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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) [8].

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.

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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, Vasantrya 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 6–8 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.

Table 1: Formulation of paneer

Coagulant	Milk(Liter)	Liquid sol ⁿ (2%)in ml
Citric Acid	1	65
Lactic Acid	1	75
Tartaric Acid	1	70
Ascorbic Acid	1	70

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 depicted in table 2. The result indicates that the appearance of paneer was found to be soft for T₁, rough for T₂, for T₃ smooth and hard for T₄. 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 Masudet *et al.*, (2007) [13], Vimalarani *et al.*, (2014) [19].

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

Sr. No.	Coagulants	Physical character		Chemical constituents (%)				
		Appearance	color	Moisture	Fat	protein	Ash	Lactose
1	T ₁	Soft	White	48.2	24.20	20.02	1.24	2.54
2	T ₂	Rough	White	47.20	23.70	19.68	1.3	2.32
3	T ₃	Smooth	White	48.30	24.30	20.34	1.28	2.18
4	T ₄	Hard	White	47.60	24.25	20.12	1.1	2.15

*Each value represents the average of ten determinations

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 2.54, 2.32, 2.18 and 2.15 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].

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 compare 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.

Overall acceptability

Overall acceptability is based on multiple organoleptic quality parameters i.e. color, flavor, texture etc. and shows the accumulative perception and acceptance by the panelists. The effect type of coagulants on overall acceptability revealed that the lactic acid was found to be overall acceptable as compared to other coagulants followed with having marginal difference. Lower overall acceptable score was observed in tartaric acid and ascorbic acid. The result of present study was in good agreement with Dwivedi *et al.*, (2014) [7] and. Yadav *et al.*, (2009) [20] as well as Kumar *et al.*, (2008) [11] and khan *et al.*, (2014) [9].

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

Sr.no	Types of coagulants	Sensory attributes			
		Color /Appearance	Body and Texture	Flavor	Overall Acceptability
1	T ₁	8.2	8.1	8.0	8.1
2	T ₂	7.8	8	8.2	8.0
3	T ₃	8.4	8.3	8.2	8.3
4	T ₄	7.7	7.6	7.9	7.7

*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%).

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