DEVELOPMENT OF VITAMIN FORTIFIED LOW FAT PANEER

Raga Madhuri Reddam¹, Gorgile Janakraj Prabhakar²

¹Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, India ² Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, India

Abstract

The study was to compare the qualitative and quantitative properties of skim milk paneer, toned milk paneer, standardized milk paneer and whole milk paneer and to compare a quality of low fat paneer and normal fat paneer for diet. Skim milk had more total solids than standardized milk and toned milk. Milk of 5.0-6.0% fat can be found to make quality paneer (Bhattacharya el al. 1971). But according to my study or trials concluded that low fat paneer also has good quality and overall acceptability. Since paneer is mostly used for cooking purposes, the relatively high level of fat may not be an absolute requirement for an acceptable product. With this view in mind, an attempt was made developing paneer of low fat content. Generally paneer is made from 5.0 to 6.0% fat milk which final product fat content is near about 26% is very high for the diet persons. But in this study four different fat level milk i.e. 0.6%, 4.5%, 3.0% and 0.5% are used for paneer preparation and according to hedonic scale and proximate analysis paneer prepared from the milk with 3.0% fat is having good acceptability. Paneer prepared from this milk is having 15% fat in final product. It indicates that the difference of fat in normal paneer and low fat paneer is near about 10%. From this comparative study of different fat level in paneer was concluded that the paneer made from low fat milk is acceptable with good hedonic points. Due to its carrier properties, Milk can be fortified with vitamins like A or D improving its nutritional properties. So the objective of this study is to prepare a vitamin fortified low fat paneer as commercial scale by adding vitamin premix in milk during preparation of paneer and to compare the qualitative and quantitative properties of vitamin fortified paneer and normal paneer.

Keywords: Low Fat Paneer, Milk Fortification, Proximate Analysis, Comparison With Normal Paneer, Sensory Analysis, Shelf Life Study.

______***

1. INTRODUCTION

According to PFA (1983), Paneer is been defined as a precipitated product made from either cow milk or buffalo milk or by combinations. Moisture and milk fat contents shall not be more than 70% and not less than 50% respectively on dry matter basis. The fat content of Paneer made from skim milk shall not be more than 13 percent of dry matter.

Since paneer is mostly used for cooking purposes, the relatively high level of fat may not be an absolute requirement for an acceptable product. With this view in mind, an attempt was made developing paneer of low fat content.

Approximate composition of different types of paneer is as given in table from which we can observe the quality of the paneer.

	Standar dized milk paneer (%)		Skimmed milk paneer (%)		
Parameters	Wet Dry basis basis		Wet basis	Dry basis	
Moisture content	53-55	67-70	53-55	67-70	
Fat content	23-26	50-53	2	10-13	
Protein content	17-18	36-38	12	25.83	
Mineral content	1.5-2	3-4	-	-	
Lactose	2-2.5	4-5	3	6	

Table 1.1 Composition of different paneer

Paneer, the Indian cheese is prepared by acid coagulation of milk at high temperatures which results in physical changes forming the basis for paneer. During acidification of milk, the casein micelle becomes unstable and results in formation of a three dimensional network. Further heating of milk results in k-casein molecules to dissociate from micelles which further sensitizes the α -s-case framework which results in development of required rheological properties of paneer. Paneer manufacture essentially involves the formation co-precipitates due to complexing of whey proteins denatured by the heat and the casein. Serum proteins, particularly β-Lactoglobulin, are bonded to κcasein via disulphide bridges and calcium linkages. The higher the degree of co-precipitation, the greater will be the total solids recovery and yield of paneer. Due to its carrier properties, Milk can be fortified with vitamins like A or D improving its nutritional properties. The term vitamin refers to an essential dietary factor which is required by an organism in small amounts and whose absence results in deficiency diseases. The terminology of vitamin is obtained from two words 'vital' and 'amine', because vitamins are required (vital) for life and were thought as amines. As we now know, not all vitamins are amines.

1.1 Need of Fortification

Vitamin D is a regulator of calcium metabolism and is involved in the absorption of calcium in the intestines and in the mineralization process required for bone growth. Lack of vitamin D in growing children causes Rickets or other bone disorders, manifested by weak bones and bone curvature that result in bowlegs, knock knees and narrow chest. In adults, vitamin D deficiencies can result in softening and weakening of bones (osteomalacia) and can hasten the development of osteoporosis commonly associated with calcium deficiencies. While people generate their own vitamin D through exposure to the sun, the level can be insufficient where sunlight is lacking. Recommended use of sunscreen also blocks the UV radiation required for this process. Although milk as it comes from the cow is a poor source of vitamin D, fortified milk is considered an excellent source, especially because of its calcium content. Vitamin D is a fat-soluble vitamin.

Vitamin A performs many functions. One is to prevent night blindness by enabling the retina of the eye to respond to dim lights. A Vitamin is also needed for having normal growth, maintenance and functioning of epithelial cells, which include skin cells and the cells lining the respiratory, gastrointestinal and reproductive tracts. Whole milk is found to be good source of A vitamin, though because it is a fat-soluble vitamin, its value is reduced in lower fat milks.

There are 2 different forms of D vitamin. One form is cholecalciferol which is synthesized by the use of UV light in the skin of humans which is called as D3 Vitamin. The second form is ergo sterol, called as D2vitamin obtained by UV irradiation of yeast or fungi. It is found rarely in foods.

1.2 Objectives of this Study

- To produce low fat paneer by using skim milk and toned milk as a base raw milk.
- To develop a vitamin fortified paneer for fulfillment of nutrition through food.
- Compare the quality of product with normal paneer i.e.standardised milk paneer and whole milk paneer.
- To check the sensory quality and shelf life of the product.

2. MATERIALS AND METHODOLOGY

The current investigation entitled **"Development of new products in Milk Processing"** was carried out in the School of Food Technology, JNTU, Kakinada.

2.1 Raw material

2.1.1 Skim Milk

Pasteurized skim milk having 0.5% fat and 9.0% SNF

2.1.2 Toned Milk

Pasteurized standardized milk having 3.0% fat and 8.5% $\rm SNF$

2.1.3 Standardized Milk

Pasteurized standardized milk having 4.5% fat and 8.5% SNF

2.1.4 Whole Milk

Pasteurized standardized milk having 6.0% fat and 9.0% SNF

2.1.5 Citric Acid

Citric acid is Generally Regarded as Safe (GRAS) additive that does not impart any flavour to food to which it is added (Kabara, 1981).

According to PFA (1983) citric acid, lactic acid and sour milk are permitted for use as coagulants for the manufacture of paneer. Vishweshwaraiah (1979) used citric acid, lactic acid and sour whey as coagulants for the preparation of paneer and reported that citric acid yielded desirable body and texture, appearance and taste.

2.1.6 Vitamin A & D Premix

Liquid form vitamin premix is used for fortification with two different manufacturers.

2.2 Composition of Milk used for Paneer

Preparation

Composition of milk used for paneer preparation /100ml. milk used for testing is of four different types are as.

Parameters	Whole milk	Stand. milk	Tone d milk	Skimmed milk
Fat (%)	6.0	4.5	3.0	0.5
SNF (%)	9.0	8.5	8.5	9.0
Energy (kcal)	88.0	75.0	62.0	41.0
Carbohydrate (gm)	5.2	4.9	5.0	5.2
Proteins (gm)	3.8	3.6	3.6	3.7
Saturated fat (gm)	3.6	2.7	1.89	0.3
Calcium (mg)	150	140	140	150
Sodium (mg)	50	50	50	50
Cholesterol (gm)	0.015	0.015	0.010	0.015

Table 2.1: Composition of raw milk / 100ml used for paneer preparation

2.3 Method

- The raw milk used for paneer manufacture was obtained from the local market.
- The fat content of milk ranged from the level of 6.0 to 0.05 % using mixed buffalo and cow milk.
- Paneer was prepared by the same procedure standardized by Bhattacharya *et at.* (1971). Raw chilled milk kept at open space or in room for getting room temperature.
- Raw milk fortified with vitamin premix and mixed well then milk is heated to 85°C upto 10 min and is followed by cooling upto 70°C. Milk was then coagulated at this temperature with one per cent citric acid solution of requisite temperature.
- The acidulate (citric acid) was added slowly and continuously stirring the milk till whey gets separated out. Stop the Stirring and allow curd to get settled..

- ➢ Whey is drained out and then curd is consolidated in hoops which are lined by muslin cloth.
- The pressure is maintained by placing a weight of four to five kg for 10 min, the paneer block was dipped in cool water for cooling and cut into pieces.
- The partially cooled pieces were placed in cool water (4 to 6° C) for a period of 2 hr. The cooled paneer was drained, wiped and packed in polythene pouches and stored in refrigerator at 10° c.

3. RESULTS AND DISCUSSIONS

3.1 Proximate Analysis Report

All four types of milks are used for preparation of paneer composition details of these milk is given above in materials and methods. Procedure followed and coagulant with its percentage for preparation of paneer is same for all type of milks. Compression weight is also same for all samples. After paneer preparation the paneer is tested for proximate analysis given table is the proximate analysis data for prepared all samples.

3.1.1 Low Fat Paneer

Low fat paneer is prepared by using skim milk but paneer prepared from skim milk is not having good acceptability as compare to the normal paneer that's why I have tested other milk samples these are Whole or full cream milk, standardized milk, toned milk and finally skim milk proximate analysis data of that paneer is given in below table.

Parameters	Whole milk (%)	Standardized milk (%)	Toned milk (%)	Skim milk (%)
% yield	18.17	16.14	15.07	9.38
Moisture	54.11	54.44	56.29	66.48
Fat content	26.72	20.78	14.96	06
Protein	17.2	17.47	18.24	31.2
Ash	0.75	0.89	1.63	1.8
T.A	0.19	0.15	0.19	0.19

Table 3.1: Proximate analysis data for low fat paneer

3.1.2 Vitamin Fortified Low Fat Paneer

Purpose of this study is to check the retention of vitamins in final product i.e. in low fat paneer and in normal paneer for this study five samples of milk are used three are whole milk (full cream milk) and two are skim milk in that whole milk one is control sample for sensory without any fortification and two are fortified with different manufacturers vitamin premix and for skim milk also same one is used as control and one for fortification of vitamin premix. Proximate analysis data for vitamin fortified low fat paneer is given in below table.

Paramet ers	WM (control) in %	WM (piramal) in %	WM (pristine) in %	SM (piramal) in %
% yield	17.15	18.24	17.08	11.19
Moisture	57.35	56.85	57.74	60.75
Fat	26.44	25.24	26.56	6.08
Protein	18.3	18.1	18.5	27.22
Ash	1.63	1.40	1.41	1.81
T.A	0.19	0.15	0.19	0.19

 Table 3.2: Proximate analysis data for fortified low fated

 milk

Same procedure and requirements followed for vitamin fortified paneer preparation which is followed for the low fated paneer the only addition of 25 μ l vitamin premix in the milk before heating is carried out. Whereas according to Nowson, C. A. and C. Margerison (2002) 2 μ l is equal to 80 IU there fore 25 μ l = 2000IU.

3.2 Sensory Evaluation of Paneer

3.2.1 Low Fat Paneer

The results presented in table 4.8: represent the influence of different fat levels with same brands on the sensory evaluation of the paneer. The average flavour scores ranges for the fat percentage ranges from 0.5 to 6.0%. As seen in Table, there was a progressive decrease in sensory scores with decrease in level of fat and increasing level of moisture (shown in proximate data).

Milk fat %	Appearance	Flavour	Texture/Body	Overall acceptability
Whole milk 6.0%	8	8	8	8
Standardized milk 4.5%	8	8	7	7.6
Toned milk 3.0%	7	8	7	7.3
Skimmed milk 0.5%	6	7	6	6.3

Table 3.3: Sensory evaluation table for low fat paneer

3.2.2 Sensory Graph For Low Fat Paneer:

For easy identification of decreasing and increasing in the sensory level of paneer graph is prepared is as.



Fig 3.1: Sensory graph for low fat paneer

Above graph can be inferred that though the level of fat in milk does increase the acceptability of raw paneer is also increases, however this minor difference may be considerably narrowed down during frying and cooking, particularly with paneer made from milk containing 3.0 per cent fat.

3.2.3 For Vitamin Fortified Low Fat Paneer

Vitamin fortified low fated paneer is prepared by using low fat milk i.e. skim milk with addition of vitamin premix and then sensory is to be carried out for checking the quality of the product. The sensory analysis data is given in the below table.

Milk type	Appearance	Flavour	Texture/Body	Overall acceptability
Control	8	8	8	8
Fortified with premix 1	8	8	8	8
Fortified with premix 2	8	8	8	8
Skim milk control	5	6	5	5.3
Fortified with skim milk	5	6	5	5.3

Table 3.4. Sensory evaluation table for fortified low fated naneer

3.2.4 Sensory Graph for Fortified Low Fat Paneer





From above graph it is concluded that there is no change in sensory quality of the paneer after addition of the vitamin premix.

3.3 Shelf-Life Study of Paneer

After paneer preparation paneer was stored at refrigeration temperature i.e. 3 to 4^{0} c and quality of paneer is checked in every day. Shelf life study of paneer is carried out by sensory evaluation of paneer with 6 member panel in each and every day. Form the given table it is concluded that the

effect of different levels of fat in milk i.e. 0.5 to 6.0 % on resulting shelf life study of paneer was investigated. It was observed that fat level of paneer contributed to its soft and spongy body and rich flavour. However milk containing up to 3.0 per cent fat resulted in fairly acceptable on 6^{th} day. Though it lacked slightly in softness and richeness of flavour. The product made from milk containing 0.5 percent fat was criticized to be hard, rubbery and chewy texture from the first day and every day there is reduction in quality of the paneer.

No of days	Samples	Appearance	Flavor	Texture/Body	Overall acceptability
	А	8	8	8	8.0
	В	8	8	7	7.6
1 st day	С	7	8	7	7.3
	D	6	7	6	6.3
	А	8	8	8	8.0
	В	8	8	7	7.6
2 nd day	С	7	8	7	7.3
	D	6	7	6	6.3
	А	8	8	8	8.0
	В	8	8	7	7.6
3 rd day	С	7	8	7	7.3
	D	6	7	6	6.3
	А	8	7	8	7.6
	В	8	7	8	7.6
4 th day	С	6	7	6	6.3
	D	5	6	6	5.6
	А	8	7	8	7.6
	В	7	7	8	7.3
5 th day	С	7	7	6	6.6
	D	5	5	6	5.3
6 th day	А	8	7	7	7.3
	В	7	7	7	7.0
	С	7	7	6	6.6
	D	5	5	5	5.0

 Table 3.5: Shelf life evaluation table

4. SUMMARY AND CONCLUSIONS

The paneer was made from the standardized milk containing 6.0 to 0.5 per cent fat. The flavour score of raw paneer ranged from 6.0 to 8.0. The paneer made from milk containing fat up to 3 .0 percent is having good acceptability. Further reduction in fat level made the paneer with hard structure and low acceptability as compare to the others. There was direct relationship between fat content and liking of the product. Bhattacharya *el al.* (1971) reported that flavour of raw paneer made from 6.0 percent fat milk was very good whereas paneer made from 3.0 per cent fat milk and from skim milk was good and fair, respectively.

The effect of fat contents in milk on the flavour quality of paneer is shown in sensory table. I have worked on the comparative study in between low fat paneer and normal paneer which prepared from different fat level of the milk by acid coagulation. And preparation of all paneer by using equal processing parameters. By conducting the proximate analysis it is found that he full cram milk paneer is having 26.72% fat, toned milk paneer is having 14.96% fat and skimmed milk paneer is having 06% fat. But after conducting sensory for all this product skim milk is having poor acceptability as compare to the other samples. And toned ilk paneer and full cream milk paneer are having nearly equal acceptability. In full cream milk the fat percentage is comparatively higher than toned milk so that the toned milk paneer is good for obased persons on the basis of sensory and proximate analysis.

On the basis of results and discussion it is concluded that the paneer prepared from tone milk is contains low fat as compare to full cream milk (whole milk) paneer but the sensory property of toned milk paneer is nearly equal to full cream milk (whole milk) paneer. Therefore toned milk paneer is good for obased person because of its low fat content.

4.1 Way Forward for Vitamin Fortified Paneer

In fortification of vitamins in paneer I worked on for developing the vitamin enriched low fat paneer. In this study I followed the same process of paneer preparation by acid coagulation method. In this study I worked on low fat vitamin fortified paneer. Because vitamin A and vitamin D are fat soluble vitamins therefore they retain in full cream milk but I used skim milk for fortification and made paneer. If in this paneer vitamin retention found according to requirement then prepared product is having good health benefits for peoples who caring about fat content in food. Vitamin premix from different suppliers was added in milk for study of recovery of vitamins in the final product i.e. low fat paneer. Vitamin premix is added in milk before heating the milk and then process carried out for paneer preparation. By conducting sensory analysis there is no change in flavour and texture of the paneer after adding vitamin premix. Product same as like normal paneer for full cream milk and for low fat milk it is same like skim milk paneer.

REFERENCES

- A.k. chawla, s. Singh and s.k. kana wjla (1984) Dairy Technology Division, National Dairy Research institute, Karnal 132001 (Haryana).
- [2] Bhattacharya DC, Mathur ON, Srinivasan MR, Samlik O (1971). Studies on the method of production and shelf life of paneer (cooking type of acid coagulated cottage cheese). J. Fd. Sci. Technol. 8: 117-120.
- [3] Chris Newcomer, Steven C. Murphy (2001) Guideline for Vitamin a & d fortification of fluid milk.
- [4] Caryl Nowson, Fortification of the food supply with vitamin D.
- [5] Chawla, A. K., Singh, S., and Kanawjia, S. K. (1987). Effect of fat levels, additives and process modifications on composition and quality of paneer and whey. Asian J. Dairy Res., 6: 87-92.
- [6] Chawla, A. K., Singh, S., and Kanawjia, S. K. (1985). Development of low fat paneer. Indian J. Dairy Sci., 38: 280-283.
- [7] FSSAI (2011). Food Safety and Standards Authority of India. Ministry of health and family welfare.Government of India. Cited from http: www.mohfw.nic.in.
- [8] Hirpara Krupa, Jana Atanu H. and Patel H. G. Synergy of dairy with non-dairy Ingredients or product: A review.

- [9] IS (1981). Hand book of Food Analysis. S P: 18 (Part XI 1981). Dairy Products. Bureau of Indian Standards, New Delhi.
- [10] IS (1983). IS: 10484-Specification for paneer. Bureau of Indian Standards, New Delhi, pp: 1-11.
- [11] IS: 5162 (1969). Specification for paneer. Bureau of Indian Standards, Manak Bhavan, New Delhi.
- [12] I.S. 1166 (1973) Specification for condensed milk.
- [13] I.S 10484 (1983) Specification for Paneer.
- [14] ISI Handbook of food analysis (1989). SP: 18 (Part XI Dairy Products). Bureau of Indian Standards, Manak Bhavan, New Delhi, India.
- [15] ISI: 1479 (Part I). (1960). Rapid examination of milk. Indian Standards Institution, Manak Bhavan, New Delhi.
- [16] ISI: 2311 (1963). Fat extraction apparatus for milk and milk products (first revision), Indian Standards Institution, Manak Bhavan, New Delhi.
- [17] Indian Standards, 1983 (IS: 10484). Specification for Paneer. Bureau of Indian Standards, New Delhi.
- [18] Method (930.30) Ash of dried milk.
- [19] Pal, M. A., and Yadav, P. L., (1991). Effect of blending buffalo and cow milk on the physico chemical and sensory quality of paneer. Indian J. Dairy Sci., 44: 327-332.
- [20] A.O.A.C (1991).Pearson's Composition and Analysis of foods, 9th edn, page 538.
- [21] A.O.A.C (2000).Pearson's Composition and Analysis of foods, 9th edn, page 567/. 17th Edn
- [22] Shah Nawaz Umer Khan and Mohammad Ashraf Pal Paneer production: A review.
- [23] T. Masud, i.h. athar and m.a. shah Comparative study on paneer making from buffalo and cow milk.
- [24] Singh, S., and Kanawjia, S. K. (1992). Effect of coagulation temperatures and total solid levels on quality of paneer made from whole milk powder. J. Food Sci. Technol., 29: 57-59.
- [25] Sachdeva, S., and Singh, S. (1988). Optimization of processing parameters in the manufacture of paneer. J. Food Sci. Technol. 25: 142-145.