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## Formulation and evaluation of wood apple supplemented Kalakand

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### Abstract

Kalakand is one of the indigenous milk product obtained by heat desiccation/concentration of whole/standardized milk with subsequent addition of sugar and proper coagulant. The present investigation was made with an attempt to develop Kalakand by addition of Wood apple pulp at different level of concentration using buffalo milk. The data collected on different aspects were tabulated and analyzed statistically using the methods of analysis of variance and critical difference. The pulp combination was incorporated at 0 per cent, 5 per cent, 10 per cent and 15 per cent level (replacing chhana). Physical analysis was conducted through organoleptic tests and chemical analysis was done through proximate analysis. According to the analysis, treatment T<sub>3</sub> with 15 per cent wood apple pulp combination was found to be the best. Thus, product acceptability judged by organoleptic evaluation and therapeutic value, the treatment can be rated as T<sub>3</sub>>T<sub>2</sub>> T<sub>1</sub>>T<sub>0</sub>.

**Keywords:** Wood apple, buffalo milk, kalakand, organoleptic evaluation, compositional analysis

### Introduction

Since times immemorial milk has been known to human beings as an almost complete food. Milk is utilized in various forms like cream, butter, cheese, concentrated milk (Khoa) and dried milk products. There is an ever increasing varieties of milk products being introduced in the market with an increased palatability and fascinating forms.

Among the indigenous milk products, kalakand occupies an important place and found to be an attractive product amongst all the classes of consumers. Kalakand is more popular in Northern and Eastern India, particularly with Bengali people. Kalakand is a milk sweet prepared by heating a mixture of khoa and sugar with continuous stirring until characteristic grainy texture and caramelized flavour develops.

Wood apple has promising therapeutic value because of the presence of various phyto constituents such as tannins, alkaloids, steroids, flavonoids, terpenoids, fatty acids and vitamins.

It has laxative effects. Wood apple include relief from constipation, indigestion, peptic ulcer, piles, respiratory problems, diarrhoea, and dysentery. It also boosts the immune system, fights off bacterial and viral infections, reduces inflammation and various inflammatory conditions, prevent cancer, increases milk production for nursing mothers, cures diabetes, increases ocular health, and helps prevent various sexual dysfunctions.

Studies on preparation of kalakand fortified with wood apple pulp are rare and hardly reported so far. In general there is a considerable scope for standardizing the process of kalakand preparation incorporated with wood apple pulp in order to improve its quality and also to enhance consumer preference. Wood apple is the most popular choice of fruits of the tropics because of its palatability, excellent taste, pleasant aroma and nutritive value.

### Materials and Methods

#### Preparation of Kalakand

The procedure given by Kumar *et al* (1997) [10] was followed with slight modifications. Buffalo milk was filtered through muslin cloth and standardized to 6 per cent fat and 9 per cent SNF. Then the milk was boiled. At the appearance of first boiling, 0.05 per cent citric acid (on volume of milk) dissolved in small quantity of water is added to milk. Milk was converted in chhana. The calculated amount of wood apple pulp and sugar @ 30 per cent of chhana were added. Finally the mixture was heated on low fire with continuous stirring till the desired texture was obtained.

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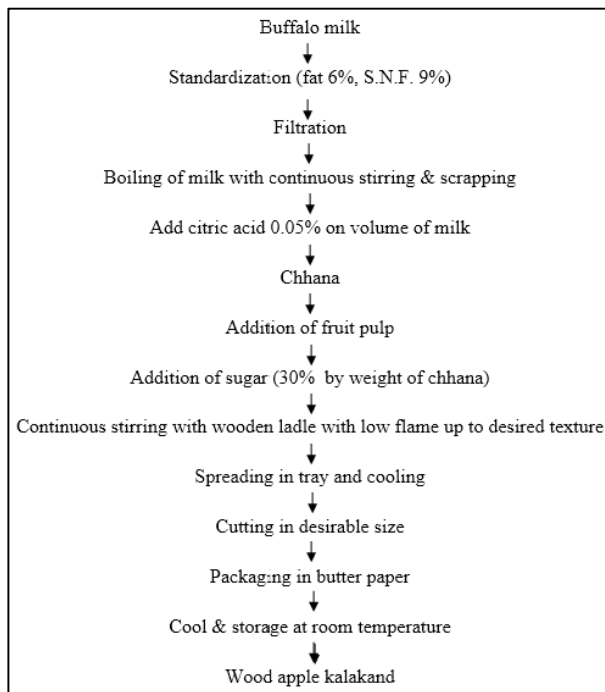


Fig. 1: Flow chart for preparation of control and wood apple pulp supplemented kalakand

**Treatment details**

T<sub>0</sub>- 0 parts of wood apple pulp + 100 parts of chhana by weight.  
 T<sub>1</sub>- 5 parts of wood apple pulp + 95 parts of chhana by weight.  
 T<sub>2</sub>- 10 parts of wood apple pulp + 90 parts of chhana by weight  
 T<sub>3</sub>- 15 parts of wood apple pulp + 85 parts of chhana by weight  
 The different levels were tried and compare with control (T<sub>0</sub>)

Table 1: Chemical composition of buffalo milk and wood apple pulp (Mean±SE)\*.

Parameters	Fat (%)	Preprotein (%)	Carbohydrate (%)	Ash (%)
Buffalo milk	6.0±0.06	3.6±0.06	4.7±0.04	0.7±0.03
Wood apple pulp	0.21±0.04	1.7±0.17	31.2±0.34	1.2±0.22

\*Average of five trials.

**Quality of Kalakand**

**Physical parameters**

The score of colour & appearance, body & texture, flavour & taste as well as the overall acceptability of different types of Kalakand were compiled in Table 2. It was observed that the individual and total score of physical parameters were

**Organoleptic evaluation**

Wood apple supplemented Kalakand was served to panel members consisting of 5 experienced persons using 9-point hedonic scale (Amerine *et al.*, 1965)<sup>[1]</sup>

**Compositional analysis**

The Kalakand was analysed for total solids, fat, protein, carbohydrate, ash and titratable acidity. Total solids of wood apple supplemented Kalakand was determined by gravimetrically as per the procedure for milk laid down in IS 2802, 1964. The fat percentage of kalakand was determined as per procedure laid down in IS:1166-1973. Determination of protein was done as per the procedure suggested by Maneffee and Overman (1940)<sup>[11]</sup>. Determination of carbohydrate was done according to SP:18, Part XI, 1981. Determination of ash content was done as per the procedure laid down in IS: 5962, 1970. Determination of titratable acidity was done according to IS:1166-1973.

**Statistical analysis**

The data obtained were statistically analyzed by MS Excel software.

**Results and Discussion**

**Initial quality of buffalo milk**

The flavor, appearance and colour of the milk sample was normal. The mean values of fat, protein, lactose and ash for buffalo milk were 6.0±0.06 per cent, 3.6±0.06 per cent, 4.7±0.04 per cent, and 0.7±0.03 per cent respectively (Table 1).

**Initial quality of wood apple pulp**

The fat (%), protein (%), carbohydrate (%) and ash (%) of wood apple pulp sample were 0.21±0.04, 1.7±0.17, 31.2±0.34 and 1.2±0.22 respectively (Table 1).

significantly increased when 5 per cent wood apple pulp added to Kalakand. These properties could further be increased significantly by increasing the level upto 15 per cent. The result of this experiment shows that physical properties of wood apple blended kalakand was higher than that of control kalakand.

Table 2: Summary of the results of physical evaluation of different Kalakand samples (Mean±SE)\*.

Parameters	Types of Kalakand			
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Body & Texture	7.90±0.04	8.00±0.03	8.20±0.04	8.40±0.05
Colour & Appearance	7.30±0.03	7.70±0.04	8.0±0.05	8.30±0.06
Flavour & Taste	7.20±0.05	7.90±0.04	8.20±0.03	8.60±0.05
Overall Acceptability	7.40±0.05	7.80±0.04	8.10±0.06	8.48±0.04

\*Average of five trials.

**Chemical parameters**

The total solids (%), fat (%), protein (%), carbohydrate (%), ash (%) and acidity (%) of different types of kalakand were compiled in Table 3. A significantly decreasing trend was

observed in the fat, protein, carbohydrate and ash content of kalakand with increasing level of the pulp combination. The probable reason may be due to the lower protein, fat and ash content of the pulp combination.

**Table 3:** Summary of the results of chemical evaluation of different Kalakand samples (Mean±SE)\*.

Parameters	Types of Kalakand			
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Total Solids (%)	82.97±0.36	80.37±0.22	78.08±0.28	75.68±0.34
Fat (%)	25.12±0.26	23.83±0.32	22.65±0.28	21.38±0.34
Protein (%)	17.45±0.56	16.53±0.48	15.84±0.37	15.09±0.51
Carbohydrate (%)	37.73±0.52	37.42±0.41	37.06±0.38	36.75±0.46
Ash (%)	2.67±0.10	2.59±0.08	2.53±0.07	2.46±0.09
Titrate acidity (%)	0.76±0.04	0.68±0.03	0.64±0.05	0.61±0.04

\*Average of five trials.

### Microbiological Analysis

The coliform count for optimized product was analysed and it was found to be absent.

### Conclusion

From this study it may be concluded that the superior and nutritional quality wood apple kalakand can be prepared by addition of 15 parts of wood apple pulp and 85 parts of channa by weight basis with addition of 30 per cent sugar. There is a great scope of manufacturing kalakand blended with wood apple pulp as it is proved to have nutritional properties as well as health benefits and it is good for all age group people.

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