumers' health.

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REFERENCE

- [1] M. Petričević, A. Stanojković, D. Ostojić-Andrić, D. Nikšić, V. Petričević, M. Gogić and V. Mandić, Comparative examination of the meat quality of the female cattle of simmental breed and crosses with charolais breed. *Biotechnology in Animal Husbandry* 33 (4), (2017), pp 439-448,
- [2] S.C. Hathwar, A.K. Rai, V.K. Modi and B. Narayan, Characteristics and consumer acceptance of healthier meat and meat product formulations—a review. *Journal of Food Science and Technology* 49(6), (2012), 653-664.
- [3] M. Tutkun, The red meat production in Turkey. *Scientific Papers. Series D. Animal Science*, Vol. LX, (2017), pp. 278-283.
- [4] O. Mahgoub and G.A. Lodge. A comparative study on growth, body composition and carcass tissue distribution in Omani sheep and goats. *Journal of Agricultural Science*, 131, (1998), 329-339.
- [5] S. Rodrigues and A. Teixeira, Effect of sex and carcass weight on sensory quality of goat meat of Cabrito Transmontano. *Journal of Animal Science*, 87 (2009), pp. 711-715.
- [6] S. Ogun, N. Koluman and I. Daskiran Marketing channels for goat meat in Turkey. In: The value chains of Mediterranean sheep and goat products. Organisation of the industry, marketing strategies, feeding and production systems (ed. M. Napoléone, H. Ben Salem, J.P. Boutonnet, A. López-Francos, D. Gabiña). pp. 475-479, (2016) (Options Méditerranéennes: Série A. Séminaires Méditerranéens; n. 115), Zaragoza: CIHEAM
- [7] J. Pogorzelska, J. Miciński, H. Ostoja, I.M. Kowalski, J. Szarek and E. Strzyżewska., Quality traits of meat from young Limousin, Charolais and Hereford bulls. *Pakistan Veterinary Journal*, 33(1), (2013), pp. 65-68.
- [8] S.A. Zarasvand, M. Kadivar, M. Aminlari and S.S. Shekarforoush, A comparative study of physico-chemical and functional properties, and ultrastructure of ostrich meat and beef during aging, *CyTA - Journal of Food*, 10 (3), (2012), pp. 201-209.
- [9] E. Çatikkaş and A. Koç, Fattening Performance, Carcass Characteristics and Beef Quality of Holstein–Friesian, Brown–Swiss and Simmental Bulls. *Adnan Menderes Üniversitesi Ziraat Fakültesi Dergisi*, 14 (1), (2017), pp. 59-64.
- [10] A. Iwanowska and E. Pospiech, Comparison of slaughter value and muscle properties of selected cattle breeds in Poland—Revue. *Acta Scientiarum Polonorum Technologia Alimentaria*, 9(1), pp. 7-22.
- [11] A. Guerrero, M.V. Valero, M.M. Campo, and C. Sañudo, Some factors that affect ruminant meat quality: from the farm to the fork. Review. *Acta Scientiarum*, 35 (4), 2013, pp. 335-347.
- [12] E. Dransfield, J.F. Martin, D. Bauchart, S. Abouelkaram, J. Lepetit, J. Culioli, C. Jurie, B. Picard, Meat quality and composition of three muscles from French cull cows and young bulls. *Animal Science*, 76, (2003), pp. 387-399.
- [13] National Research Council, Nutrient requirements of small ruminants: Sheep, goats, cervids, and new world camelids. *National Academy Press*, (2007), 384 p.
- [14] F. Colomer-Rocher, P. Morand-Fehr and A.H. Kirton, Standard methods and procedures for goat carcass evaluation, jointing and tissue separation. *Livestock Production Sciences*, 17: (1987), pp. 149-159.
- [15] R. Sheridan, L.C. Hoffman, A.V. Ferreira, Meat quality of Boer goat kids and Mutton Merino lambs 2. Sensory meat evaluation. *Animal Science* 76, (2003), pp. 73-79.
- [16] H.M. Mursheda, M.A.H. Sarkerb, S.M.E., Rahmana, and M.A., Hashema, Comparison of carcass and meat quality of Black Bengal goat and Indigenous sheep of Ban-

gladesh. *Journal of Meat Science and Technology* 2 (3), (2014), pp. 63-67.

[17] S.A. Babiker, I.A. El Khider and S.A. Shafie, Chemical Composition and Quality Attributes of Goat Meat and Lamb. *Meat Science*, 28, (1990), pp. 273-277.

[18] A.A. Siham, Sensory Evaluations of Different Types of Red meat in Sudan. *Bulletin of Environment, Pharmacology and Life Sciences*. 4(11): 2015, pp. 45-48.

[19] H.C. Schönfeldt, R.T. Naudé, W. Bok, S.M. van Heerden and L. Sowden,. Cooking- and Juiciness-Related Quality Characteristics of Goat and Sheep Meat. *Meat Science*, 34, (1993a), pp. 381-394.

[20] H.C. Schönfeldt, R.T. Naudé, W. Bok., S.M. van Heerden and R., Smit, Flavour and Tenderness-Related Quality Characteristics of Goat and Sheep Meat. *Meat Science*, 34, (1993b), pp. 363-379.

[20] M. Christensen, P. Ertbjerg, S. Failla, C. Sañudo, R.I. Richardson, G.R. Nute, J.L. Olleta, B. Panea, P. Albertí, M. Juárez, J.F. Hocquette and J. Williams, Relationship between collagen characteristics, lipid content and raw and cooked texture of meat from young bulls of fifteen European breeds. *Meat Science*, 87, (2011), pp. 61-65.