



E-ISSN: 2278-4136

P-ISSN: 2349-8234

www.phytojournal.com

JPP 2021; 10(6): 343-347

Received: 07-09-2021

Accepted: 09-10-2021

Arsul Shriram Ramkisan

Department of Dairy
Technology, Warner College of
Dairy Technology, SHUATS,
Prayagraj, Uttar Pradesh, India

John David

Professor & Head of
Department, Department of
Dairy Technology, Warner
College of Dairy Technology,
SHUATS, Prayagraj,
Uttar Pradesh, India

Giram Kishor K

Ph.D. Scholar, Department of
Dairy Technology, Warner
College of Dairy Technology,
SHUATS, Prayagraj,
Uttar Pradesh, India

Corresponding Author:**Arsul Shriram Ramkisan**

Department of Dairy
Technology, Warner College of
Dairy Technology, SHUATS,
Prayagraj, Uttar Pradesh, India

Studies on quality assessment and value addition of kalakand by admixing sapota and papaya pulp with Ashwagandha (*Withania somnifera* L.) Powder

Arsul Shriram Ramkisan, John David and Giram Kishor K

DOI: <https://doi.org/10.22271/phyto.2021.v10.i6e.14307>

Abstract

Kalakand is one of the indigenous milk products obtained by heat desiccation or concentration of whole or standardized milk with subsequent addition of sugar and proper coagulant. Kalakand was prepared under standard procedure from standardized buffalo milk (6% fat and 9% snf). Sapota and Papaya Pulp was incorporated in the Kalakand @ 5% 10% 15% and 20% in combination with constant incorporation of Ashwagandha powder @ 2%. Sensory qualities of the product (Colour and Appearance, Body and Texture, Flavour and Taste) were judged by 9-point Hedonic scale. Effect of different levels of pulp ratio and sensory scores for all attributes were highly acceptable for Kalakand S₂P₂ made with 80% Kalakand, 10% Sapota pulp and 10% Papaya pulp. Increased levels of fruit pulp in S₄P₄ made with 60% Kalakand, 20% Sapota pulp and 20% papaya pulp, resulted in decrease in flavour, texture and overall acceptability. The cost of Kalakand (S₄P₄) estimated to be Rs.251.04 per kg lowest of all treatments was economical.

Keywords: sapota, papaya, ashwagandha, kalakand and sensory quality

Introduction

With an annual growth rate of 6%, India is quickly becoming the world's largest milk producer. India's current milk production is 198.40 MT with per capita availability of 407 gm per day (NDDB Statistics, 2019-20). Milk-based sweets are an important feature of the Indian subcontinent's diet. These delicacies are traditionally served at weddings, festivals, and other special occasions. Traditional Indian dairy products, also known as Indian Indigenous milk products, are any milk products that are indigenous to India and have evolved over time using locally accessible fuels and cooking utensils.

Kalakand is a traditional milk product manufactured by desiccation of heat and prepared from acidified milk with a caramelized flavor and gritty texture. Denaturation and coagulation of milk proteins are the major reactions in the preparation process. Kalakand ranges in color from off white to light caramel. Due to the fact that it is a whole milk concentrate, Kalakand is a rich source of protein, minerals, fat, and lactose. It is 4-6 times more nutrient-dense than milk in terms of calorific content and weight per serving.

Carica papaya L., member of the Caricaceae family, is a native to Tropical America. There is a good reason why papaya is renowned as "the wonder fruit of the tropics," and that is because of its remarkable nutritional and therapeutic properties. Papaya is available throughout the year in India. Area under papaya cultivation in India is 1, 42,000 ha with annual production of about 57, 80,000 MT (National Horticulture Board, 2019-20). Chemical composition of papaya pulp, moisture 87.50%, total solid 12.50%, protein 0.61%, fat 0.14%, ash 0.42%, titrable acidity 0.31%. (Hingne, 2016)^[7].

Sapota (*Manikara achras* Mill.) popularly known as Chikoo is another famous tropical and subtropical fruit in line with mango, banana, jackfruit, etc. Sapota is made up of a soft, easily digested pulp that is rich in sugars like fructose and sucrose, which are easily absorbed. In India, Sapota is cultivated on more than 84,000 ha with an annual production of 9,06,000 MT (National Horticultural Board, 2019-20). The chemical composition of fresh sapota fruits is Moisture content 77 to 83%, protein 0.6 to 0.80, carbohydrate 14.3 to 28.31, fat 0.4 to 1.25, fiber content 0.42 to 28.31. Jadhav *et al.*, (2018)^[8]

India is home to a diverse range of natural flora and wildlife, including medicinal plants used for a variety of purposes. Ashwagandha (*Withania somnifera* L.), which is also known as

Indian ginseng or winter cherry is a significant plant that has been long utilized to treat a variety of clinical problems. Its overall pharmacological characteristics make it a promising therapeutic treatment for anxiety, cancer, microbial infection, and immune-modulation and neurological illnesses. A Dar *et al.*, (2016) [3]

Materials and Method

The present study was carried out in the research Lab of Department of Dairy Technology, Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj- 211007, U.P. (India). All the raw materials were collected from the local market of Prayagraj. The product was prepared with potable water. It was made certain that the materials used were devoid of any illnesses.

Manufacturing of Kalakand

Kalakand was manufactured using standardized milk (6% fat and 9% SNF). It was made using a process specified by Manohar *et al.*, (2018) [11], with minor changes. Standardized milk was placed in a jacketed jar and heated to a simmering temperature (85-90°C) by stirring continuously in a circular motion with occasional scraping of the heating surface with a wooden spoon. 0.02 percent citric acid (in the form of a solution) was added to the milk after 10-15 minutes of boiling, resulting in partial coagulation of the milk. After 1-2 minutes of stirring sapota pulp, papaya pulp and ashwagandha powder was added as per treatment combination. At this stage vigorous stirring was required to obtain a product of good quality. The intensity of heating was reduced when semi-solid state was reached after 10-15 min. Sugar was added @ 7% of amount of milk taken. The finished product was transferred to tray greased (single layer) with ghee for cooling and setting. After cooling and setting at room temperature the set product was cut into the square pieces of 1.5 cm³ size.

Table 1: Recipe formulation for Kalakand

Sr. No.	Treatment	Khoa (%)	Sapota Pulp (%)	Papaya Pulp (%)	Ashwagandha Powder (%)
1	S ₀ P ₀	100	0	0	0
2	S ₁ P ₁	90	5	5	2
3	S ₁ P ₂	85	5	10	2
4	S ₁ P ₃	80	5	15	2
5	S ₁ P ₄	75	5	20	2
6	S ₂ P ₁	85	10	5	2
7	S ₂ P ₂	80	10	10	2
8	S ₂ P ₃	75	10	15	2
9	S ₂ P ₄	70	10	20	2
10	S ₃ P ₁	80	15	5	2
11	S ₃ P ₂	75	15	10	2
12	S ₃ P ₃	70	15	15	2
13	S ₃ P ₄	65	15	20	2
14	S ₄ P ₁	75	20	5	2
15	S ₄ P ₂	70	20	10	2
16	S ₄ P ₃	65	20	15	2
17	S ₄ P ₄	60	20	20	2
Note: Sugar use For all treatment: @ 7% of milk taken					
Papaya Pulp			Sapota Pulp		
P ₀ = 0%			S ₀ = 0%		
P ₁ = 5%			S ₁ = 5%		
P ₂ = 10%			S ₂ = 10%		
P ₃ = 15%			S ₃ = 15%		
P ₄ = 20%			S ₄ = 20%		

Result and Discussion

A panel of five judges assessed the finished product for sensory evaluation (colour and appearance, flavour, body and texture, and overall acceptability). The 9 point Hedonic scale was used to evaluate the product.

Table 2: Sensory evaluation Attributes of Kalakand

Sr. No	Treatment	Colour and Appearance	Flavour and Taste	Body and Texture	Overall Acceptability**
1	S ₀ P ₀	7.39	8.14	8.44	8.09
2	S ₁ P ₁	7.84	8.48	8.17	8.29
3	S ₁ P ₂	8.12	8.52	8.25	8.22
4	S ₁ P ₃	8.39	8.62	8.41	8.13
5	S ₁ P ₄	8.44	8.68	8.48	8.10
6	S ₂ P ₁	8.52	8.64	8.52	8.18
7	S ₂ P ₂	8.68	8.72	8.62	8.33
8	S ₂ P ₃	8.54	8.53	8.56	8.13
9	S ₂ P ₄	8.43	7.32	8.42	7.74
10	S ₃ P ₁	7.58	7.46	7.93	8.18
11	S ₃ P ₂	7.51	7.58	7.88	8.03
12	S ₃ P ₃	7.68	7.63	7.73	7.88
13	S ₃ P ₄	7.89	7.69	7.62	7.62
14	S ₄ P ₁	7.52	7.38	7.42	7.48
15	S ₄ P ₂	7.45	7.42	7.56	7.64
16	S ₄ P ₃	7.52	7.28	7.64	7.58
17	S ₄ P ₄	7.13	7.13	7.31	7.42

I. Sensory evaluation of Kalakand

1. Colour and appearance score of Kalakand

The highest mean in colour and appearance score of Kalakand was obtained maximum in treatment S₂P₂ (8.68) while S₄P₄ recorded the minimum (7.13). Fruit pulp added showed impact on the colour and appearance score of Kalakand.

2. Flavour and taste score of Kalakand

The highest mean in flavor and taste score of Kalakand was obtained in treatment S₂P₂ (8.72) while S₄P₄ recorded the minimum (7.13). Fruit pulp added showed impact on the flavor and taste score of Kalakand.

3. Body and texture score of Kalakand

The highest mean in body and texture score of Kalakand was obtained in treatment S₂P₂ (8.62) while S₄P₄ recorded the minimum (7.31). Fruit pulp added showed impact on the body and texture score of Kalakand.

4. Overall Acceptability score of Kalakand

The highest mean in overall acceptability score of Kalakand was obtained in treatment S₂P₂ (8.33) while S₄P₄ recorded the minimum (7.42). Fruit pulp added showed impact on the overall acceptability score of Kalakand.

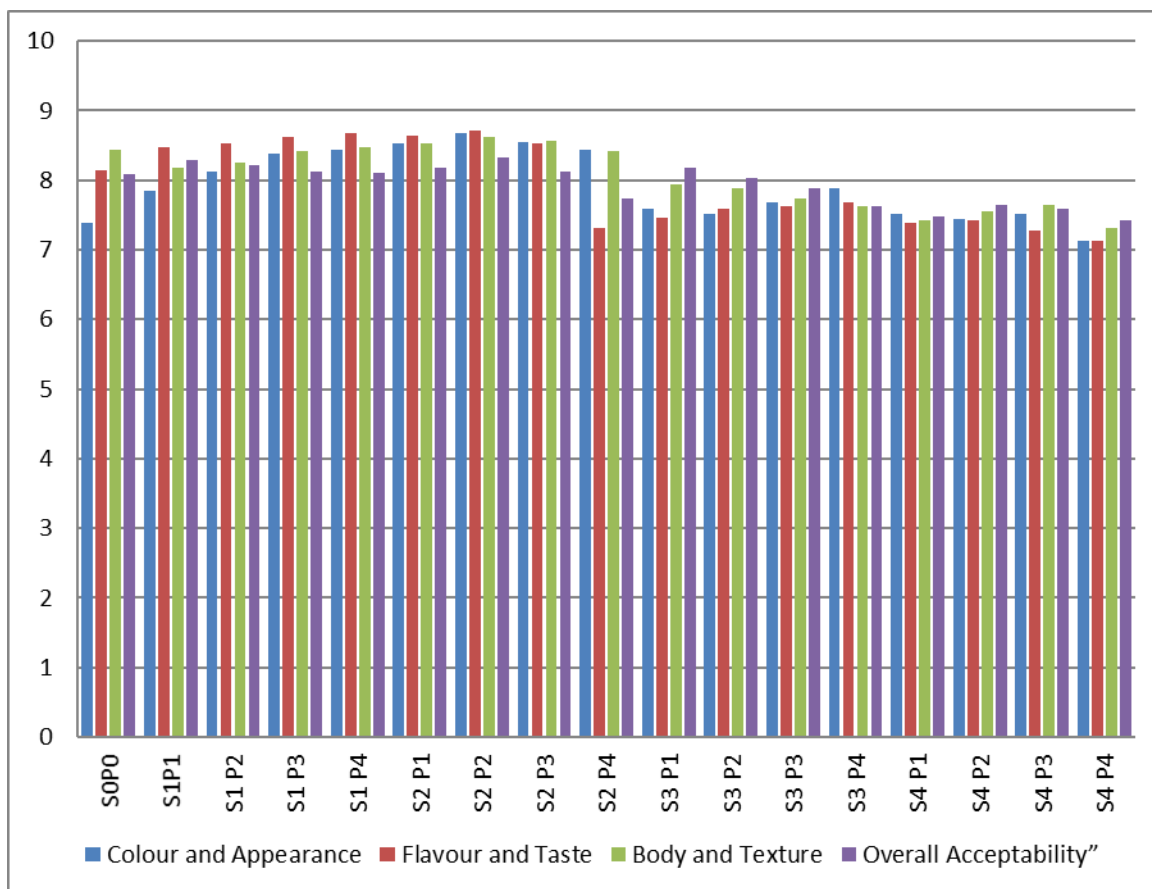


Fig 1: Chart for Sensory evaluation of Kalakand

II. Cost of Kalakand

In addition to other aspects, the cost of the ingredients plays a significant role in determining the cost of production of Kalakand. It serves as a foundation for setting prices and

calculating profits. The cost of production determines the price of a product. Kalakand's price was computed and is listed in the table. Tables-2 exhibit the cost analysis results as well as formulas.

Table 2: Ingredients used in the preparation of Kalakand

Sr. No.	Treatment	Kalakand		Sapota Pulp		Papaya Pulp		Ashwagandha Powder		Sugar	Processing cost	Total Cost
		260 Rs./Kg	90 Rs/kg	140 Rs./Kg	500 Rs/Kg	35 Rs./Kg	(15%)	Rs./kg				
		gm.	Rs.	gm.	Rs.	gm.	Rs.	gm.	Rs.	Rs.	Rs.	Rs."
1	S ₀ P ₀	1000	260	0	0	0	0	0	0	10.5	40.57	311.08
2	S ₁ P ₁	900	234	50	4.5	50	7.0	20	10	9.45	39.74	304.69
3	S ₁ P ₂	850	221	50	4.5	100	14.0	20	10	8.90	38.76	297.16
4	S ₁ P ₃	800	208	50	4.5	150	21.0	20	10	8.40	37.78	289.68
5	S ₁ P ₄	750	195	50	4.5	200	28.0	20	10	7.85	36.80	282.15
6	S ₂ P ₁	850	221	100	9.0	50	7.0	20	10	8.90	38.38	294.28
7	S ₂ P ₂	800	208	100	9.0	100	14.0	20	10	8.40	37.41	286.81
8	S ₂ P ₃	750	195	100	9.0	150	21.0	20	10	7.85	36.43	279.27
9	S ₂ P ₄	700	182	100	9.0	200	28.0	20	10	7.35	35.45	271.80
10	S ₃ P ₁	800	208	150	13.5	50	7.0	20	10	8.40	37.03	283.93
11	S ₃ P ₂	750	195	150	13.5	10	14.0	20	10	7.85	36.05	276.40
12	S ₃ P ₃	700	182	150	13.5	150	21.0	20	10	7.35	35.07	268.92
13	S ₃ P ₄	650	169	150	13.5	200	28.0	20	10	6.80	34.09	261.39
14	S ₄ P ₁	750	195	200	18.0	50	7.0	20	10	7.85	35.67	273.52
15	S ₄ P ₂	700	182	200	18.0	100	14.0	20	10	7.35	34.70	266.05
16	S ₄ P ₃	650	169	200	18.0	150	21.0	20	10	6.80	33.72	258.52
17	S ₄ P ₄	600	156	200	18.0	200	28.0	20	10	6.30	32.74	251.04

Note: Sugar use for all treatment: 7% of milk taken

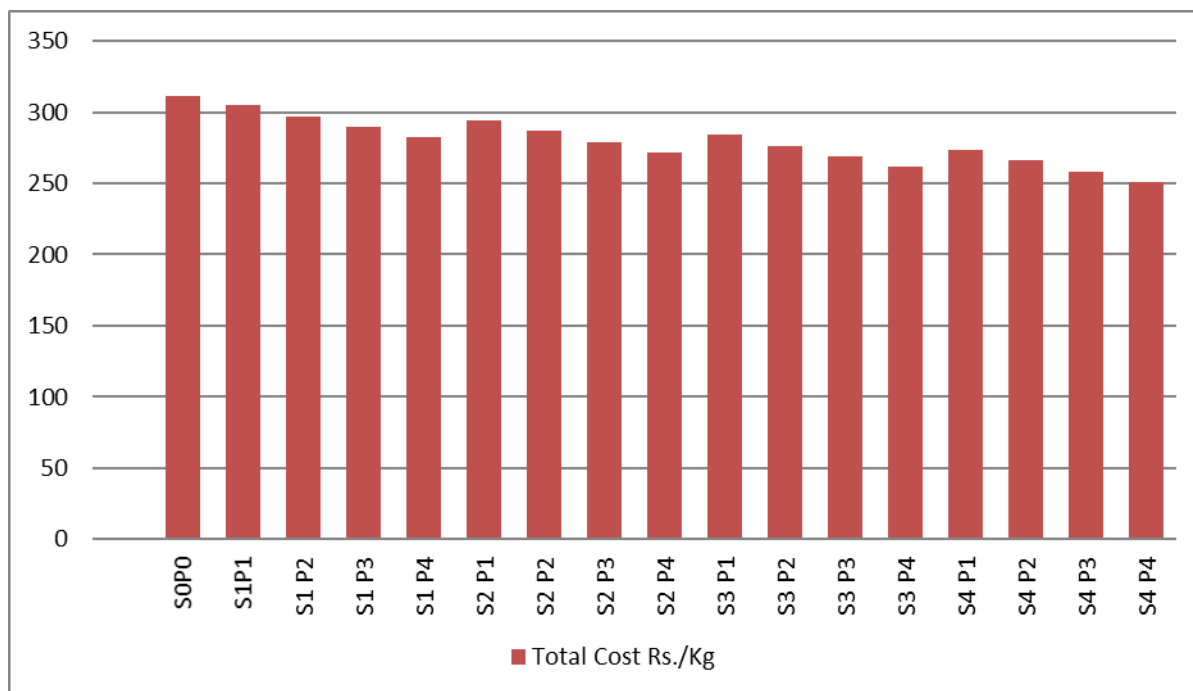


Fig 2: Chart for Sensory evaluation of Kalakand

Rates of different ingredients used for preparation of Kalakand

1. Cost of Kalakand 260 Rs. per kg.
2. Cost of Sapota pulp 90 Rs. Per kg.
3. Cost of Papaya pulp 140 Rs. Per kg.
4. Cost Ashwagandha powder @ Rs 500 per kg.
5. Sugar Rs. 35 per kg.
6. Cost of processing taken as 15% of cost of ingredients used.

The cost of prepared Kalakand

The average cost of 1 kg Kalakand samples S₀P₀, S₁P₁, S₁P₂, S₁P₃, S₁P₄, S₂P₁, S₂P₂, S₂P₃, S₂P₄, S₃P₁, S₃P₂, S₃P₃, S₃P₄, S₄P₁, S₄P₂, S₄P₃ and S₄P₄ were Rs. 311.08, 304.69, 297.16, 289.68, 282.15, 294.28, 286.81, 279.27, 271.80, 283.93, 276.40, 268.92, 261.39, 273.52, 266.65, 258.52, and 251.04 respectively.”

It can be reveals that the cost of production of Kalakand control treatment (S₀P₀) is Rs. 311.08 and is higher than all other treatments. While the cost of production of Kalakand treatment (S₄P₄) is Rs. 251.04 is lower than all other treatments. The cost differences were attributable to the different percentages of fruit pulp utilized in the Kalakand preparation.

Conclusion

Kalakand is one of the traditional milk product which is made by desiccation of milk by direct heat with caramelized flavor and granular texture prepared from acidified milk. The main reaction in preparation is denaturation and coagulation of milk proteins. Kalakand has unique importance in market because it is liked by all classes of people Kalakand is indisputable product having economic importance especially in rural part of India as it provides good means for converting surplus milk into value added products. From the investigation, it is evident that manufacturing of Kalakand in appropriate proportions with other ingredients like sapota pulp, papaya pulp and ashwagandha powder produced acceptable quality in the product.

Further, it is concluded that the Kalakand containing 10% sapota pulp and 10% papaya pulp (S₂P₂) showed significant difference in organoleptic characteristics (Colour & Appearance, Flavour & Taste, Body & Texture and Overall Acceptability). On the other hand, it will be helpful from economic point of view for that person who comes under economically weaker section, because by using standardized buffalo milk with fruit pulp, cost of the product can considerably be reduced. The cost of Kalakand prepared from standardized buffalo milk and by addition of 20% sapota pulp and papaya pulp with 2% ashwagandha (S₄P₄) was estimated to be Rs.251.04 Rs /kg.

References

1. Aneja RP, Mathur BN, Chandan RC, Banerjee AK. Heat-acid coagulated products. Technology of Indian milk products. A Dairy India Publication, Delhi, India, 2002, 133-158.
2. AOAC. Official method of Analysis, Assoc. off. Anal. Chem. Washington; D.C.13th. ED, 1980.
3. Dar AP, Singh RL, Kamal AM, Dar AT. Unique medicinal properties of *Withania somnifera*: Phytochemical constituents and protein component. Current pharmaceutical design 2016;22(5):535-540.
4. BIS IS: 18 Handbook of food analysis Part XI. Dairy products. Bureau of Indian Standards, Manak Bhavan, New Delhi, 1981.
5. De S. Textbook of Outlines of Dairy Technology, Oxford University Press, Bombay, Calcutta, Madras, 1982, 416-514.
6. Dukare SS. Process Standardization for the Manufacture of Kalakand using Amla Powder as Acidulent (Doctoral dissertation, AAU, Anand), 2015.
7. Hingne PN. Studies on preparation of milk shake blended with papaya pulp. M.Sc. (Agri.) Thesis Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola, India, 2016.
8. Jadhav SS, Swami SB, Pujari KH. Study the Physico-Chemical Properties of Sapota (*Achras sapota* L.). Trends Tech Sci Res 2018;3(1):555-565.

9. Kadam SG, Chavan KD. Sensory quality of *Kalakand* Prepared by using ginger (*Zingiber officinale*) paste, International Journal of Chemical Studies 2019;7(4):1663-1666.
10. Kumar P, Singh SB. Formulation and evaluation of wood apple supplemented Kalakand. The Pharma Innovation 2017;6(4C):145-147.
11. Manohar AB, Gawali AS, Raundal RM, Kedare VS, Shinde DV. Sensory evaluation of Kalakand enriched with papaya pulp (*Carica Papaya*), International Journal of Chemical Studies 2018;6(2):3385-3386.
12. Manual in Dairy Chemistry ICAR sub-committee on dairy education, NDRI Karnal 1972;(28):74-86.
13. National Horticulture board, (2019-20). Indian Horticulture database, Ministry of Agriculture, Government of India.
14. NDDB Statistics Milk Production in India. www.nddbstatistics.com, Gujrat. 2019-20.
15. Nagar A, Rai DC, Jain VK. Standardization of papaya (*Carica papaya* L.) enriched kalakand and estimation of its cost of production. IJCS, 2017;5(3):93-96.
16. Patel KM, Patel JM, Patel DC, Patel NB, Raval JK, Vihol PD. Effect of metabolized polyethylene terephthalate, vacuum packaging and storage temperature on shelf life of papaya pulp Kalakand (Indian cookie). Journal of Applied and Natural Science 2016;8(3):1375-1379.
17. Sawant VY, Thombre BM, Chauhan DS, Padghan PV. Preparation of kalarand with sapota fruit. Journal of Dairying, Foods and Home Sciences 2006;25(3, 4):186-189.
18. Tayade DN. Preparation of kalakand from cow milk blended with mango (*Mangifera indica* L.) pulp. M.Sc. (Agri) Dissertation submitted to Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola, (M.S.) India, 2016.
19. Verma G, Singh SS, Singh R, Singh A. Development and quality assessment of kalakand prepared by using buffalo milk blended with coconut milk and sapota. The Pharma Innovation Journal 2018;7(8):52-56.