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SHORT COMMUNICATION

Feasibility of manufacture and investigation of physicochemical properties of camel milk – based ice cream

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Abstract

Ice cream is one of the most popular foods worldwide commonly made from cow milk. Camel milk is an invaluable foods component which is less frequently used in diets. The aim of this study was to provide a proper formulation for manufacture of ice cream using camel milk and investigate the physicochemical and organoleptic properties of camel milk – made ice cream. The results showed no significant difference between fat and protein contents however solid matters content viscosity and melting point of cow milk containing sample were higher than those of camel milk containing ice cream. Sensory tests also did not show any significant difference among samples. Thus manufacture and competition of an ice cream made from camel milk is feasible.

Key words: Physicochemical properties; camel milk; ice cream

Introduction

Ice cream is one of the most widely used desserts worldwide. It has been increasingly consumed by people and as the technology and manufacture, storage and supply methods improve it is being paid more attention not only by food industry but also by families especially children and other susceptible groups due to high nutritional value as well as desirable rheological properties, thus type and amount of its constituents is of enormous importance for consumer's health (Soukoulis et al., 2009). Use of animal's milk in place of cow milk in products such as ice cream has been considered in recent years. In different parts people use milk of animals especially cow as well as buffalo, sheep, goat and camel (Agrawal et al., 2003). Milk is used for manufacturing dairy products including cream, butter, yogurt, ice cream, cheese, dried whey, etc. camel milk possesses nutritional and therapeutically properties as well as higher K, Na, Ca, Mg, unsaturated fatty acids, protein, Cl and folic acid contents and is rich in antibodies and anticancer compounds and higher fat, lactose and insulin contents as compared to cow milk, thus it is suitable for diabetic, and lactose – intolerant people (Agrawal et al., 2004). Milk is increased in acidity rapidly when stored for period with pH value being 6.5-6.7 similar to that of sheep milk. Problems with production industrialization and marketing need to be solved in order to provide markets for camel milk (Ahmed et al., 2016). According to the experts camel milk has higher nutrients content than cow milk but its flavor may not be welcomed by everyone (Abu-Lehia et al., 1989). According to FAO there are about 17 million camels worldwide with 12.2%

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existing in Africa and 4.8% in Asia. Camels are an invaluable source of milk production with the lactation period varies from 9 to 18 month producing 1800-12700 L milk annually (Yagil, 1982). So it is considered a good source of milk. This study was aimed at providing a proper formulation for vamel milk containing ice cream and investigating the physicochemical and its organoleptic properties.

Materials and methods

Materials

Camel and cow milk was obtained from Golestan province Iran. Malt dextrin was obtained from milatech. Stabilizer was obtained from palsgard Co. and vanilla from Quivadan Co. France.

Ice cream preparation

Initially dry matters were weighed and added to the boiling milk. Solid matters were dissolved through mixing at 70 C for 10 min. The samples were pasteurized at 75C for 15 min and homogenized at two phases at 2000 psi at first and 500 psi at second phase by use of a laboratory homogenizer. The mixture then was cooled to 5C and was refrigerated at 5C for 16 h to be ripened. Eventually the ice cream mixtures were frozen by a laboratory ice cream – maker to given the final product. The formulation of the samples is given in Table 1.

Tests

All tests including protein, fat, solid matters, acidity, viscosity and melting point determinations were carried out according to national Iranian standard No. 2450. These parameters were evaluated by a 20- member panel consisting of trained panelists. Hedonic sensory test (5-point) representing very bad, bad, intermediate, good, very good was used.

Data analysis

Data collected from different test and then analyzed based on %.05 coefficients of error by a software Minitab. At first step software proved samples' normal conditions and then the significant difference among data was precisely studied via one way anova test and *p*-value was determined.

Result and discussion

The results from total dry matters measurement are shown in Table 2 indicating significant difference (at 5% level) between the treatments. The highest dry matters content was found for cow milk and the lowest content was observed for camel milk. Given the fact that dry matters content in camel milk (10.02%) is less than in cow milk (12.3% the observed lower dry matters content when cow milk was replaced by camel milk is explained. It should be noted that A2 showed no significant difference from two other samples. There was no significant difference among samples because the fats of cow and camel milk used in the formulation were similar. There was no significant difference in acidity among three samples with the highest acidity (18%) being observed for camel milk containing sample followed by A2 (16%) and A3 (18.53%). Cow and camel milks have similar acidity upon milking however camel milk is increased in acidity over time.

The camel milk used in this study had higher initial acidity contributing the increased acidity of the sample. The protein content was not significantly different with the average amount being 3.5% protein content in cow milk containing sample was higher than that in camel milk containing sample due to the higher initial protein content though it was not significantly different. A2 and A3 were not significantly different in viscosity however cow milk containing sample had higher viscosity (CP 248.87) than A2 (243.20). Camel milk containing sample showed significantly the lowest viscosity. The most important factors affecting viscosity are fat and dry matters contents. Since the fat content in three samples was the same the only parameter affecting viscosity was solid matters. Cow milk – made sample had higher viscosity because of having higher solid matters content.

The samples showed significant difference in melting point. Melting point of ice cream is directly dependent upon its solid matters content. As shown in table 2 the highest melting point was observed for cow milk containing sample (19.76C) and the lowest one for camel milk – made sample (15.04C). the results from sensory evaluation are given in Table 3. It is evident from the table that there was no significant difference between the properties including color. Flavor, texture and mouthfeel. Thus all samples showed the same total acceptability. It may be concluded that camel milk may be substituted for cow milk up to 100%.

Table 1. Prepared samples.

	Sugar	fat	Glucose	E/S	Vanilla	Maltodextrin	Camel's milk	Cow's milk
A1	13	7	5	0.55	0.15	1	73.3	-
A2	13	7	5	0.55	0.15	1	-	73.3
A3	13	7	5	0.55	0.15	1	36.15	36.15

Table 2. Phisico- chemical properties of samples.

	Dry matter (%)	Fat (%)	Acidity (%)	Protein (%)	Viscosity (CP)	Melting point (°c)
A1	35.00±0.46^{b}	10.20±0.00^{a}	18.00±0.02^{a}	3.4±0.01^{a}	212.63±2.78^{b}	15.04±1.40c
A2	36.57±0.42^{ab}	10.10±0.06^{a}	16.00±0.01^{b}	3.6±0.03^{a}	243.20±1.93^{a}	18.67±0.71b
A3	37.17±1.06^{a}	10.13±0.11^{a}	15.83±0.00^{c}	3.5±0.07^{a}	248.87±5.92^{a}	19.76±0.54a

Table 3. Organoleptic properties of samples.

Samples	Color	Flavor	Texture	Moues feel	Overall acceptability
A1	5.00±0.00^{a}	4.95±0.22^{a}	4.65±0.67^{a}	4.95±0.22^{a}	4.95±0.22^{a}
A2	4.85±0.37^{a}	4.75±0.64^{a}	4.35±0.81^{a}	4.85±0.48^{a}	4.85±0.48^{a}
A3	4.70±0.65^{a}	4.30±1.12^{a}	4.50±0.76^{a}	4.70±0.77^{a}	4.60±0.82^{a}

Conclusion

Although camel milk production in Iran is not significant in terms of its amount the investigation of its properties and comparison with other milks is important when seeking a healthier replacement for cow's milk. The present study showed that the ice cream made from camel milk with malt dextrin is acceptable.

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