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Storage study of filled milk chhana spread

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Abstract
The present study was conducted on storage study of filled milk chhana spread in different temperature for one month i.e. T_1(A) refrigerator temperature with preservative, T_1(B) refrigerator temperature without preservative, T_2(A) Room temperature with preservative and T_2(B) Room temperature without preservative. Filled milk chhana spread was evaluated for physico-chemical, microbial and sensory quality parameters of different storage temperature. Sensory evaluation at every three days interval and chemical and microbial evaluation at seven days interval.

Keywords: Filled milk, chhana, physico- chemical, microbial, sensory parameters

Introduction
Table spread is water-in-oil type emulsion, normally having lower level of fat. These soft spreadable products rich in poly-unsaturated fatty acid are perceived to have better nutritional profile. Spread is added to food in order to enhance the flavour or texture of the food. Butter and soft cheese are typically spreading. Evolution of fat spread has continued along the lines of achieving lower and lower fat levels without losing the sensory appeal of the high fat product viz., conventional table butter margarine, etc. Butter has a high fat, most of the consumer's particularly fat conscious group is hesitant to consume butter fat because of the possibility of coronary heart diseases. High cost of butter in addition to its high saturated fatty acid, cholesterol content, high calorific value and poor spreadability at temperature below 15 ^{0}C limits is consumption (Prajapati *et al*., 1991) [6]. Protein are added to the spread for their organoleptic, functional and nutritional properties. They also contribute the viscosity and water holding capacity to the aqueous phase there by improving the emulsion stability during processing and storage. The type and level of protein affects body and texture of low-fat spreads (Deshpande and Thompkinson, 2000) [2]. A number of spreads has been prepared using skimmed milk powder, concentrated skim milk, whey protein concentrate, butter milk is considered to be highly valuable as it is a major source of edible oil and protein meal with high nutritional value. Chhana spread has contains low fat than butter spread, so it is good for cardiac patient. Chhana spread has contains higher protein than butter spread.
Hedrick, (1969) [5] refers to filled milk those products in which part of the milk fat is replaced by vegetable oil. According to the federal filled milk Act (21 code section 61 to 64) of U.S.A., the term "filled milk" means any milk, cream or skim milk, whether non-condensed, evaporated, concentrated, dried which has been blended or compounded with any fat or oil other than milk fat so that the resulting product is an imitation of milk, cream or skim milk (Chandrasekhara *et al*., 1971) [1].
Peanut seeds are a good source of protein and lipid and fatty acids for human nutrition (Tai *et al*., 1975; Gaydou *et al*., 1983) [9, 4]. Peanut proteins are relatively rich in amino acid needed for growth age children, except for lysine. In addition, roasted peanut kernels, are an excellent source of folate, niacin and vitamin E, but are deficient in vitamins A and C and the minerals calcium and iron. Meanwhile, a large portion of vitamin B complex is destroyed during the roasting and blanching steps associated with peanut butter processing (Yeh *et al*., 2002) [10]. Peanuts are the major source of proteins and oil. It contains about 26% protein and 44% oil (Sunda, 2012) [8]. Peanut milk, which is a rich source of good quality protein, can be used the manufacture of chhana spread. Peanut kernels contain 47 to 50% oil and since peanut butter must contain at least 90% peanut, it is a high fat food. Peanut milk has been extensively utilized in developing countries by low income group, undernourished children, vegetarians and people allergic to cow's milk. Use of peanut milk for manufacture of intermediate product for preparation of chhana based spread as an alternative for existing cheese and butter spread, with improve functional properties and nutritional benefits to the consumers. Chhana is one of the semi soft coagulated milk product having high moisture content (70%).

It is generally consumed fresh for preparation of indigenous sweet meats. According to legal standards, it shall not contain more than 70% moisture and milk fat content should not be less than 50% of the dry matter (FSSAI, 2015) [3]. Chhana is fresh unripened curd cheese made from buffalo milk. A soft coagulated product which is used as base to make dessert such as Rosogulla. Chhana is made by boiling milk and then curding it with a small amount of diluted acid solution. The resulting coagulated component is collected and wrapped in cheese cloth and strained to remove access of moisture, until it becomes quite firm. This mixture is kneaded well before use. So that it acquires a very soft and smooth consistency. Chhana is used to make desserts like kheer sugar, chhana kheer and Rasmalai, mithai sweets, such as chhana jalebi, chhana podo, pantua Rasgulla and sandesh. For the sweets, mostly cow milk chhana is used. Chhana is consumed by lactose intolerant people.

Materials and Methods

Storage study of filled milk chhana spread was carried out in the research Lab of Department Dairy Technology at Warner Collage of Dairy Technology, SHUATS, Prayagraj (U.P.) INDIA-211007. Peanut, milk fat, vegetable oil, emulsifier, salt, turmeric powder (Food Grade), black paper powder, cumin powder were collected from the local market of Prayagraj and used as a flavouring powder, whereas the required analytical grade chemicals and preservatives (sodium benzoate) were obtained from the research lab Warner Collage of Dairy Technology, SHUATS, Prayagraj (U.P.). Acidulant: Lactic acid AR (Food grade) was procured from Qualigens Fine chemicals, Anibasent road, Mumbai.

Preparation of peanut milk: The peanut grain was first roasted on slow fire for a period of 1.5 to 2min. The roasted peanut grains were then socked in 1:3 quantity of portable water for next 8 hours. The socked peanut grains were then grinded in high speed electric mixer using 1:8 parts of warm water. The mixture thus obtained was passed through double layered filter cloth and the clear filtrate was peanut milk.

Methodology

Preparation of peanut milk chhana: The peanut milk was heated in karahi, over an open fire to 70°C. The milk was slowly stirred by a ladle during heating to avoid burning. When temperature of milk reached 70°C then coagulation with 0.8% solution of calcium lactate was added to the milk slowly with stirring till the complete coagulation took place. After coagulation the stirring was stopped and contents were poured over a piece of clean muslin cloth for straining of whey. After the draining of whey chhana was collected.

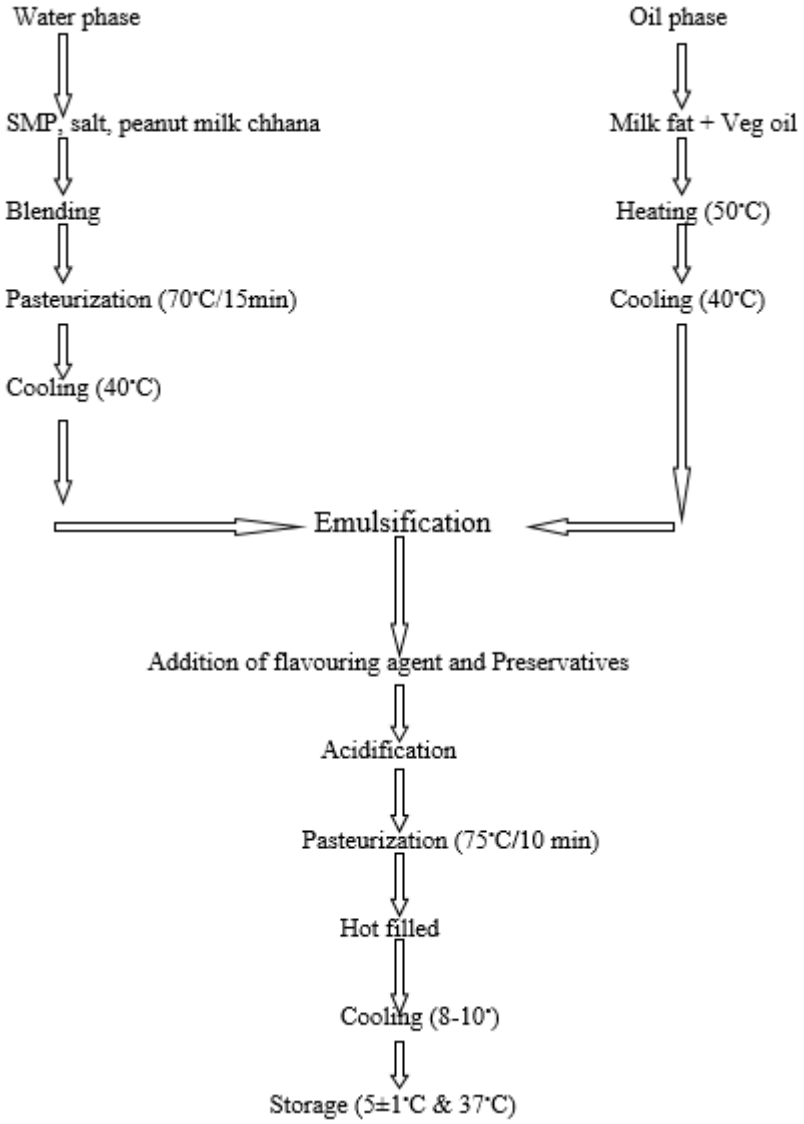

Fig 1: Schematic representation for preparation of Peanut milk

Storage period: The product was stored at room temperature and refrigerated temperature for a period of 30 days and the product was analyzed for various chemical and microbiological parameters as well as sensory attributes at an interval of three days during storage.

Treatment details: T_1 (A) Refrigerator +Preservative@0.2% (sodium benzoate)
T_1 (B) Refrigerator +Non-Preservative
T_2 (A) Room temperature + preservative@0.2% (Sodium benzoate)
T_2 (B) Room temperature +Non-Preservative

Analytical methods: Various methods employed for the physico-chemical, sensory and microbiological analyses during the investigation are given here under-

Physico-chemical attributes: Moisture content to the filled milk china spread was estimated as per the method delineated in hand book of food analysis, SP: 18 (Part XI), 1981. The fat content of the spread was determined as per the method delineated in hand book of food analysis, SP: 18 (Part XI), 1981. The carbohydrates content of spread as determined by calculation**.** The total ash content was determined as per IS SP: 18 (Part XI), 1981. Total protein content of filled chhana spread was estimated by Kjeldhal method. The PV value was determined by Iodometric method. Free fatty acid was determined as per procedure laid down in IS: 3508–1997 methods of sampling and test for Ghee. Bureau of Indian standards, New Delhi.

Microbiological analysis: The filled soy milk chhana spread was examined for the total plate count; yeast and mould count and coliform. Determination of Standard Plate Counts (SPC): bacterial count was determined as per procedure laid down in IS: 1947 part 3 and manual dairy bacteriology, ICAR Publications (1972). Determination of Yeast and Mould Counts (YMC): by IS: 5403 (1999) using Potato Dextrose Agar (PDA). Coliform Counts: by as per the procedure described in IS: 5550 (1970) using McConkey's Agar.

Sensory evaluation: The experimental filled milk chhana and filled milk chhana spread was evaluated by trained judges selected from the Warner of college Dairy Technology, SHUATS, Prayagraj, for sensory characteristics using 9-point hedonic scale (Shone *et al.*, 1977) [7].

Results and Discussion

The Refrigerator and Room temperature storage condition at 0, 7, 14, 21 and 28 days interval of filled milk chhana spread with and without added preservative in each replication were analyzed- physico-chemical and microbial properties such as Free fatty acid (FFA), Peroxide value , SPC (cfu/g), Coliform (cfu/g) and Yeast and mould (cfu/g) and sensory attributes of Colour and appearance, flavor and taste, spreadability and overall acceptability. Data obtained these aspects were statistically analyzed by using simple RBD analysis and critical difference (CD) technique. The results obtained after the analysis of filled milk chhana spread and conclusion there from are as follows-

Effect of free fatty acid (FFA) of filled milk chhana spread

Table 1: Average value for Free fatty acid (FFA) of filled milk chhana spread

Treatments / Interval	Chemical analysis (FFA)				
	0	7	14	21	28
T_1 (A) Refrigerator +Preservative	0.12	0.43	0.85	1.20	1.60
T_1 (B) Refrigerator +Non-Preservative	0.12	0.50	0.90	1.30	1.70
T_2 (A) Room temperature +Preservative	0.12	1.66	2.70	3.84	4.88
T_2 (B) Room temperature +Non-Preservative	0.12	1.74	2.87	3.90	4.94

It can be observed from the table 1, Addition of preservative at refrigerated temperature in filled milk chhana spread, free fatty acid value at 0, 7, 14, 21 and 28 days were 0.12, 0.43, 0.85. 1.20 and 1.60. The mean value of FFA was increased from 0.12 to 1.60. But in the case of room temperature with addition of preservative, mean value of free fatty acid was increased 0.12 to 4.88 from 0 to 28 days storage. This value shown to shelf life of filled milk chhana spread was less in room temperature. So, the addition of preservative shown better keeping quality in refrigerated temperature as well as room temperature. The highest average value of Free fatty acid (FFA) of filled milk chhana spread at 0, 7, 14, 21 and 28 days (0.12, 1.74, 2.87, 3.90 and 4.94) was obtained in the treatment T_2 (B) Room temperature (Non preservative).

Effect of peroxide value of filled milk chhana spread

Table 2: Average value for Peroxide value of filled milk chhana spread

Treatments / Interval	Chemical analysis Peroxide value (meq/kg)				
	0	7	14	21	28
T_1 (A) Refrigerator +Preservative	0.00	0.4	0.9	1.4	1.9
T_1 (B) Refrigerator +Non preservative	0.00	0.4	1.0	1.6	2.2
T_2 (A) Room temperature +Preservative	0.00	7.00	15.00	23.00	30.00
T_2 (B) Room temperature +Non preservative	0.00	7.00	18.00	27.00	36.00

It can be observed from the table 2, In refrigerated temperature, addition of preservative in filled milk chhana spread, the highest peroxide value was obtained at 28 days (1.9) and lowest peroxide value was found at 0 days (0.00). Peroxide value was marginally increased from 0 days to 28 days after addition of chemical preservative (T_1A) at refrigerated temperature. The highest average Peroxide value of filled milk chhana spread at 0, 7, 14, 21 and 28 days (0.00, 7.00, 18.00, 27.00, and 36.00) was obtained in the treatment T_2(B) Room temperature (Non preservative).

Microbiological analysis of filled milk chhana spread

Table 3: Average value for SPC (cfu/g) of filled milk chhana spread

Treatment / Interval	Chemical analysis SPC (cfu/g)				
	0	7	14	21	28
T_1(A) Refrigerator +Preservative	$3x10^3$	$10x10^3$	$19x10^3$	$32x10^3$	$50x10^3$
T_1(B) Refrigerator +Non-Preservative	$3x10^3$	$11x10^3$	$23x10^3$	$40x10^3$	$62x10^3$
T_2(A) Room temperature +Preservative	$3x10^3$	$24x10^3$	$72x10^3$	$130x10^3$	$250x10^3$
T_2(B) Room temperature +Non-Preservative	$3x10^3$	$25x10^3$	$80x10^3$	$150x10^3$	$280x10^3$

It can be observed from the table 3, The highest average value of SPC (cfu/g) of filled milk chhana spread at 0, 7, 14, 21 and 28 days ($3x10^3$ $25x10^3$, $80x10^3$, $150x10^3$ and $280x10^3$,) was obtained in the treatment T_2 (B) Room temperature Non-Preservative.

Table 4: Average value for Yeast and mould (cfu/g) of filled milk chhana spread

Treatment / Interval	Microbiological analysis Yeast and mould (cfu/g)				
	0	7	14	21	28
T_1(A) Refrigerator +Preservative	Nil	$2x10^1$	$6x10^1$	$13x10^1$	$20x10^1$
T_1(B) Refrigerator +Non-Preservative	Nil	$2x10^1$	$9x10^1$	$15x10^1$	$24x10^1$
T_2(A) Room temperature +Preservative	Nil	$3x10^1$	$22x10^1$	$46x10^1$	$70x10^1$
T_2(B) Room temperature +Non-Preservative	Nil	$5x10^1$	$28x10^1$	$55x10^1$	$75x10^1$

It can be observed from the table 4. The highest average value of Yeast and mould (cfu/g) of filled milk chhana spread at 0, 7, 14, 21 and 28 days (Nil, $5x10^1$, $28x10^1$, $55x10^1$ and $75x10^1$) was obtained in the treatment T_2 (B) Room temperature +Non Preservative.

Table 5: Average value for Coliform (cfu/g) of filled milk channel spread

Treatment / Interval	Chemical analysis Coliform (cfu/g)				
	0	7	14	21	28
T_1(A) Refrigerator +Preservative	$0.00x10^2$	$1x10^2$	$4x10^2$	$7x10^2$	$12x10^2$
T_1(B) Refrigerator +Non-Preservative	$0.00x10^2$	$3x10^2$	$5x10^2$	$9x10^2$	$15x10^2$
T_2(A) Room temperature +Preservative	$0.00x10^2$	$6x10^2$	$13x10^2$	$28x10^2$	$42x10^2$
T_2(B) Room temperature +Non-Preservative	$0.00x10^2$	$7x10^2$	$15x10^2$	$33x10^2$	$55x10^2$

It can be observed from the table 5. The highest average value of Coliform (cfu/g) of filled milk chhana spread at 0, 7, 14, 21 and 28 days ($0.00x10^2$, $7x10^2$, $15x10^2$, $33x10^2$, and $55x10^2$,) was obtained in the treatment T_2(B) Room temperature +Non-Preservative.

Effect of preservative at stored and room temperature on sensory attributes of filled milk chhana spread

Effect on color and appearance

Table 6: Average score various Colour and appearance of filled milk chhana spread

Storage condition	0 Days	3 Days	6 Days	9 Days	12 Days	15 Days	18 Days	21 Days	24 Days	27 Days	30 Days	Mean
T_1 (A) Refrigerator +Preservative	8.45	8.20	8.00	8.00	8.00	7.7	7.0	6.10	4.80	4.70	4.60	6.87
T_1 (B) Refrigerator +Non-Preservative	8.15	8.00	8.00	8.00	8.00	7.7	6.9	5.60	4.70	4.60	4.50	6.74
T_2 (A) Room temperature +Preservative	8.22	7.8	8.00	8.00	8.00	7.2	0	0.00	0.00	0.00	0.00	4.29
T_2 (B) Room temperature +Non-Preservative	7.93	7.7	8.00	8.00	8.00	7.2	0	0.00	0.00	0.00	0.00	4.26

The colour and appearance score presented in table 6, indicates irrespective of storage temperature, samples, of filled milk chhana spread scored between 8.45 to 8.00 (like very much) up to 12 days of storage. Therefore, the scores declined continuously. Further, the sample containing preservative & stored at low temperature 7.7 compared to 7.2 for the sample store at room temperature, up to a period of 15 days. All samples stored at refrigerated temperature, were acceptable up to 18 days to storage. However, all sample stored at room temperature scored no marks after 15 days to storage leading to their unacceptability.

Effect on flavor and taste

Table 7: Average score for flavor and taste of filled milk chhana spread during storage

Storage condition	0 Days	3 Days	6 Days	9 Days	12 Days	15 Days	18 Days	21 Days	24 Days	27 Days	30 Days	Mean
T_1 (A) Refrigerator +Preservative	7.86	7.70	7.20	7.10	7.10	7.00	6.90	6.00	4.50	4.30	4.00	6.33
T_1 (B) Refrigerator +Non Preservative	7.29	7.30	7.00	6.80	6.80	6.50	4.40	4.80	3.70	3.50	3.20	5.57
T_2 (A) Room temperature +Preservative	7.29	6.90	6.20	5.50	5.10	3.70	0.00	0.00	0.00	0.00	0.00	3.15
T_2 (B) Room temperature +Non-Preservative	6.86	6.40	5.90	5.50	5.00	2.80	0.00	0.00	0.00	0.00	0.00	2.95

The flavor and taste score presented in table 7, indicates irrespective of storage temperature, samples, of filled milk chhana spread scored between 7.86 to 6.80 (like very much) up to 12 days of storage. Therefore, the scores declined continuously. Further, the sample containing preservative & stored at low temperature 7.00 compared to 6.50 for the sample store at room temperature, up to a period of 15 days. All samples stored at refrigerated temperature, were

acceptable up to18 days to storage. However, all sample stored at room temperature scored no marks after 15 days to storage leading to their unacceptability.

Effect on spreadability

Table 8: Average score for spreadability of filled milk chhana spread during storage

Storage condition	0 Days	3 Days	6 Days	9 Days	12 Days	15 Days	18 Days	21 Days	24 Days	27 Days	30 Days	Mean
T_1 (A) Refrigerator +Preservative	8.00	8.00	7.70	7.70	7.50	7.30	7.00	6.50	5.40	5.20	5.00	6.85
T_1 (B) Refrigerator +Non-Preservative	7.72	7.70	7.70	7.70	7.40	7.20	7.00	5.90	4.40	4.20	4.00	6.45
T_2 (A) Room temperature +Preservative	7.72	7.60	6.50	7.00	6.90	5.60	0.00	0.00	0.00	0.00	0.00	3.76
T_2 (B) Room temperature +Non-Preservative	7.43	7.20	7.50	6.90	6.80	5.50	0.00	0.00	0.00	0.00	0.00	3.76

The spreadability score presented in table 8, indicates irrespective of storage temperature, samples, of filled milk chhana spread scored between 8.22 to 6.20 (like very much) up to 12 days of storage. Therefore, the scores declined continuously. Further, the sample containing preservative & stored at low temperature 7.20 compared to 6.40 for the sample store at room temperature, up to a period of 15 days. All samples stored at refrigerated temperature, were acceptable up to 18 days to storage. However, all sample stored at room temperature scored no marks after 15 days to storage leading to their unacceptability.

Effect on acceptability

Table 9: Average score for overall acceptability of filled milk chhana spread

Storage condition	0 Days	3 Days	6 Days	9 Days	12 Days	15 Days	18 Days	21 Days	24 Days	27 Days	30 Days	Mean
T_1 (A) Refrigerator +Preservative	8.22	8.00	7.60	7.50	7.50	7.20	7.00	6.20	5.00	4.50	4.00	6.61
T_1 (B) Refrigerator +Non Preservative	7.75	7.80	7.60	7.50	7.50	7.00	6.40	5.30	4.20	4.00	3.80	6.26
T_2 (A) Room temperature +Preservative	7.79	7.60	7.00	6.70	6.50	5.20	0.00	0.00	0.00	0.00	0.00	3.71
T_2 (B) Room temperature +Non-Preservative	7.50	6.20	7.00	6.60	6.50	5.10	0.00	0.00	0.00	0.00	0.00	3.54

The overall acceptability score presented in table 9, indicates irrespective of storage temperature, samples, of filled milk chhana spread scored between 8.00 to 6.80 (Like very much) up to 12 days of storage. Therefore, the scores declined continuously. Further, the sample containing preservative & stored at low temperature 7.30 compared to 6.50 for the sample store at room temperature, up to a period of 15 days. All samples stored at refrigerated temperature, were acceptable up to 18 days to storage. However, all sample stored at room temperature scored no marks after 15 days to storage leading to their unacceptability.

Conclusion

In view of experimental result obtained during the present investigation it may be concluded that filled milk chhana could be made using peanut milk, peanut chhana, skim milk powder at 70°C coagulation temperature. This filled milk chhana spread was analyzed on storage study and found to contain highest average value of Free fatty acid was obtained in the treatment T_2 (B) Room temperature + Non preservative. The highest average Peroxide value was also obtained in the treatment T_2 (B) Room temperature + Non preservative. The highest average value was obtained in the treatment T_2 (B) Room temperature + Non preservative. Similarly, the highest average value of Coliform was obtained in the treatment T_2 (B) Room temperature + Non preservative. The highest average value of Yeast and mould was obtained in the treatment T_2 (B) Room temperature + Non preservative. The colour and appearance score indicates irrespective of storage temperature, samples, of filled milk chhana spread scored between 8.45 to 8.00 (like very much) up to 12 days of storage. The flavor and taste score indicate irrespective of storage temperature, samples, of filled milk chhana spread scored between 7.86 to 6.80 (like very much) up to 12 days of storage. The spreadability score indicates irrespective of storage temperature, samples, of filled milk chhana spread scored between 8.22 to 6.20 (like very much) up to 12 days of storage. The overall acceptability of filled milk chhana spread scored between 8.00 to 6.80 (Like very much) up to 12 days of storage.

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