

PANEER FROM GIR COW MILK: PRODUCTION, FACTORS AFFECTING COMPOSITION, AND STORAGE

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ABSTRACT

Food products that include significant amounts of milk and other ingredients may be referred to as dairy products. Among the various dairy products, paneer is a popular Indian soft cheese variety which occupies a prominent place among traditional milk products. PFA (1954) described paneer as "A product made from cow or buffalo milk or the combination of the two via precipitation with sour milk, lactic acid or citric acid". Paneer is a rich animal protein, vitamin, calcium and iron source. In addition, whey is a valuable byproduct obtained during paneer production, containing lactose, whey protein, minerals and vitamins.



INTRODUCTION

Milk is a complete food as it fulfils all the nutritional ingredients. The importance of milk and milk products has been reported since the Vedic times. Traditional dairy products have the most enhancing role in society's social, economic and nutritional health (Gupta 1999). Due to the successful implementation of the "operation flood programme" in 1970s India, the exceptionable increment in milk production over the last few years has been achieved. So India has achieved the top rank in milk production worldwide. (NDDB 2009; Bhasin 2009) Out of total milk production in India, it is estimated that 5% of milk is processed as paneer and paneer production is growing annually at 13% (ICMR 2000; Chandan 2007a). The estimated milk production in India is about 198 million metric tons (MMT) in 2020, about 40% of the world's total milk production.

Paneer is one type of soft cheese popular in South Asia, and it is prepared by acid and heat coagulation of milk. Paneer's physical appearance and flour are mentioned as white in colour, sweetish, mild acidic taste, nutty flavour, spongy body and smooth texture. According to the PFA (2010), paneer means "Milk product processed from Buffalo or cow milk or a combination thereof, by acid precipitation with citric acid, sour milk, or lactic acid. The moisture content in it should be not more than 70%, and the fat content should not be less than 50% which is expressed on a dry matter basis. Bureau of Indian Standards (BIS 1983) mentioned that paneer's maximum moisture and minimum fat percentage should be 60% and 50%, respectively, on a dry matter basis.

Paneer is an indigenous milk product and is very popular in preparing several types of culinary dishes and snacks. Paneer production is now spreading worldwide (Aneja 2002). It is a rich source of casein protein, an animal protein and valuable animal protein for vegetarians. As paneer is a Protein-rich milk product and easy to digest for human beings, its biological value ranges from 80 to 86% (Shrivastava and Goyal 2007). It is also a source of fat, vitamins, and minerals like calcium and phosphorus. Also, in refrigerated temperatures, it has a long shelf life.

MATERIALS

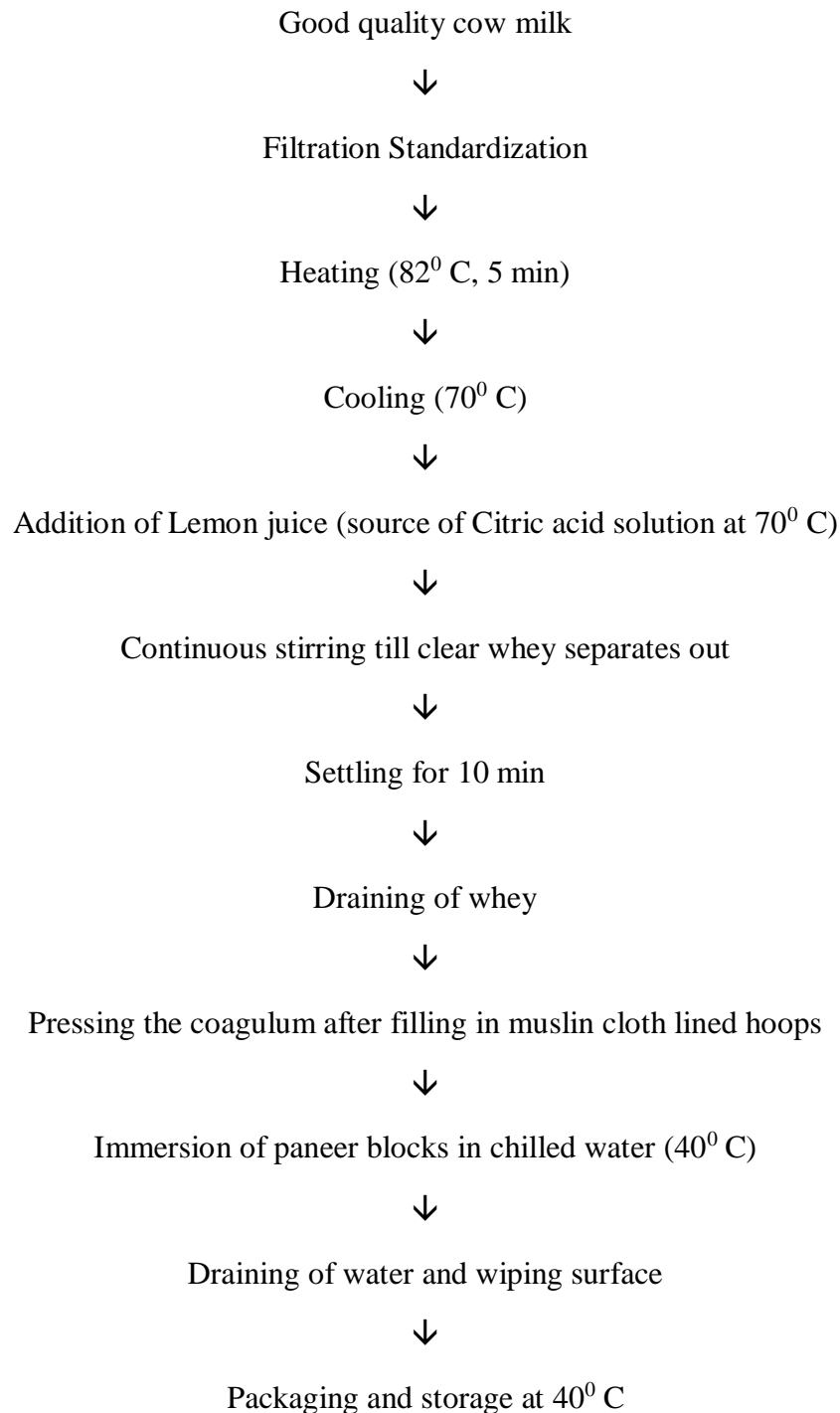
Gir cow milk, Lemon as source of citric acid, open pan, muslin cloth, stirrer, Paneer pressing machine, gas burner.

PREPARATION OF PANEER

The unorganized dairy sector follows traditional and very inefficient milk processing methods in paneer. The major role in the improvement of traditional methods of paneer manufacture was carried out by Bhattacharya et al. (1971).

Gir cow milk with 4.5% fat content was heated at 82°C in an open pan for 5 min and cooled to 70°C. After adding lemon juice as a source of citric acid (1% solution), precaution is to be taken here that it should be slowly added to boiled milk with continuous stirring till the coagulation and clear whey separated. This coagulated milk was kept for settling down for 10 min. Then, by using a muslin cloth, the whey was drained out. Here care should be taken for the temperature of whey maintained above 63°C. The coagulated mass was collected in a muslin cloth and kept for pressing under the pressing machine (hoop) by placing a weight of 45 kg for about 15–20 min. The pressed block of curd is removed from the hoop, cut into 6-8" pieces, and immersed in pasteurized chilled water (4-6°C) for 2–3 hr. It was stored at a refrigeration temperature (of 4±1°C).

A schematic approach for the manufacture of paneer is given below



CHEMICAL COMPOSITION OF PANEER

Nutritional Value of Paneer is more as it contains about 90% of the fat and protein as well as 50% of the minerals and lactose content 10% of the original milk. The proximate composition of Paneer is 54% moisture, 17.5% proteins, 25% fat, 2% lactose, and 1.5% minerals.

Table 1: Paneer Nutrition Facts (per 100 grams)

Nutrients	Composition /100 g
Total Fat	26.9 grams
Saturated Fat	18.1 g
Trans fatty acids	<0.1 g
Cholesterol	56.2 mg
sodium	22.1 mg
Total Carbs	6.1 g
Protein	19.1 grams
Vitamin A	210 mcg
Calcium	420 mg
Iron	2.16 mg

FACTORS AFFECTING THE QUALITY AND YIELD OF PANEER

1. TYPE OF MILK

Paneer prepared from buffalo milk possesses desirable frying properties, body and texture compared to cow milk. On the other hand, cow milk paneer is soft, weak and fragile and tends to disintegrate during cooking. However, mixed milk and buffalo milk in equal quantity yield a better product than cow milk. Production of Paneer from 1 lit buffalo milk is 200-250 grams, whereas cow milk is obtained from 150-200 grams. Paneer made from skim milk has a chewy, rubbery texture and a hard body. However, cow milk yields inferior quality paneer, especially in sensory characteristics, compared to buffalo milk. Such effect could be ascribed to different make-up of casein micelles and lower protein and calcium contents in cow milk compared to buffalo milk (Sindhu,1996).

2. QUALITY OF MILK

Milk must be fresh and free from off-flavour. The growth of psychrotrophic organisms should be minimized to restrict off-flavour development. Acidic milk having a titrable acidity of more than 0.20% lactic acid yields a product of inferior quality.

3. TYPE, STRENGTH AND TEMPERATURE OF COAGULANT

Product yield and moisture retention are directly influenced by the type and concentration of the acid and the mode of delivery and blending into the hot milk. Citric acid is generally used as a coagulant. Lemon, lime juice, or vinegar imparts a typical flavour to the product. 1% solution of citric acid yields a good quality paneer. Sufficient acid is added gently but quickly blended with the milk (within one min) to reach the optimum pH of coagulation. High acid concentration imparts acidic flavour and hardness and causes more significant solids loss. Whey cultured with *Lactobacillus acidophilus* at a level of 2% and incubated overnight at 37°C can be used as a substitute for citric acid. However, acidic whey must be heat treated to destroy these lactic organisms before use to prevent loss of the shelf life of paneer. Coagulation temperature influences the moisture content of paneer. It is reported that an increase in temperature from 60⁰ C to 86⁰ C decreases the moisture content from 59 to 49%. However, the optimum coagulation temperature for the best organoleptic and frying quality product is 76⁰ C

4. HEAT TREATMENT OF MILK

This is one of the process's technological requirements, which affects the paneer's sensory and microbiological quality. The objective of heating milk is to prepare it for rapid precipitation, control the moisture content, develop a typical body and texture, create conditions conducive to the destruction of pathogenic and other microflora in milk, and ensure the safety and quality of the final product. The milk is heated to 90°C without holding or 82°C for 5min in order to maximize the total solids recovery. In addition, the high heat treatment imparts desirable cooked flavour by controlled liberation of sulphhydryl compounds.

5. COAGULATION TEMPERATURE

It influences the moisture content of the paneer. For example, an increase in temperature from 60⁰ C to 86⁰ C decreases the moisture in the paneer from 59 to 49%. At 70⁰ C, Paneer made from buffalo milk has the best organoleptic and frying quality in shape retention, softness and integrity.

6. PH OF COAGULATION

De (1980) reported that, as there is a decrease in pH, the moisture retention in the paneer is also decreased. The optimum pH of milk coagulation at 70°C is 5.30-5.35 for better product quality and maximum solids recovery when made from buffalo milk. The moisture retention in paneer decreases with the reduction in pH; consequently, the yield decreases. At a pH of more than 5.35,

the paneer is very soft with a fragile and crumbly body. The optimum pH for paneer preparation from cow milk is 5.2.

STORAGE OF PANEER

1. The product can be stored under frozen conditions (below -18°C) for more than one year without any deterioration in its quality and used after careful thawing.
2. Paneer dipped in 5% brine solution lasts for about 22 days at $8-10^{\circ}\text{C}$.
3. The salting at the time of dipping into chilled water can extend the paneer's shelf life.
4. Dipping in benzoic acid (1200 ppm) increases the shelf life of paneer to 40 days at refrigerated temperature and 20 days at 37°C .
5. By adding sorbic acid to milk (0.15%) and wrapping paneer in sorbic acid-coated waxed paper, the shelf life of paneer can be increased to 36 days at room temperature.

CONCLUSION

Milk is a perishable commodity, and the farmer has to bear heavy losses. There will be an increase in demand from the diet-conscious consumer segment, both from India and abroad. Dairy products have many beneficial roles and can fulfil the human body's nutritional requirements. Paneer is quite popular in India, and there are very easy methods to make paneer, and the cost of making it is also very less. Paneer is a rich animal protein, vitamin, calcium and iron source. It appeals to the farmers to adopt this method as much as possible. This article aims to convert milk into value-added products such as paneer and get maximum profit.

REFERENCES

- Aneja RP, Mathur BN, Chandan RC, Baneerjee AK, 2002. Heat acid coagulated products. In: Technology of Indian milk products. A Dairy India Publication, Delhi, India, pp 133–158
- Bhasin NR. From the President's desk. Indian Dairyman, 2009;61(10):4–5.
- Bhattacharya, D.C., Mathur, O.N.; Srinivasan, M.R. and Samlik, O., 1971. Studies on the Methods of Production and Shelf life of Paneer (Cooking Type of Acid Coagulated cottage cheese). J. Food Sci. Technol., 8 (5): 117- 120.
- BIS (1983) Bureau of Indian Standards, IS 10484. Specification for Paneer. Manak Bhawan, New Delhi
- Chandan RC, 2007. Manufacturing of Paneer. In: Gupta S (ed) Dairy India. Dairy India Yearbook, New Delhi, p 411
- De S., 1980. Indian Dairy Products. In: Outlines of dairy technology. Oxford University Press, New Delhi, India, p 412

- Gupta RK, 1999. Quality of raw milk in India. In: Advances in processing and preservation of milk. Lecture compendium, National Dairy Research Institute, Karnal.
- ICMR 2000. Application of hazard analysis and critical control point for improvement of quality of processed foods. *Indian Council Med Res Bulletin* 30 p 5.
- Mathur BN, Hashizume K, Musumi S, Nakazawa Y, Watanabe T. Traditional cheese 'paneer' in India and soyabean food 'tofu' in Japan (1986). *Jap. J. Dairy Food Sci.* 35(4):A137–A141.
- NDDB 2009. Statistical database. National Dairy Development Board, Anand.
- PFA 2010. Prevention of food adulteration rules, 1954 (amended up to 2009). Universal Law Publishing Company Pvt Ltd, New Delhi, pp 165–166.
- PFA. Prevention of food adulteration rules, 1954 (amended up to 2009) In. New Delhi, Universal Law Publishing Company Pvt Ltd. 2010, 165–166.
- Shanaziya ASF, ULP Mangalika, WAD Nayananjalie, 2018. Effect of Different Coagulants on the Quality of Paneer Made from Cow Milk. *International Journal of Scientific and Research Publications*, 8(4):189.
- Sindhu JS., 1996. Suitability of buffalo milk for products manufacturing. *Indian Dairyman* 48:41–47
- Srivastava S, Goyal GK., 2007. Preparation of paneer—A review. *Indian J Dairy Sci* 60:337