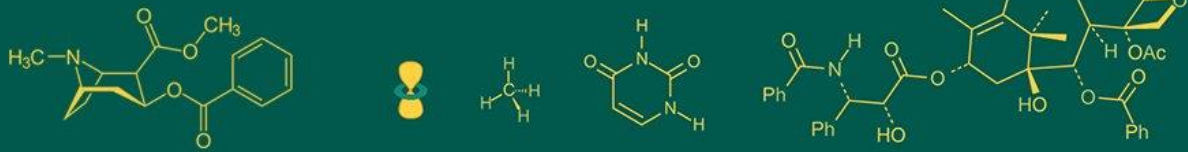


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Effect of slaughter age and weight on physicochemical properties of Osmanabadi goat meat

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Abstract

Twelve Osmanabadi male goats were obtained from the ILFC, College of Veterinary and Animal Science, Parbhani, with the goal of studying the carcass features and meat quality of these goats. Goats were divided into two groups based on weight and age. Group I (6 months old): 18-20 kg; group II (8 months old): 23-25 kg. The study found that slaughter weight had a substantial influence on proximate protein and fat composition, but as age progressed from 6 to 8 months, protein, fat, and ash content rose. There was no significant change in moisture percentage between the two groups, however when the kid ages from 6 to 8 months, its moisture content decreases. The physicochemical parameters include water retaining.

Keywords: Slaughter age, physicochemical, Osmanabadi goat meat

Introduction

The goat is a versatile animal that was the first ruminant to be tamed by humans (about 7000 B.C). Mahatma Gandhi, the father of the nation, openly defined it as a "poor man's cow" in light of its merits and relevance in the rural economy. In Europe, the goat is also known as a 'Wet Nurse of Infants', 'Mobile bank of the nomads on hoof', 'mini cow', and so on. Their great disease resistance, enhanced productivity, rapid growth in a short period of time, high demand and market, and droppings make them suitable for rearing by small, marginal, and landless farmers (Rajkumar *et al.* 2010) ^[16]. Goat meat, also known as chevon, is preferred as fresh hot meat in India. Because it is lean, it is a great source product for the manufacture of low-fat meats. Goat meat is consumed by all levels of society without regard for religious or societal taboos, making it the country's primary source of red meat. Sheep and goats play an important role in the development of rural impoverished communities, with around 5 million families relying on sheep and goat rearing and production (Karthik *et al.* 2017) ^[10]. The most significant aspects of efficient and cost-effective meat production are slaughter age, weight, dressing percentage, proportion of various cuts, and meat composition. Colour, look, smell, taste, and fibrous nature of meat, as well as total organoleptic quality, all contribute to chevon quality (Sivakumar 2013) ^[18]

Materials and Methods

The goat was fasted overnight before being slaughtered. Prior to slaughter, the live weights of six goats from each group were recorded on a digital weighing balance. It is expressed in kilogrammes. The kids were brought to the DST-SSSTP Poultry and Goat Meat Demonstration Unit and butchered in accordance with federal regulations. The animals were fasted for 18 hours prior to killing. These children were slain using humane ways (Halal method) in the morning hours by cutting the throat transversely near to the head and disconnecting the carotid arteries and jugular veins on both sides. Following slaughter, the head was removed at the atlanto-occipital junction. The fore and hind cannons were formed by disjuncting at the carpal and tarsal joints, respectively. The creatures were partially skinned and lay on their backs on the floor. The animals were then hanged by their hind legs for further skinning. Immediately after skinning, evisceration occurred. The carcass and non-carcass components were weighed immediately following evisceration.

Chevon's pH was calculated using the AOAC (1995) [1] technique. To prepare the pH suspension, 10 gm of fresh chevon sample was mixed into a fine suspension with 50 ml of distilled water and tested using a digital pH metre. To evaluate the (ERV) Extract Release Volume of chevon meat samples, about 25 g of mince was blended with 100 mL of distilled water in a Warring blender for 5 minutes. The resulting slurry was filtered through Whatman No. 2 filter paper, and the amount of filtrate released in 15 minutes was calculated as the extract release volume (Jay, 1964) [9]. To evaluate the (WHC) water holding capacity of chevon meat samples, place approximately 15 gramme in a 50 mL polyurethane centrifuge tube. Add 22.5 millilitres of 0.6 M NaCl solution. Centrifuge for 15 minutes @ 3500 RPM. Decant the supernatant liquor and measure its volume. The amount of additional solution (ml) held by 100 gm of meat was determined and reported as water retention capacity (Wardlaw *et al.* 1973) [23]. A cross-section of the left half-carcass was taken between the 12th and 13th thoracic vertebrae to determine the loin eye area (LEA). To evaluate

the (MSC) meat swelling capacity of goat meat, combine 25 gramme of meat sample with 100 ml of distilled water for 2 minutes. 35ml homogenate and centrifuge at 2000 rpm for 15 minutes. The volume of supernatant is designated as "S" (Wardlaw *et al.* 1973) [23]. According to the degree of marbling in the LD muscle between the 6th and 7th ribs, the distribution of marbling is greater than that of the 12th and 13th ribs (USDA 1992) [20]. The proximate composition of fresh Longissimus dorsi muscle samples, including moisture, protein, fat, and total ash, was determined in accordance with AOAC (1995) [1]. The data collected throughout the investigation were evaluated using an unpaired T-test according to the conventional approach (Snedecor and Cochran, 1994) [19].

Results and Discussion

Physico-chemical characteristics

Table 1 displays the physicochemical properties of Osmanabadi goats at 6 and 8 months of age, including percent pH, WHC, MSC, ERV, LEA (cm²), and marbling.

Table 1: Effect of Age and Weight on Physiochemical Analysis

Physiochemical Analysis				
Characteristics	Group-I	Group-II	t- value	P- value
pH	6.25±0.09	6.23±0.05	0.89	0.20 NS
WHC	24.82±0.40	26.23±0.38	-2.97	0.01*
ERV	41.16±0.27	41.03±0.13	0.61	0.29 NS
MSC	39.34±0.41	39.70±0.40	-0.52	0.31 NS
LEA (cm ²)	9.55±0.29	10.82±0.21	-5.79	0.00**
Marbling	266.67±2.61	291.67±8.33	-1.17	0.15 NS

* Significant at 0.01% level ** Significant at 0.05% level NS – Non-significant
[Group I (6 months of age) 18-20 Kg and group II (8 months of age) 23-25 Kg]

pH

The pH of group I and group II goats were 6.25±0.09 and 6.23±0.05, respectively. There was no significant variation in pH % between the two groups ($p < 0.05$). These findings are consistent with (Sivakumar 2013) [18], who investigated the effect of pre-slaughter weight on carcass features and organoleptic characteristics of Kanni goats. A similar finding was found by Kopzlu *et al.* (2018) [11], who investigated the impact of slaughter age and muscle type on meat quality attributes of Eastern Anatolian Red bulls.

Water Holding Capacity

The mean ± S.E % of WHC in goats from groups I and II was 24.82±0.40 and 26.23±0.38, respectively. There was a significant ($p < 0.05$) difference in WHC percentages between the two groups. The current findings were consistent with those of Ayanniyi *et al.* (2022) [2] in African dwarf goat (bucks). Lende *et al.* (2019) [12] reported a similar conclusion for water-holding capacity in goat meat.

Extract Release Volume

The mean ± S.E % of ERV in group I and group II goats were 41.16±0.27 and 41.03±0.13, respectively. There was no significant difference in ERV percentage between the two groups ($p < 0.05$). A substantial volume of extract was collected during the investigation, showing the organoleptic and microbiological quality of the meat. Rajkumar *et al.* (2010) [16] reported similar findings in Sirohi children aged 9 and 12 months.

Meat Swelling Capacity

The mean ± S.E % of MSC in goats from groups I and II was 39.34±0.41 and 39.70±0.40, respectively. There was no

significant difference between the two groups in terms of MSC percentage. The study found that as age grew, flesh swelling capacity increased insignificantly.

Loin Eye Area

The average median eye area (cm²) at 6 and 8 months was 9.55±0.29 and 10.82±0.21, respectively. A significant difference ($p < 0.05$) was seen between the two groups in terms of LEA (cm²) present. The results showed that goats' LEA grew as they aged and gained weight. The findings were consistent with Shanthessa *et al.* (2023) [17]. Mule *et al.* (2012) [14] found that the average loin eye area of two lambs varied considerably ($p < 0.01$) with age, ranging from 12.15 cm² at 4 months to 19.32 cm² at 12 months.













Marbling

The study indicated that the mean ± S.E of marbling of group I and group II goats were 266.67±2.61 and 291.67±8.33, respectively. In terms of marbling, there was no significant difference between the two groups ($p > 0.05$). (Tables 1 and 2). Based to USDA (2001) [21], the mean result for group II was somewhat higher marbling, while group I had a trace of goat in muscle. The marbling fat is the last fat to accumulate on animal meat. Thus, elder animals had more time for fat deposition. Because marbling is a key factor in meat quality, it is linked to softness and juiciness. Gurung *et al.* (2022) [5] found a similar pattern of marbling in the carcasses of developing meat goats given varying amounts of hempseed meal. A similar conclusion was made by Islam (2010) [8], who discovered that marbling differed slightly amongst carcasses of different ages, such as one year, two years, and three years. Marbling increases with

age, but not considerably so. Prado *et al.* (2015) [15] revealed comparable findings on animal performance and carcass characteristics were slaughtered at 16 and 22 months old and at three different weights. Bulls slain at 22 months had

superior marbling ($p < 0.05$) than those slaughtered at 16 months. According to Mowlem (1992) [13], the proportion of intramuscular fat (marbling) in goat corpses does not change significantly as animals age or gain weight.

Table 2: Marbling of chevon of Osmanabadi goat

Marbling						
(Group-I)	T1	T2	T3	T4	T5	T6
Marbling						
Grades	200	300	300	250	300	250
(Group-II)	T7	T8	T9	T10	T11	T12
Marbling						
Grades	300	300	250	300	300	300

* Significant at 0.01% level ** Significant at 0.05% level NS – Non-significant

Proximate composition

Table 3 shows the approximate composition of both groups of goats at 6 and 8 months of age, including percentages of hydration, protein, fat, and ash.

Table 3: Effect of Age and Weight on Proximate Composition

Proximate Composition				
Characteristics	Group-I	Group-II	t -value	P- value
Moisture (%)	72.84±0.16	72.74±0.20	0.91	0.20 NS
Protein (%)	18.58±0.22	22.05±0.29	-16.32	0.00**
Fat (%)	2.19±0.07	3.07±0.11	-29.62	0.00**
Ash (%)	1.52±0.01	1.56±0.01	0.78	0.23 NS

* Significant at 0.01% level ** Significant at 0.05% level NS – Non-significant

Moisture percent

The mean \pm S.E of percent moisture in goat meat from groups I and II was 72.84±0.16 and 72.74±0.20, respectively. There was no significant ($p < 0.05$) variation in moisture percentages between the two groups. As the meat ages from 6 to 8 months, the moisture content decreases due to an increase in fat and collagen content. Veena (2014) [22] showed a similar tendency in Vizianagaram sheep: as the age increased from 9 to 12 months, the moisture content in the flesh reduced. Islam *et al.* (2010) [8] observed a similar tendency while determining the quality of various wholesale cuts of goat carcasses at different ages. Choi *et al.* (2023) [3] found similar results when they investigated the physiochemical parameters of Black Korean goat meat at different slaughter ages. Mule *et al.* (2012) [14] found that the moisture content was lowered at 12 months of age when investigating the effect of slaughter age on carcass characteristics and meat quality in Deccani sheep.

Protein percent

The mean \pm S.E of protein % in group I and group II goats were 18.58±0.22 and 22.05±0.29, respectively. Moisture percentages differed significantly ($p < 0.05$) between the two groups. A similar conclusion was seen by Hossain *et al.* (2021) [6], who evaluated the optimisation of the slaughter

age of Jamuna basin lamb based on carcass features and meat quality and found a considerable increase in protein content between two age groups. A similar tendency was seen by Ilavarasam *et al.* (2015) [7], who investigated the effect of age on the physiochemical and nutritional composition of indigenous Kodiadu goat meat. Furthermore, this tendency was consistent with the findings of Islam *et al.* (2010) [8], who discovered a considerable rise in protein percentage as age increased from one to two years. Mule *et al.* (2012) [14] reported similar findings, concluding that protein, fat, and cholesterol levels in mutton increased as lamb slaughter age increased from 4 to 12 months.

Fat percent

The fat % of goats in groups I and II had mean \pm S.E. values of 2.19±0.07 and 3.07±0.11, respectively. The fat percentage differed significantly ($p < 0.05$) between the two groups. Choi *et al.* (2023) [3] found similar results for the physiochemical parameters of Black Korean goat meat at different slaughter ages. Similar findings were reported by Ayanniyi *et al.* (2022) [2], who investigated the effect of slaughter weight on meat yield and chevon characteristics of West African dwarf goats (bucks) and discovered a substantial rise in fat content as buck weight increased. A similar conclusion was reported by Veena (2014) [22], who investigated the carcass and meat quality features of Vizianagaram sheep.

Ash percent

The percentage of ash in group-I and group-II goats was 1.52±0.01 and 1.56±0.01 respectively. There was no significant difference in ash percentage between the two groups ($p < 0.05$). These findings were consistent with Sivakumar *et al.* (2013) [18], who found no significant difference between the two weight groups. Das *et al.* (2008) [4] found no significant ($p < 0.05$) increase in ash per cent as age advanced from 6 to 9 months. The results were in close agreement with Islam *et al.* (2010) [8], who noted that quality determination of different wholesale cuts of goat carcass at different ages and found the ash content of the cuts of 1-year

aged groups (0.99±0.13%) respectively, was higher than that of other age groups.

Conclusion

The quantity of chevon increases as kids age increases. The protein, fat, and ash content of chevon increased as the slaughter age of kids progressed from 6 to 8 months, however the moisture content decreased with increasing weight and age of the goat.

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References

1. AOAC. Official Methods of Analysis, 16th ed. Association of Official Agricultural Chemists, Washington, W.C; c1995.
2. Ayanniyi NN, Olusola OO, Kenneth-Obosi O, Adeyemi SA, Umar A, Eze JN, *et al.* Badeggi Journal of Agricultural Research and Environment. 2022;04(03):18-27.
3. Choi DM, Kang KM, Kang SM, Kim HY. Physicochemical Properties of Black Korean Goat Meat with Various Slaughter Ages. *Animals*. 2023;13:692.
4. Das AK, Gopal Dass, Singh NP. Growth, carcass characteristics and meat quality of Muzaffarnagari lambs at various stages under intensive and semi-intensive management *Indian Journal of Animal Sciences*. 2008;78(5):541-546.
5. Gurung R, Ale KB, Abrahamsen FW, Moyer K, Sawyer JT, Gurung NK. Carcass Traits of Growing Meat Goats Fed Different Levels of Hempseed Meal. *Animals*. 2022, 12.
6. Hossain MA, Rahman MM, Rahman MW, Hossain MM, Hashem MA. Optimization of Slaughter Age of Jamuna Basin Lamb Based on Carcass Traits and Meat Quality. *SAARC Journal Agriculture*. 2021;19(2):257-27.
7. Ilavarasan R, Abraham RJJ, Rao VA, Pandiyan V, Narendra Babu R, Wilfred Ruban S. Effect of Age on Physico-Chemical and Nutritional Composition of Indigenous Kodiadu Goat Meat. *J Anim. Res*. 2015;5(3):585-590.
8. Islam R, Rahman SME, Khan M, Akhter S, Hossain MM, Tian Ding, *et al.* Quality Determination of Different Wholesale Cuts of Goat Carcass at Different Ages. *Journal of Food Hygiene Safety*. 2010;25(3):251-257.
9. Jay JM. Release of aqueous extracts by beef homogenates and factors affecting release volume. *Food Technology*. 1964;18:1633-1638.
10. Karthik J, Robinson JJ, Abrham V, Appa Rao Parthiban M, Narendra Babu R. A Survey on Preferred Slaughter Age of Goats in Tamil Nadu, India. *International Journal of Current Microbiology Applied Science*. 2017;6(10):285-287.
11. Kopuzlu S, Esenbuga N, Onenc A, Macit M, Yanar M, Sadrettin Yuksel S, *et al.* Effects of slaughter age and muscle type on meat quality characteristics of Eastern Anatolian Red Bulls. *Archives Animal Breeding*. 2018;61:497-504.
12. Lende SR, Deshmukh AD, Dhok AP, Kurkure NV, Bonde SW, Chahande JM, *et al.* Effect of Bypass Nutrients on pH and Water Holding Capacity of Goat Meat. *International Journal of Current Microbiology Applied Science*. 2019;8(8):1825-1829.
13. Mowlem A. Goat Farming. Farming Press Book, Ibswich IPI 4 LG, U.K; c1992.
14. Mule AD, Pachpute ST, Dhage SA. Effect of Slaughter Age on Carcass Traits and Meat Quality of Deccani Sheep. *The Indian Journal of Small Ruminants*. 2012;19(1):67-70.
15. Prado IN, Eiras CE, Fugita CA, Passetti RA, Ornaghi MG, Rivaroli DC, *et al.* Animal Performance and Carcass Characteristics of Bulls, 1/2 Puruna vs 1/2 Canchim. Slaughtered at 16 and 22 Months Old and Three Different Weights. *Asian Australasian Journal of animal sciences*. 2015;28(5):612-619.
16. Rajkumar V, Agnihotri MK, Arun Das K, Ramachandran N, Singh D. Effect of age on carcass characteristics and meat quality of Sirohi goat kids reared under semi-intensive and intensive management systems. *Indian Journal of Animal Sciences*. 2010;80(8):775-780.
17. Shanthasha KM, Ruban SW, Guruprasad R, Shivappanayaka HB, Naveen KS, Shivakumar R, *et al.* Effect of Age at Slaughter on Various Carcass Characteristics of Hassan Sheep. *Indian Journal Veterinary Science and Biotech*. 2023;19(1):91-95.
18. Sivakumar P. A Study on the Effect of Preslaughter Weight on Carcass Traits and Meat Quality and Proximate Composition of Kanni Goat Meat. *International Journal of Science, Environment and Technology*. 2013;2(5):994-999.
19. Snedecor GW, Cochran WG. "Statistical methods," 8th Edition, Iowa State University Press, Ames, 1994.
20. USDA. Composition of foods: pork products-raw, processed, prepared. Agriculture Handbook No. 8-10. Washington DC, USDA: USDA Human Nutrition Information Service, 1992.
21. USDA. Institutional Meat Purchased Specifications for Fresh Goat; Series 11; Meat Grading Certification Branch; USDA, MRP, AMF, Livestock and Seed Program: Washington, DC, USA; c2001.
22. Veena Dhanekula. Evaluation of carcass and meat quality characteristics of Vizianagaram sheep. Sri. Venkateswara Veterinary University, Tirupati; c2014.
23. Wardlaw FB, Caskill LH, Acton JC. Effect of postmortem muscle changes on poultry meat loaf properties. *Journal Food Science*. 1973;38(3):421-423.