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Study on textural analysis of camel and goat milk paneer incorporated with spices

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Abstract

The present study was carried out to assess the textural analysis of camel and goat milk paneer incorporated with spices. Formation of paneer was done by using different ratio of camel and goat milk (70% of camel milk and 30% of goat milk) and then the incorporation of spices viz black pepper and cardamom in single or in combination was done, whereas the control paneer was obtained without incorporation of spices. Paneer was subjected to the textural analysis on TA-XT texture analyzer. Various textural characteristics like hardness, cohesiveness, adhesiveness, springiness and chewiness were determined. The overall textural profile of Paneer showed a wide difference in value of texture parameters like Hardness, Springiness, Cohesiveness and Adhesiveness in control as well as all treatment group of developed paneer. The incorporation of 30% goat milk and 70% camel milk with or without spices incorporation forms a good textural structure of the Paneer.

Keywords: Paneer, texture, camel milk, goat milk

Introduction

Paneer is an important heat and acid coagulated milk product which is used as a base material for the preparation of a large number of culinary dishes. Paneer provides an easy means of conserving and preserving valuable milk solids. It contains casein, part of denatured whey proteins, and almost all fat. It has firm, close spongy body and smooth texture (Kanawjia *et al.* 1996) [4]. Paneer contains about 40 per cent total solids, 17.5 per cent proteins, 25 per cent fat, 2 per cent carbohydrates and 1.5 per cent minerals, which is one of the major sources of animal protein for vegetarian people (Sachdeva, 1998) [5]. Due to its high nutritive value, paneer is an ideal food for the expectant mothers, infants, growing children, adolescents and adults. Paneer is also recommended by the clinicians for diabetic and coronary heart disease patients (Chopra and Mamtani 1995) [1].

Camel milk is unique in terms of having low fat (1.5-3%) and low protein (2.5%) (Gorachiya, 2017) [3]. It is different from other milks, however, having low sugar and cholesterol, high minerals (Sodium, potassium, iron, copper, zinc and magnesium, and vitamin C). Fresh and fermented camel milk is having antibacterial, therapeutic properties and important nutritional and functional source (Wernery, 2006) [9].

Goat milk's impressive health benefits and recent research into its positive effects on the human body have made it a very popular choice. Although goats produce only about 2 percent of the global supply of milk, processing is cheaper because it does not require homogenization (Small fat molecules do not separate and remain suspended in the cream). People suffering from intolerance to lactose, Because of its higher levels of beneficial fatty acids (Twice that of cow milk), people who suffer from lactose intolerance digest goat milk far better than cow milk. Goat milk is often processed into cheese, butter, ice cream and yogurt, many of which are considered to be delicacies due to their high content of buttermilk and rich consistency.

In recent years, interest has focused on the use of natural plant antibiotics for food preservation. Spices like cardamom, black pepper, cinnamon, clove and herbs are known for their medicinal, preservative and antioxidant properties and can be used as natural preservatives. (Rajarshibhai, 2012) [7]. Texture is an important fundamental sensory property of foods which can be regarded as a manifestation of the rheological properties of foods.

Texture is an important quality of attribute as it affects processing, handling and influence shelf life as well as consumer acceptance as their food habits. The present investigation was carried out to study the effect of different levels of goat milk incorporation on textural quality profile of Paneer.

Materials and Methods

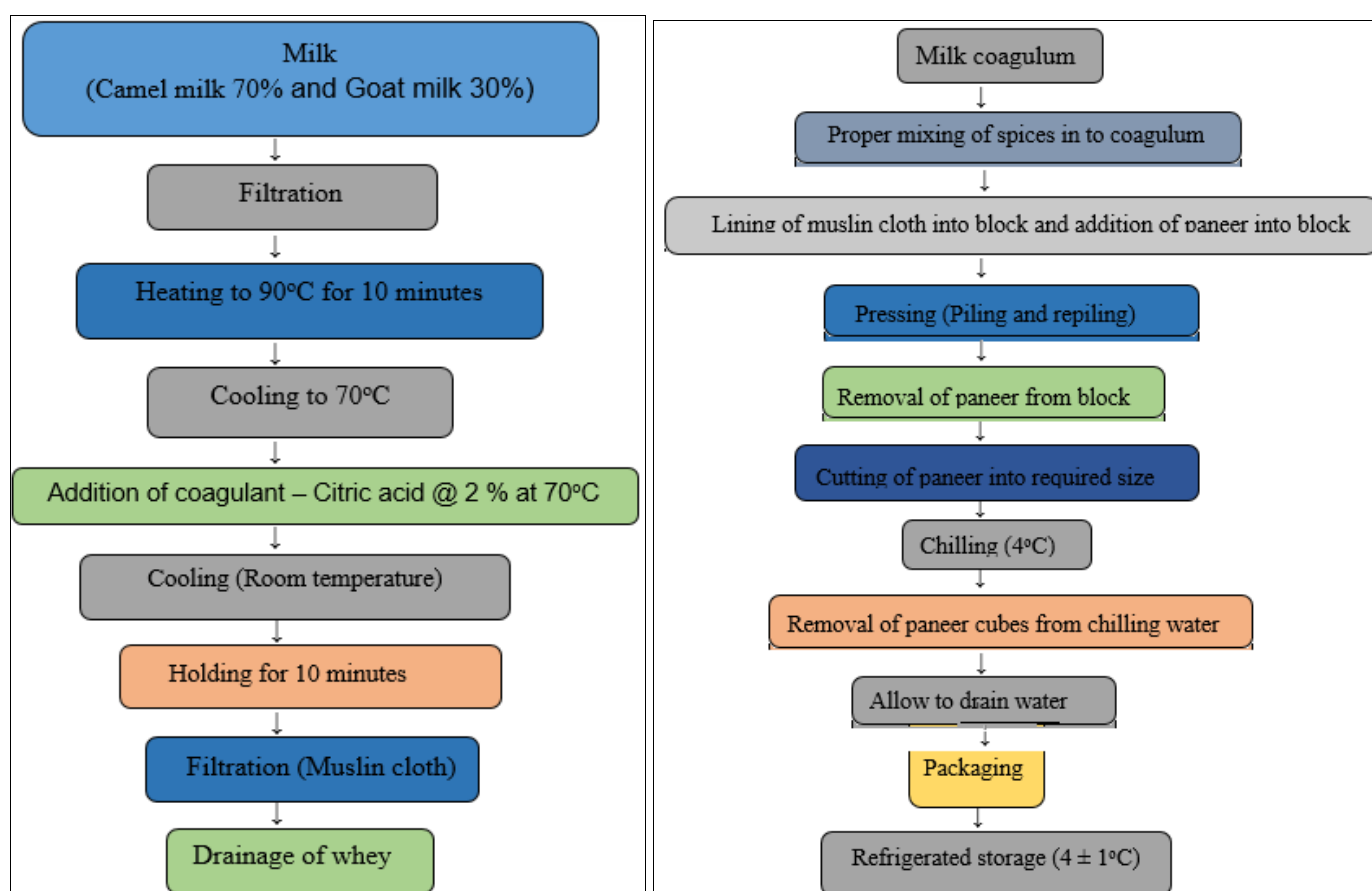
TA-XT *plus* Texture Analyzer equipped with an Acoustic Envelop Detector (AED) device (Stable Micro System Ltd., Godalming, UK) was used to perform a more comprehensive analysis of the paneer texture. Textural profile analysis was conducted for paneer samples for all experiments to obtain textural responses *viz*- hardness, springiness, adhesiveness, cohesiveness.

Formation and accessibility of paneer with Incorporation of spices

Formation of paneer was done by using 70% camel milk and

30% goat milk with incorporation of spices. The milk used for preparation of paneer was subjected to heating 90 °C for 10 minutes. The milk was subsequent cooled to 70 °C. Citric acid was added at the rate of 2% by weight of milk in form of 2% solution. The solution was added with continuous agitation until the coagulation was complete. The curd or milk coagulum was allowed to settle for 10 minutes. Whey was drained through a muslin cloth by gentle squeezing with hand and coagulum was collected and spices were added as per treatment. Each sample of coagulum was then filled in a round shaped per sterilized stainless-steel hoop lined with clean muslin cloth. The coagulum was pressed for 20 minutes and cut in to required size followed by immersing in chilled water (4 °C) for 1-2 hours. The samples were removed from chilled water and blocks on wooden planks for allowing the water to drain off for 15 minutes and developed paneer is stored at refrigeration followed by packaging.

Flow diagram for preparation of spices incorporated camel and goat milk paneer



Product development

Various levels of black pepper, cardamom and black pepper + cardamom incorporated camel and goat milk paneer by inclusion of 0.6% black pepper, 0.6% cardamom and 0.3% black pepper + 0.3% cardamom were used for preparation of treatment paneer under investigation.

T₀ – camel and goat milk paneer without inclusion of any spices,

T₁ – camel and goat milk paneer with inclusion of black pepper (0.6%),

T₂ – camel and goat milk paneer with inclusion of cardamom (0.6%),

T₃ – camel and goat milk paneer with inclusion of black pepper + cardamom (0.3+0.3%).

Textural properties of spices incorporated camel and goat milk paneer

The textural properties were evaluated using the TA.XT *plus* Texture analyzer of Stable Micro System equipped with 25 kg load cell. The analyzer is linked to a computer that recorded the data via a software programme. Paneer samples of length 1 cm³ were cut from the central portion with a stainless-steel cutter. A stainless-steel problem of 5 mm diameter with a flat end was used to determine the textural properties.

The textural properties of spices incorporated camel and goat milk paneer has been summarized in table 1 and depicted in figures 1, 2, 3 and 4 for hardness, adhesiveness, springiness and cohesiveness respectively. Hardness

For the analysis of *paneer* texture, hardness is the most commonly evaluated characteristic. It may be described as the force necessary to attain a given deformation. The hardness value is the peak force of first compression of the product during textural determination. Factors such as moisture and fat content, type of protein, processing treatments etc. affect the hardness of the paneer.

Hardness: Value of the peak force of the first compression of the product.

Hardness, g = Maximum force of first compression.

The value of black pepper + cardamom incorporated camel and goat milk paneer (T₃) was 1922.08±28.40. The value of black pepper incorporated camel and goat milk paneer (T₁)

was 1863.85±24.99. Whereas the value of cardamom incorporated camel and goat milk paneer (T₂) and the value of camel and goat milk paneer without incorporation of any spices (T₀) were 1844.98±16.30 and 1749.55±11.89.

The value obtained for hardness of spices incorporated camel and goat milk paneer was almost similar with findings of Mhatre (2007) [6]. The hardness values obtained by Mhatre (2007) [6] for the paneer coagulated at various temperatures were in the range of 47.7 to 1649.7 gm. When the proportions of the soymilk, increases from 0 to 25%, in the paneer sample hardness values decreases from 1251.8 to 160.4 gm, 1586.0 to 173.0 gm, 1649.7 to 184.0 gm and 1177.2 to 152.1 gm for coagulations temperatures of 80, 85, 90 and 95 °C respectively.

Table 1: Texture analysis (Mean ± SE) spices incorporated camel and goat milk paneer

Parameter	T ₀	T ₁	T ₂	T ₃
Hardness, g	1749.55±11.89	1863.85±24.99	1844.98±16.30	1922.08±28.40
Adhesiveness, g/sec	-28.25±0.65	-28.52±0.50	-20±0.53	-22.95±0.65
Springiness, mm	0.49±0.02	0.33±0.02	0.49±0.02	0.39±0.02
Cohesiveness, Mj	0.75±0.016	0.56±0.016	0.57±0.012	0.47±0.018

T₀ – camel and goat milk paneer without any spices, T₁ – camel and goat milk paneer with black pepper (0.6%), T₂ – camel and goat milk paneer with cardamom (0.6%), T₃ – camel and goat milk paneer with black pepper + cardamom (0.3 + 0.3%)

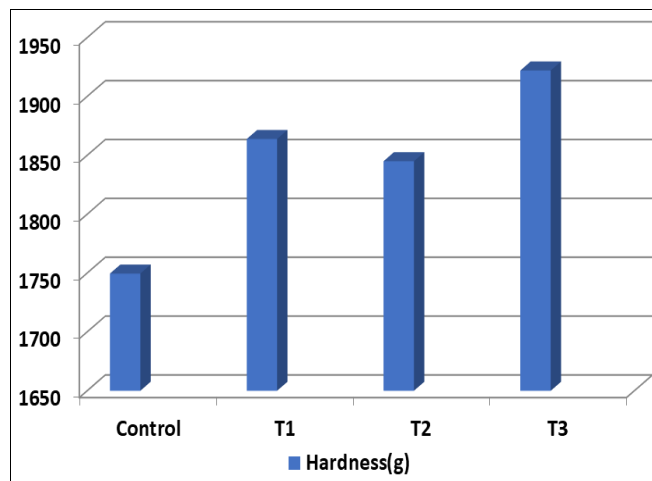


Fig 1: Hardness of spices incorporated camel and goat milk paneer

Adhesiveness

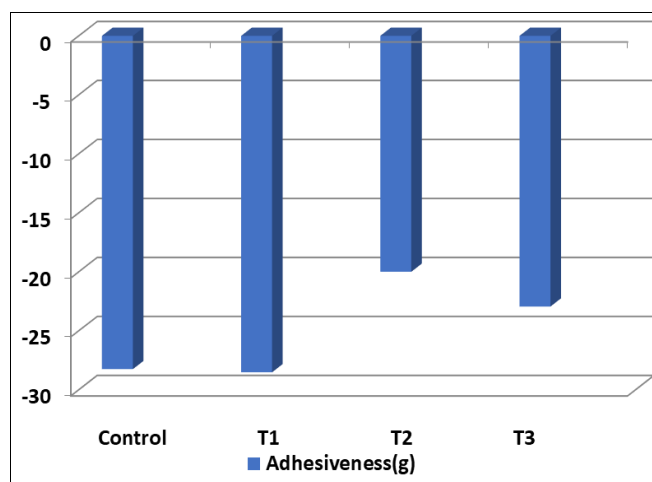


Fig 2: Adhesiveness of spices incorporated camel and goat milk paneer

The negative forces area of the first bite is defined as adhesiveness. It gives the force that is required to remove the sample from adhering to the probe while compression.

Adhesiveness: Force necessary to remove the material that adheres to the mouth during eating food.

Adhesiveness, g/sec = Negative area in the graph.

The adhesiveness values obtained for the spices incorporated camel and goat milk paneer were in the ranged from -28.52±0.50 to -20±0.53g. The maximum value of adhesiveness was found of black pepper incorporated camel and goat milk paneer (T₁) -28.52±0.50. The value of camel and goat milk paneer without incorporation of any spices (T₀) was -28.25±0.65. Whereas the value of cardamom incorporated camel and goat milk paneer (T₂) and black pepper + cardamom incorporated camel and goat milk paneer (T₃) were -20±0.53 and -22.95±0.65.

Cohesiveness

Cohesiveness is the ratio of areas under the first and second bite. It is defined as the extent to which a material can be deformed before its rupture and it mainly depends upon the strength of internal bonds.

Cohesiveness: Extent to which a material can be deformed before it ruptures and it depends upon the strength of internal bonds.

$$\text{Cohesiveness} = \frac{\text{Area under 1}^{\text{st}} \text{ compression}}{\text{Area under 2}^{\text{nd}} \text{ compression}}$$

The maximum value of cohesiveness was found for value of camel and goat milk paneer without incorporation of any spices (T₀) was (0.75±0.016). The minimum value was black pepper + cardamom incorporated camel and goat milk paneer (T₃) (0.47±0.018). Whereas the value of black pepper incorporated camel and goat milk paneer (T₁) (0.56±0.016) and the value of cardamom incorporated camel and goat milk paneer (T₂) 0.57±0.012. The nature of the protein matrix and extent of fat dispersion may contribute to cohesiveness or tendency to adhere to itself. Data related to cohesiveness of

spices incorporated camel and goat milk paneer is in line with result demonstrated by Shrivastav and Kumbhar (2010) [8].

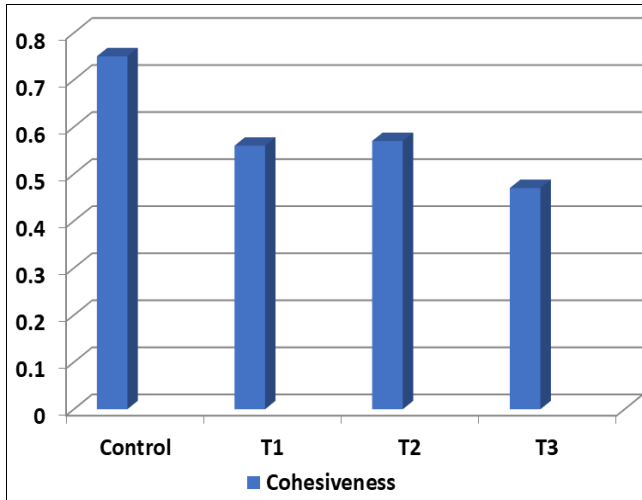


Fig 3: Cohesiveness of spices incorporated camel and goat milk paneer

Springiness

Springiness: Extent to which a product physically springs back after it has deformed during the first compression.

$$\text{Springiness} = \frac{\text{Length 1}}{\text{Length 2}}$$

Distance between the end of 1st bite and beginning of 2nd bite. Its unit is in millimeter, how well a product springs back physically after deformation during the first bite. The spring back is measured at the lower stroke of the second bite, so the wait time between two strokes can be relatively important. In some cases, an excessively long waiting time will allow a product to spring back more than it could under the conditions being investigated (for example, one would not wait 60 seconds between the chews).

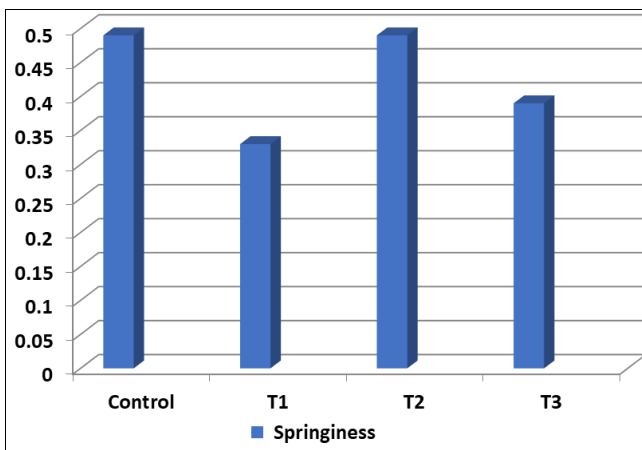


Fig 4: Springiness of spices incorporated camel and goat milk paneer

The springiness values obtained for the spices incorporated camel and goat milk paneer were in the range from 0.49±0.02 to 0.33±0.02. The value of camel and goat milk paneer without incorporation of any spices (T₀) was 0.49±0.02. The value of black pepper incorporated camel and goat milk paneer (T₁) was 0.33±0.02. Whereas the value of cardamom incorporated camel and goat milk paneer (T₂) and black

pepper + cardamom incorporated camel and goat milk paneer (T₃) were 0.49±0.02 and -0.39±0.02 respectively.

Conclusion

From the present study it may be concluded that the overall textural profile of Paneer showed a wide difference in value of texture parameters like Hardness, Springiness, Cohesiveness and Adhesiveness in control as well as all treatment group of developed paneer.

The incorporation of 30% goat milk and 70% camel milk with or without spices incorporation forms a good textural structure of the Paneer.

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