A new dairy product analogue - coconut cream filled flavoured yoghurt - process design and economics

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A saving in the cost of 10.53 per cent was achieved as compared to control by 100 per cent replacement of milk fat with coconut fat in the form of coconut cream with or without sodium alginate, the stabilizer. The different yoghurt analogues had more or less similar sensory properties as compared to control.

Abstract

A study was conducted to assess the feasibility of incorporating the coconut fat as coconut cream in filled yoghurt by replacing the milk fat. The treatments were divided into Tc (control without stabiliser), T_2, T_3, T_4, T_5 (25, 50, 75 and 100 per cent replacement of milk fat with coconut cream without stabiliser). T_6, T_7, T_8 and T_9 (25, 50, 75 and 100 per cent replacement of milk fat with coconut cream with stabiliser). The yoghurt mixes and their economics were formulated by using computer linear programming model. The process for the preparation of different yoghurt analogues was designed. A saving in the cost of 10.53 per cent was achieved as compared to control by 100 per cent replacement of milk fat with coconut fat in the form of coconut cream with or without sodium alginate, the stabilizer. The different yoghurt analogues had more or less similar sensory properties as compared to control.

Introduction

The high quality nutrients of milk can be preserved by fermentation process. Yoghurt is one of the fermented milk product, having several health benefits due to the biochemical activity of the *Streptococcus thermophilus* and *Lactobacillus bulgaricus* during control fermentation process (Tamine and Robinson 1985). Now-a-days, functional dairy foods are gaining popularity among the consumers due to health consciousness. Such functional foods are prepared by using several techniques. Coconut *(Cocos nucifera L.)* extensively grown in south India, has several nutritional and medicinal properties (Warrier, 1994 and Ulpalakshan, 1994). By using coconut cream, various dairy analogues such as paneer, rasagolla, mozzarella cheese, coconut water filled yoghurt and ice cream were prepared by Mini Jose (1992), Johnson (1994), Malarkannan (1996) and Geevarghese (1996).

This study was designed with the objective of replacing the milk fat with coconut fat as coconut cream in the preparation of filled yoghurt by introducing a technique along with its economics. Pineapple flavour was added to mask the coconut aroma and sodium alginate was used as stabiliser.

Materials and methods

Mature coconuts collected from Government Agricultural farm, Mannuthy, Thrissur were dehusked and broken into two halves. The kernel was grated and the coconut cream was extracted by using screw press. The pressed milk was sieved through a muslin cloth to remove the solid particles to get the coconut cream and the fat was adjusted to 30 per cent level by adding potable water.

Yoghurt mixes were prepared incorporating skim milk, skim milk powder, sugar, coconut cream and milk cream at different levels. Liquid synthetic pineapple flavour and permitted food colour (lemon yellow powder) containing tartarzine (dye content in 21.9 per cent) were used as colour for yoghurt. The colour solution was prepared by mixing four gram of powder in 100 ml distilled water. Three drops of liquid synthetic pineapple flavour and two drops of colour solution has been added in the 100 gram of yoghurt mixes and mixed well before incubation.

The treatments were divided into T_C (control) containing 14 per cent milk solids-not-fat (MSNF), three per cent fat and six per cent sugar. T_2 (25 per cent replacement of milk fat using coconut fat), T_3 (50 per cent replacement of milk fat using coconut fat), T_4 (75 per cent replacement of milk fat using coconut fat) and T_5 (100 per cent replacement of milk fat using coconut fat). Treatments T_6, T_7, T_8 and T_9 contained 0.2 per cent sodium alginate as stabilizer in the respective treatment groups of T_2, T_3, T_4 and T_5.

These experiments were carried out with six replications. The quantity of ingredients along with its cost estimation was derived by linear programming model.

Result and Discussion

The cost of ingredients for control and treatment groups for 100 gram of yoghurt mixes was calculated from the linear programming model.

Cost of the ingredients

Ingredients	Cost *(Rs/kg)*
Skim milk powder	130.00
Cream	100.00
Coconut cream	23.25
Skim milk	8.00
Sugar	16.00
Stabiliser	136.00
Flavour	85.00
Colour	400.00

Process Flow Chart for the Preparation of Filled Flavoured Yoghurt

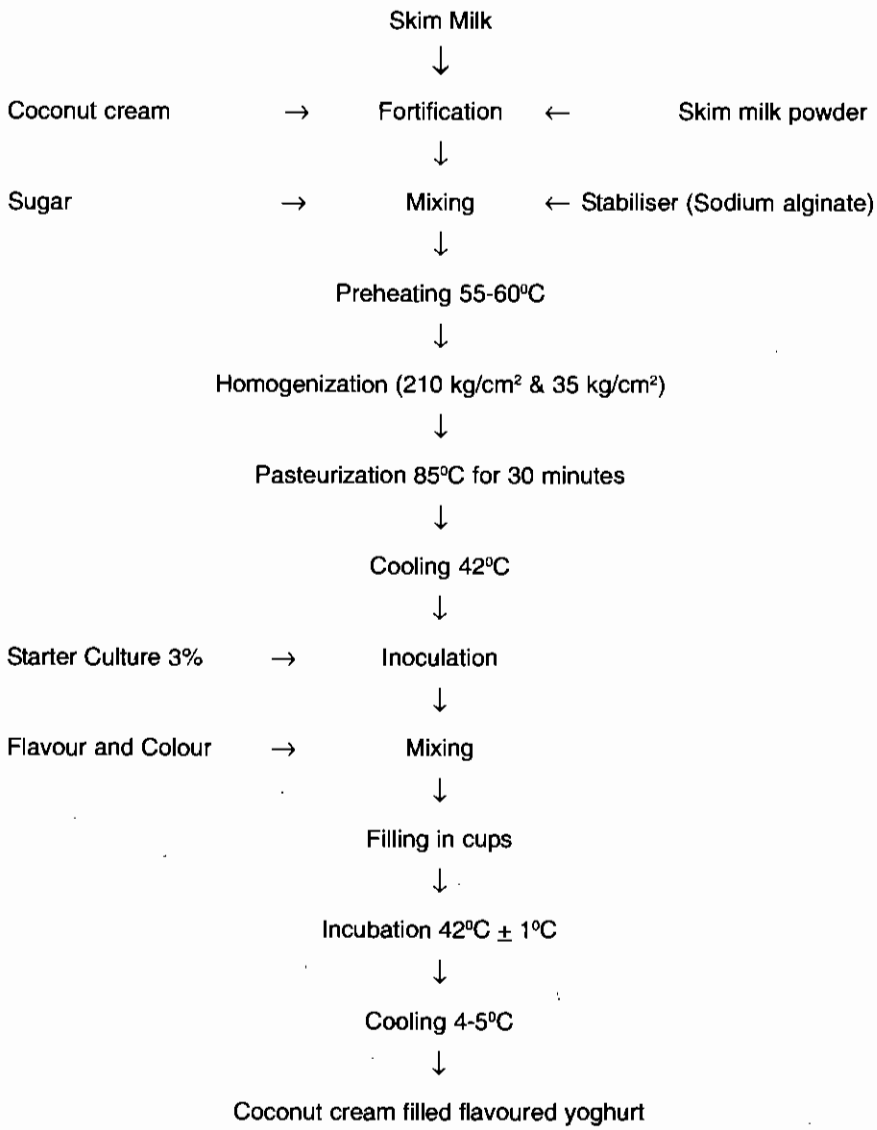

Table 1. Quantity of ingredients and their cost for 100 g of yoghurt mix (cost in Rs.)

Ingredients	T_C	T_2	T_3	T_4	T_5*	T_6	T_7	T_8	T_9*
Skim milk powder	5.760	5.889	6.017	6.146	6.255	5.682	5.811	5.946	6.049
Cost	0.749	0.766	0.782	0.799	0.813	0.739	0.755	0.772	0.786
Milk cream	4.648	3.446	2.231	1.022	-	3.442	2.233	1.024	-
Cost	0.465	0.344	0.223	0.102		0.344	0.223	0.102	
Coconut cream	-	2.500	5.000	7.500	9.614	2.500	5.000	7.500	9.619
Cost		0.058	0.116	0.174	0.224	0.058	0.116	0.174	0.224
Skim milk	83.592	82.172	80.752	79.331	78.130	82.176	80.756	79.336	78.132
Cost	0.669	0.657	0.646	0.635	0.625	0.657	0.646	0.635	0.625
Sugar	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000
Cost	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Stabiliser	-	-	-	-	-	0.200	0.200	0.200	0.200
Cost						0.027	0.027	0.027	0.027
Flavour (0.5%)	-	-	-	-	-	-	-	-	-
Cost	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
Colour (0.5%)	-	-	-	-	-	-	-	-	-
Cost	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Cost	2.098	2.041	1.984	1.926	1.877	2.042	1.984	1.927	1.877

*Coconut fat replacement in treatment T5 and T9 are only 2.89 per cent out of 3.0 per eent fat in yoghurt and the remaining 0.11 per eent met from skim milk powder and skim milk.

The cost of ingredients for 100 grams of yoghurt mixes for control was Rs. 2.098 and the treatments T_2, T_3, T_4, T_5, T_6, T_7, T_8 and T_9 were Rs. 2.041, Rs 1.984, Rs. 1.926, Rs. 1.877, Rs. 2.042, Rs. 1.984, Rs. 1.927 and Rs. 1.877 respectively. The savings in the cost was 2.72%, 5.43%, 8.20%, 10.53%, 2.67%, 5.43%, 8.15% and 10.53% for the treatments T_2 to T_9 respectively as compared to the control. There was no significant difference in the cost at 50 per cent and 100 per cent levels with or without the stabilizer sodium alginate. The reduction in the cost for experimental yoghurt samples could be attributed to the lower cost of coconut cream as compared to the milk cream.

The total sensory score for the control was 16.55 and the treatments T_2, T_3, T_4, T_5, T_6, T_7, T_8 and T_9 were 16.67, 17.07, 16.99, 16.99, 16.43, 16.80, 16.89 and 16.52 respectively (Table 2). Also the total sensory score showed no significant difference among the control and treatments. The results of the present study are in close agreement with the reports of Baig (1994) and Malarkannan (1996). The final product had 3.0 per cent fat and 23 per cent total solids.

Table 2. Total sensory score of filled flavoured yoghurt incorporating coconut cream at different levels

Score	Tc Control	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
1	15.71	15.86	17.99	16.00	16.81	16.08	16.48	17.30	16.18
2	15.56	16.08	16.16	16.43	16.15	15.85	15.82	15.70	15.84
3	16.56	16.45	17.00	16.71	16.63	16.04	17.05	16.93	16.67
4	17.14	16.64	17.07	17.72	16.50	16.78	16.40	17.22	16.20
5	16.86	17.72	17.57	17.56	17.15	16.72	17.11	17.15	16.95
6	17.44	17.26	16.63	17.49	17.16	17.13	19.94	17.01	17.25
Total score	16.55 ±0.31	16.67 ±0.31	17.07 ±0.27	16.99 ±0.29	16.99 ±0.16	16.43 ±0.21	16.80 ±0.30	16.89 ±0.24	16.52 ±0.22

*Not significant

Conclusion

From the above studies, it can be concluded that coconut fat as coconut cream can be used to replace milk fat upto 100 per cent levels with or without the stabilizer in the preparation of yoghurt with the saving in the cost of 10.53 per cent as compared to control. The different yoghurt analogues had more or less similar sensory properties as compared to control.

Acknowledgment

The authors are grateful to the Dean, College of Veterinary and Animal Sciences, Mannuthy for providing facilities.

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COCONUT DISHES

1. COASTAL FISH CURRY

Ingredients:

Pomfret	-	1 large
Coconut	-	Half
Onion	-	1
Chilli powder	-	2 tsp
Chopped ginger	-	2 tsp
Turmeric	-	Half tsp
Tamarind pulp	-	2 tbsp
Coconut oil	-	As needed
Salt	-	To taste

Method : Clean the fish. Discard head, fins and tail. Cut into one cm thick slices. Apply ¼ tsp turmeric and half tsp salt and keep aside. Grind scraped coconut with the remaining turmeric and chilli powder and add 2 cups of water. Heat 2 tbsp oil in a pan. Add fish pieces and turn once. Add coconut paste, tamarind pulp, finely chopped onion and ginger and simmer till fish is cooked but not broken. Add salt and water if needed. Serve hot with boiled rice.

2. FISH IN COCONUT-PEANUT CURRY

Ingredients:

Pomfret	-	One kg
Pea nuts	-	250 gms
Coconut milk	-	¾ cup
Chilli powder	-	2 tsp
Turmeric powder	-	One tsp
Onions	-	4
Cloves	-	2
Garlic	-	2
Tamarind pulp	-	2 tbsp
Vinegar	-	One tsp
Coconut oil	-	As required
Salt	-	To taste

Method: Grind garlic, turmeric, salt and chilli powder. Clean and slice the fish. Apply the masala paste to fish pieces and fry to a golden colour. Heat 5 tbsp oil and fry chopped onions till golden brown. Add coconut milk, tamarind pulp and salt. Add roasted and powdered peanuts. Cook till gravy is thick and creamy. Add vinegar and pour the gravy over the fried fish . Serve hot.

3. KONKANI FISH CURRY

Ingredients:

Pomfret	-	500 gms
Coconut	-	Half
Tomato	-	4
Red chillies	-	4
Green chillies	-	4
Onions	-	4
Turmeric powder	-	One tsp
Cumin powder	-	One tsp
Coriander seeds	-	One tsp

Method: Scrape and grind coconut into a fine paste and mix with the masala. Heat 4 tbsp oil and fry sliced onion , ground masala and chopped green chillies. Add chopped tomatoes and salt, add half a cup of water. Set aside. Clean and cut the fish and wash well, smear salt and turmeric powder in it. Add the fish to the sauce and cook. When the fish is cooked , add the tamarind pulp and simmer till well cooked and blended. Garnish with curry leaves.

4. CHEPLA KURA

Ingredients:

Large fish	-	500 gms
Sesame seeds	-	One tbsp
Cumin seeds	-	Half tbsp
Coriander seeds	-	2 tbsp
Coconut	-	Half
Onions	-	5
Red chillies	-	4
Tamarind pulp	-	2 tbsp
Coconut oil	-	As required

Method: Clean and slice the fish. Roast the whole onion on gas or on hot charcoal. Fry coriander seeds, red chilli, cumin seeds, sesame seeds and grated coconut. Grind these with the onion to a thick paste. Heat one tbsp oil and fry asafoetida. Remove from oil.and keep it aside. Heat the remaining oil and fry the ground masala till golden brown. Add the sliced fish, tamarind pulp and cook till done. Add fried asafoetida. Garnish with fried curry leaves.

-Indu Narayan