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Quality of Value Added Goat Meat Spread Enriched with Honey

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ABSTRACT

Background: Honey is largely used on a small scale as well as at an industrial level in beverages, baked products, confectionaries, candies, marmalades, jams and spreads. The nutritional value of honey is very high and it is highly acceptable by the consumers due to its characteristic flavour, sweetness and texture. Hence, a study was conducted to improve the quality of value added goat meat spread enriched with honey.

Methods: Honey at different levels *viz*. 0, 1.0%, 3.0% and 5.0% was incorporated in the value added goat meat spread for which instrumental colour, physico-chemical properties and sensory quality analysis was carried out.

Result: Redness (*a**) score increased significantly ($p<0.01$) high in goat meat spread after incorporation of honey but in the lightness and yellowness score there was a non significant ($p>0.05$) increase noticed. There was no significant effect on hue and chroma due to incorporation of honey in goat meat spread. Cooking yield and spreadability were highly significant ($p<0.01$) and they increased with the increasing levels of honey as compared to control whereas, pH was decreased non significantly ($p>0.05$). Moisture content of meat spread decreased significantly ($P<0.05$), whereas protein content increased signiûcantly ($P<0.05$) with the increasing levels of honey. Sensory qualities in respect to appearance, flavor, spreadability, texture, after taste, adhesive ability and overall acceptability score were found to be significantly ($p<0.01$) increasing in 3% incorporated honey as compared to control, 1% and 5%. On the basis of all the above observations it was concluded that 3% incorporation of honey improved the quality of goat meat spread.

Key words: Goat meat, Honey, Instrumental colour, Physico-chemical properties, Spread, Sensory qualitie.

INTRODUCTION

Meat obtained from spent goat is hard, fibrous and dark brown in colour has poor juiciness and flavor after cooking. Fresh meat of spent goat is dark red in colour due to relatively more muscle myoglobin content. Toughness of spent meat increases due to increase in thickness of muscle fiber and increase in tensile strength of collagen with age due to non-reducible intermolecular cross-links in collagen of older animals. By mincing and chopping the spent meat, becomes suitable for manufacture of variety of value added products that may modernize meat industry by standardizing appropriate and economic technology for processing such tough and under utilized meat in to palatable and economically viable one (Jin *et al.,* 2007).

Various spreadable products like milk based spreads, mayonnaise, jam, jelly, honey spread, honey-fruit spread and honey-fat are used in convenient snacks with bread as base. Spreads add value to food by enhancing its flavor and/or texture along with an increase in nutritional quality of food. The global meat snacks market is growing because of various factors such as demand for low calorie and high quality protein food products by consumers.

Honey is most widely used as a sweetener in food industry. It is basically a solution supersaturated in sugars composed of 181 components, fructose (38%) and glucose (31%) are the most important composition (Gheldof *et al.*, 2002), The moisture content of honey is about 17.7% with total acidity and ashes of about 0.08% and 0.18% respectively (Nagai *et al.,* 2006). Whole honey composition accounts for about 2.1% for pigments, flavor, aroma substances, phenolics compounds, colloids, sugar alcohols and vitamins (Todd and Vansell, 1942). Many factors such as the pollen source, climate, environmental conditions and the processing varies the composition of honey (Gheldof *et al.,* 2002 and Azeredo *et al.,* 2003). The color of the honey depends on floral source and its mineral content, which usually ranges from water white to dark amber. Honey is an intermediate moisture food having a moisture content of 16-18% and water activity of 0.6. Honey is self stable for a reasonable period of time because due to low water activity

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and high osmotic environment do not support microbial growth. The honey can be processed into a number of value added products ranging from intermediate moisture to dried products.

There is an ever increasing demand for consumer based diversified meat products that not only provide high quality proteins but also are enriched with high quality nutrients. Hence, this study was carried out to study the processing of value added goat meat spread incorporated with honey.

MATERIALS AND METHODS

The study was conducted in the Department of Livestock Products Technology (Meat Science), Madras Veterinary College, TANUVAS, Chennai, Tamil Nadu, in the year 2020 -21. 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. All the visible fat, fascia and connective tissue were trimmed off and meat was minced twice through a 4.5 mm sieve in a meat mincer. Minced meat after packaging in colorless low density polyethylene (LDPE) bag was conditioned for about 24 hr. 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. The condiment paste of onion, garlic and ginger in the ratio of 3:2:1 was used. 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 as shown in Table 1 suggested by Ashish *et al*. (2015).

Processing of meat spread

The present study was carried out in the following steps to formulate the product and the incorporation of honey was standardized by Control, 1.0%, 3.0% and 5.0% incorporations. The mix was cooked (Table 2) by applying braising process (Raziuddin *et al.,* 2020). The developed value added goat meat spread incorporated with honey was analyzed on the basis of instrumental color, physico-chemical properties, sensory evaluation and proximate composition.

Table 1: Composition of spice mix for meat spread.

Ingredients	% in the mix (W/W)
Coriander powder (Dhania)	25.0
Cumin seeds (Zeera)	12.0
Dried ginger (Sont)	10.0
Aniseed (Soanf)	10.0
Black pepper (Kali mirch)	10.0
Caraway seed (Ajowan)	05.0
Turmeric (Haldi)	05.0
Capsicum (Mirch powder)	08.0
Cardamom (Badi elaichi)	05.0
Cinnamon (Dal chini)	05.0
Cloves (Laung)	03.0
Nutmeg (Jaiphal)	01.0
Mace (Jaipatri)	01.0

Process protocol of value added goat meat spread

The salt, spices, condiments and other additives were added to spent goat meat spread. Mixing the ingredients completely and cooked by braising (85±2°C for12 min). After braising cooling the product at room temperature and adding honey in product. Grinding the final product for 3-4 min. in mixer grinder to get fine paste like consistency and stored the final product at room temperature till the evaluation.

Products analysis

Instrumental color analysis

Colour was measured in triplicates for each sample using Hunter lab Mini scan XE plus Spectro- colorimeter having an illuminant of D65/10° (Model No. 45/O-L, Reston Virginia, USA) (Bindu *et al*., 2007). 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.

$$\text{Hue} = \tan\text{-}1\ (b^*/a^*)$$

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

Determination of cooking yield

Product yield was determined as per the method outlined by Verma *et al*. (2012). The weight before cooking and the weight after cooking were recorded and the product yield was calculated by using the equation.

$$\text{Cooking yield \%} = \frac{\text{Weight of product after cooking}}{\text{Weight of product before cooking}} \times 100$$

pH

The product pH was estimated by immersing product slurry in a pre-calibrated digital pH meter (Cyberscan pH 510, Merck). The slurry was prepared by homogenizing 5 g of sample with 45 ml of distilled water in a laboratory blender for one minute following the procedure of Trout *et al*. (1992).

Spreadability

The spreadability of the gel was determined (Bachhav and Patravale, 2009) using the following technique: 0.5 g gel

Table 2: Formulation for the processing of value added goat meat spread.

Ingredients %	C	HT1	HT2	HT3
Spent goat meat	48.3	48.3	48.3	48.3
Salt	2.23	2.23	2.23	2.23
Spice mix	1.47	1.47	1.47	1.47
Skimmed milk powder	1.86	1.86	1.86	1.86
Condiments	5.95	5.95	5.95	5.95
Corn starch	2.97	2.97	2.97	2.97
Paprika	1.0	1.0	1.0	1.0
Honey	0	1.0	3.0	5.0
Water	36.17	35.17	33.17	31.17

C-Control, HT1-1.0% honey, HT2-3.0% honey and HT3-5.0% honey.

was placed within a circle of 1 cm diameter premarked on a glass plate over which a second glass plate was placed. A weight of 500 g was allowed to rest on the upper glass plate for 5 min. The increase in the diameter due to spreading of the gel was noted.

Proximate analysis

Moisture, crude fat, crude protein and total ash of the value added goat meat spread were determined as per the standard procedures of Association of Official Analytical Chemists (AOAC, 2012).

Sensory evaluation

Sensory evaluation of spread was done by using a nine point descriptive scale (Keeton, 1983) with slight modiûcations, where 9 = excellent and 1= extremely poor. The sensory panelists consisted of Faculty and Postgraduate students of the Livestock Products Technology Division (Meat Science) of Madras Veterinary College. Fresh spread was served to the panelists with coding. The panelists evaluated the samples for attributes such as general appearance, flavor, spreadability, texture, after taste, adhesive ability and overall 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) and means were compared by using Duncan's multiple range test (1995).

RESULTS AND DISCUSSION

Instrumental color parameters

Instrumental colour score were observed (Table 3) for lightness, redness, yellowness, hue and chroma of goat meat spread. Redness (*a**) score of goat meat spread increased significantly ($p<0.01$) after incorporation of honey. The redness (*a**) score of goat meat spread was increasing from 12.92 to 13.78 after incorporation of honey levels from 1% to 5%. Incorporation of 5% honey level showed significantly ($p<0.01$) higher score for *a** as compared to control, 1% and 3% in product. It might be due to influence of colour of honey incorporated in spread. These results agree with the findings of Dawson and Acton (1999), who reported darkening effects of honey on the color of breast meats. Preston and Smith (1995) also found that addition of honey resulted in a slightly darker color of honey-apple spread. Further, the lightness and yellowness scores for honey incorporated spread showed non significant ($p>0.05$) differences between the treatment. A slight increase in lightness and yellowness score were noticed in 3% incorporation of honey in goat meat spread. Both hue and chroma showed non significant ($p>0.05$) effect on quality of spread incorporated with honey. However, the chroma scores slightly increased in 3% incorporation of honey in meat spread but the hue values were similar in control and honey treated meat spread.

Physico-chemical properties

Physico-chemical properties of different levels of honey incorporated meat spread are presented in (Table 4). It was found that the increase in cooking yield of treatments were highly signiûcant ($p<0.01$) with the increasing levels of honey as compared to control. Dawson and Mathew (2000) found similar improvements in cooking yield of turkey rolls with 15% honey having a higher yield than 5%, which had a higher yield than without honey. pH was non significantly ($p>0.05$) decreasing between the treatments as compared to control. Echigo *et al*., (1974) reported that it was due to the presence of gluconic acid in honey, there was decrease in pH of spread. Spreadability of products significantly ($p<0.01$) increased with increasing levels of honey from 1% to 5%. Significantly higher spreadability of meat spread was observed in 5% level of honey incorporation. Phillips (1995) found improved mouthfulness, spreadability, textural qualities and overall acceptability after 20 to 70% incorporation of honey in fat spread.

Moisture content of goat meat spread decreased signiûcantly ($p<0.05$) in all the treatments with the increasing levels of honey from 1.0 to 5.0%. Belewu and Morakingo (2009) revealed that high osmotic pressure and low water activity of honey led to the reduction of moisture content. The result was reliable with the report of Antony *et al*. (2006) who revealed reduction in the moisture content of meat products treated with honey. There was significant ($p<0.05$)

Table 3: Mean±SD values of instrumental colour analysis of goat meat spread enriched with honey.

Instrumental colour analysis	Incorporation levels of honey (%)				
	Control	1.0	3.0	5.0	Over all mean treatment
Lightness (*L**)	55.15±0.68	55.46±0.58	56.20±0.95	55.72±0.58	55.63±0.73^{NS}
Redness (*a**)	12.42±0.65^{c}	12.92±0.38^{bc}	13.54±0.21^{ab}	13.78±0.07^{a}	13.16±0.65**
Yellowness (*b**)	36.23±0.99	36.61±1.12	37.09±0.84	35.59±1.05	36.38±1.03^{NS}
Hue	0.99±0.00	0.99±0.00	0.99±0.00	0.99±0.00	0.99±0.00^{NS}
Chroma	38.30±1.13	38.82±0.95	39.48±0.71	38.17±0.95	38.69±0.97^{NS}

*Means bearing different superscripts between columns differ significantly ($p<0.05$).

**Means bearing different superscripts between columns differ highly significantly ($p<0.01$).

^{NS} Non significant.

Table 4: Mean±SD values of physico-chemical quality of goat meat spread enriched with honey.

Physico-chemical quality	Incorporation levels of honey (%)				
	Control	1.0	3.0	5.0	Over all mean Treatment
pH	6.07±0.05	5.99±0.02	5.98±0.02	5.97±0.01	6.00±0.10 ^{NS}
Cooking yield (%)	87.16±0.05^{d}	87.26±0.05^{c}	88.03±0.03^{b}	88.89±0.02^{a}	87.84±0.72**
Spreadability (cm)	3.60±0.10^{b}	3.70±0.10^{b}	3.90±0.10^{a}	4.00±0.10^{a}	3.80±0.18**
Moisture (%)	66.35±0.89^{a}	66.14±0.43^{a}	65.72±0.90^{a}	64.29±1.11^{b}	65.63±1.15*
Crude protein (%)	21.06±0.76^{c}	21.52±1.02^{bc}	22.22±0.89^{ab}	23.14±0.40^{a}	21.98±1.09*
Crude fat (%)	2.88±0.38	2.90±0.48	3.15±0.04	3.31±0.29	3.06±0.36^{NS}
Total ash (%)	3.42±0.31	3.32±0.39	3.25±0.30	3.14±0.34	3.28±0.33 ^{NS}

*Means bearing different superscripts between columns differ significantly ($p<0.05$).
**Means bearing different superscripts between columns differ highly significantly ($p<0.01$).
^{NS} Non significant.

Table 5: Mean±SD values of sensory quality of goat meat spread enriched with honey.

Sensory quality	Incorporation levels of honey (%)				
	Control	1.0	3.0	5.0	Over all mean treatment
Appearance	5.00±0.60^{c}	5.58±0.51^{b}	7.33±0.65^{a}	5.83±0.83^{b}	5.93±1.07**
Flavour	4.50±0.52^{c}	5.83±0.71^{b}	7.08±0.66^{a}	6.16±0.71^{b}	5.89±1.13**
Spreadability	5.08±0.79^{c}	6.25±0.62^{b}	7.41±0.51^{a}	6.66±0.65^{b}	6.35±1.06**
Texture	5.33±0.49^{c}	5.50±0.52^{c}	6.91±0.99^{a}	6.33±0.65^{b}	6.35±1.06**
After taste	5.33±0.49^{c}	5.50±0.52^{c}	6.91±0.99^{a}	6.33±0.65^{b}	6.02±0.93**
Adhesive ability	5.58±0.51^{b}	6.66±0.49^{a}	7.16±0.71^{a}	6.91±0.79^{a}	6.58±0.87**
Overall acceptability	5.25±0.75^{c}	6.25±0.62^{b}	7.25±0.62^{a}	6.58±0.51^{b}	6.33±0.95**

*Means bearing different superscripts between columns differ significantly ($p<0.05$).
**Means bearing different superscripts between columns differ highly significantly ($p<0.01$).
^{NS} Non significant.

increase in the protein content in all the treatments with the increasing level of honey. The higher protein content of the honey treated goat meat spread concurred with the work of Haskim *et al.* (1999) who found that addition of honey to meat increased the protein content. The result of Dawson and Mathew (1998) reported that increase in protein content of honey added meat may be probably due to the enzyme present in the honey. Honey treated goat meat spread demonstrated no significant variation in the fat content. This was in agreement with the results of Haffejee and Mossa (2001) who found that nutritionally, honey does not add any fat to the meat and turkey products. The total ash content of the honey treated goat meat spread revealed non significant ($p>0.05$) decrease with the increasing levels of honey. This could probably be due to the poor content of ash in honey (Mouteria *et al.,* 2006).

Sensory evaluation

Comparable mean sensory qualities were observed (Table 5) for appearance, flavor, spreadability, texture, after taste, adhesive ability and overall acceptability scores. These values increase signiûcantly ($p<0.01$) higher in 3% honey incorporated spread as compared to control, 1% and 5%. Significantly ($p<0.01$) higher score for appearance and flavor in 3% honey incorporated meat spread was due to golden appearance and sweet acceptable flavor of honey. However, appearance and flavor score of 5% honey treated product was lower as compared to 3%. Superior texture score of meat spread probably could be due to the strong hygroscopic ability of honey. As the level of honey increased in the formulation, the overall acceptability score increased up to 3% in meat spread as compared to control, 1% and 5%. After taste and adhesive ability score of products showed significant ($p<0.01$) increase up to 3% incorporation of honey and later the scores reduce. The after taste and adhesive ability of product could have been improved due to the sweet taste and hygroscopic nature of honey.

CONCLUSION

In the present study, it was concluded that the incorporation of honey to the value added goat meat spread improved the product quality and acceptability. Incorporation of honey at the level of 3% improved the instrumental colour, physico-chemical and sensory quality of value added goat meat spread. The honey treated value added goat meat spreads were highly acceptable by panelist as compared to the control.

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Declaration of interest statement

The authors declare that there is no conflict of interests regarding the publication of this article.

Authors' contribution

Authors contributed equally to this study.

REFERENCES

Antony, S., Rieck, J.R., Acton, J., Han I.Y., EL-Halpin and Dawson, P.L. (2006). Effect of dry honey on the shelf life of packaged Turkey slices. Poultry Science. 85: 1811-1820.

AOAC (2012). Oficial Methods of Analysis, 19th edn. Association of Oficial Analytical Chemist. Inc., Washington DC.

Ashish Kumar, Mendiratta, S.K., Sen, A.R., Kandeepan, G., Talukder, S., Sharma, H., Soni, A., Irshad, A. and Kumar, S. (2015). Preparation and storage stability of meat spread developed from spent hens. Veterinary World. 8(5): 651-655.

Azeredo, L. da, C., Azeredo, M.A.A., De Souza, S.R. and Dutra, V.M.L. (2003). Protein contents a physicochemical properties in honey samples of *Apis mellifera* of different floral origins. Food Chemistry. 80: 249-54.

Bachhav, Y.G. and Patravale, V.B. (2009). Microemulsion based vaginal gel of fluconazole: Formulation, *in vitro* and *in vivo* evaluation. International Journal of Pharmaceutic. 365: 175-9.

Belewu, M.A. and Morakinyo, O.A. (2009). Nutritional, microbiological and sensory evaluation of honey treated and untreated soft cheese. European Journal of Scientific Research. 26: 124-131.

Bindu, J., Ravishankar, C.V. and Gopal, T.K.S. (2007). Shelf-life evaluation of a ready to eat black cam (*Villorita criprinoides*) product in Indigenous retort pouches. Journal of Food Engineering. 78: 995-1000.

Dawson, P.L. and Mathew, S. (1998). Antioxidative properties of honey in Poultry meat. Retrieved from www.nbh.org on the 25th August, 2006.

Dawson, P.L. and Mathew, S. (2000). Antioxidative properties of honey in poultry meat. Summary of research funded by the National Honey Board (NHB) and conducted at Clemson University. Available from NHB (www.nhb.org).

Dawson, P.L. and Acton, J.C. (1999). Honey in Processed Poultry Meat. National Honey Board. 800: I-5. (www.nhb.org).

Duncan, D.B. (1955). Multiple range and multiple F tests. Biometrics. 11(1): 1-42.

Echigo, T. and Takenaka, T. (1974) Production of organic acids in honey by honeybees. Journal of the Agricultural Chemical Society of Japan. 48(4): 225-230.

Gheldof, N., Wang, X.H., Engeseth, N.J. (2002). Identification and quantification of antioxidant components of honeys from various floral sources. Journal of Agricultural and Food Chemistry. 50: 5870-7.

Haffejee, E.E. and Mossa, A. (2001). Honey in the treatment of infantile gastroenteritis. British Medical Journal. 209: 1866-1867.

Haskim, I.B. McWarters, K.H. and Chuy (1999). Marination method and honey level affect on physical and sensory characteristics of roasted chicken. Journal of Food Science. 64: 163-166.

Jin, S.K., Kim, I.S., Kim, S.J., Jeong, K.J., Choi, Y.J. and Hur, S.J. (2007). Effects of muscle type and washing times on physicochemical characteristic and qualities of surimi. Journal of Food Engineering. 81: 618-623.

Keeton, J.T. (1983). Effects of fat and NaCl/phosphate levels on the chemical and sensory properties of pork patties. Journal of Food Science. 48(3): 878-881.

Mouteria, M.C. Malacalzea, N.H. Lupano, C.E. and Baldi, B.M. (2006). Analysis of honey produced in the province of Buenos Aires, Argentine from 1997-2000. Retrieved from http://www.beekeeping.com/article/US/analysis_honey_buenes_aires.htm.

Nagai, T., Inoue, R., Kanamori, N., Suzuki, N. and Nagashima, T. (2006). Characterization of honey from different floral sources. Its functional properties and effects of honey species on storage of meat. Food Chemistry. 97: 256-62.

Phillips, R.D. (1995). Honey in Reduced Fat Spreads. National Honey Board: Firestone, CO, USA, http://honey.com/foodindustry/resourcedb/reducedfatspreads.htm.

Preston, M.B. and Smith, D.A. (1995). Honey fruit spreads. National Honey Board: Firestone, CO, USA. www.nhb.org.

Raziuddin, M., Babu, R.N., Appa Rao, V., Ramesh, S. and Karuna-Karan, R. (2020). Impact of paprika (*Capsicum annuum*) addition on quality of value-added goat meat spread. International Journal of Livestock Research. 10 (10): 230-238.

Snedecor, G.W. and Cochran, W.G. (1989). Statistical Methods. 8th ed. Ames, Iowa: Iowa State University Press.

Todd, F.E. and Vansell, G.H. (1942). Pollen grains in nectar and honey. Journal of Economic Entomology. 35: 728-31.

Trout, E.S., Hunt, N.C., Johnson, D.E., Claus, J.R., Kastner, C.L., Kropf, D.H. and Stroda, S. (1992). Chemical, physical, and sensory characterization of ground beef containing 5 to 30 per cent fat. Journal of Food Science. 57: 25-29.

Verma, A.K., Banerjee, R. and Sharma, B.D. (2012). Quality of low fat chicken nuggets: Effect of sodium chloride replacement and added chickpea (*Cicer arietinum* L.) hull flour. Asian-Australian Journal of Animal Science. 25: 291-298.