PHYSICO-CHEMICAL AND SENSORY ATTRIBUTES OF READY TO EAT LOW FAT MILK SLICES

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ABSTRACT

On the basis of the conducted research study, this may be concluded that ready to eat low fat milk slices with good to very good acceptability can be prepared with the use of coagulum from 1.5% Fat corrected milk and other ingredients viz. refined wheat flour, spices and condiments. Thus development of ready to eat low fat milk slices gives a healthy product along with the scope for efficient utilization of Skim milk.

Key words : Physico-chemical, sensory evaluation, milk slices, low fat milk, ready to eat (RTE), skim milk.

Milk and milk products has long been a major constituent of our diet. These have long been central to diet in both developed and developing countries. Milk is highly nutritious food providing high quality proteins with almost all essential amino acids. It also supplies bone forming minerals and vitamins as well as suffices daily energy intake. Milk is widely accepted livestock product and enjoyed a special status in food culture of human societies worldwide. In India, milk is considered not only the source of nutrition but medicine as well in indigenous medicine. Milk is known for its nutritional and therapeutic values and other health benefits owing of bioactive peptides and short chain fatty acids. Milk is rich source of vitamins, minerals like calcium and phosphorus, fat and protein; however it lacks some critical component like iron and dietary fiber.

Milk utilization pattern is dominated by liquid milk consumption (50%) followed by preparation of traditional milk products (45%). Only 5% of the total output is utilized to produce processed milk products. Use of liquid milk dominates the milk consumption pattern though sizable of milk is converted into other milk products. Diversification of product base can be improved with adding more functionality in food development endeavor. Demand for dairy products is influenced by dietary preferences, socio-economic and other demographic factors. Research and development efforts for diversification of dairy products with emphasis on neutraceuticals and functional foods represent newer opportunities for creating niche market (1). Growing awareness regarding health concerns among consumers along with appearance of more scientific communications regarding diet and health has paved the way for neutraceuticals and functional food segment of food sector. Dietary fat is needed as a metabolic energy source and a supplier of essential nutrients, but it must be consumed in moderation for reasons of human health. There is growing evidence associating dietary fat (quantity and type of fat) with chronic disorders such as ischaemic heart diseases, some types of cancer and obesity (2). Fat reduction has generally been seen as an important strategy to improve the fat content of foods and produce healthier products. low-fat and fat-free milk and milk products are recommended as part of a healthy diet to reduce the risk of cardiovascular disease through the maintenance of healthy plasma lipids and lipoprotein cholesterol levels (3). Several epidemiological studies have found an association of low-fat dairy product intake with lower risk of type 2 diabetes in men and women (4). Compatibility of milk with cereals has given rise the range of cuisine and desserts in Indian food culture. Consumption of cereals based milk products is very popular in India e.g. kheer or pyrum. Product diversification is one of the important research and development activity for sustainability of the food processing sector. More than 1.2 billion population with great cultural diversity offer opportunities for innovation in food products (5). Milk slice, a new variety of convenience emulsion based dairy product which may be tried as adjunct to breakfast or as such. In view of above facts, the present research study was conducted with an aim of development and quality evaluation of ready to eat low fat milk slices.

MATERIALS AND METHODS

Milk : Milk for pursuing this study was procured from the Dairy Technology Section of Indian Veterinary Research Institute, Izatnagar, Bareilly (U.P.). The procured milk was pasteurized one with combination of cow and buffalo milk as per daily production at dairy farm. Skim milk used in this study was prepared by separating the cream using a hand-driven centrifugal cream separator and fat content in required milk was standardized with skimmed milk using Pearson square method.

Chemicals and ingredients : Chemicals of analytical and food grade were purchased from standard firms (Hi-media, Qualigenes, Merck etc.). Other ingredients like refined wheat flour, sugar, spices, and condiments etc. were procured from the local market.
Table-1: Sensory attributes of low fat milk nuggets prepared with skim milk coagulum and extended with different levels of Barnyard millet flour (Mean± S.E.)*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>7.52±0.09³</td>
<td>7.20±0.15³</td>
<td>7.19±0.13³</td>
<td>7.04±0.18⁵</td>
</tr>
<tr>
<td>Flavour</td>
<td>7.45±0.09³</td>
<td>7.45±0.12³</td>
<td>7.28±0.12⁵</td>
<td>7.29±0.15⁵</td>
</tr>
<tr>
<td>Juiciness</td>
<td>7.32±0.12³</td>
<td>7.05±0.11³</td>
<td>7.23±0.12³</td>
<td>7.02±0.12⁵</td>
</tr>
<tr>
<td>Body and texture</td>
<td>7.41±0.15³</td>
<td>7.34±0.09³</td>
<td>7.48±0.16³</td>
<td>7.42±0.13³</td>
</tr>
<tr>
<td>Overall acceptability</td>
<td>7.23±0.07⁵</td>
<td>7.31±0.12³</td>
<td>7.67±0.13³</td>
<td>7.21±0.16⁵</td>
</tr>
</tbody>
</table>

Mean ± S.E. with different superscripts in a row differ significantly (p<0.05). n = 21 for each treatment. T₁-10% Barnyard millet flour, T₂-15% Barnyard millet flour, T₃-20% Barnyard millet flour.

Table-2: Physico-chemical characteristics of low fat milk nuggets prepared with skim milk coagulum and optimum level of Barnyard millet flour (Mean±SE)*

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooking yield (%)</td>
<td>93.63 ± 0.63⁶</td>
<td>95.81 ± 0.59⁶</td>
</tr>
<tr>
<td>pH</td>
<td>6.14 ± 0.00³</td>
<td>6.27± 0.02⁶</td>
</tr>
<tr>
<td>Moisture content (%)</td>
<td>58.11 ± 0.54⁸</td>
<td>61.21± 0.57⁷</td>
</tr>
<tr>
<td>Protein content (%)</td>
<td>24.02 ± 0.37⁸</td>
<td>22.07 ± 0.35⁸</td>
</tr>
<tr>
<td>Fat content (%)</td>
<td>2.68 ± 0.63⁷</td>
<td>1.80 ± 0.36⁶</td>
</tr>
<tr>
<td>Ash content (%)</td>
<td>3.46 ± 0.02³</td>
<td>2.55 ± 0.05⁵</td>
</tr>
</tbody>
</table>

*Mean ± S.E. with different superscripts in a row differ significantly (p<0.05), n = 6 for each treatment. Treatment-15% Barnyard millet flour

The moisture, protein, fat and ash contents of milk nuggets were determined by standard methods using hot air oven, Kjeldahl assembly, Soxhlet extraction apparatus and muffle furnace respectively as per (7).

Sensory evaluation of milk slices: Sensory evaluation of milk slices was conducted by the method used by (8) using nine point descriptive scale, where 9=excellent and 1=extremely poor. The experienced panel consisting of scientists and Post Graduate students of the Division of Livestock Products Technology, IVRI, Izatnagar evaluated the samples. The panelists were briefed with the nature of the experiments without disclosing the identity of the samples and were requested to rate them on a nine point descriptive scale on the sensory evaluation pro-forma for different attributes. The product was warmed for 10-15 seconds and served to the panelists. Water was provided to rinse the mouth between tasting of each sample. The panelists evaluated the samples for attributes such as appearance, flavour, body and texture, juiciness and overall acceptability.

Statistical analysis: Data generated from various trials under each experiment were pooled and compiled and analysed as per the standard statistical methods (9) and interpreted. Means and standard error were computed for each parameter. The data were subjected to analysis of variance.

RESULTS AND DISCUSSION

The mean±SE for various physico-chemical characteristics of milk slices prepared with coagulum of milk with different fat level are presented in table-1. ANOVA revealed that milk fat level had highly significant (p<0.01) effect on moisture, protein, fat and ash content of milk slices. The mean moisture content ranged from 54.36±0.40% in control product to 56.94±0.40% for the product prepared with skim milk. The moisture content showed increasing trend with the decreasing level of fat in milk however, there was no significant difference (p>0.05) between control and the product from 3% fat milk, between the products from 3% and 1.5% fat milk and between the products from 1.5% fat milk and skim milk. Mean value of protein content ranged from 18.08±0.09%
in control to 23.58±0.15% in the product from skim milk. Further, a significant (p<0.05) increase in protein content was observed with the incremental reduction of fat in milk. Mean value of fat content ranged from 3.34±0.08% in product from skim milk to 12.23±0.07% for control product. As obvious, a significant (p<0.05) reduction in fat content of milk slices was observed with reduction of fat level in milk. Mean value of ash content ranged from 3.45±0.02% in milk slices prepared from skim milk to 3.65±0.02% in control milk slices, showing a insignificant difference among all the variants. Further addition of non dairy ingredients may have increased carbohydrate contents affecting the fat and protein ratio. The mean±SE for various sensory attributes of milk slices prepared with coagulum of milk with different fat level are presented in table 2. ANOVA revealed that milk fat level had highly significant (p<0.01) effect on juiciness, milk flavor intensity and overall acceptability of milk slices.

Mean score for appearance of milk slice ranged from 6.76±0.13 for milk slices prepared with coagulum from skim milk to 6.95±0.12 for control product. Further, the appearance score for all the products was comparable to each other. Mean score for flavour ranged from 6.51±0.14 for treatment product prepared with skim milk to 6.92±0.11 for the product with 3.0% fat milk. Mean score for body and texture ranged from 6.73±0.09 for treatment product from skim milk to 6.84±0.12 for product prepared from 3% fat milk. Further, the scores were comparable among all the products. Mean score for binding ranged from 6.77±0.12 for treatment product with 1.5% fat milk to 6.81±0.09 for control product. Further, no significant difference (p>0.05) was found among different variants. Mean juiciness score ranged from 6.38±0.14 for milk slices prepared from skim milk to 7.04±0.06 for product prepared from 3% fat milk. Further, the juiciness scores of control, and treatment products from 3% and 1.5% fat milk were comparable to each other, but the score was significantly (p<0.05) lower for the product from skim milk. Mean score for milk flavor intensity ranged from 6.61±0.13 for milk slices prepared from skim milk to 7.05± 0.05 for the control product prepared from 4.5% fat milk. Further, the scores of control and treatment product from 3% fat milk were comparable and of 3% fat milk product and 1.5% fat milk were also comparable to each other. However, the score was significantly (p<0.05) lower for the product from skim milk. A decreasing trend in score with decrease in milk fat content and the lowest score for the product from skim milk may be attributed to the lower milk fat content it is the major component providing milk flavor. Mean overall acceptability score ranged from 6.28± 0.10 for milk slices from skim milk to 6.95± 0.07 for the product from 3% fat milk. Further, the scores were comparable for control and products from 3% and 1.5% fat milk. However, the score was significantly (p<0.05) lowest in skim milk product. Hence, on the basis of sensory scores and physico-chemical characteristics, the optimum level of fat in milk for preparation of low fat milk slices was adjudged to be 1.5%.

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