

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.909.306>

Quality Evaluation of Paneer Prepared with Sheep and Camel Milk with Spices Incorporation

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ABSTRACT

Keywords

Sheep milk, Camel milk, Texture analysis, Proximate, Probiotic

Article Info

Accepted:
18 August 2020
Available Online:
10 September 2020

In the present study, textural and composition parameters of paneer prepared with sheep and camel milk containing with different spices. Paneer is of great value in diet, especially in the Indian vegetarian context, because it contains a fairly high level of fat and proteins as well as some minerals, especially calcium and phosphorous. The high protein and overall solid contents of sheep milk make it particularly appropriate for cheese and yoghurt making. The biological and functional value of camel milk, make it more appropriate for human health. The results of the study indicated that the product has good acceptability and major benefits as human food. The values obtained for texture analysis of spices incorporated sheep and camel milk paneer were found to be appropriate for human consumption.

Introduction

Milk is highly nutritious and supplies body building proteins, bone forming minerals, healthful vitamins and provide energy giving lactose and milk fat. It provides essential nutrients and make a significant contribution to the required nutrient intakes for calcium, magnesium, selenium, riboflavin, vitamin B₁₂ etc. it is very good source of high-quality, i.e. casein and whey proteins. Insoluble milk proteins are called casein, whereas soluble proteins are known as whey proteins. Both of these groups of milk proteins are considered

to be of excellent quality, with a high proportion of essential amino acids and good digestibility. Casein forms the majority (80%) of proteins in milk.

The physicochemical and nutritional characteristics of sheep milk make it suitable for the manufacture of products containing prebiotic ingredients and probiotic bacteria in the functional food market. Sheep milk contains one and half times more protein than cow milk (up to 6-7%), and has more A, B₁ & B₁₂ vitamins. Sheep milk is an important attribute of food of many nations in Europe

Asia and the Middle East. Mostly the milk products such as yogurt, kefir, cheese, butter are made from sheep milk. It also has simple lipids (diacylglycerols, monoacylglycerols, and cholesterol esters), complex lipids (phospholipids), and liposoluble compounds (sterols, cholesterol esters, hydrocarbons). Sheep colostrum is also higher in basic nutrients than cow colostrum in the early postpartum period: fat 13.0% and 5.1%, protein 11.8% and 7.1%, lactose 3.3% and 3.6%, minerals 0.9% and 0.9% total solids 28.9% and 15.6% respectively (Park *et al.* 2007).

Sheep milk proteins are also important sources of bioactive ACE inhibitory peptides and antihypertensive peptides. They can protect and control microbial infections against non-immune diseases. The total antibacterial effect in milk exceeds the sum of the individual contributions of immunoglobulin and non-immunoglobulin proteins such as lactoferrin, lactoperoxidase, lysozyme and other peptide proteins. In fermented milk products such as yogurt, sour milk and cheese, a variety of naturally formed bioactive peptides have been found. Bioactive peptide can be used as a potent drug with well-defined pharmacological effects in the formulation of nutraceuticals that improve health (Atanasova and Ivanova, 2010).

Camel milk is known for its medicinal properties, which are widely exploited for human health, as in several countries from the ex-Soviet Union (Kenzhebulat *et al.*, 2000) and developing countries (Mal *et al.*, 2006). Camel milk is considered to have anti-cancerous (Magjeed, 2005), hypo-allergic (Shabo *et al.*, 2005) and anti-diabetic properties (Agarwal *et al.*, 2003). A high content in unsaturated fatty acids contributes to its overall dietary quality (Karray *et al.*, 2005; Konuspayeva *et al.*, 2008). The low quantity of β -casein and the lack of β -

lactoglobulin are linked to the hypo-allergic effect of camel milk. The low quantity of β -casein and the lack of β -lactoglobulin are linked to the hypo-allergic effect of camel milk. Other components such as lactoferrin, immunoglobulin, lysozyme or vitamin C were reported to play a central role in the determination of these properties (Elagamy *et al.*, 1996; Konuspayeva *et al.*, 2007).

Paneer is of great value in diet, especially in the Indian vegetarian context, because it contains a fairly high level of fat and proteins as well as some minerals, especially calcium and phosphorous. Paneer is a rich source of fat soluble vitamins A, D and animal protein available at a comparatively lower cost and forms an important source of animal protein for vegetarians. Over and above its high protein content and digestibility, the biological value of protein in paneer is in the range of 80 to 86 (Shrivastava and Goyal, 2007).

Superior nutritive value of paneer is attributed to the presence of whey proteins that are rich source of essential amino acids. 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). Keeping in view to harness maximum health benefits of sheep and camel milk paneer, present study was undertaken to develop paneer from sheep and camel milk and evaluate its quality.

Materials and Methods

Proximate analysis of paneer was done according to method described by A.O.A.C. (2000). TA-XTplus Texture Analyzer (Stable Micro System Ltd., Godalming, UK) use to perform a more comprehensive analysis of the paneer texture.

Product development

Provide sources of milk for sheep and camel then how paneer was prepared products.

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

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

T₂ – sheep and camel milk paneer with inclusion of cinnamon (0.6 %),

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

Moisture content of sheep and camel milk paneer was (55.51 ± 0.12%), T₁, T₂, and T₃ (55.27 ± 0.04%, 55.40 ± 0.07% and 55.40 ± 0.17%) respectively. The crude protein content of control, T₁, T₂ and T₃ were 17.19 ± 0.15%, 17.50 ± 0.08%, 17.28 ± 0.05% and 17.34 ± 0.11% respectively. The mean ether extract percentage of sample T₀, T₁, T₂ and T₃ were 24.3 ± 0.11%, 24.10 ± 0.06%, 24.22 ± 0.08% and 24.31 ± 0.09% respectively. The mean carbohydrate percentage of sample T₀, T₁, T₂ and T₃ were found 2.15 ± 0.11%, 2.34 ± 0.09%, 2.29 ± 0.061% and 2.39 ± 0.12% respectively. The total ash percentage of sample T₀, T₁, T₂ and T₃ were found 0.88 ± 0.07%, 0.82 ± 0.05%, 0.76 ± 0.072% and 0.88 ± 0.10% respectively whereas the value of 0 ± 0%, 0.05 ± 0.002%, 0.09 ± 0.002% and 0.67 ± 0.001% were observed for the mean crude fibre percentage of sample T₀, T₁, T₂ and T₃ respectively (Table 1).

Textural properties of spices incorporated sheep and camel milk paneer

The textural properties of spices incorporated sheep and camel milk paneer has been presented in Table 2.

Hardness

Hardness is the most commonly evaluated feature for the analysis of texture. It may be described as the force needed to achieve a deformation. During textural determination the hardness is the peak force of the first compression of the product.

The mean ± SE hardness values obtained for the spices incorporated sheep and camel milk paneer were in the range of 1656.53 ± 37.47 to 2055.45 ± 13.57g. The value of sheep and camel milk paneer without incorporation of any spices (T₀) was 1656.53 ± 37.47. The values of black pepper incorporated sheep and camel milk paneer (T₁) was 1845.5 ± 36.32.

Whereas the value of cinnamon incorporated sheep and camel milk paneer (T₂) and black pepper + cinnamon incorporated sheep and camel milk paneer (T₃) were 1915.03 ± 17.30 and 2055.45 ± 13.57 respectively.

The values obtained for hardness of spices incorporated sheep and camel milk paneer were found to be comparable with the findings of Mhatre (2007). The hardness values obtained by Mhatre (2007) 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.

Adhesiveness

The negative forces area for the first bite, representing the work necessary to pull compressing probe away from sample is defined as adhesiveness.

Table.1 Proximate analysis (Mean \pm SE) of spices incorporated sheep and camel milk paneer

Constituent (%)	T ₀	T ₁	T ₂	T ₃
Moisture	55.51 \pm 0.12	55.27 \pm 0.04	55.40 \pm 0.07	55.4 \pm 0.17
Crude Fibre	-	0.05 \pm 0.002	0.09 \pm 0.002	0.67 \pm 0.001
Crude Protein	17.19 \pm 0.15	17.50 \pm 0.08	17.28 \pm 0.05	17.34 \pm 0.11
Ether Extract	24.3 \pm 0.11	24.10 \pm 0.06	24.22 \pm 0.08	24.31 \pm 0.09
Carbohydrate	2.15 \pm 0.11	2.34 \pm 0.09	2.29 \pm 0.061	2.39 \pm 0.12
Total ash	0.88 \pm 0.07	0.82 \pm 0.05	0.76 \pm 0.072	0.88 \pm 0.10

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

Table.2 Texture analysis spices incorporated sheep and camel milk paneer (mean \pm SE)

Parameter	T ₀	T ₁	T ₂	T ₃
Hardness(gm)	1656.53 \pm 37.47	1845.5 \pm 36.32	1915.03 \pm 17.30	2055.45 \pm 13.57
Adhesiveness (gm/sec)	-26.61 \pm 0.44	-24.45 \pm 0.30	-30.85 \pm 0.57	-21.2 \pm 0.49
Springiness (mm)	0.58 \pm 0.01	0.31 \pm 0.04	0.31 \pm 0.034	0.23 \pm 0.07
Cohesiveness (Mj)	0.92 \pm 0.01	0.63 \pm 0.02	0.82 \pm 0.006	0.62 \pm 0.01

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

The adhesiveness values obtained for the spices incorporated sheep and camel milk paneer were in the range from -21.2 \pm 0.49 to -30.85 \pm 0.57g. The maximum value of adhesiveness was found for black pepper + cinnamon incorporated sheep and camel milk paneer (T₃) -21.20 \pm 0.49g. The value of sheep and camel milk paneer without incorporation of any spices (T₀) was -26.61 \pm 0.44. Whereas the value of black pepper incorporated sheep and camel milk paneer (T₁) and cinnamon incorporated sheep and camel milk paneer (T₂) were -24.45 \pm 0.30 and -30.85 \pm 0.57 respectively.

Springiness

Springiness means is how well a product springs back physically after it was deformed during the first compression and was allowed to wait for the target time between strokes.

The spring back is measured by the second compression down-stroke.

The springiness values obtained for the spices incorporated sheep and camel milk paneer were ranged from 0.23 \pm 0.07 to 0.58 \pm 0.01. The value of sheep and camel milk paneer without incorporation of any spices (T₀) was 0.58 \pm 0.01. The value of black pepper incorporated sheep and camel milk paneer (T₁) was 0.31 \pm 0.04. Whereas the value of cinnamon incorporated sheep and camel milk paneer (T₂) and black pepper + cinnamon incorporated sheep and camel milk paneer (T₃) were 0.31 \pm 0.034 and 0.23 \pm 0.07 respectively.

Cohesiveness

Cohesiveness is the ratio of first and second bite areas. It is defined as the extent to which

a material can be deformed before its rupture and depends primarily on internal bond strength.

The maximum cohesiveness value was found in control (T₀) sheep and camel milk paneer (0.92 ± 0.01). The minimum value was black pepper + cinnamon (T₃) incorporated sheep and camel milk paneer (0.62 ± 0.01). The value of black pepper incorporated sheep and camel milk paneer (T₁) was 0.63 ± 0.02 and the value of cinnamon incorporated sheep and camel milk paneer (T₂) 0.82 ± 0.006. The nature of the protein matrix and extent of fat dispersion may contribute to cohesiveness or tendency to adhere to it. Data related to cohesiveness of spices incorporated sheep and camel milk paneer is in line with result demonstrated by Shrivastav and Kumbhar (2010).

Thus from the present study it may be concluded that by the result of textural properties of sheep and camel milk paneer it may concluded that although the control paneer was best but among the spices incorporated paneer the T₁ is better as compared to T₂ and T₃.

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How to cite this article:

Rohit Meena, Basant Bais, Y. P. Gadekar, Ashok Prajapat, Lokesh Tak and Devender kumar. 2020. Quality Evaluation of Paneer Prepared with Sheep and Camel Milk with Spices Incorporation. *Int.J.Curr.Microbiol.App.Sci.* 9(09): 2458-2463.
doi: <https://doi.org/10.20546/ijcmas.2020.909.306>