The Pharma Innovation Journal 2018; 7(8): 52-56

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(8): 52-56

www.thepharmajournal.com
Received: 29-06-2018
Accepted: 30-07-2018

Gaurav Verma
M. Tech. (Dairy Technology) Student Warner College of Dairy Technology, SHUATS, Naini, Allahabad, Uttar Pradesh, India

Shanker Suwan Singh
Assistant Professor, Warner College of Dairy Technology, SHUATS, Naini, Allahabad, Uttar Pradesh, India

Rajan Singh
M.Sc. (Dairy Technology) Student Warner College of Dairy Technology, SHUATS, Naini, Allahabad, Uttar Pradesh, India

Abhishek Singh
M. Tech. (Dairy Technology) Student Warner College of Dairy Technology, SHUATS, Naini, Allahabad, Uttar Pradesh, India

Correspondence
Gaurav Verma
M. Tech. (Dairy Technology) Student Warner College of Dairy Technology, SHUATS, Naini, Allahabad, Uttar Pradesh, India

Development and quality assessment of kalakand prepared by using buffalo milk blended with coconut milk and sapota

Gaurav Verma, Shanker Suwan Singh, Rajan Singh and Abhishek Singh

DOI: https://doi.org/10.22271/tpi.2018.v7.i8a.2399

Abstract
Kalakand is one of the major heat desiccated indigenous milk product, which is gaining more popularity in modern societies of the developing countries. It contains milk solids in a fourfold concentration, its food and nutritive value is very high. Coconut and Sapota are tropical fruits with good anti-carcinogenic and anti-diabetic properties. The basic aim of study was to find out the quality parameters of Kalakand prepared by addition of Coconut milk and Sapota at different level of concentration (*i.e.* T0, T1, T2 and T3) using buffalo milk. The concentration of Coconut milk and Sapota in experimental samples were 15% & 5% for treatment T1; 10% & 10% for treatment T2 and 5% & 15% for treatment T3 respectively. While control sample T0 was prepared from 100% of buffalo milk. The concentration of sugar was 6% which was constant for all the treatments. The data collected on different aspects were tabulated and analysed statistically using the methods of analysis of variance and critical difference. Physicochemical analysis (protein, fat, total solids, moisture, ash, acidity and carbohydrate) was done for estimating its nutritional content and organoleptic characteristics (flavour and taste, body and texture, colour and appearance, overall acceptability) were judged by panel on 9 point hedonic scale. Overall acceptability score for treatments T0, T1, T2 and T3 were 7.5, 8.0, 8.4 and 8.9 respectively. The cost of production of final product for treatments T0, T1, T2 and T3 were 209, 222.57, 221.95 and 218 Rs. / Kg respectively. According to the analysis, treatment T1 with 15% Coconut milk and 5% Sapota was found to be the best among all. Thus, product acceptability judged by organoleptic evaluation and therapeutic value, the treatment can be rated as T1>T2>T3>T0.

Keywords: Kalakand, buffalo milk, coconut milk, sapota, physico-chemical and organoleptic analysis

Introduction
Milk and milk products played an important role in human life to enhance the body by promoting necessary nutrition, it is recognized as most satisfactory almost complete food for humans since 4,000 B.C. An annual output of 137.7 million tonnes of milk during the year 2013-14 as compared to 132.4 million tonnes in 2012-13 recording a growth of 4.0% (NDDB Statistics, 2013) [9]. Approx. 150 types of milk based sweets are available in India but they have been infested with several troubles during production on large scale due to short shelf-life (Bandyopadhyay 2006) [2]. Among 100% of total milk production, 46% milk is consumed as a liquid form while remaining 54% used for the preparation of milk products, in which 7% is used for the preparation of converted into heat and acid coagulated indigenous milk products among which Kalakand is one of the products (Bhutkar *et al*., 2015) [3]. Kalakand is a popular Indian sweet prepared from solidified, sweetened milk, it was invented in 1947 by Baba Thakur Das in Alwar, Rajasthan, India. Fruits/vegetable juices or pulp has been used for the fortification process to
improve the taste and acceptability of kalakand (Patel and Roy, 2015) [10]. It is popular in north-east India including Jharkhand, Orissa and Bengal states. It is originated in Braj area of western Uttar Pradesh (Goyal and Goyal, 2011) [6]. The following recipe for preparation of Kalakand such as take required quantity of milk and boil it in a container with continuous stirring through khunti in a rotational motion. After 10-15 min of stirring required quantity of diluted citric acid should be added into the milk for coagulation. Make semisolid consistency through continues stirring during heating and add sugar (6%), crushed cardamom if desired and stir well for 5 min. Final product is set in a greasy tray for reduce the chances of stickiness and allow to cool at room temperature (De, 1991) [5].

Coconut production and processing cover the larger economic sector of rural communities in many tropical regions of south-east Asia in which production of coconut oil from "copra" (dehydrated coconut meat) has been the largest economic sector of the coconut industry. (Hagenmaier, 1977) [7]. The developed product prepared from coconut contains desirable nutritional composition with respect to cholesterol inducing fat levels because coconut contains good quality saturated fat which can easily metabolized to give the body quick energy (Timmen and Patton, 1989) [12]. Coconut has important anti-carcinogenic and anti-pathogenic properties as well as it produces light weight gain compare to polyunsaturated oils (Coconut Research Centre, 2004) [4]. The blend of coconut milk and cow's milk has pH of about 6.5 similar to that of milk because coconut milk is very rich in emulsifiers and it is a natural oil-in-water emulsion just like cow milk; hence, both can mix readily (Hagenmaier, 1977) [7].

Nutritional data on raw Coconut milk		
Nutrients	**Units**	**Value per 100 gram**
Water	g	67.62
Energy	kcal	230
Protein	g	2.29
Total lipid (Fat)	g	23.84
Ash (Minerals)	g	0.72
Carbohydrate	g	5.54
Total fibre	g	2.20
Total solid	g	32.17

Source: USDA National Nutrient Database for Standard Reference, (2004)

India is the largest producer of Sapota followed by Mexico, Guatemala and Venezuela. Area under sapota in India is estimated to be 1.40 lakh hectares, with an annual production of 11.17 lakh tonnes (www.apeda.com). Only mature fruits are used for making mixed jams because immature fruits are astringent, while ripe fruits are sweet smelling and delicious (Sulladmath and Reddy, 1985). The colour of Sapota pulp *i.e.* light brown, brownish yellow to reddish brown, with a texture varying from gritty to smooth and have a berry type structure with a scurfy brown peel may be round to oval-shaped or conical, 2 to 4 inches (5-10 cm) in diameter and 2.6 oz to
2.2 lbs (75 to 1000 g) in weight. Sapota pulp has a sweet (19 – 24° Brix), pleasant flavour.
Sapota seeds are dark brown to black, smooth, flattened, shiny, and ¾ inch (1.9 cm) long ranges from 0-12 in a single Sapota fruit. Sapota is eaten as fresh fruit due to its high nutritive value and sweet taste but it also used for the preparation of Sherbets, milk shakes and ice cream (Balerdi *et al*. 2005) [1].

Nutritional value of Sapota		
Nutrients	**Units**	**Value per 100 grams**
Moisture	g	73.70
Energy	kcal	98.0
Protein	g	0.70
Fat	g	1.10
Carbohydrate	g	21.40
Fiber	g	2.60
Ash	g	0.50
Acidity	g	0.15
Vitamin A, RAE	µg	8.1
Total carotene	µg	97
Vitamin C	mg	6.0
Niacin	mg	0.2
Iron	mg	1.3
Calcium	mg	28
Phosphorus	mg	27
Total solid	gm	26.03

Source: Nutritive value of Indian foods. 2002. S no 303 (Ref#2). Code: 2297

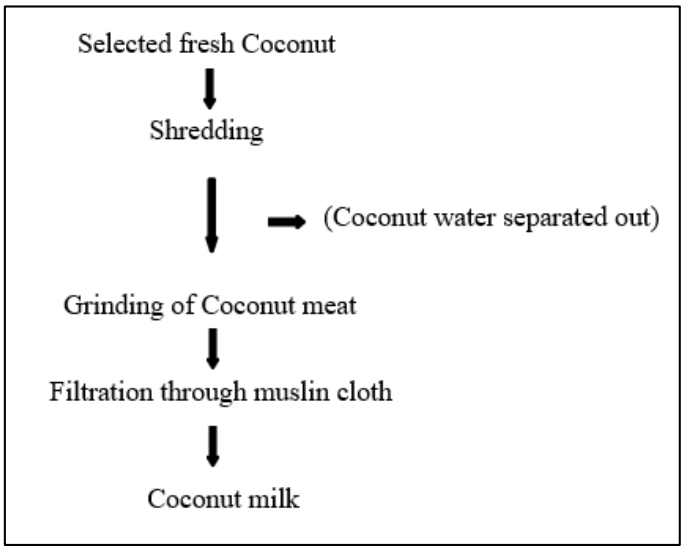
Materials and methods

Buffalo milk, coconut milk, sapota and sugar were collected from the local market of Lucknow whereas the required analytical grade chemicals and compounds were obtained from the research lab of "CytoGene research & development" B- block chauraha, Indranagar, Lucknow, UP. Four treatment samples were studied and each treatment was replicated for five times. Average values for physico-chemical, microbial and organoleptic analysis were recorded for the final product. The final products were analysed for percent ash, acidity, carbohydrate, fat, moisture, protein and total solid. Microbial analysis involved estimation of coliform count, standard plate count and yeast & mould count. Organoleptic analysis was carried out on 9 point hedonic scale to judge for body & texture, colour & appearance, flavour & taste and over-all acceptability.

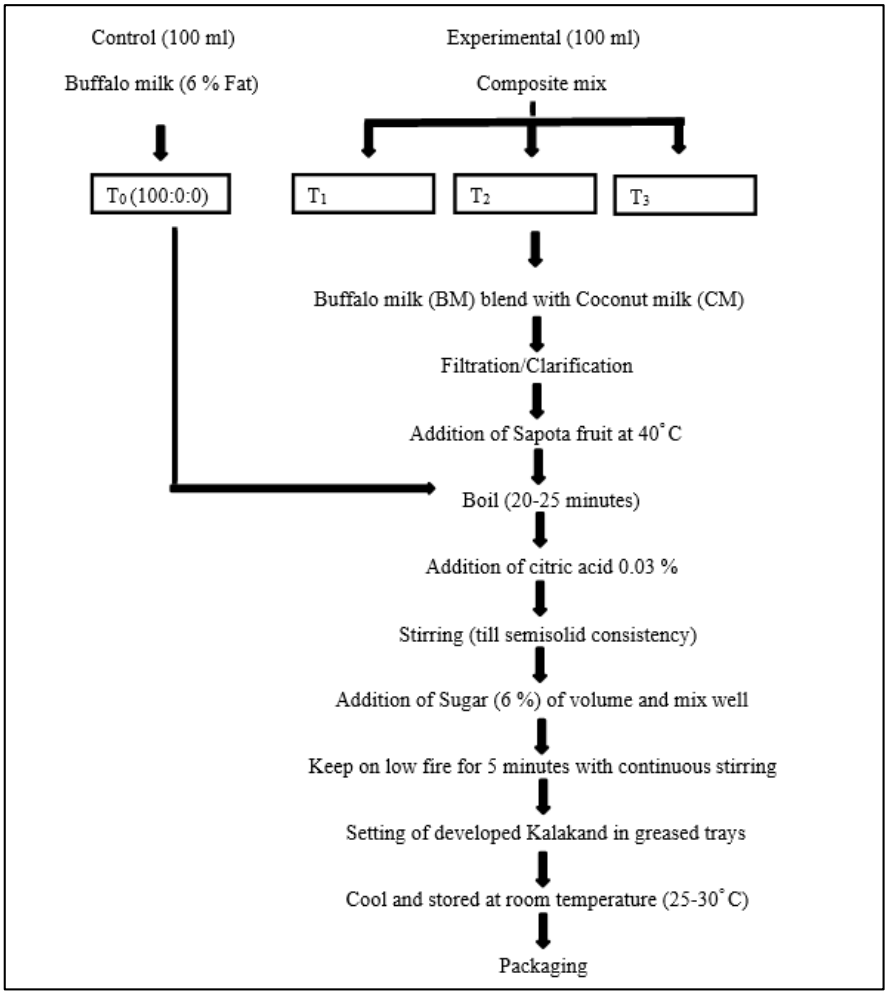
Treatment combination

Treatment	Milk (%)	Coconut milk (%)	Sapota (%)
T0 (Control)	100	0	0
T1	80	15	05
T2	80	10	10
T3	80	05	15

Flow diagram for preparation of coconut milk



Flow diagram for preparation of Kalakand



Result and Discussion

Average data for different parameters of control and experimental Kalakand

Parameters (%)	Values based on mean value of different parameters of treatments				
	Chemical analysis				
	Treatments				
	T0	T1	T2	T3	S/NS
Moisture	25.14	21.09	22.21	23.32	S
Fat	22.29	25.32	23.86	22.41	S
Ash	2.67	2.59	2.55	2.51	S
Protein	16.91	15.15	14.80	14.47	S

Acidity	0.67	0.57	0.61	0.65	S
Carbohydrate	32.22	35.23	35.77	36.59	S
Total solid	74.38	78.69	77.15	76.64	S
Microbial Analysis					
Parameters (cfu/gm)	**Treatments**				**S/NS**
	T0	**T1**	**T2**	**T3**	
Yeast & Mould count	2.8	3.2	4.2	4.4	S
Coliform	Nil	Nil	Nil	Nil	-
SPC x 103	10.6	13.2	17.6	19.8	S
Organoleptic Score (9-pointhedonic scale)					
Parameters	**Treatments**				**S/NS**
	T0	**T1**	**T2**	**T3**	
Colour & appearance	7.6	8.0	8.5	8.8	S
Body & texture	8.7	8.1	7.7	7.2	S
Flavour & taste	7.3	7.9	8.6	9.1	S
Overall acceptability	7.5	8.0	8.4	8.9	S
Cost analysis					
Treatments	**T0**	**T1**	**T2**	**T3**	
Cost per 1 kg (In rupees)	209	222.57	221.95	218	

Physico-chemical analysis Moisture Percentage

There was significant difference in moisture were observed in different treatment combination. Maximum moisture of 25.14% was found in the treatment T0 followed by treatments T3 (23.32), T2 (22.21) and T1 (21.09).

The difference in moisture was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Fat Percentage

There was significant difference in fat were observed in different treatment combination. Maximum fat of 25.32% was found in the treatment T1 followed by treatments T2 (23.86), T3 (22.41) and T0 (22.29).

The difference in fat was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Ash Percentage

There was significant difference in ash were observed in different treatment combination. Maximum ash of 2.67% was found in the treatment T0 followed by treatments T1 (2.59), T2 (2.55) and T3 (2.51).

The difference in ash was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Protein Percentage

There was significant difference in protein were observed in different treatment combination. Maximum protein of 16.91% was found in the treatment T0 followed by treatments T1 (15.15), T2 (14.80) and T3 (14.47).

The difference in protein was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Acidity Percentage

There was significant difference in acidity were observed in different treatment combination. Maximum acidity of 0.67% was found in the treatment T0 followed by treatments T3 (0.65), T2 (0.61) and T1 (0.57).

The difference in acidity was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Carbohydrate Percentage

There was significant difference in carbohydrate were observed in different treatment combination. Maximum carbohydrate of 36.59% was found in the treatment T3 followed by treatments T2 (35.77), T1 (35.23) and T0 (32.22).

The difference in carbohydrate was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Total solid Percentage

There was significant difference in total solid were observed in different treatment combination. Maximum total solid of 78.69% was found in the treatment T1 followed by treatments T2 (77.15), T3 (76.64) and T0 (74.38).

The difference in total solid was occur due to the different ratios of Coconut milk and Sapota in different experimental treatments.

Microbial analysis Yeast & Mold count

There was significant difference in yeast and mould scores were observed in different treatment combination. Maximum yeast and mould score of 4.4 was found in the treatment T3 followed by treatments T2 (4.2), T1 (3.2) and T0 (2.8).

Coliform count

In each treatment of prepared Kalakand the coliform count was nil.

Standard plate count

There was significant difference in SPC scores were observed in different treatment combination. Maximum SPC score of 19.8 was found in the treatment T3 followed by treatments T2 (17.6), T1 (13.2) and T0 (10.6).

Organoleptic scores Color & appearance

There was significant difference in color & appearance scores were observed in different treatment combination. Maximum color & appearance score of 8.8 was found in the treatment T3 followed by treatments T2 (8.5), T1 (8.0) and T0 (7.6).

Body & texture

There was significant difference in body & texture scores were observed in different treatment combination. Maximum body & texture score of 8.7 was found in the treatment T0 followed by treatments T1 (8.1), T2 (7.7) and T3 (7.2).

Flavor & taste

There was significant difference in flavor & taste scores were observed in different treatment combination. Maximum flavor

& taste score of 9.1 was found in the treatment T3 followed by treatments T2 (8.6), T1 (7.9) and T0 (7.3).

Overall acceptability

There was significant difference in overall acceptability scores were observed in different treatment combination. Maximum overall acceptability score of 8.9 was found in the treatment T3 followed by treatments T2 (8.4), T1 (8.0) and T0 (7.5).

Conclusion

From present investigation it can be stated that the Coconut milk and Sapota pulp can be very well utilized with buffalo milk for preparation of palatable and nutritious Kalakand by blending them in three different formulations. The product obtained was subjected for chemical, microbial and organoleptic evaluation by panel of judges. It was observed that as the blending of Coconut milk increased, there was increase in total solid, fat and carbohydrate content. Also, there was decrease in moisture, acidity, ash and protein content but ash was decreased in very trace quantity. It was found that as the blending of Sapota pulp increased, there was increase in total solid, acidity and carbohydrate content but acidity was increased in trace quantity. Also, there was decrease in moisture, fat, ash and protein content. It was also observed that the overall acceptability score for treatment T0, T1, T2 and T3 was 7.5, 8.0, 8.4 and 8.9, respectively. The shelf life of treatment T1 was also higher than treatment T0, T2 and T3 due to less acidity and moisture content. The blend of treatment T1 was more acceptable than treatment T1 and T3 due to higher quantity of total solid, fat, protein and ash content and lesser quantity of acidity and moisture content. The cost for treatment T1 was Rs.222.57/Kg.

References

1. Balerdi CF, Crane JH, Maguire I. Sapodilla growing in the Florida home landscape. University of Florida, IFAS Extension, 2005, 10.
2. Bandyopadhyay P. Technological advancement on traditional Indian desiccated and heat-acid coagulated dairy products. Indian Dairyman. 2006; 58(11):59-65.
3. Bhutkar SS, Nimbalkar SS, Kumbhar TV. Studies on effect of different levels of ash gourd pulp for manufacturing of kalakand. IOSR Journal of Agriculture and Veterinary Science. 2015; 8(3):4-6.
4. Coconut Research Centre, 2004
5. Sukumar De. Outlines of dairy technology. Oxford University Press, New Delhi. 1991; 9:514-515.
6. Goyal S, Goyal GK. Advanced computing research on cascade single and double hidden layers for detecting shelf life of kalakand: an artificial neural network approach. International Journal of Computer Sci. and Technology. 2011; 2(5):292.
7. Hagenmaier R. Coconut Aqueous Processing. University of Carlos. Cebu City, Philippines, 1977, 313.
8. Nutritive value of Indian foods, 2002, 303 (Ref#2). Code: 2297
9. NDDB Statistics, 2013, 2
10. Patel KM, Roy SK. Studies on development of value added kalakand using papaya fruit. Indian J of Dairy Science. 2015; 68(1).
11. Sulladmath UV, Reddy NMA. Fruits: Tropical and Sub-tropical. 1985, 565-591.
12. Timmen H, Patton S. Milk fat globules: fatty acid composition, size and *in vivo* regulation of fat liquidity. Lipids. 1989; 23:685-689.
13. USDA. United States Department of Agriculture. National Nutrient Database for Standard Reference, Release. 2004, 16-1. www.apeda.com