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Goat tripe as a meat substitute in goat meat cutlets: Effects on quality and acceptability

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Abstract

A study was conducted to evaluate the effect of incorporation of goat tripe on physico-chemical and sensory characteristics of goat meat cutlets. Goat tripe was incorporated at 12.5, 20, 25 and 30% levels by replacing goat meat in the formulation. Goat meat cutlets prepared with 100% goat meat served as control. Significant ($p < 0.05$) increase was observed for pH, diameter shrinkage, protein and fat contents in goat tripe incorporated goat meat cutlets than control. However, significant ($p < 0.05$) reverse trends were observed for breading pickup, product yield, water holding capacity, moisture retention and moisture content. Sensory scores for appearance and colour, flavour, juiciness, tenderness, binding and overall acceptability were significantly ($p < 0.05$) higher for 12.5 and 20% goat tripe incorporated goat meat cutlets and the values were comparable with control goat meat cutlets. Further increase in goat tripe incorporation significantly reduced sensory scores. Therefore, it can be concluded that goat tripe can be effectively utilized up to 20% level in preparation of goat meat cutlets without affecting product quality and acceptability.

Keywords: Goat meat, goat tripe, cutlets, physico-chemical characteristics, sensory quality, acceptability

Introduction

Goat meat is one of the most preferred red meats because of its desirable flavour, high protein content and comparatively lower fat level. In addition to skeletal meat, edible by-products generated during slaughter also possess considerable nutritional and economic importance (Anna Anandh *et al.*, 2008) [3]. Goat tripe or rumen musculature is one of the major edible offals obtained during slaughter and accounts for a substantial proportion of slaughter by-products (Anna Anandh *et al.*, 2012) [4]. Goat tripe contains appreciable quantities of protein and minerals; however, its utilization is limited because of poor consumer preference and lack of suitable processing technologies.

Utilization of edible by-products in value added meat products can improve economic returns to meat industry and minimize wastage associated with slaughter house operations (Anjaneyulu and Kondaiah, 1990) [2]. In recent years, increasing competition in meat processing industry has encouraged utilization of low-cost edible by-products for development of economical and acceptable meat products (Anna Anandh *et al.*, 2008) [3].

Cutlets are popular ready-to-eat convenience meat products prepared from minced meat, spices, condiments and binders. The product is highly acceptable because of its desirable flavour, tenderness and palatability (Anna Anandh, 2019) [5]. Incorporation of goat tripe in meat products may influence physico-chemical and sensory characteristics because of differences in connective tissue content and functional properties of tripe compared to skeletal muscle meat (Anna Anandh, 2026) [6]. Therefore, the present study was undertaken to evaluate the effect of incorporation of goat tripe at different levels on physico-chemical and sensory characteristics of goat meat cutlets.

Materials and Methods

Goat meat

Fresh goat skeletal meat was procured from local goat meat stalls. Visible fat and connective

tissues were removed manually. The meat was cut into small chunks and frozen for 2 hr to facilitate easy mincing. The meat chunks were minced twice through a meat mincer using 5 mm plate.

Goat tripe

Fresh goat tripe was procured from local goat meat stalls. The adhering fat and extraneous materials present on the surface were removed manually using knife. The tripe was washed thoroughly with potable water and pressure cooked at 15 psi for 20 min. The cooked tripe was cut into small pieces and frozen for 2 hr to facilitate easy mincing. The tripe pieces were minced twice through a meat mincer using 5 mm plate.

Formulation and treatments goat meat cutlets

The basic control goat meat cutlet recipe consisted of 100% goat meat. The goat meat replaced at of 12.5%, 20%, 25% and 30%. of the goat tripe in the basic control formulation. Each formulation also contained salt (1.5%), dry spice mix (2.0%), condiments mix (10.0%), vegetable oil (3.0%) and bread crumbs (2.5%). The condiment paste consisted of onion, garlic and ginger in a 3:2:1 ratio.

Preparation of goat meat cutlets

The minced goat meat and goat tripe were mixed according to treatment formulations. Condiments and spices were fried separately and blended thoroughly with meat mixture and bread crumbs to obtain uniform dough. Approximately 50 gm of batter was moulded into oval shaped cutlets and chilled. The cutlets were dipped in beaten whole egg, rolled in bread crumbs and deep fat fried until golden brown colour developed.

Physico-chemical analysis

Digital pH meter was used for pH measurement. Product yield was calculated using standard procedures and expressed as percentage (Anna Anandh *et al.*, 2008) [3]. Diameter shrinkage values were measured before and after frying using digital vernier caliper as per the method described by Ahamed *et al.* (2007) [1]. Breeding pickup, moisture retention and oil uptake were determined using standard procedures (Anna Anandh, 2019) [5]. Moisture, protein and fat contents were estimated by using standard methods described by AOAC (1995) [7].

Sensory evaluation

The cutlet samples were served warm to semi-trained panelists consisting of faculty and students. Sensory attributes such as appearance and colour, flavour, tenderness, juiciness, binding and overall acceptability were evaluated using an 9-point hedonic scale wherein 1 = extremely undesirable and 9 = extremely desirable (Keeton, 1983) [8].

Statistical analysis

The experiment was repeated six times and the data generated were statistically analyzed by following standard procedures described by Snedecor and Cochran (1989) [12].

Results and Discussion

Physico-chemical characteristics

The physico-chemical characteristics of goat meat cutlets incorporated with different levels of goat tripe are presented in Table 1. Significant ($p < 0.05$) differences were observed among treatments for all the physico-chemical parameters were studied. The pH values increased significantly ($p <$

0.05) with increasing levels of goat tripe incorporation. The control goat meat cutlets recorded the lowest pH value (5.84 ± 0.12), whereas the highest pH value (6.02 ± 0.12) was observed in T₄ containing 30 per cent goat tripe. The increase in pH with increasing goat tripe incorporation might be attributed to the comparatively higher connective tissue and collagen content present in goat tripe (Nisa *et al.*, 2024) [10].

Breeding pickup percentage decreased significantly ($p < 0.05$) with increase in goat tripe incorporation. The control goat meat cutlets showed the highest breeding pickup value ($12.84 \pm 0.14\%$), whereas the lowest value ($11.48 \pm 0.10\%$) was recorded in T₄. The reduction in breeding pickup might be due to lower surface binding characteristics and increased moisture loss in cutlets incorporated with higher levels of goat tripe (Voong *et al.*, 2018) [13].

Product yield decreased significantly ($p < 0.05$) as the level of goat tripe incorporation increased. The highest product yield was observed in control cutlets ($94.82 \pm 0.18\%$), while the lowest value was recorded in T₄ ($91.84 \pm 0.18\%$). The reduction in product yield might be due to lower water holding capacity and higher cooking losses associated with increased goat tripe incorporation (Anna Anandh *et al.*, 2008) [3]. Water holding capacity values decreased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The control cutlets exhibited the highest water holding capacity ($58.46 \pm 0.16\%$), whereas T₄ recorded the lowest value ($55.62 \pm 0.16\%$). The decrease in water holding capacity might be due to lower myofibrillar protein content and higher connective tissue proportion in goat tripe (Wang *et al.*, 2022) [14].

Diameter shrinkage increased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The lowest diameter shrinkage was observed in control cutlets ($8.24 \pm 0.16\%$), whereas the highest value was recorded in T₄ ($9.58 \pm 0.16\%$). Increased shrinkage in goat tripe incorporated cutlets might be due to moisture loss and collagen contraction during frying (Voong *et al.*, 2018) [13]. Moisture retention values decreased significantly ($p < 0.05$) as the level of goat tripe incorporation increased. The control cutlets recorded the highest moisture retention value ($56.84 \pm 0.14\%$), whereas the lowest value was observed in T₄ ($53.88 \pm 0.14\%$). Reduced moisture retention in higher tripe incorporated treatments might be attributed to lower water binding ability of connective tissue-rich goat tripe (Schock *et al.* 2006) [11]. Oil uptake values increased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The control cutlets showed the lowest oil uptake value ($8.18 \pm 0.12\%$), whereas T₄ recorded the highest value ($9.58 \pm 0.12\%$). The increase in oil uptake might be due to greater moisture loss during frying, which created void spaces facilitating absorption of oil into the product (Lumanlan *et al.*, 2019) [9].

Moisture content decreased significantly ($p < 0.05$) with increase in goat tripe incorporation. The control cutlets recorded the highest moisture content ($64.82 \pm 0.16\%$), whereas T₄ showed the lowest value ($61.86 \pm 0.16\%$). The decrease in moisture content might be due to lower water holding capacity and increased cooking loss in goat tripe incorporated cutlets (Anna Anandh *et al.*, 2008) [3]. Protein content increased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The highest protein content was observed in T₄ ($19.22 \pm 0.14\%$), whereas the control cutlets recorded the lowest value ($17.84 \pm 0.14\%$). The increase in protein content might be attributed to the high collagen and connective tissue protein content present in goat tripe (Anna Anandh *et al.*, 2008) [3]. Fat content also increased significantly ($p < 0.05$) with increasing levels of goat tripe

incorporation. The control cutlets recorded the lowest fat content ($11.24 \pm 0.12\%$), while T₄ showed the highest value ($12.62 \pm 0.12\%$). The increase in fat content might be associated with higher oil absorption during frying as well as

reduction in moisture content in goat tripe incorporated cutlets. Overall, incorporation of goat tripe significantly influenced the physico-chemical characteristics of goat meat cutlets.

Table 1: Physico-chemical characteristics of goat meat cutlets incorporated with goat tripe (Mean $\pm$ S.E)

Physico - chemical characteristics (n = 6)	Control goat meat cutlet	T ₁ (12.5% goat tripe)	T ₂ (20% goat tripe)	T ₃ (25% goat tripe)	T ₄ (30% goat tripe)
pH	5.84 ± 0.12^e	5.86 ± 0.10^d	5.90 ± 0.12^c	5.96 ± 0.10^b	6.02 ± 0.12^a
Breading pickup (%)	12.84 ± 0.14^a	12.62 ± 0.12^b	12.28 ± 0.10^c	11.94 ± 0.12^d	11.48 ± 0.10^e
Product yield (%)	94.82 ± 0.18^a	94.12 ± 0.16^b	93.42 ± 0.14^c	92.68 ± 0.16^d	91.84 ± 0.18^e
Water holding capacity (%)	58.46 ± 0.16^a	57.98 ± 0.14^b	57.22 ± 0.12^c	56.46 ± 0.14^d	55.62 ± 0.16^e
Diameter shrinkage (%)	8.24 ± 0.16^e	8.46 ± 0.14^d	8.82 ± 0.12^c	9.16 ± 0.14^b	9.58 ± 0.16^a
Moisture retention (%)	56.84 ± 0.14^a	56.22 ± 0.12^b	55.48 ± 0.10^c	54.72 ± 0.12^d	53.88 ± 0.14^e
Oil uptake (%)	8.18 ± 0.12^e	8.46 ± 0.10^d	8.82 ± 0.12^c	9.16 ± 0.10^b	9.58 ± 0.12^a
Moisture (%)	64.82 ± 0.16^a	64.14 ± 0.14^b	63.42 ± 0.12^c	62.68 ± 0.14^d	61.86 ± 0.16^e
Protein (%)	17.84 ± 0.14^e	18.06 ± 0.12^d	18.42 ± 0.10^c	18.84 ± 0.12^b	19.22 ± 0.14^a
Fat (%)	11.24 ± 0.12^e	11.46 ± 0.10^d	11.82 ± 0.12^c	12.18 ± 0.10^b	12.62 ± 0.12^a

Means bearing same superscripts row-wise do not differ significantly ($p < 0.05$).

Sensory characteristics

The sensory characteristics of goat meat cutlets incorporated with different levels of goat tripe are presented in Table 2. Significant ($p < 0.05$) differences were observed among treatments for all sensory attributes studied. Appearance and colour scores decreased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The control goat meat cutlets recorded the highest appearance and colour score (8.2 ± 0.12), whereas the lowest score (7.4 ± 0.12) was observed in T₄ containing 30 per cent goat tripe. The reduction in appearance and colour scores at higher levels of goat tripe incorporation might be due to darker colour and uneven surface texture associated with higher connective tissue content. Flavour scores also decreased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The control cutlets showed the highest flavour score (8.1 ± 0.10), while T₄ recorded the lowest score (7.2 ± 0.14). The decrease

in flavour scores in higher tripe incorporated treatments might be due to the characteristic flavour of goat tripe, which could have affected overall palatability. Juiciness scores decreased significantly ($p < 0.05$) as the level of goat tripe incorporation increased. The control cutlets recorded the highest juiciness score (8.0 ± 0.14), whereas T₄ showed the lowest score (7.0 ± 0.14). The reduction in juiciness scores might be associated with lower moisture retention and higher cooking losses in cutlets incorporated with higher levels of goat tripe. Tenderness scores also decreased significantly ($p < 0.05$) with increasing goat tripe incorporation. The control cutlets recorded the highest tenderness score (8.2 ± 0.12), whereas the lowest score was observed in T₄ (7.2 ± 0.12). The decrease in tenderness might be attributed to the higher collagen and connective tissue content present in goat tripe, which imparted slightly tougher texture to the cutlets.

Table 2: Sensory attributes of goat meat cutlets incorporated with goat tripe (Mean $\pm$ S.E)

Sensory Characteristics** (n= 42)	Control goat meat cutlet	T ₁ (12.5% goat tripe)	T ₂ (20% goat tripe)	T ₃ (25% goat tripe)	T ₄ (30% goat tripe)
Appearance and colour	8.2 ± 0.12^a	8.2 ± 0.10^b	8.0 ± 0.12^c	7.8 ± 0.10^d	7.4 ± 0.12^e
Flavour	8.1 ± 0.10^a	8.0 ± 0.12^b	7.8 ± 0.10^c	7.6 ± 0.12^d	7.2 ± 0.14^e
Juiciness	8.0 ± 0.14^a	7.9 ± 0.12^b	7.6 ± 0.10^c	7.4 ± 0.12^d	7.0 ± 0.14^e
Tenderness	8.2 ± 0.12^a	8.1 ± 0.10^b	7.8 ± 0.12^c	7.6 ± 0.10^d	7.2 ± 0.12^e
Binding	8.0 ± 0.10^a	7.9 ± 0.12^b	7.6 ± 0.10^c	7.4 ± 0.12^d	7.0 ± 0.10^e
Overall acceptability	8.1 ± 0.12^a	8.0 ± 0.10^b	7.8 ± 0.12^c	7.6 ± 0.10^d	7.2 ± 0.12^e

Means bearing same superscripts row-wise do not differ significantly ($p < 0.05$).

**Sensory attributes were evaluated on a 9 – point hedonic scale (wherein 1 = extremely undesirable; 9 = extremely desirable).

Overall acceptability scores decreased significantly ($p < 0.05$) with increasing levels of goat tripe incorporation. The control cutlets recorded the highest overall acceptability score (8.1 ± 0.12), while T₄ showed the lowest score (7.2 ± 0.12). However, cutlets incorporated with up to 20 per cent goat tripe (T₂) were rated highly acceptable by the sensory panel without significant deterioration in sensory quality compared to control. Overall, incorporation of goat tripe influenced the sensory quality of goat meat cutlets. Incorporation up to 20% goat tripe resulted in acceptable sensory characteristics and could be effectively utilized for preparation of value-added goat meat cutlets.

Conclusion

Based on the results of physico-chemical and sensory characteristics, it can be concluded that goat tripe can be

effectively utilized up to 20% incorporation level in preparation of goat meat cutlets without adversely affecting product quality and acceptability. Incorporation of goat tripe in value added meat products could improve utilization of edible slaughter house by-products and increase economic returns to meat industry.

Conflict of Interest

Not available

Financial Support

Not available

References

- Ahamed ME, Anjaneyulu AS, Sathu T, Thomas R, Kondaiah N. Effect of different binders on the quality of

- enrobed buffalo meat cutlets and their shelf life at refrigeration storage (4 ± 1 °C). *Meat Sci.* 2007;75(3):451-459.
2. Anjaneyulu ASR, Kondaiah N. Quality of buffalo meat nuggets and rolls containing edible by-products. *Indian J Meat Sci.* 1990;3:95-99.
 3. Anna Anandh M, Radha K, Lakshmanan V, Mendiratta SK. Development and quality evaluation of cooked buffalo tripe rolls. *Meat Sci.* 2008;80:1194-1199.
 4. Anna Anandh M, Richard Jagatheesan PN, Rajarajan G, Senthil Kumar P, Paramasivam V, Lakshmanan V. Quality and acceptability of traditional styled fried tripe products from buffalo and goat rumen meat. *Int Food Res J.* 2012;19:807.
 5. Anna Anandh M. Quality and acceptability of chicken meat cutlets incorporated with chicken meat emulsion. *Food Sci Res J.* 2019;10(1):31-36.
 6. Anna Anandh M. Quality and acceptability of shami kebab incorporated with goat meat and tripe. *Int J Agric Food Sci.* 2026;8(5):409-412.
 7. Association of Official Analytical Chemists. Official methods of analysis. 16th ed. Washington, DC: Association of Official Analytical Chemists; 1995.
 8. Keeton JT. Effect of fat and NaCl/phosphate levels on the chemical and sensory properties of pork patties. *J Food Sci.* 1983;48:878-881.
 9. Lumanlan J, Fernando W, Jayasena V. Mechanisms of oil uptake during deep frying and applications of predrying and hydrocolloids in reducing fat content of chips. *Int J Food Sci Technol.* 2020;55. doi:10.1111/ijfs.14435.
 10. Salim VN, Madhan B, Glattauer V, Ramshaw JAM. Comprehensive review on collagen extraction from food by-products and waste as a value-added material. *Int J Biol Macromol.* 2024;278:134374.
 11. Schock D, Harrison D, Anderson L. Effect of dry and heat treatments on selected beef quality factors. *J Food Sci.* 2006;35:195-198.
 12. Snedecor GW, Cochran WG. Statistical methods. 8th ed. Calcutta: Oxford and IBH Publishing Co.; 1989.
 13. Voong KY, Norton AB, Mills TB, Norton IT. Characterization of deep-fried batter and breaded coatings. *Food Struct.* 2018;16:43-49.
 14. Wang J, Yang P, Han D, Huang F, Li X, Song Y, *et al.* Role of intramuscular connective tissue in water holding capacity of porcine muscles. *Foods.* 2022;11(23):3835.

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