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Effect of maltodextrin as fat replacer on physico chemical properties of low fat dietetic kalakand

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Abstract
A study was conducted to use Maltodextrin as a fat replacer which being a carbohydrate, (very low in fat) is used for manufacturing dietetic kalakand. Three different levels of maltodextrin i.e. 1%, 2%, and 3% were used along with skim milk to manufacture kalakand. Skim milk and maltodextrin mixture were heated and partially coagulated by citric acid to get pat stage. Sugar @ 7% of milk is added along with Cardamom and Pista. The mixture was allowed to cool and set. It was cut and given shapes to get marketable kalakand. The product was analyzed for organoleptic attributes (colour and appearance, body and texture, flavour and taste and overall acceptability) by trained panelist using 9 point hedonic scale. Physicochemical (fat%, total solids%, acidity%, moisture content and yield%) and microbiological analysis (SPC, yeast and moulds, coliform) analysis were done for estimating its nutritional content and safety. Based on the statistical analysis of data obtained from various parameters using different percentage of maltodextrin, experimental treatments were found superior to control as far as organoleptic attributes are concern.

Keywords: Skim milk, Maltodextrin, Kalakand.

Introduction
Milk and milk products have been recognized as significant contributors of important nutrients to human diet. Among the indigenous milk products, Kalakand occupies an important place and found to be attractive product amongst all the classes of consumers. Kalakand is partially desiccated milk product with caramelized flavour and granular texture prepared from acidified milk (David, 2009) [5]. The granular mass is fused and held together in loosely compact body. The colour of Kalakand varies from off-white to light caramel colour. Being a whole milk concentrate, Kalakand is a good source of protein, mineral, energy giving fat and lactose. It is 4-6 times more nutritious in terms of per unit weight and calorific value.
Among the indigenous milk products, kalakand occupies an important place. It is a partially desiccated milk product with caramelized flavour and granular texture prepared from acidified milk and found to be an attractive product among all classes of consumers (Suresh and Jha, 1994) [7]. Kalakand is a good source of proteins, minerals, energy giving fat and lactose. It is 4-6 times more nutritious than milk in terms of per unit weight and calorific values, being a whole milk concentrate. It can be made by two methods, i.e. from milk or from khoa. Kalakand made from milk slightly differ in respect of its manufacturing process to that of kalakand made from khoa. Maltodextrin is easily digestible carbohydrate made from natural corn starch. The starch is cooked and then acid or enzymes are used to break the starch into smaller polymers. Maltodextrin is defined as a product having dextrose equivalent (DE) less than 20. It is recognized as safe food ingredient. Maltodextrin is excellent solids builder for standard and low fat products. Maltodextrin can be used as a fat replacer (Dorp, 1995) [6], texture modifier and bulking agent in dairy products. It provides only 4 calories/g of food. Keeping in mind the nutritional properties and energy value of maltodextrin, an attempt has been made to explore the use of maltodexrin for manufacturing dietetic kalakand using the method of manufacture as laid down by (Aneja *et.al*., 2002) [1]

Material and Methods
First of all, buffalo milk containing 6% fat and 9% SNF was used as control (T_0) and for experimental treatments skim milk was standardized with 0.5% fat and 8.7% SNF together with 1% maltodextrin (T_1), skim milk and 2% maltodextrin (T_2) and skim milk and 3% maltodextrin (T_3) were used. Milk was heated upto boiling temperature and 0.01% citric acid was added to obtain pat stage. Then sugar was added @ 7% of milk along with Cardamom and Pista. The finished product was set in a greasy tray and allowed to cool at room temperature. It was then cut into desired size and shape. Thus the kalakand was ready. Samples were tested

for physicochemical parameters (moisture, fat, total solids, acidity, & yield) and microbiological parameters (Standard Plate Count, yeast and mould count, coliform count) as per procedure given in the food chemistry manual of Allahabad Central University.

Table 1: Details of different treatments using Maltodextrin for preparation of Low fat Dietetic Kalakand

Materials	Different treatments (Low fat Dietetic Kalakand)			
	T_0	T_1	T_2	T_3
Maltodextrin	-	1%	2%	3%

Skim milk + maltodextrin (1%, 2%, 3%)
↓
Heating of milk
↓
Addition of citric acid
↓
Pat stage
↓
Addition of sugar(7% of milk)
↓
Addition of cardamom and pista
↓
Setting of mixture
↓
Cutting and shaping
↓
Low fat Dietetic Kalakand

Fig 1: Flow chart for preparation of low fat Dietetic Kalakand

Results and Discussion

Physicochemical properties

Table-2 shows average Physico-chemical parameters of control and low fat dietetic kalakand

Table 2: Physicochemical parameters of control and low fat dietetic kalakand

Parameters (%)	Control and Low fat Dietetic Kalakand				F Value	CD
	T_0	T_1	T_2	T_3		
Fat	16.98	2.78	1.74	1.30	4983.25*	0.33
Moisture	15.09	20.05	18.85	15.91	938.85*	0.24
Total Solids	84.91	79.95	81.15	84.09	1609.64*	0.23
Acidity	0.15	0.13	0.11	0.09	3.20**	-
Yield	26.04	22.20	23.08	23.96	85.47*	0.55

* Significant at 5 % level
** Non-significant at 5 % level

Moisture percentage

The lowest moisture content of kalakand (15.09%) was obtained from T_0 (control), whereas the maximum moisture content (20.05%) was found in treatment (T_1), followed by T_2 (18.85%) and T_3 (15.91%). There were significant difference found in average moisture content (%) of kalakand of control and experimental samples. F value was 938.85, indicating significant effect of treatment on moisture percentage.

Fat percentage

The lowest fat content of kalakand (1.3%) was obtained from T_3 (skim milk and 3% maltodextrin) whereas the highest fat% in the product was obtained in T_0 (16.98), followed by T_1 (2.78), T_2 (1.74). There were significant difference found in average fat content of kalakand of control and experimental samples. F value was 4983.25, indicating significant effect of treatment on fat percentage.

Total solids

The maximum total solids of kalakand (84.91%) was obtained from treatment T_0 (control) followed by T_3 (84.09) and T_2 (81.15%), whereas the minimum total solids (79.95%) was found in T_1. There were significant difference found in average total solids content of kalakand of control and experimental samples. F value was 1609.64, indicating significant effect of treatment on total solids.

Acidity

The lowest acidity of kalakand (0.09%) was obtained for treatment T_3 (skim milk and 3% maltodextrin), whereas the maximum acidity was found in control T_0 (0.15%), followed by T_1 (0.13%) and T_2 (0.11%). There were no significant differences found in average acidity (%) of kalakand of control and experimental sample. F value was 3.20, indicating significant effect of treatment on acidity.

Yield

The maximum yield of kalakand (26.04) was obtained for treatment T_0 (control) followed by T_3 (23.96) and T_2 (23.08%), whereas the minimum yield (22.20%) was found in T_1. There was significant difference found in average yield (%) of kalakand of control and experimental samples. F value was 85.47, indicating significant effect of treatment on yield.

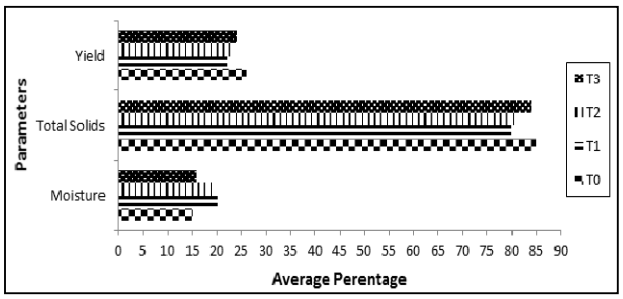

Fig 2: Average of different physico-chemical parameters and yield of Control and Low fat Dietetic Kalakand.

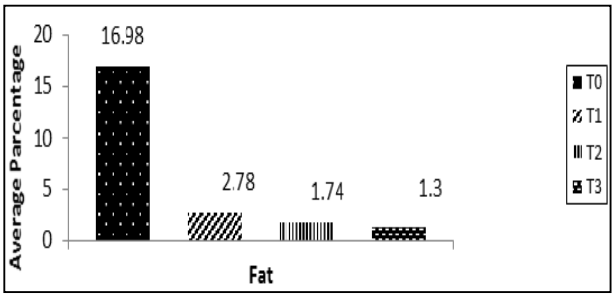

Fig 3: Average of fat percentage of Control and Low fat Dietetic Kalakand.

Average of different Microbial Parameters of control and low fat dietetic kalakand

Standard Plate count

As per table-3, the minimum standard plate count of kalakand was obtained from T_3 (7.60), whereas the maximum Standard Plate Count was found in T_0 (8.80), followed by T_1 (8.60), and T_2 (8.40). There was no significant difference found in average standard Plate Count of kalakand of control and experimental samples. There were no significant differences found among the treatments. F value was 2.96, indicating no significant effect of treatment on standard plate count.

Yeast and Mould count

The highest mean value for yeast and mould count was found in T_0 (29.80), followed by T_1 (27.60), T_2 (25.20) and T_3 (24.20). The treatments differed significantly. F value was 2.23, indicating significant effect of treatment on Yeast and mould count.

Coliform count

There were no coliform found in all the treatments, thus indicated proper hygiene was followed.

Table 3: Microbial parameters of control and low fat dietetic kalakand

Parameters	Control and low fat dietetic kalakand				F Value	CD
	T_0	T_1	T_2	T_3		
SPC(10^3)cfu/gm	8.80	8.60	8.40	7.60	2.96**	-
Yeast and mould count (10^2)cfu/gm	29.80	27.60	25.20	24.20	2.23**	-
Coliform count (10^1)cfu/gm	Nil	Nil	Nil	Nil	-	-

* Significant at 5 % level

** Non-significant at 5 % level

Conclusion

In view of the experimental results obtained during the present investigation, it may be concluded that the kalakand made from buffalo milk i.e. T_0 (control) received highest score and was liked very much by the panel of judges in the organoleptic evaluation. This treatment also recorded maximum total solids, yield and minimum moisture content. Kalakand samples of T_3 (skim milk and 3% maltodextrin) were found to be the best in chemical and microbiological analysis (minimum fat, acidity, SPC, yeast & mould count, coliform count). There were no significant difference found between control and experimental kalakand. So it may be concluded the product was as good as control.

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