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Preparation of non dairy cheese analogue enriched with coconut milk

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Abstract

On the basis of present study Non-dairy cheese analogue enriched with coconut milk made by using combination of Soya milk, coconut milk, rennet enzyme, salt, stabilizer-Sodium phosphate by addition of Preservative-Calcium propionate. The different sample made by different formulations as a blend of (Soya milk: Coconut milk) as (90:10, 80:20, 70:30, 60:40 and 50:50) The yield of non-dairy cheese analogue was 27.9g, 26.60g, 25.80g, 24.27g and 22.06g per 100 ml respectively. Final product was judged on the basis of best Appearance, Color, Flavor and Texture evaluated by the sensory evaluation method and their chemical Composition. Out of which Sample CA5 Formulation (50:50) Soya milk: coconut milk, Rennet enzyme-0.1%, Salt-1.5%, Stabilizer-0.5%, Preservative-1%) is most acceptable. This sample has moisture-52.34%, acidity-0.19%, Ash-1.72%, Protein-16.37%, Fat-27.10%, Crude fibre-0.55%. Keeping quality of that sample was determined as three days and after treatments (Raw, boiling in water) which was extended to seven days.

Keywords: Soya milk, coconut milk, rennet enzyme, salt, stabilizer, preservative, nondairy cheese

1. Introduction

Cheese is the product obtained by draining after the coagulation of milk by milk coagulating agent under the influence of harmless bacterial cultures. From which part of the moisture has been removed by cutting, cooking, pressing & which has been shaped in a mould and then ripened by holding it for some time at suitable temperatures and humidity.

Cheese analogues are the products made by blending or substituting animal fats by vegetable fats and oils, including non-dairy fats or proteins to produce a cheese-like product to meet specific requirements of cheese. This type of food products contains less total fat, saturated fat, cholesterol, calories and help to lower health risks. Such products are useful in controlling body weight and reducing the risk of heart and artery disease. Cheese substitutes and cheese imitates are synonyms. Making this type of products by substituting the higher cost ingredients with lower cost ingredients from vegetable sources may be a possible solution for low economic status people.

Cheese analogues have gained popularly in different areas due to rapidly increasing prices of cheese, cost-effectiveness, attributable to the simplicity of their manufacture and the replacement of selected milk ingredients by cheaper vegetable products. In developing countries where dairy products are expensive and insufficient in quantity, so the cheese analog is the best option for milk cheese. Thus cheese analogues may offer an excellent opportunity for substituting a traditional product with a new one which offers the same or better nutritional and texture characteristics.

Need For Cheese Analogues

The any analogue cheese product success may be attributed to a number of factors:

1. Fast foods and ready-made conventional meals have become extremely popular wherein cheese is used as one of the preferential ingredient.
2. Costs of natural cheese is more than substitutes. The low cost of analogues is due to low cost of vegetable oils compared with butter fat, the low cost of imported casein, relatively low cost of manufacturing equipment compared to that required for natural cheese and the absence of a maturation period for these types of products.
3. Cheese substitutes offer diverse functionality range (e.g. flowability, melt resistance, shredability, etc), which is made possible by tailor-made formulations and they exhibit high functional stability during storage.

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4. Substitute products can be designed to meet special dietary needs through changes in formulation (e.g. lactose-free, low calorie, low in saturated fat and cholesterol and even vitamin and mineral-enriched).

Materials and Method

This chapter deals with the description of various materials and methods used to accomplish the experimental work done to attain the desired objectives of the study entitled “Preparation of Non-dairy Cheese Analogue enriched with coconut milk”.

Raw materials

Soya beans, coconuts, rennet, preservatives (Calcium propionate), stabilizer, emulsifying salt-sodium phosphate, salt are used according to the formulation.

5 samples were made with different formulation (Table no. 1) as follow:

Table 1: Formulation for non-dairy cheese analogue enriched with coconut milk:

Sr. No.	Ingredients	CA ₁	CA ₂	CA ₃	CA ₄	CA ₅
1	Soya milk (per 100 ml)	90	80	70	60	50
2	Coconut milk(per 100 ml)	10	20	30	40	50
3	Rennet Enzyme (%)	0.1	0.1	0.1	0.1	0.1
4	Salt (%)	1.5	1.5	1.5	1.5	1.5
5	Stabilizer-Sodium phosphate (%)	0.5	0.5	0.5	0.5	0.5
6	Preservative-Calcium propionate (%)	1	1	1	1	1

Where,

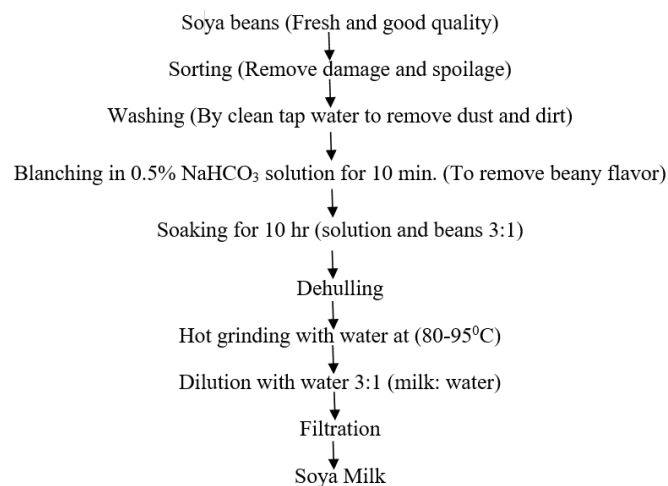
- CA₁ – Cheese Analogue sample no 1
- CA₂ – Cheese Analogue sample no 2
- CA₃ – Cheese Analogue sample no 3
- CA₄ – Cheese Analogue sample no 4
- CA₅ – Cheese Analogue sample no 5

Method of preparation

The cheese analogues enriched with coconut milk are made by blending of various raw materials together using techniques similar to those for processed milk cheese manufacture. The majority of cheese analogues are manufactured by the blending process.

1. Preparation of soya milk

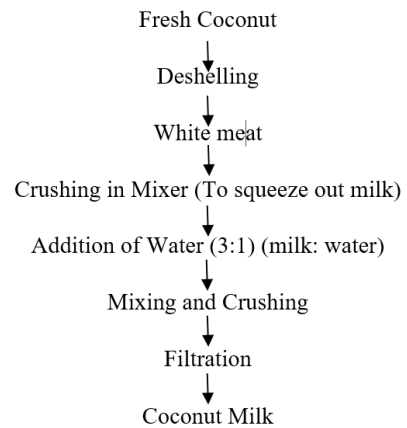
Soya milk is milk obtained from the soybean by soaking dried soybeans and grinding them in water.



Flow chart 1: Preparation of Soya milk

2. Preparation of coconut milk

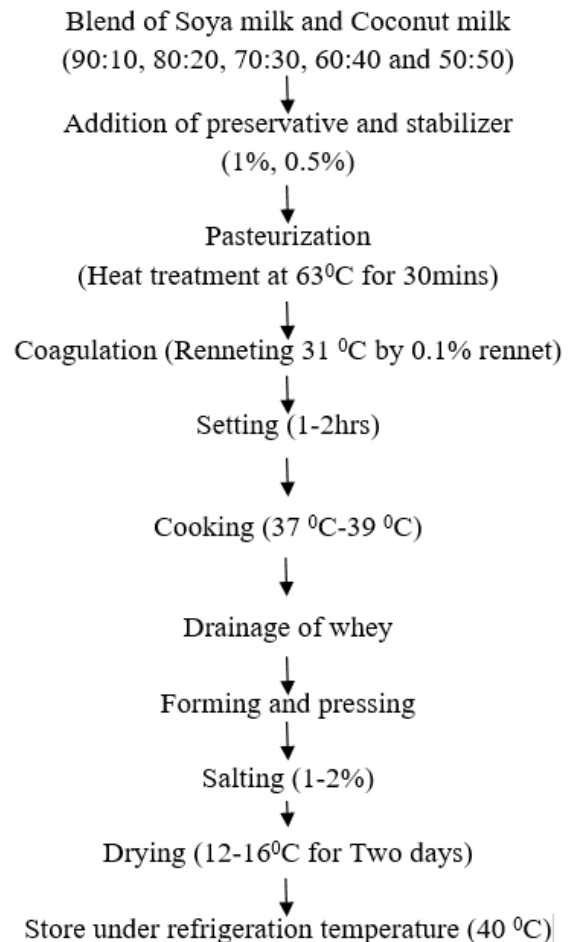
Coconut milk is a sweet, milky white cooking base derived from the meat of a mature coconut fruit. The color and taste of the milk can be attributed to the high content of oil and sugars.



Flow chart 2: Preparation of Coconut milk

3. Preparation of non-dairy cheese analogue from blend of soya milk and coconut milk

Product was packed in polyethylene wrapper and stored at refrigeration temperature.



Flow chart 3: Preparation of non-dairy cheese analogue

Result and Discussion

This chapter deals with the result obtain during present investigation. The present investigation was under taken to

evaluate the quality as well as acceptability of product. Physiochemical analysis was done based on moisture, ash, acidity, pH, protein, fat and texture. Also we done sensory evaluation for the optimization and overall acceptability of non-dairy cheese analogue fortified with coconut milk. The result of study is being presented and discussed in following sections.

1. Nutritional composition of raw material (Soya milk and coconut milk)

The quality of raw material is analyzed that is shown in table no. 2. That shows the Soya milk have pH 6, Titrable acidity-0.23(%), Protein-9.61 g, Fat-4.33g. For Coconut milk have pH 5.2, Titrable acidity-0.12(%), Protein-3.29g, Fat-23.84g.

Table 2: Nutritional Composition of raw material per 100 ml

Raw material	pH	Titrable Acidity (%)	Protein(g)	Fat(g)
Soya milk	6	0.23	9.61	4.33
Coconut milk	5.2	0.12	3.29	23.84

2. Yield of non-dairy cheese analogue enriched with coconut milk

The yield of cheese products was determined on the basis of weight of coagulated milk product (In grams) collected by means of cheese cloth. Table no.3 shows that cheese yield increased with increase in soya milk content. The cheese product was formed by the coagulation of proteins in the soya milk and coconut milk, thus the greater protein content the greater the yield of cheese product.

Table 3: Yield of non-dairy cheese analogue enriched with coconut milk

S. No.	Content	CA ₁ (ml)	CA ₂ (ml)	CA ₃ (ml)	CA ₄ (ml)	CA ₅ (ml)
1	Blend (soya milk: coconut milk)	90:10	80:20	70:30	60:40	50:50
2	Yield	27.9	26.60	25.80	24.27	22.06

3. Chemical analysis of nondairy cheese analogue samples

Table 4: Analysis of nondairy cheese analogue samples

Samples	Titrable Acidity (%)	Protein (%)	Fat (%)	Crude Fiber (%)	Ash (%)	Moisture (%)
CA ₁	0.23	22.67	22.12	0.79	1.60	53.83
CA ₂	0.21	18.78	23.14	0.66	1.66	54.76
CA ₃	0.20	19.66	21.61	0.91	1.71	53.10
CA ₄	0.18	16.13	25.23	0.64	1.57	56.43
CA ₅	0.19	16.37	27.10	0.55	1.72	52.34

4. Sensory evaluation of non-dairy cheese analogue samples

Composite scoring test is used for Sensory Evaluation. The sensory attributes were color, flavor, texture, taste and overall

acceptability was measure. The sensory analysis of various optimized product performed right after they are prepared which is shown in table no: 5, 6, and 7.

Table 5: Sensory evaluation of non-dairy cheese analogue sample on 1st day at 4 °C

Organoleptic Characteristics	Possible scores	Non-dairy Cheese analogue Samples				
		CA ₁	CA ₂	CA ₃	CA ₄	CA ₅
Appearance	20	13	14	12	13	15
Color	10	6	7	7	7	8
Flavor	10	5	6	5	6	7
Texture	40	30	31	32	34	36
Taste	20	8	9	11	9	12
Overall acceptability	100	62	67	67	69	78

Table 6: Sensory evaluation of cheese analogue sample on 3th day at 4 °C

Organoleptic Characteristics	Possible scores	Non-dairy Cheese analogue Samples				
		CA ₁	CA ₂	CA ₃	CA ₄	CA ₅
Appearance	20	13	14	13	12	15
Color	10	7	7	6	7	8
Flavor	10	5	5	6	5	7
Texture	40	29	30	30	32	33
Taste	20	7	8	8	9	11
Overall acceptability	100	61	64	63	65	74

Table 7: Sensory evaluation of cheese analogue sample on 6th day at 4 °C

Organoleptic Characteristics	Possible scores	Non-dairy Cheese analogue Samples				
		CA ₁	CA ₂	CA ₃	CA ₄	CA ₅
Appearance	20	11	12	13	12	13
Color	10	5	6	6	7	7
Flavor	10	4	5	5	6	6
Texture	40	25	27	28	29	30
Taste	20	5	7	6	8	9
Overall acceptability	100	50	57	58	62	65

5. Texture analysis non-dairy cheese analogue samples

Test of texture is show the firmness of curd. In texture measure the feel and appearance of the cheese surface, especially how compact the curd formation is. The instrument comprised of a round aluminum plate (4 cm diameter) with four pointed end stands. This was placed on the surface of the cheese. Weights were added to drive the stands into the cheese and recorded as gram weight added. Through that study we know that any textural changes occur up to the 6 days. Obtained data of analysis is shown in Table no: 8.

Table 8: Texture analysis of prepared nondairy cheese analogue samples

Time (in Days)	Samples	+ve peak force (g)
Day 1	CA ₁	557.1
	CA ₂	551.7
	CA ₃	547.3
	CA ₄	542.5
	CA ₅	540.9

Time (in Days)	Samples	+ve peak force (g)
Day 3	CA ₁	552.6
	CA ₂	550.7
	CA ₃	546.3
	CA ₄	541.5
	CA ₅	540.2

Time (in Days)	Samples	+ve peak force (g)
Day 7	CA ₁	551.9
	CA ₂	550.3
	CA ₃	545.8
	CA ₄	540.5
	CA ₅	539.9

6. Moisture levels (%) for cheese analogue samples during storage

Table No.9 shows a general decline in moisture content for all samples. From day 1 to day 4 the rate of decrease was highest for samples boiled in water, followed by those with the raw samples recording the least rate of decrease in moisture content. It was observed that cheese analogue samples boiled in water showed greater loss of moisture than the raw samples.

Table 9: Moisture levels (%) for cheese analogue Samples during storage

Sample	Storage periods(days)				
	0	1	2	3	7
CA ₁	53.83	50.36	44.52	42.10	41.74
CA ₂	54.76	49.23	43.17	41.65	40.81
CA ₃	53.10	48.91	41.36	40.29	38.13
CA ₄	56.43	46.51	40.78	39.17	37.55
CA ₅	52.34	45.77	39.10	37.61	36.50

7. pH for cheese analogue samples during storage

Table 10: Change in pH and titrable acidity during storage at 4 °C

pH	Sample		CA1	CA2	CA3	CA4	CA5	
	Days							
		1		6.48	6.47	6.60	6.41	6.45
		3		6.41	6.40	6.53	6.39	6.40
	7		6.35	6.33	6.46	6.32	6.35	
Titrable Acidity	Sample		CA1	CA2	CA3	CA4	CA5	
	Days							
		1		0.20	0.22	0.25	0.23	0.21
		3		0.25	0.27	0.29	0.27	0.26
	7		0.31	0.32	0.33	0.31	0.30	

Conclusion

On the basis of present study Non dairy Cheese analogue enriched with coconut milk were prepared using partial substitution of soya milk with coconut milk blend (90:10), (80:20), (70:30), (60:40), (50:50), rennet enzyme, salt, stabilizer-Sodium phosphate, Preservative-Calcium propionate and final optimized products were judged for best Appearance, color, flavor, texture and taste. The formulations were analyzed for their Organoleptic qualities by sensory evaluation for optimization and final samples. Samples with different formulations were prepared out of Sample CA5 (50:50) are found to be the best.

This formulation contains Soya milk-50%, Coconut milk-50%, Rennet enzyme-0.1%, Salt-1.5%, Stabilizer-0.5%, Preservative-1%. Sample CA5 has moisture-52.34%, acidity-0.19%, Ash-1.72%, Protein-16.37%, Fat-27.10%, Crude fibre-0.55%.The keeping quality was determined as 1,3 days for all product treatments (raw, boiling in water) which was extended to 7 days. The color characteristic was scored the highest in respect of sensory appeal while taste recorded the lowest average scores.

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