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Studies on preparation and sensory evaluation of paneer developed from sheep and camel milk using different spice

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Abstract
Spices can work as natural preservative and helps to increase the shelf life of the product. In present study the paneer obtained by admixture of sheep and camel milk in a ratio of 30:70 respectively with the help of citric acid coagulation was evaluated a control sample (T_0) was prepared by sheep and camel milk (30:70 ratio) without any spices, different treatments were prepared by adding different spices as T_1 was sheep and camel milk paneer with black pepper (0.6%), T_2 was sheep and camel milk paneer with black cinnamon (0.6%) and T_3 was sheep and camel milk paneer with black pepper + cinnamon (0.3% + 0.3%). The samples of paneer were evaluated by a group of panelists for sensory evaluation using 8 point Hedonic scale. As per results, the black pepper incorporated paneer (T_1) had highest overall acceptability. Thus from the present study it may be concluded that the inclusion of spices, enhanced the sensory quality like flavour, color/appearance and overall acceptability of sheep and camel milk paneer and spices like black pepper and cinnamon may be used to incorporate in sheep and camel milk paneer with very good acceptability.

Keywords: Sheep milk, camel milk, paneer, spices, black pepper, cinnamon

Introduction
Sheep milk has high nutritional value and high concentrations of proteins, fats, minerals, and vitamins as compared to the milk of other domestic species. The high levels of protein, fat, and calcium make it an excellent matrix for cheese production (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 (Atanasova and Ivanova, 2010) [3].

Camel milk is unique in terms of having low fat (1.5-3%) and low protein (2.5%) (Gorachiya, 2017 and Devi, 2018) [6, 4]. Due to low cholesterol, low sugar, high minerals (potassium, sodium, iron, magnesium and zinc), high vitamin C, low protein and high insulin camel milk concentrations differ from other ruminant milk. The values of trace minerals in camel milk were significantly higher than in bovine milk (Agarwal *et al*. 2004 and Arrowal *et al*. 2005) [1, 2].

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) [9].

Now a days there has been increasing trend of the consumers about foods free from chemical preservatives because of their possible toxic effect in human beings. The consumers are also demanding foods with long shelf life and absence of risk of causing food borne diseases. There is an increasing demand for foods containing natural ingredients (Jagannath, 2012) [7]. The spices offer a promising alternative in food safety. The spices have been well known for their medicinal, preservative and antioxidant properties (Souza *et al*. 2005) [10].

Different spices (black pepper, cardamom, cinnamon and clove) for extending the shelf life of paneer. The order of the relative effectiveness in enhancing shelf life of paneer was cardamom

> cinnamon > clove > black pepper (Eresam *et al.*, 2015) [5]. The present study was therefore, undertaken to evaluate the paneer prepared from sheep and camel milk.

Materials and Methods

Paneer was prepared by using different ratio of sheep and camel milk coagulum with or without incorporation of spices. Best result was obtained on the basis of yield and consistency of milk by combination of 30% sheep milk and 70% camel milk. Increasing camel milk ratio made the paneer consistency inappropriate and decreased yield of milk coagulum. The milk used for preparation of paneer was subjected to heating at 90°C for 10 minutes. The milk was subsequently by 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 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 was stored at refrigeration (4 ± 1°C) followed by packaging.

Material and method

On the basis of sensory quality of various levels of black pepper, cinnamon and black pepper + cinnamon incorporated sheep and camel milk paneer, it was found that the inclusion of 0.6% black pepper, 0.6% cinnamon and 0.3% black pepper + 0.3% cinnamon was most suitable for preparation or formation of treatment paneer under study.

T_0: Sheep (30%) and camel milk (70%) paneer without inclusion of any spices,

T_1: Sheep (30%) and camel milk (70%) paneer with inclusion of black pepper (0.6%),

T_2: Sheep (30%) and camel milk (70%) paneer with inclusion of cinnamon (0.6%),

T_3: sheep (30%) and camel milk (70%) paneer with inclusion of black pepper + cinnamon (0.3%+0.3%).

Results and Discussions

The sensory evaluation of spices incorporated sheep and camel milk paneer was performed by using 8-point hedonic scale to know the sensory characteristics such as appearance and colour, flavour, body and texture and overall acceptability. Eight semi- trained panelists consisting of academic staff and students were included in sensory evaluation. Control sheep and camel milk paneer and all the preparations of spices incorporated sheep and camel milk were presented in under fluorescent light. All samples were marked with digital code and the order of presentation of samples was randomized for each panelist.

The average score for flavor of control (T_0) was found to be 6.90 ± 0.07 and spices incorporated sheep and camel milk paneer i.e. for T_1, T_2, and T_3 were found to be 7.00 ± 0.09, 6.90 ± 0.11 and 6.85 ± 0.10 respectively Thus it may be concluded that T_1 (black pepper incorporated sheep and camel milk paneer) scored maximum point (7.00 ± 0.09) for flavor by the panelists.

The average score for body and texture of control (T_0) sheep and camel milk paneer was found to be 6.93 ± 0.06 and for spices incorporated sheep and camel milk paneer i.e. for T_1, T_2, and T_3 were found to be 6.68 ± 0.17, 6.88 ± 0.12 and 6.85 ± 0.14 respectively. The control paneer scored maximum point (6.93 ± 0.063) for Body and texture by the panelist.

Table 1: Sensory evaluation (mean ± SE) of spices incorporated sheep and camel milk paneer

Treatment	T_0	T_1	T_2	T_3
Flavour	6.90 ± 0.07	7.00 ± 0.09	6.90 ± 0.11	6.85 ± 0.10
Body and Texture	6.93 ± 0.06	6.68 ± 0.17	6.88 ± 0.12	6.85 ± 0.14
Appearance and colour	7.11 ± 0.11	7.13 ± 0.12	7.05 ± 0.10	7.08 ± 0.08
Overall acceptability	6.82 ± 0.16	6.85 ± 0.10	6.70 ± 0.09	6.80 ± 0.07

T_0 –sheep and camel milk paneer without any spices, T_1 – sheep and camel milk paneer with black pepper (0.6%), T_2 – sheep and camel milk paneer with cinnamon (0.6%), T_3 – sheep and camel milk paneer with black pepper + cinnamon (0.3% + 0.3%).

The average score for appearance and colour of control (T_0) was found to be 7.11 ± 0.11 and for T_1, T_2, and T_3 was found to be 7.13 ± 0.12, 7.05 ± 0.10 and 7.08 ± 0.08 respectively The T_1 (black pepper incorporated sheep and camel milk paneer) scored maximum point (7.13 ± 0.12) for appearance and colour by the panelist.

The data related to overall acceptability for T_0, T_1, T_2 and T_3 were found to be 6.82 ± 0.16, 6.85 ± 0.10, 6.70 ± 0.09 and 6.80 ± 0.07 respectively. The T_1 (black pepper incorporated sheep and camel milk paneer) scored maximum point (6.85 ± 0.10) for overall acceptability by the panelist.

Conclusion

From Findings of the present study it may be concluded that the inclusion of spices, enhanced the sensory quality like flavour, color/appearance and overall acceptability of sheep and camel milk paneer and spices like black pepper and cinnamon may be used to incorporate in sheep and camel milk paneer with very good acceptability.

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