Physicochemical and sensory properties of paneer prepared from buffalo milk

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Abstract

In the present study, buffalo milk is standardized on the level of fat (6 percent milk fat, 9 percent SNF) using different coagulants, i.e. citric acid (T1), tartaric acid (T2), lactic acid (T3) and ascorbic acid (T4) was used in manufacturing of Paneer. Moreover, Physicochemical and sensory properties of prepared paneer was assessed. Physicochemical properties showed that smooth texture and white color of paneer was observed by using lactic acid. Significant variation among the different samples of paneer. Study Sensory evaluation found that the sample (T3) i.e. lactic acid paneer obtained the highest sensory score for the each sensory attributes.

Keywords: paneer, coagulants, buffalo milk, sensory properties

Introduction

Milk has long been recognized as almost complete ideal food in nature. It supplies fat and lactose for energy, proteins and vitamins for body building and health and minerals for bone formation. Milk contains all above nutrients in an easily digestible and assumable form, so it is regarded as most ideal complete food (Bhadekar et al., 2008) [3]. Buffalo milk for making good quality paneer and considered more suitable than cow milk (Sachdeva et al., 1985) [18]. The higher amounts of casein and minerals (calcium, phosphorus) were responsible for imparting firm and rubbery body to buffalo milk paneer. Fat globules and casein micelles of bigger size and higher concentration of fat, casein, calcium, phosphorus and lower voluminosity and salvation properties of casein micelles in buffalo milk compared to cow milk makes it better suited to paneer making with spongy character (Ghodekar, 1989) [4].

Good quality paneer is obtained by heating milk to about 90 °C, acidifying the hot milk by adding citric acid solution followed by removal of whey and pressing of the curd before cooling the pressed mass in chilled water. Chemical and physical changes in casein and whey proteins, brought about by the combined influence of heat and acid treatment, form the basis of paneer making. Conventionally, citric acid is used for coagulating hot milk for paneer making but certain non-conventional, low-cost coagulants have been suggested for manufacture of paneer without any loss of its yield and quality. Normally, paneer blocks of required size/weight are packaged in polyethylene pouches, heat sealed and stored under refrigeration conditions. Alternatively, they are vacuum packaged in laminated or co-extruded films (Sachdeva and Singh, 1987) [17].

According to Prevention of Food Adulteration Act (2010) [15], paneer has been defined as a product obtained from the cow or buffalo milk or combinations thereof by precipitation with sour milk, lactic acid or citric acid. It shall not contain more than 70% moisture and milk fat content shall not be less than 50% of the dry matter. The milk fat content of skim milk paneer shall not exceed 13.0% of the dry matter. Due to the ever growing demand of paneer by varied health conscious consumers, researchers were encouraged to develop new types and varieties of paneer includes skim milk paneer, low-fat paneer, reduced-fat paneer, fiber enriched low-fat paneer, low-fat paneer enriched with whey protein concentrate/soy protein isolate, soy paneer, filled paneer, protein-enriched filled paneer, microfiltered paneer, ultrafiltered paneer, vegetable impregnated paneer, paneer curry, paneer spreads, paneer pickles, spiced paneer, masala paneer, fruit paneer and processed paneer. Several coagulants have been tried namely lemon juice, citric acid, tartaric acid, lactic acid, malic acid, hydrochloric acid, phosphoric acid, acetic acid, fermented milk, sour/cultured whey, yoghurt and lactic cultures. Calcium lactate has also been used as coagulant (Sachdeva and Singh 1987; Kumar et al., 1998; Deshmukh et al., 2009) [17, 10, 4].

Keeping all above points in view the present study was done to ensure the quality as well as the safety of the paneer with minimum processing and expenditure and to study effect of different coagulants on chemical, physical, textural qualities of paneer.
Materials and Methods
Buffalo milk and Packaging material were purchased from Parbhani local market. Coagulants citric acid, ascorbic acid, tartaric acid and lactic acid were taken from the Department of Food Chemistry and Nutrition, College Food Technology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

Standardization of milk
The buffalo milk was standardized for fat and SNF by using Pearson’s square method

Preparation of paneer
Buffalo milk having 6% fat content was heated at 82 °C in a cheese vat for 5 min and cooled to 70 °C, and was coagulated with citric acid (1% solution), which was added slowly to the milk with continuous stirring until a curd and clear whey separated out. The mixture was allowed to settle down for 10 min and the whey was drained out through a muslin cloth. During this time, the temperature of whey was maintained above 63 °C. The curd was then collected and filled in a hoop (35×28×10 cm) lined with a clean and strong muslin cloth. The hoop had a rectangular frame with the top as well as bottom open. The frame was then rested on a wooden plank and filled with the curd before covering with another plank on the top of the hoop by placing a weight of 45 kg for about 15–20 min. The pressed block of curd is removed from the hoop and cut into 6 pieces and immersed in pasteurized chilled water (4–6 °C) for 2–3 h. The chilled pieces of paneer are then removed and placed on a wooden plank for 10–15 min to drain occluded water. Afterwards, these pieces were wrapped in parchment paper, and stored at refrigeration temperature (4±1 °C). A schematic approach for the manufacture of paneer is depicted. (Kumar et al., 2011) [12]. The formulation of paneer is presented in Table 1.

Physicochemical properties of paneer
Color and appearance was observed visually. Moisture, Fat, Protein, Ash was determined by methods given in A.O.A.C. (2003) [1]. Reducing sugar content of paneer was determined by the method given by Raganna (1986) [16].

Sensory evaluation of Paneer
Paneer were evaluated for sensory characteristics like appearance, color and appearance, body and texture, flavor and overall acceptability by 10 semi-trained panel members comprised of academic staff members of the Department of Food Chemistry and Nutrition, College of Food Technology, Parbhani. Judgments were made through rating products on a 9 point Hedonic Scale with corresponding descriptive terms ranging from 9 ‘like extremely’ to 1 ‘dislike extremely’.

Results and Discussion
Physicochemical properties of paneer prepared from different coagulant (2%)
The data related to physicochemical characteristics of paneer is depicted in table 2. The result indicates that the appearance of paneer was found to be soft for T1, rough for T2, smooth and hard for T1. Sample T3 showed significant results in case of color it was noticed that all samples were found to be white in color and no any in marginal difference was seen regarding color of paneer. These results are more or less similar to Dhankhar (2014) [5] and good accordance with Masud et al., (2007) [13], Vimalarani et al., (2014) [19].

Table 1: Formulation of paneer

<table>
<thead>
<tr>
<th>Coagulant</th>
<th>Milk(Liter)</th>
<th>Liquid sol(2%)in ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citric Acid</td>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>Lactic Acid</td>
<td>1</td>
<td>75</td>
</tr>
<tr>
<td>Tartaric Acid</td>
<td>1</td>
<td>70</td>
</tr>
<tr>
<td>Ascorbic Acid</td>
<td>1</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 2: Physicochemical properties of paneer prepared from different coagulants (2%).

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Coagulants</th>
<th>Physical character</th>
<th>Chemical constituents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Appearance color</td>
<td>Moisture Fat Protein Ash Lactose</td>
</tr>
<tr>
<td>1</td>
<td>T1</td>
<td>Soft White</td>
<td>48.2 24.20 20.02 1.24 2.54</td>
</tr>
<tr>
<td>2</td>
<td>T2</td>
<td>Rough White</td>
<td>47.20 23.70 19.68 1.3 2.32</td>
</tr>
<tr>
<td>3</td>
<td>T3</td>
<td>Smooth White</td>
<td>48.30 24.30 20.34 1.28 2.18</td>
</tr>
<tr>
<td>4</td>
<td>T4</td>
<td>Hard White</td>
<td>47.60 24.25 20.12 1.1 2.15</td>
</tr>
</tbody>
</table>

On the other hand moisture contents exhibited significant variation with type of coagulants. The moisture content was highest in case of lactic acid paneer. The moisture contents in lactic acid could be result of milder effect of lactic acid on milk protein compare to citric acid, tartaric acid and ascorbic acid. Results were similar more or less to pal et al., (1999) [14]. The decrease in moisture content was observed in case of tartaric acid paneer and ascorbic acid paneer followed by citric acid paneer.

However, when the fat contents in the paneer was compared on the basis of type of coagulants. Highest fat content was noticed in lactic acid paneer followed by citric acid, ascorbic acid and tartaric acid. Decrease in fat content was due to the decreasing fat recovery from citric acid through tartaric acid and ascorbic acid. These result good accordance with Khan et al., (2014) [9] and Kumar et al., (2008) [11].

The lower value of in case of protein was found in tartaric acid paneer, could be on the basis of poor recovery of solids. The ash content did not show any variation among the three coagulants citric acid, tartaric acid, and lactic acid respectively. However tartaric acid resulted higher ash content and in case of ascorbic acid showed lower value of ash content.

There was gradual decrease in lactose content of paneer sample viz citric acid, tartaric acid, lactic acid and ascorbic acid respectively. However significant difference observed among four different treatments. Averagely lactose content results are very close to Khan et al., (2014) [9] and also good accordance with Ahuja et al., (2012) [2].

Table 3: Sensory evaluation of paneer

<table>
<thead>
<tr>
<th>Sample</th>
<th>Appearance, color, body and texture</th>
<th>Flavor and overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>9 point Hedonic Scale</td>
<td>9 point Hedonic Scale</td>
</tr>
<tr>
<td>T2</td>
<td>9 point Hedonic Scale</td>
<td>9 point Hedonic Scale</td>
</tr>
<tr>
<td>T3</td>
<td>9 point Hedonic Scale</td>
<td>9 point Hedonic Scale</td>
</tr>
<tr>
<td>T4</td>
<td>9 point Hedonic Scale</td>
<td>9 point Hedonic Scale</td>
</tr>
</tbody>
</table>

[1] Pearson`s square method
[2] Preparative of paneer
[3] Standardization of milk
[4] Physicochemical properties of paneer
[5] Sensory evaluation of Paneer
[6] Results and Discussion
[7] Table 1: Formulation of paneer
[8] Table 2: Physicochemical properties of paneer prepared from different coagulants (2%).
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Sensory evaluation of paneer

Color and appearance
Scores for color and appearance in paneer sample prepared by incorporation of citric acid and lactic acid were found better as compared to tartaric and ascorbic. These results are in harmony with Dwivedi (1999) [6].

Body and texture
The highest texture score was observed in case of paneer sample prepared from coagulants with lactic acid followed by citric acid, tartaric acid, ascorbic acid. Could be reason that good conversion of lactose.

Flavor
Significantly decrease in flavor was noticed in tartaric acid and ascorbic acid followed by citric acid, lactic acid. The highest flavor score was noticed in case of lactic acid paneer followed by tartaric acid, ascorbic and citric acid.

Table 3: Effect of different coagulants (2%) on sensory evaluation of paneer

<table>
<thead>
<tr>
<th>Sr.no</th>
<th>Types of coagulants</th>
<th>Color/Appearance</th>
<th>Body and Texture</th>
<th>Flavor</th>
<th>Overall Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>8.2</td>
<td>8.1</td>
<td>8.0</td>
<td>8.1</td>
</tr>
<tr>
<td>2</td>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>7.8</td>
<td>8</td>
<td>8.2</td>
<td>8.0</td>
</tr>
<tr>
<td>3</td>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>8.4</td>
<td>8.3</td>
<td>8.2</td>
<td>8.3</td>
</tr>
<tr>
<td>4</td>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>7.7</td>
<td>7.6</td>
<td>7.9</td>
<td>7.7</td>
</tr>
</tbody>
</table>

*Each value represents the average of ten determinations

Conclusion
It was concluded that the results of the present finding that the good quality paneer can be prepared by using lactic acid coagulant (2%).

References