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Research Article

IMPACT OF BUTTER ON QUALITY OF GOAT MEAT SPREAD

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Abstract: It is a common myth that adding butter to meals makes it taste better and enhances other flavours. Investigation was done to develop goat meat spread added with various concentrations of butter *viz*., 1.0, 3.0and 5.0 per cent and the final quality of products was assessed based on physico-chemical quality, instrumental colour profile analysis and sensory quality. The pH of spread was significant (P<0.05) increased whereas cooking yield and spread ability was increased highly significant (P<0.01) with increase in concentration of butter. Further, highly significant (P<0.01) decrease in redness (a*) and increase in lightness (L*) was observed after incorporation of butter. The Yellowness (b*) of product was significant (P<0.05) increased. All the sensory attributes of spread were exhibited highly significant (P<0.01) differences except texture and adhesive ability. Sensory quality of goat meat spread was increase significant (P<0.05) with increase in concentration of butter upto 3% and thereafter the sensory quality was decreased. Thus, based on results it may be concluded that incorporation of 3.0% butter was most suitable for development of goat meat spread.

Keywords: *Spread, Butter, Physcio-chemical quality, Instrumental colour profile, Sensory quality*

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Introduction

The world's total output of goat meat is estimated to be 6.2 million tonnes, whereas India produces 937.64 tonnes of goat meat worldwide. Goat meat is virtually universally accepted, consumer preference is influenced by cultural traditions, social norms, and economic factors [1, 2]. Goat meat tenderness values are frequently within acceptable limits; however, they are lower than those of lamb, mutton and beef [3]. Goat meat is known to have a low-fat level and excellent processing qualities, such as colour and water holding capacity. Additionally, there is a high proportion of polyunsaturated to saturated fatty acids.

The snack sector, which often includes bakery goods, ready-to-eat mixes, chips, pretzels, crackers, cookies, bars, namkeen and other minimally processed ready-to-eat foods, can satisfy short-term hunger. The bulk of snacks on the market are made of cereal are high in calories and lack essential amino acids like tryptophan, threonine, and lysine [4]. "Spreading's" are a variety of quick snacks made to be spread on top of or sandwiched between a base like bread. Several products, including cheese, mayonnaise, jam and jelly are available in India's quick snack market. The demand from customers for food products with high protein content and low calories is one of the factors contributing to the growth of the overall meat snack sector. It is generally accepted that food's sensory qualities are impacted by fats. In addition to their significant role as precursors of flavour compounds, they influence the mouthfeel, volatility, and threshold value of flavour components, which alter the overall flavour of many foods [5], as well as texture, appearance and aroma [6, 7]. The distinctive flavour molecules found in dairy fat enhance to the flavour and taste of foods [8]. It is a common myth that adding butter makes food tastier [9] and other flavours are also enhanced. In restaurants, it is usual practise to add butter to foods before serving to improve their appearance, flavour, and consistency. Many cookbooks make the same suggestion, but often do not specify how much butter to use [10] & [11].

It is usually up to the cook to get the correct consistency and flavour and the amount of butter used is commonly arbitrary. The aim of this research was to determine how various butter addition levels affected the perceived physic-chemical quality, instrumental colour profile and sensory characteristics of goat meat spread.

Material and methods

The study was conducted in the Department of Livestock Products Technology (Meat Science), Madras Veterinary College, TANUVAS, Chennai-600007, TN in the year 2021-22. Spent goat meat samples required for the experiments were purchased from local market at Vepery, Chennai-07. Meat was deboned after 24 hrs. of chilling at 4±1°C. A 4.5 mm sieve was used to mince the goat meat twice in a meat mincer after all visible fat, fascia and connective tissue were removed. Minced beef was placed in a colourless low-density polyethylene (LDPE) bag and condition for approximately 24 hours at 4±1°C in a refrigerator and then maintained at -18±1°C. Before product preparation, the meat was thawed at 4±1°C for 12 hr. Onion, garlic, and ginger paste was used as a condiment in a 3:2:1 ratio. Spice ingredients, procured from the local market were dried at 50 ± 1°C for 4 hr. in a hot air oven. The ingredients were finely ground, sieved and added in fixed proportions [Table-1] as suggested by Raziuddin, *et al.,* (2021) [12].

Processing of meat spread

The current investigation was conducted in the following steps to formulate the goat meat spread by incorporation of varying butter levels at 1.0%, 3.0% and 5.0% incorporations. The braising technique was used to cook the [Table-2] ingredients as subjected by Raziuddin, *et al*., (2020) [13]. The developed goat meat spread fortified with butter was analyzed based on physico-chemical analysis, instrumental color profile and sensory evaluation.

Table-1 *Composition of spice mix for formulation of goat meat spread*

SN	Ingredients	% in the mix
1	Coriander powder (Dhania)	25.0
2	Cumin seeds (Zeera)	12.0
3	Dried ginger (Sont)	10.0
4	Aniseed (Soanf)	10.0
5	Black pepper (Kali mirch)	10.0
6	Caraway seed (Ajowan)	05.0
7	Turmeric (Haldi)	05.0
8	Capsicum (Mirch powder)	08.0
9	Cardamom (Badi elaichi)	05.0
10	Cinnamon (Dal chini)	05.0
11	Cloves (Laung)	03.0
12	Nutmeg (Jaiphal)	01.0
13	Mace (Jaipatri)	01.0

Table-2 *Formulation for the development of goat meat spread*

SN	Ingredients	Percentage (w/w)			
		Control	T_1	T_2	T_3
1	Spent Goat Meat	48.53	48.53	48.53	48.53
2	Salt	2.00	2.00	2.00	2.00
3	Spice Mix	2.23	2.23	2.23	2.23
4	Skimmed Milk Powder	1.86	1.86	1.86	1.86
5	Condiments	5.95	5.95	5.95	5.95
6	Corn Starch	2.97	2.97	2.97	2.97
7	Paprika	1.0	1.0	1.0	1.0
8	Honey	3.0	3.0	3.0	3.0
9	Butter	00	1.0	3.0	5.0
10	Water	32.46	31.46	29.46	27.46

Process protocol of goat meat spread

Salt, spices and other ingredients were mixed into the cooked goat meat. Mixing the ingredients completely and cooked by braising (85 + 2°C for 12 min). Cooling and adding honey in final product and grinding for 3-4 min. to get fine paste like consistency. Stored until examination at room temperature.

Products Analysis

Physico-chemical analysis

Determination of Cooking Yield

Product yield was calculated using [14] the formula given below was used to calculate the product yield and the weights before and after cooking.

Cooking yield % = [Weight of product after cooking / Weight of product before cooking] x 100

pH

A pre-calibrated digital pH metre was used to calculate pH of the product slurry. (Cyberscan pH 510, Merck). The slurry was prepared by homogenizing 5g of sample with 45 ml of distilled water in a laboratory blender for one minute following the procedure of Trout, *et al*., (1992) [15].

Spread ability

To assess the gel's spread ability [16] a pre-marked circle with a diameter of 1 cm was filled with 0.5 g gel and a glass plate was placed on top of it. A weight of 500 g was let to lie on the top glass plate for five minutes. The diameter increased due to the gel's spreading.

Instrumental color analysis

The colour of each sample was assessed in triplicate using a Hunter lab Mini scan XE plus Spectro-colorimeter with a D65/10° illuminant (Model No. 45/O-L, Reston Virginia, USA) [17]. The absorbance was expressed as L* (brightness), a* (redness) and b* (yellowness). The hue (relative position of colour between redness and yellowness) and chroma (colour intensity) was calculated as follows.

Hue = tan-1 (b*/a*)

Chroma = $\sqrt{(a^*)^2 + (b^*)^2}$

Sensory Evaluation

The sensory evaluation of the spread was using a nine-point scale descriptive scale [18] with minor modifications, with 9 indicating excellent and 1 indicating extremely poor. The sensory panelists consisted of Professors and Postgraduate students of the Livestock Products Technology Division (Meat Science) of Madras Veterinary College. Fresh spread was served to the panelists. The panellists assessed the samples based on their overall appearance, flavour, spread ability, texture, aftertaste, adhesive ability, and acceptability.

Statistical Analysis

All the experiments were replicated six times, and the data generated was analyzed by statistical methods *viz*., one way ANOVA, mean ± S.D using SPSS software package developed as per the procedure of Snedecor and Cochran (1995) [19] and means compared by using Duncan's multiple range test, 1995.

Result and Discussion

Physico-chemical quality of goat meat spread

The data revealed from physic-chemical quality of goat meat spread are tabulated in [Table-3]. The pH of goat meat spread was significantly (P<0.05) increased with an increase in concentration of butter (6.07 to 6.15). This increased in pH of goat meat spread might be due to increasing concentration of butter which had mild acidity. However, highly significant (P<0.01) increased in cooking yield (86.17 to 88.10) and spread ability (3.30 to 4.00) was observed in product after incorporation of butter level. The differences in the cooking yield of the meat spread could be related to water absorption ability of the non-meat ingredients used [20], whereas incorporation of butter to goat meat spread has made the spread to be soft with superior spread ability.

Table-3 *Mean + SD values of Physico-chemical quality of goat meat spread incorporated with different levels of butter*

Treatment	Physico-chemical Quality		
	pH	Cooking yield (%)	Spread ability (cm)
Control	6.07 ± 0.02^c	86.17 ± 0.02^c	3.30 ± 0.10^d
T_1	6.10 ± 0.02b^c	86.23 ± 0.04^c	3.50 ± 0.10^c
T_2	6.13 ± 0.02^{ab}	87.22 ± 0.09^b	3.70 ± 0.10^b
T_3	6.15 ± 0.01^a	88.10 ± 0.02^a	4.00 ± 0.10^a
F Value	8.767*	922.131**	26.750**

Instrumental colour profile analysis of goat meat spread

The values of lightness (L*), redness (a*), yellowness (b*), hue and chroma are presented in [Table-4]. The analysis of variance revealed highly significant (P<0.01) difference between control and treatment for lightness (L*) and redness (a*) whereas significant (P<0.05) difference for yellowness (b*) and chroma of spread was observed with incorporation of butter. Lightness (L*) and yellowness (b*) of product was increased but redness (a*) was decreased with increasing level of incorporation of butter in the products. This increased L* and b* values and decreased a* of goat meat spread incorporated with butter might be due to the yellow colour of butter. Further, non-significant (P>0.05) decrease in hue angle and significant (p<0.05) increase in chroma was observed with incorporation of butter. This lower hue angle and higher chroma of spread indicated that the effect of incorporation of butter was minute on redness. A similar finding was suggested by Dzudie, *et al*., (2002) [21] prepared beef sausage added with bean flour.

Sensory quality of goat meat spread

The data pertaining to appearance, flavour, spread ability, texture, after taste, adhesive ability and overall acceptability of butter incorporated value added meat spread are presented in [Table-5]. The sensory quality revealed highly significant (P<0.01) difference between control and treatments for appearance, flavour, spread ability, after taste and overall acceptability with incorporation of butter in goat meat spread, whereas significant (P<0.05) difference for adhesive ability. Highly significant (P<0.01) differences in all the sensory attributes except texture and adhesive ability of products was observed after incorporation of butter while, non-significant and significant differences was observed for texture and adhesive ability of products. Superior appearance, flavour, spread ability, texture, after taste, adhesive ability and overall acceptability score were observed for 3.0 % (T_2) butter incorporated goat meat spread. This might be due to the ideal concentration of butter which resulted in more intense coloration in spread.

Table-4 Mean + SD values of Instrumental colour profile analysis of goat meat spread incorporated with different levels of butter

Treatment	Instrumental colour profile analysis				
	Lightness (L*)	Redness (a*)	Yellowness (b*)	Hue	Chroma
Control	51.90 ± 0.06^{d}	14.38 ± 0.08^{a}	33.03 ± 0.22^{c}	0.98 ± 0.00	36.03 ± 0.24^{b}
T_1	52.94 ± 0.04^{c}	14.28 ± 0.09^{ab}	33.42 ± 0.17^{bc}	0.98 ± 0.00	36.35 ± 0.19^{ab}
T_2	53.43 ± 0.07^{b}	14.16 ± 0.04^{b}	33.65 ± 0.36^{b}	0.98 ± 0.00	36.51 ± 0.35^{a}
T_3	54.65 ± 0.07^{a}	13.27 ± 0.05^{c}	34.22 ± 0.07^{a}	0.99 ± 0.00	36.70 ± 0.09^{a}
F Value	925.177**	150.893**	13.160*	NS	4.213*

Table-5 Mean + SD values of Sensory quality of goat meat spread incorporated with different levels of butter

Treatment	Sensory Quality						
	Appearance	Flavour	Spread ability	Texture	After Taste	Adhesive Ability	Overall Acceptability
Control	4.75 ± 0.75^{d}	4.66 ± 0.88^{c}	5.58 ± 0.51^{b}	5.83 ± 0.57	5.00 ± 0.73^{c}	6.66± 0.77^{a}	5.66 ± 0.65^{c}
T_1	5.91 ± 0.66^{b}	6.08 ± 0.79^{b}	5.91 ± 0.66^{b}	5.83 ± 0.57	6.41 ± 0.51^{a}	6.41± 0.51^{a}	6.41 ± 0.51^{b}
T_2	7.50 ± 0.52^{a}	7.25 ±.062^{a}	7.08 ± 0.66^{a}	6.08 ± 0.66	6.83 ± 0.71^{a}	6.25± 0.45^{ab}	7.41 ± 0.66^{a}
T_3	5.33± 0.65^{c}	5.66 ± 0.65^{b}	7.50 ± 0.522^{a}	6.16 ± 0.71	5.83 ± 0.71^{b}	5.83 ± 0.38^{b}	5.91 ± 0.79^{bc}
F Value	39.263**	24.644**	28.150**	0.870^{NS}	16.462**	4.798*	16.288**

C: Control, T_1: 1.0% butter, T_2: 3.0% butter, T_3: 5.0% butter (n=6).

*Means bearing different superscripts within columns (a,b,c,d) differ significantly P < 0.05; NS- P > 0.05; *- P < 0.05; **- P < 0.01*

These results were correlated with instrumental colour where the yellowness (b*) values were higher than the control and slight decrease in redness (a*). Higher flavour score for 3 % (T_2) butter incorporated spread might be due to the increase in total volatile fatty acid (TVFA) presence in butter. Appearance, flavour, spread ability, after taste and overall acceptability scores was significant (P<0.05) increase till 3 % level of incorporation of butter there after decreased at 5 % level. Addition of butter in goat meat spread increased the spread ability of products which enhanced the quality of spread. The spread ability was an important character in uniform application of the product to the bread. Changes in texture quality could probably be associated to the relatively higher fat in butter. This increased score of after taste for certain level (3 %) might be due to the pleasant flavor characteristic of butter. Higher overall acceptability scores were recorded upto 3 % level of incorporation of butter (T_2) could probably be due to superior appearance, flavour, texture and excellent taste of goat meat spread.

Conclusion

Based on observation it may be concluded that good quality goat meat spread could be prepared after incorporation of 3 per cent butter without affecting the physico-chemical quality, instrumental colour profile and sensory quality.

Application of research: This research will be applicable to food processor, meat technologists and those postgraduate students involved in meat technology research.

Research Category: Food Processing, Meat Technology

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Breed name: Goat

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