

Process development of low cost technology for manufacture of filled milk paneer

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Abstract

Filled milk paneer was prepared by replacing the milk fat by three levels (4.0, 5.0, and 6.0 percent) of vegetable oils (ground nut, mustard or sunflower refined oils) using blending temperatures of 35^o, 40^o and 45^o C at coagulation temp 60^o, 70^o and 80^o C employing one percent citric acid as coagulant. The filled milk paneer was assessed for sensory attributes using a 9-point hedonic scale. Results indicated that irrespective of the oils used, the appearance, flavour, body and texture of the product improved as the level of oil, blending temperature and coagulation temperatures were increased in preparation of filled milk paneer. It was inferred that filled milk paneer with acceptable appearance, flavour and body and texture could also be produced from milk containing 5 percent vegetable oil, blended at 45^o C and coagulated at 80^o C temperature.

Key words: filled milk, filled milk paneer, blending temperature, coagulant, sensory quality

Introduction

Paneer is a highly nutritious dairy product because of its high protein, fat and mineral contents. It has gained an important place in the culinary dishes like curries with pea, potatoes, spinach etc. in the Indian kitchen. Paneer snacks are close competitors of those made out of fried fish or chicken in terms of popularity. Although, the buffalo milk is best suited for paneer manufacture but good quality paneer has also been made from cow or mixed milk (Dwivedi *et al.*, 2010)

The high price of the conventional paneer is beyond the reach of majority of population, as the price of milk per liter has escalated over the years. During the lean season, milk and milk products price touches sky high, the price of milk fat being the highest. Hence, the reduction in the price of milk by replacement of the expensive milk fat in part or whole by cheaper edible fat other than that of milk origin may be desirable and shall suit the Indian pocket. The vegetable oil or fats have been successfully substituted in place of milk fat for preparation of filled milk and filled milk products in several countries like Japan, USA and European countries. Filled milk is any milk in which milk fat is replaced with vegetable oil or fat other than that of milk origin. Thus, the filled milk contains all milk solids except milk fat.

Filled paneer technology involves blending of skim milk with vegetable oil or vanaspati and coagulation of milk with suitable coagulant at desired temperature. This milk is converted into paneer employing the remaining steps same as in conventional paneer making.

The present communication reports data on low cost technology for the preparation of filled milk paneer using commonly available vegetable oils to replace milk fat in filled paneer.

Materials and Methods

Milk: Buffalo milk was procured from the College dairy and standardised as per the requirement using skim milk obtained by separation of cream from the buffalo milk.

Selection of vegetable oil: Three types of refined vegetable oil, namely ground nut, mustard and sunflower refined oils were procured from the standard shops.

Preparation of filled milk paneer: Filled milk paneer was prepared by replacing the milk fat by three levels of vegetable oils viz. 4.0, 5.0, and 6.0 percent, using blending temperatures of 35, 40 and 45^oC at coagulation temperatures, 60, 70 and 80^oC using one percent citric acid as coagulant.

The skim milk was blended with different levels of vegetable oils in a blender at requisite temperatures to get the filled milk, which was then coagulated with one percent citric acid at specified temperatures, mentioned above, to get the filled milk paneer by the process as detailed below:

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Process development: Filled milk paneer was made according to Roy (1990) with necessary modification. In each batch, 10.0 litre of filled milk (having three levels of vegetable fat, 4.0, 5.0 or 6.0 percent) was taken in a stainless steel pan and heated to 99°C for 5 minutes (Roy and Singh, 1999), then cooled it to 60, 70 or 80°C. The milk was then coagulated with one percent citric acid, added slowly till clear whey separated out. The curd was allowed to settle for five minutes and then the whey drained out through the muslin cloth. The coagulated mass was pressed in a rectangular hoop lined with clean muslin cloth by applying pressure of 2 kg/cm². It was then dipped in chilled water for 2 hours and packed in LDPE packs and stored at 5°C.

Preparation of milk paneer: It was made using standardised buffalo milk according to Bhattacharya *et al.* (1971) and subsequently modified by Sachdeva (1983), as described by Dwivedi *et al.* (2010).

Sensory quality of filled milk paneer: The sensory attributes of the products, viz. appearance, flavour, body and texture and the overall acceptability were assessed on a 9-point hedonic scale by a selected panel of five experienced judges as per BIS (1971).

Results and Discussion

The primary objective of this study was to assess the effect of vegetable oil content in filled milk, temperature of blending of skim milk with vegetable oil for proper emulsification and the temperature of coagulation on the sensory quality of filled milk paneer. Results on sensory quality of the product are presented in Table 1 to 3.

The results in Table 1 indicated that irrespective of oils used, the appearance score increased with increase in the level of fat in filled milk paneer. Five and 6.0% levels had however, insignificant effect. The increases in blending temp for emulsification of fat also led it increase in appearance of the product. The 40 and 45°C had, however, non-significant effect. The coagulation temperature had significant influence in improving the appearance of the product, which was found to be the highest (7.73±0.30) at 80°C. In general, the appearance score was found to be maximum at 6% level of oil blended at 45°C and coagulated at 80°C temperature.

The results on flavour score (Table 2) also revealed that with increase in oil level in filled milk paneer, its flavour score increased. However, there were insignificant difference between 5 and 6% levels on flavour score. Increase in blending temp also improved

Table 1: Average score for appearance of filled milk paneer, as influenced by vegetable oil levels, blending temperature and coagulation temperature

Treatment	Level	Mean
Oil percent	4.05.06.0	6.83 + 0.59 ^a
		7.16 + 0.80 ^b
		7.27 + 0.73 ^b
Blending temp. (C)	35.40.45	6.91 + 0.75 ^a
		7.10 + 0.75 ^b
		7.24 + 0.67 ^b
Coagulation Temp.(C)	60.70.80	6.23 + 0.27 ^a
		7.30 + 0.49 ^b
		7.73 ± 0.30 ^c

Interaction among oil levels, blending temp and coagulation temp. on appearance

	C ₁			C ₂			C ₃		
	O ₁	O ₂	O ₃	O ₁	O ₂	O ₃	O ₁	O ₂	O ₃
B1	6.00	6.00	6.15	6.50	7.25	7.50	7.25	7.75	7.80
B2	6.25	6.15	6.25	7.75	7.60	7.65	7.50	7.85	7.90
B3	7.00	7.25	7.60	7.00	7.70	7.75	7.70	7.90	7.90

Note: O₁, O₂, O₃ – oil levels 4, 5 and 6 percent; B₁, B₂, B₃ – blending temp. 35, 40 and 45°C, C₁, C₂ and C₃ – coagulation temp 60, 70 and 80°C, respectively. Values with different superscripts, a, b, c differ significantly (p<0.01)

the flavour score of filled paneer, being highest (6.69±0.85) at 45°C. Likewise, increase in coagulation temperature also improved the flavour of the product, the highest score (7.17) being observed at 80°C.

The interaction among oil content, blending temperature and coagulation temp also elicited the same trend. It revealed that the highest flavour score in the product was noticeable at 80°C coagulation temp with 5 or 6% oil level irrespective of blending temperature.

Body and texture: It was also influenced by the oil content, blending temp and coagulation temp of filled milk (Table 3). The body and texture score of the product was lowest (5.90±0.36) at 4.0 percent level of fat in the filled milk. The score increased significantly with increase in fat content from 4.0 to 5.0 (6.69±0.48) and further to 6.76±0.35 at 6.0 level of fat. The increase in blending temperature also improved the body and texture. The score was lowest at 60°C coagulation temp (6.07±0.48) and highest (6.84±0.48) at 80°C.

The interaction among oil percent, blending temp and coagulation temp indicated that the effect of 5.0 and 6.0 percent levels of fat had almost same effect on body & texture of filled milk paneer at 45°C blending

Table 2: Average score for flavour of filled milk paneer.

S. No.	Treatment	Level	Mean
1	Oil percent	4.0	5.53 + 0.69 ^a
		5.0	6.92 + 0.65 ^b
		6.0	7.00 + 0.51 ^b
2	Blending temp. (C)	35	6.28 + 0.98 ^a
		40	6.48 + 0.93 ^b
		45	6.69 + 0.85 ^b
3	Coagulation temp.(C)	60	5.80 + 0.80 ^a
		70	6.49 + 0.72 ^b
		80	7.17 ± 0.69 ^c

Interaction among oil levels, blending temp and coagulation temp on flavour score

	C ₁			C ₂			C ₃		
	O ₁	O ₂	O ₃	O ₁	O ₂	O ₃	O ₁	O ₂	O ₃
B1	4.50	6.00	6.25	5.25	6.50	7.00	6.00	7.50	7.55
B2	7.70	6.20	6.50	5.50	6.75	7.15	6.25	7.60	7.65
B3	5.00	6.25	6.75	6.00	7.00	7.00	6.50	7.70	7.75

Note: O₁, O₂, O₃ – oil levels 4, 5 and 6 percent; B₁, B₂, B₃ – blending temp. 35, 40 and 45^o. C, C₁, C₂ and C₃ - Coagulation temp 60, 70 and 80^oC, respectively. Values with different superscripts, a, b, c differ significantly (p<0.01)

temp and 80^o C coagulation temp of filled milk.

The results showed that filled paneer with acceptable body and texture could be produced from milk containing 5 percent vegetable oil, blended at 45^o C and coagulated at 80^o C and coagulated at 80^o C temperatures.

The overall acceptability: The overall mean acceptability of filled milk paneer as composed to milk paneer was found it be 8.19 0.12 for milk paneer as against 7.62 0.20, 7.23 0.12, 7.57 0.29 for ground nut oil, mustard oil and sunflower oil filled milk paneer, respectively.

The results of present study are in agreement with Roy and Singh (1999), who studied on filled milk paneer using different vegetable oils.

The studies indicated that filled milk paneer could be good alternative to milk paneer, as far as the nutritive values are concerned. Milk fat being the costliest milk constituent can be replaced by vegetable oils, which are *about one-third to one-fourth cheaper* but rich sources of polyunsaturated fatty acids, required for good health.

Table 3: Average score for body and texture of filled milk paneer

S. No.	Treatment	Level	Mean
1	Oil percent	4.0	5.90 + 0.36 ^a
		5.0	6.69 + 0.43 ^b
		6.0	6.76 + 0.35 ^b
2	Blending temp.(^o C)	35	6.28 + 0.59 ^a
		40	6.46 + 0.54 ^{ab}
		45	6.62 + 0.47 ^b
3	Coagulation temp.(^o C)	60	6.07 + 0.48 ^a
		70	6.44 + 0.40 ^b
		80	6.84 ± 0.48 ^c

Interaction among oil levels, blending temp and coagulation temp on body and texture score

	C ₁			C ₂			C ₃		
	O ₁	O ₂	O ₃	O ₁	O ₂	O ₃	O ₁	O ₂	O ₃
B1	5.52	6.00	6.25	5.75	6.25	6.75	6.10	7.10	7.10
B2	5.50	6.25	6.50	6.00	6.50	6.80	6.20	7.15	7.20
B3	5.75	6.50	6.65	6.25	6.75	6.90	6.30	7.20	7.25

Note: O₁, O₂, O₃ – oil levels 4, 5 and 6 percent; B₁, B₂, B₃ – blending temp. 35, 40 and 45^o. C, C₁, C₂ and C₃ - coagulation temp 60, 70 and 80^o C, respectively. Values with different superscripts, a, b, c differ significantly (p<0.01)

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