

POTENTIAL OF USING CAMEL MILK FOR ICE CREAM MAKING

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ABSTRACT

Ice-creams variants like chocolate, dry fruit, pineapple, rose-petal, strawberry and vanilla were developed and standardised in the laboratory using different combination of camel and cow milk as an experimental samples and cow milk as a control sample. Results indicated great potential of camel milk in the field of ice-cream development for economic and nutrition security. Value addition of camel milk in the form of ice-cream may open up new frontiers and camel milk production in India.

Key words: Camel, ice-cream, milk, value addition

Camel milk is opaque white in colour with normal odour and salty, sweet and sharp taste (Khaskheli *et al*, 2005). It is slightly saltier than cow's milk, three times as rich in vitamin C and is known to be rich in iron, unsaturated fatty acids and vitamins (FAO, 2009 and Shamsia, 2009).

Camel milk contains polyunsaturated fatty acids in the form of fat which is very little (2%) and are completely homogenised to give the milk a smooth white appearance. Lactose is present in concentrations of 4.8%, but this milk sugar is easily metabolised by persons suffering from lactose intolerance (Yagil, 1985; Beg *et al*, 1986; Hanna, 2001). Camel milk is also known for its medicinal properties which are widely exploited for human health (Mal *et al*, 2006).

In India, camel milk is being used since long by the camel keepers either in fresh or boiled form or for the preparation of few milk products such as Butter milk, *Raabree* a local product made by mixing curd with millet flour and Tea.

Goyal and Bishnoi (2007) developed camel milk products like ice creams, *paneer*, *khoa*, *kheer* and *raabree* in India. Singh (2004) prepared "*kesar kulfi*" ice cream with saffron flavour, a typical Indian market acceptable ice cream which is a candy like presentation on a stick with saffron mixed camel milk.

Prajapati *et al* (2012) prepared medium fat (6%) camel milk ice cream using three different flavours like vanilla, strawberry and pineapple.

Wernery (2006) opined that camel milk products are consumed commercially as fresh raw

or pasteurised camel milk cheese, ice creams with different flavours and milk shakes, puddings and the Arabian dishes as sour milk.

In view of nutritional qualities and easy availability of camel milk in arid areas, it seems imperative to utilise it in the form of value added products. This will definitely help motivating camel milk producers in generating income.

Ice-cream is considered to be the most popular desert variety of camel milk, hence value addition of camel milk in the form of ice-cream may open up a new avenue for developing modern camel dairies. Present study is based on exploring the potential of using camel milk for ice cream making with different flavours.

Materials and Methods

Tetra packs of camel and cow milk (control sample) and Amul cream were procured in bulk from Uttari Rajasthan Milk Union Limited; Bikaner and were used as the base material for ice-cream manufacturing. Other additives i.e. Glycerol Mono Stearate (GMS), Carboxy Methyl Cellulose (CMC) were obtained from M/s Brion Fine Chemicals, Mumbai. Different flavours and essence were obtained from M/s Bush Boake Allen (India) Ltd., Chennai. Food grade 'Bush' brand colours were obtained from M/s International Flavours and Fragrance India Ltd. Corn flour and sugar were procured from local market in airtight packs.

Camel and cow milk samples were used either in their pure or combination forms (Table 1) to

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develop and standardise ice-cream samples. Five milk samples and 25 ice-cream samples were obtained under the study for further evaluation.

Table 1. Combination of camel and cow milk for preparation of different products.

Ingredients	Sample number				
	C1	C2	C3	C4	C5
Camel milk (ml)	0	100	75	50	25
Cow milk (ml)	100	0	25	50	75

C1: Control sample, C2, C3, C4, and C5: Experimental samples.

Initially ice-cream base was standardised, which was later on used for the development of different types of ice-cream samples.

Development of Ice-cream base

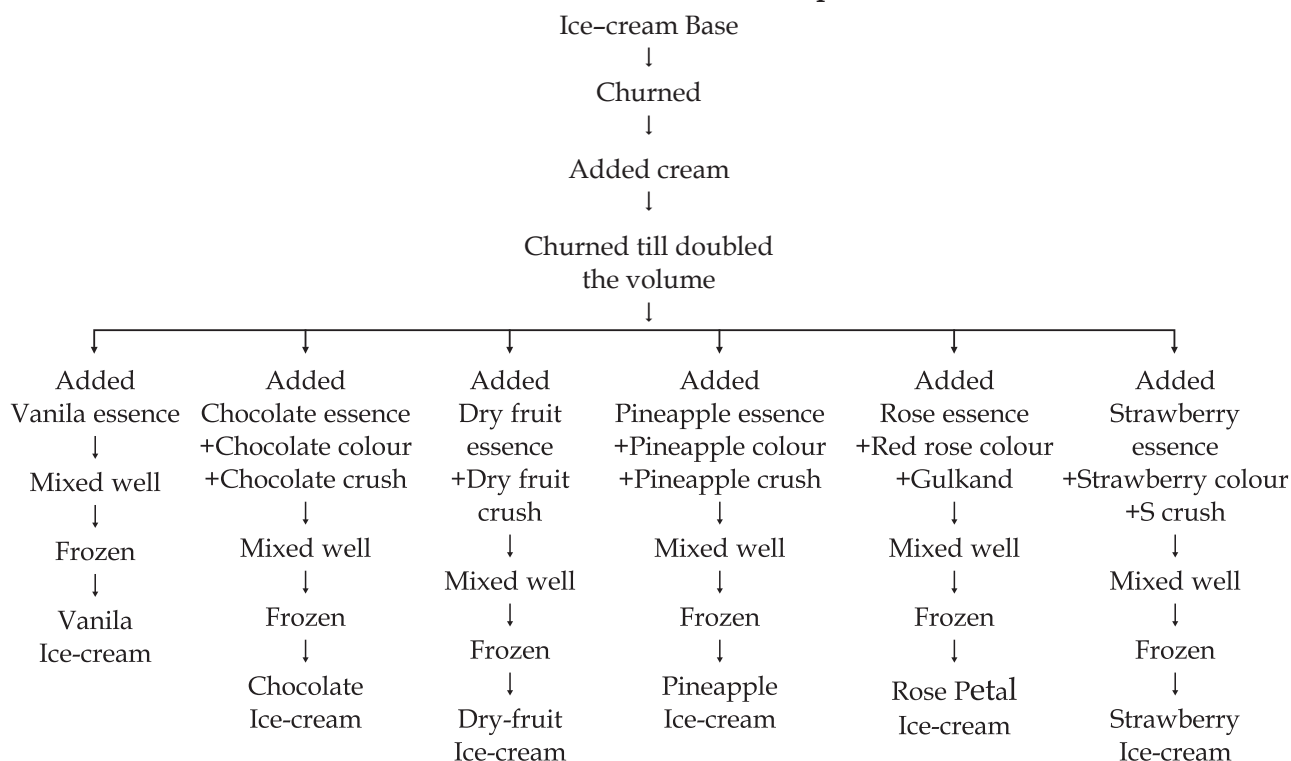
All milk samples were boiled separately. GMC (2.7 per cent), CMC (1 per cent) and corn flour (2.7 per cent) were mixed well with 5 ml of water, added to

boiling milk samples and cooked on low flame for 5 minutes with continuous stirring. Sugar (10 per cent) was added at the end and cooked for two minutes with stirring in between and removed from fire. The mixture was cooled and homogenised, poured in ice-cream mold and kept overnight at 3-4°C. Base was prepared for all five type of milk samples separately.

Preparation of Products

Ice-cream base of all samples was churned separately one by one till ice-cream crystals were broken down. Commercial Amul milk cream (30 per cent) was added in all base samples and again churned till the volume was doubled. To obtain 6 different types of ice-cream, additives like essence (few drops), colour (few drops), fruit crush, chocolate or dry fruit (5 per cent) were added, as per requirement. These were mixed well and transferred into shallow containers and frozen separately. In all 25 samples of ice-cream were obtained.

Flow Chart of Ice-Cream Development



Sensory Descriptive Analysis

Sensory profiling of the milk and ice-cream samples were conducted using a panel of ten trained Judges selected from among the faculty and postgraduate students of the department of Food and Nutrition. Members of the panel were selected on the basis of threshold test (THT) and organoleptic test (Potter, 1987). Their knowledge and willingness to

participate throughout the evaluation period was also considered while selecting them. All samples were marked with codes before serving, to the panelists.

As per table (2 to 7) the five milk samples and 30 ice-cream samples were served to the panel members separately for obtaining the mean acceptability scores for colour appearances, consistency, flavour and taste on the basis of a nine point hedonic rating scale.

Table 2. Overall mean acceptability scores of chocolate ice-cream samples.

Sensory traits	Scores of sensory characteristics on nine point scale					Over all mean score	SD	F-value
	C1	C2	C3	C4	C5			
Colour	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	4.073
Appearance	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	3.441
Consistency	8.8	8.8	8.8	8.8	8.8	8.80	± 0.404	3.818
Flavour	8.9	8.3	8.5	8.7	8.9	8.66	± 0.419	5.625*
Taste	8.9	7.6	8.5	8.7	8.8	8.50	± 0.678	8.982*
Mean score	8.88	8.50	8.72	8.80	8.86	8.75	±0.154	0.625

Table 3. Overall mean acceptability scores of dry fruit ice-cream samples.

Sensory traits	Scores of sensory characteristics on nine point scale					Over all mean score	SD	F-value
	C1	C2	C3	C4	C5			
Colour	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Appearance	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Consistency	8.8	8.8	8.8	8.8	8.8	8.80	± 0.404	0.0
Flavour	8.9	8.4	8.5	8.8	8.9	8.70	± 0.544	2.012
Taste	8.9	8.0	8.4	8.7	8.9	8.58	± 0.575	6.422*
Mean score	8.88	8.60	8.70	8.78	8.82	8.75	±0.109	0.628

Table 4. Overall mean acceptability scores of pineapple ice-cream.

Sensory traits	Scores of sensory characteristics on nine point scale					Over all mean score	SD	F-value
	C1	C2	C3	C4	C5			
Colour	8.8	8.8	8.8	8.8	8.8	8.80	± 0.404	0.0
Appearance	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Consistency	8.8	8.7	8.7	8.7	8.8	8.74	± 0.443	0.142
Flavour	8.9	8.4	8.6	8.8	8.9	8.72	± 0.536	1.734
Taste	8.9	8.2	8.4	8.7	8.9	8.62	± 0.567	3.668*
Mean score	8.86	8.60	8.68	8.78	8.86	8.75	±0.114	0.425

Results

Sensory profiling

Sensory evaluation was performed in a well-lit and ventilated laboratory. A 9-point hedonic scale score card was used in paper form. Data on important organoleptic characteristics viz. colour, appearance, consistency, flavour, taste and mean overall scores of milk samples prepared from various proportion of camel milk and cow milk (C1, C2, C3, C4 and C5) is given in table 1.

It is evident from the table that a non-significant difference existed with in colour, appearance and consistency of the fresh boiled milk samples obtained by various combinations. The mean scores for flavour and taste of pure camel milk samples were significantly lower (8.9 for flavour and 8.8-8.9 for taste) from its pure cow milk samples counterparts. Hence, with the decrease in proportion of camel milk along with increase in cow milk proportion in case of sample C3,

C4 and C5, the mean scores of flavour (8.1-8.4) and taste (7.6-8.2) kept on rising although with non-significant difference between them.

However, it is important to note that there was a non-significant difference in the overall mean scores of all the milk samples, which indicates that all milk samples were acceptable to the panelist with a narrow difference.

Tables 2-7 display the organoleptic scores of 6 different types of ice-cream samples prepared from 5 different samples of milk in each case.

Overview of all ice-cream samples revealed slightly lower mean scores for vanilla ice-cream. This indicated that addition of other added flavours or fruit pulp or dry fruit or chocolate crush made a difference in the level of their acceptability.

Significant difference was observed between flavour and taste of ice-cream samples prepared with either pure camel milk (C2) or pure cow milk (C1).

Table 5. Overall mean acceptability scores of rose ice-cream samples.

Sensory traits	Scores of sensory characteristics on nine point scale					Over all mean score	SD	F-value
	C1	C2	C3	C4	C5			
Colour	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Appearance	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Consistency	8.8	8.8	8.8	8.8	8.8	8.80	± 0.404	0.0
Flavour	8.9	8.2	8.5	8.7	8.9	8.64	± 0.463	3.3*
Taste	8.8	8.0	8.5	8.7	8.8	8.56	± 0.577	4.309*
Mean score	8.86	8.56	8.72	8.80	8.86	8.76	±0.125	0.610

Table 6. Overall mean acceptability scores of vanilla ice-cream samples.

Sensory traits	Scores of sensory characteristics on nine point scale					Over all mean score	SD	F-value
	C1	C2	C3	C4	C5			
Colour	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Appearance	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Consistency	8.8	8.7	8.8	8.8	8.8	8.78	± 0.418	0.106
Flavour	8.9	8.1	8.3	8.5	8.8	8.54	± 0.579	5.097*
Taste	8.9	7.7	8.0	8.5	8.8	8.38	± 0.725	7.957*
Mean score	8.88	8.46	8.58	8.72	8.84	8.69	±0.176	0.680

Table 7. Overall mean acceptability scores of strawberry ice-cream samples.

Sensory traits	Scores of sensory characteristics on nine point scale					Over all mean score	SD	F-value
	C1	C2	C3	C4	C5			
Colour	8.9	8.9	8.9	8.9	8.9	8.88	± 0.328	0.173
Appearance	8.9	8.9	8.9	8.9	8.9	8.90	± 0.303	0.0
Consistency	8.8	8.8	8.8	8.8	8.8	8.80	± 0.404	0.0
Flavour	8.9	8.3	8.5	8.7	8.8	8.64	± 0.525	2.33
Taste	8.8	7.7	8.1	8.6	8.8	8.40	± 0.639	9.976*
Mean score	8.86	8.52	8.64	8.78	8.84	8.72	±0.144	0.630

*Significant at 1% level of significance

This may be due to peculiar flavour and taste of camel milk (Wernery, 2007).

A comparison of acceptability of camel milk based ice-cream samples against the reference milk samples (C1) revealed that there was a non significant difference between C3, C4, C5 and C1 but addition of cow milk sample improved the acceptability and sample C4, C5 were at par with reference ice-cream sample. Results on similar lines have been documented by Singh (2004) who also prepared well acceptable Kesar Kulfi (a frozen milk product from camel milk with saffron added).

Improvement in the scores for flavour and taste occurred with the addition of additives of Ice-cream (essence, chocolate powder, fruit crush, dry fruit etc).

However, all milk samples were acceptable to the judges. Acceptability of all ice-cream samples varied between 'Liked extremely' (8-9) to 'liked moderately' (7-8) indicating wide scope of utilising

camel milk in the form of ice-cream. Results of present study point to the value addition of camel milk in developing a wide range of ice-creams.

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