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Quality and acceptability of traditional styled fried tripe products from buffalo and goat rumen meat

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Abstract: Rumen meat otherwise known as tripe is one of the important edible offal and the material offers good scope for products processing. Traditional styled fried tripe products were prepared from buffalo and goat tripe and were studied for various physico-chemical, microbial and sensory qualities. Significantly ($p<0.01$) higher pH, product yield, moisture and fat percentage were observed in fried buffalo tripe product as compared to fried goat tripe product. Protein content of buffalo and goat fried tripe products did not differ significantly between them. Total plate, coliform and yeast and mould counts of buffalo and goat fried tripe products did not differ significantly between them and were within the standards specified for cooked meat products. All sensory scores were better for fried goat tripe product as compared to fried buffalo tripe product. Therefore, it can be concluded that traditional styled fried tripe products prepared from buffalo and goat tripe had better physico-chemical, microbial qualities and sensory scores were rated moderately to highly acceptable.

Key words: Buffalo, goat, rumen, tripe, frying, fried tripe, quality, acceptability

Introduction

Food animals are slaughtered mainly for meat, the by products that are eminated from slaughtered animals are also of good value. Rumen musculature otherwise called as 'tripe' and colloquially called as '*butt*' or '*potti*', is one of the important edible offal with substantial yield and it accounts for 2.8 and 1.3% of slaughter weight of goat and buffalo, respectively. Tripe is one of the high proteinnacious by product obtainable from slaughter house. Development of value added products from tripe is very limited because its inherent toughness due to high collagen content, off odors, poor functional properties and shelf life. The material offers good scope for processing products processing, subject to successfully overcoming these limitations. In India most of the tripe is underutilized or thrown as waste because of socio-cultural factors and lack of technology. To overcome this disposal problem and to find means of better utilization, very few attempts have been made to develop value added products exclusively from tripe (Anna Anandh *et al.*, 2008). Some attempts have been made to utilize tripe as partial substitute for lean meat in the preparation of comminuted meat products (Anjaneyulu and Kondaiah, 1990). It is observed that in Indian household utilized the tripe for preparation of tripe curry and tripe fry. Taking a clue from this practice and in order to diversify the available product range, the cost effective recipe for fried buffalo and goat tripe was standardized and their quality characteristics were evaluated.

Material and Methods

Buffalo and goat tripe

Fresh goat and buffalo tripe obtained from local meat market. The fat and adhering extraneous materials on the surface of tripe were removed by knife and it was cut in to small chunks of about 2.5 cm. The time lag between the slaughter of the animal and the commencement of the experiment was about 3 h. The tripe meat has typical off – odour reminiscent of ingesta. Hence, the materials has to be suitably treated to reduce, eliminate such off - odour prior to its used for preparation in to products by immersion in 5% trisodium phosphate solution for 30 min was used as per standard procedure (Anna Anandh *et al.*, 2004).

Spices and condiments

Dry spices viz. aniseed (10%), black peper (10%), capsicum (8%) caraway seed (10%), cardamams (5%), cinnamum (4%), cloves (1%), coriander (20%), cumin seed (22%) and turmeric (10%) were cleaned to remove the extraneous materials and dried in oven at 50º C for 4 h. The ingredients were ground in a grinder and sieved through a fine mesh. For

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preparation of condiments mix, fresh onion, garlic and ginger were procured from the local market and were peeled of the external covering. The required quantities were cut in to small bits and mixed in a laboratory blender to a fine paste.

Product formulation

The formula for fried tripe product was developed after conducting a series of preliminary trials. The fried tripe product formulation consisted of pressure cooked tripe pieces 100%, spice mixture 5.0% , table salt 2.5%, turmeric 2.5%, condiments mix 6.0% (onion, ginger and garlic paste in the ratio of 2: 3: 1) and refined oil 15%.

Process schedule for preparation of fried tripe products

The deodorized tripe pieces were pressure cooked at 15 psi for 10 min and then used for preparation of tripe fry. The spices and condiments were shallow fried in oil to get the "golden brown stage" of spices-condiments mixture and then pre-cooked tripe pieces are added to the fried spice mixture. The cooked tripe pieces and spice mixture were further shallow fried and cooked for about 15 min to ensure uniform penetration of spice extract into meat pieces. The end-point of the fried tripe product was development of an attractive golden brown colour and flavor of the product. After cooling, the fried tripe products were packaged in sterile polyethylene pouches, sealed and stored at room temperature. The products were evaluated the various physico-chemical parameters, microbial profile and sensory attributes on a 8-point hedonic scale.

Physico-chemical and sensory analysis pH

The pH of fried tripe products were determined by using digital pH meter. Homogenates were prepared by blending 10 g sample with 90 ml distilled water using an Ultra Turrax tissue homogenizer for 1 min. The pH of the homogenates was recorded by immersing combined glass electrode of digital pH meter (Century Instruments Ltd, India).

Product yield

The weight of fried tripe products were recorded before and after fring and the yield was calculated (product yield = weight of smoked products / weight of raw products 100) and expressed as percentage.

Shear force value (SFV)

Core of 1 cm2 were taken from fried tripe products after cooling at 4$\pm$2ºC for overnight and sheared using Warner Bratzler shear press (GR Elect. Mfg, Co., USA). The force required to shear the sample was observed and recorded (Kg/cm^{-3}). 10 observations were recorded for each sample to get the average value.

TBA value

The procedure of Witte *et al*. (1970) was followed to estimate thiobarbituric acid value (TBA). Trichloroacetic acid extracts of each sample were used for measuring the absorbance at 532 nm. TBA value was calculated as mg malonaldehyde per kg meat sample by referring to a standard graph prepared using known concentration of malonaldehyde.

Proximate composition

The moisture, protein and fat contents of fried tripe products were determined by standard methods using Hot air oven, Kjeldahl's assembly and Soxhlet ether extraction apparatus, respectively (AOAC, 1995).

Microbial profile

Total plate, coliform, yeast and mold counts of freshly prepared fried tripe product samples were determined by the methods described by APHA (1984). Readymade media (Hi-media Laboratory Pvt. Ltd., Mumbai, India) used for enumeration of microbes. Preparation of samples and serial dilutions were done near the flame in a horizontal laminar flow apparatus which was pre sterilized by ultraviolet irradiation (Yarco Sales Pvt. Ltd., India) by observing all possible aseptic precautions. 10 fold dilutions of each sample were prepared aseptically by blending 10 g of sample with 10 ml of 0.1 % sterile peptone water with a pre sterilized blender. Plating medium was prepared by dissolving 23.5 g of plate count agar in 1 lit of distilled water and pH was adjusted to 7.0 $\pm$ 0.2. Media was autoclaved at 15 1b pressure for 15 min before plating. The plates were incubated at 30 $\pm$1ºC for 48 h for total plate count. Coliform count was detected using 41.5g of Violet Red Bile Agar and plates were incubated at 37 $\pm$ 1º C for 48 h. 60.5 g of Potato Dextrose Agar was used for enumeration of yeast and mold count and the plates were incubated at 25 $\pm$ 1ºC for 5 days. The plates were incubated at 37 $\pm$ 1ºC for 48 hr. Following incubation, plates showing 30-300 colonies were counted. The average number of colonies for each species was expressed as log10 cfu / g sample.

Sensory evaluation

Sensory evaluation was conducted with semi-trained panelists. Fried goat and buffalo tripe product slices were served to the panelists. The sensory attributes like appearance and colour, flavour, juiciness, tenderness and overall palatability were evaluated on 8 point descriptive scale (where in 1 is extremely undesirable and 8 is extremely desirable).

Statistical analysis

The experiment was repeated four times. The data generated from each experiment were analyzed statistically by following standard procedures (Snedecor and Cochran, 1989) for comparing the means and to determine the effect of treatment.

Results and Discussion

Physico-chemical characteristics of fried buffalo and goat tripe products

Physico-chemical parameters of fried buffalo and goat tripe products prepared by traditional style are presented in Table 1.Overall mean for pH value was 6.79±0.31. The mean pH values were 6.99±0.14 and 6.59±0.48 for fried buffalo and goat tripe products, Mean pH value was significantly (p<0.01) higher for fried buffalo tripe product as compared to fried goat tripe product. Higher pH values of fried buffalo tripe product might be due to higher pH of fresh buffalo tripe as compared to goat tripe. Overall mean for product yield was 54.33±0.15. The mean product yield values were 57.48±0.22 and 51.18±0.08 for fried buffalo and goat tripe products. Mean product yield was significantly (p<0.01) higher for fried buffalo tripe product as compared to fried goat tripe product. Low product yield of goat tripe was due to higher cooking loss in goat tripe. This might be due to very low water holding capacity and comparatively poor functional and binding properties of fresh goat tripe as compared to buffalo tripe. Overall mean for shear force value was 3.92±0.61. The mean shear force values were 4.72±0.93 and 3.12±0.28 for fried buffalo and goat tripe products. The mean shear force value was significantly (p<0.01) higher for fried buffalo product followed by fried goat tripe product. This might be due to higher collagen content and collagen solubility of buffalo tripe as compared to goat tripe. Overall mean for moisture, protein and fat value were 53.64±0.09, 17.75 ± 0.33 and 3.08 ± 0.19, respectively. The mean moisture, protein and fat content values were 59.92±0.10 and 47.36±0.08, 16.30±0.42, 19.20±0.26 and 2.89±0.20 for fried buffalo and goat tripe products, respectively. Moisture content was significantly (p<0.01) low in fried goat tripe and high in fried buffalo tripe product. This lower moisture content of the fried goat tripe product might be due to lower water holding capacity of goat tripe as compared to buffalo tripe meat. The protein content of fried buffalo and goat tripe products did not differ significantly between them.

Table1. Physico-chemical characteristics of fried buffalo and goat tripe products (Mean ± S.E)

Parameters	Fried buffalo tripe	Fried goat tripe	Overall mean ± SE
pH	6.99±0.14 ^{a}	6.59±0.48 ^{b}	6.79±0.31
Product yield (%)	57.48±0.22 ^{a}	51.18±0.08 ^{b}	54.33±0.15
Shear force value (Kg/cm^{-3})	4.72±0.93 ^{a}	3.12±0.28 ^{b}	3.92±0.61
Moisture (%)	59.92±0.10 ^{a}	47.36±0.08 ^{b}	53.64 ± 0.09
Protein (%)	16.30±0.42^{NS}	19.20±0.26^{NS}	17.75 ± 0.33
Fat (%)	2.89±0.20 ^{a}	3.27±0.18 ^{b}	3.08 ± 0.19
TBA value (mg malonaldehyde / kg)	0.65±0.64 ^{a}	0.22±0.28 ^{b}	0.44 ± 0.46

Number of observations: = 4
Means bearing different superscripts row- wise differ significantly (P<0.01)

Table 2. Microbial profile (log_{10} cfu/g) of fried buffalo and goat tripe products (Mean ± S.E)

Microbial profile (log_{10} cfu/g)	Fried buffalo tripe	Fried goat tripe	Overall mean ± SE
Total plate count	1.65±0.12^{NS}	1.59±0.58^{NS}	1.62 ± 0.35
Coliform count	1.36±0.02^{NS}	1.24±0.08^{NS}	1.30 ± 0.05
Yeast and mould count	0.85±0.18^{NS}	0.84±0.32^{NS}	0.85 ± 0.20

Higher protein content value was observed in fried goat tripe products as compared to fried buffalo tripe products. The decrease in protein content of fried buffalo tripe product was due to relatively higher moisture content of the product (Reddy *et al*., 1998). Significantly (p<0.01) increased fat content value observed in fried goat tripe product as compared to fried buffalo tripe product. The variation might be due to absorption of fat during frying in oil (Jindal and Bawa, 1988). Overall mean for TBA value was 0.44±0.46. TBA values for fried buffalo tripe and goat products were 0.65±0.64 and 0.22±0.28 mg malonaldehyde/kg meat. There was a significant (p<0.01) increase in TBA values was observed fried buffalo tripe as compared to fried goat tripe product but the values remained well within the threshold limit of limit of 1-2mg malonaldehyde/kg of meat product (Watts, 1962). A positive correlation between microbial load and TBA value was reported. Increase of microbial load in meat samples caused increased oxidative charges. Increased oxidative changes might be attributed to increase in TBA value (Jay, 1996).

Microbial profile of fried buffalo and goat tripe products

Microbial profile of fried buffalo and goat tripe products prepared by traditional style are presented in Table 2. Overall mean for total plate count, coliform count and yeast and mould count were 1.62 ± 0.35, 1.30 ± 0.05 and 0.85 ± 0.20, respectively. The mean total plate count, coliform count and yeast and mould count were 1.65±0.12 and 1.59±0.58, 1.36±0.02

and 1.24±0.08 and 0.85±0.18 and 0.84±0.32 for fried buffalo and goat tripe products, respectively. Increased microbial counts were observed in fried buffalo tripe product as compared to fried goat tripe product. However, there was no significant difference between fried buffalo and goat tripe products and the microbial counts were within the standard stipulated for cooked meat products (Jay, 1996).

Sensory characteristics of fried buffalo and goat tripe products

Sensory attributes of fried buffalo and goat tripe products prepared by traditional style are presented in Table 3. The sensory attributes score for appearance and colour, flavour, juiciness, tenderness and overall acceptability were higher for fried goat tripe product as compared to fried buffalo tripe product. Between fried tripe products, the sensory attributes of flavour and tenderness were significantly ($p<0.01$) higher for fried goat tripe product than fried buffalo tripe product. However, appearance and colour, juiciness and overall acceptability scores between fried buffalo tripe and fried goat tripe products were non significant. Among fried tripe products fried goat tripe product was rated moderately to very acceptable and fried buffalo tripe product was rated moderately acceptable.

Table 3. Sensory attributes of fried buffalo and goat tripe products (Mean ± S.E)

Sensory attributes *	Fried buffalo tripe	Fried goat tripe	Overall mean ± SE
Appearance and colour	7.25±0.32 ^{a}	7.32±0.82 ^{b}	7.29± 0.57
Flavour	6.39±0.12 ^{a}	6.79±0.04 ^{b}	6.59 ± 0.08
Juiciness	6.92±0.14 ^{NS}	7.26±0.10 ^{NS}	7.09 ± 0.12
Tenderness	6.43±0.88 ^{a}	7.01±0.04 ^{b}	6.72± 0.46
Overall acceptability	6.91±0.09 ^{NS}	7.30±0.06 ^{NS}	7.11 ± 0.80

Number of observations: = 20
*Sensory attributes of fried tripe products were evaluated on a 8 – point descriptive scale (wherein 1 = extremely undesirable; 8 = extremely desirable).
Means bearing different superscripts row- wise differ significantly (P<0.01)

Conclusions

Based on the results of physico-chemical parameters, microbial profile and sensory attributes, it can be concluded that goat and buffalo tripe can be successfully used for value addition into preparation traditional styled fried tripe products with acceptable physico - chemical, microbial and sensory characteristics.

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