



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(5): 2590-2593

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Received: 10-07-2019

Accepted: 12-08-2019

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Preparation of value added Sandesh by adding bael and stevia

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Abstract

Sandesh is a traditional Indian dairy product consumed as sweet dairy desserts, prepared by acid and heat coagulation of milk. It is popular throughout eastern part of India especially in West Bengal. The aim of the present study was to incorporate beneficial components of bael fruit pulp in the product and reducing the energy content by addition of stevia. For substituting one gram of sugar, five milligram of stevia was added in Sandesh. Organoleptic evaluation of Sandesh was done and was found to be highly acceptable at incorporation of 15% bael pulp powder. Percentage of sugar reduced in Sandesh was 50 by using stevia powder in milk based bael product. Addition of bael pulp powder resulted in significant increase in fibre content of the product. The potassium content increased significantly in the acceptable sweet product as compared to the control and the sodium content decreased significantly in the value added sweet product. Addition of stevia resulted in a significant decrease in energy content of Sandesh.

Keywords: Sandesh, incorporate, traditional, stevia, bael pulp powder

Introduction

Sandesh is heat-acid coagulated milk product available in India. It is a sweet product mostly produced in unorganized small-scale sectors. Sandesh is popular due to its palatability and aroma. It is a rich source of milk protein, fat, carbohydrate and vitamins like A and D (Patil, 2005) [7]. The partly dewatered product, called chhana, is kneaded into a uniform dough, mixed with sugar and cooked over low flame with constant scraping until the mixture gets the desired consistency and flavor. Bael fruit is acrid and bitter. It enhances the production of bile. It acts as a restorative and enhances body's immunity and resistance. The dry powder of bael when taken with fresh curd or water thrice a day can control diarrhoea. The fruit of *A. marmelos* has high nutritional value. The fruit is used to make jam, juice, jelly, syrup, toffee and other products. The pulp contains water, sugars, protein, fiber, fat, calcium, phosphorus, potassium, iron and vitamins (Vitamin A, Vitamin B1, Vitamin C and Riboflavin) (Rathore 2009) [9]. The purified constituents of this fruit are biologically active in fighting against several major diseases like diabetes, cancer and cardio vascular diseases (Maity *et al.* 2009) [6].

The addition of stevia leaves (dried) in various products not only aid in increasing the sweetness but also help in rejuvenating the pancreatic gland. Stevia is nutrient rich containing substantial amounts of protein, calcium and phosphorous (Geuns 2003) [3]. The sensory characteristics of three recipes using stevia sweetener and concluded that stevia can replace some or all of the sugar in recipes without drastically changing the visual acceptability or physical characteristics of the food product (Kerzicnik *et al.* (1999) [4].

Materials and Methods: Raw ingredient eas purchased from local market. Bael pulp was cleaned to remove unwanted material and seeds. Bael fruit powder was prepared by drying the pulp in thin layers and dried to below four per cent moisture in a cabinet drier at $60 \pm 5^\circ\text{C}$. Dried pulp pieces were ground to make a fine powder. The powder thus obtained was incorporated for development of value added products. Sandesh was first standardized with different levels of bael pulp powder. In second standardization, the sugar content of acceptable product with bael was then reduced and stevia powder was incorporated at different levels. The sensory evaluation of the developed value added products was carried out to select the most acceptable level of bael pulp powder from the first trial as well as the acceptable level of stevia powder in the development of products in the second trial on a nine point hedonic scale (Larmond E, 1970) [5]. Nutritional evaluation of developed value added products was carried out using standard AOAC methods (AOAC, 2000) [1].

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Results and Discussions

Sandesh

Sandesh was standardized at two levels:

Standardization-I

Table 1: Sandesh using different levels of bael powder

Ingredients	Sandesh				
	C	B1	B2	B3	B4
Fresh cottage cheese/channa (g)	100	95	90	85	80
Bael powder (g)	--	5	10	15	20
Sugar (g)	20	20	20	20	20

C – Control (100% cheese)

B1-5% bael powder B2-10% bael powder B3-15% bael powder B4-20% bael Standardization-II

Table 2: Sandesh using acceptable level of bael and different levels of stevia powder

Ingredients	Sandesh				
	C	BS1	BS2	BS3	BS4
Fresh cottage cheese/channa (g)	85	85	85	85	85
Bael powder (g)	15	15	15	15	15
Sugar (g)	20	15	10	5	--
Stevia (mg)	--	25	50	75	100

C – Control (85% cheese+ 15% bael powder+100% sugar)

Table 3: Mean sensory scores for Sandesh incorporated with bael powder

Samples	Parameters					
	Appearance	Colour	Texture	Flavour	Taste	Overall acceptability
C	7.8	7.8	7.85	8.05	7.85	7.87
B1	7.7	7.4	7.7	7.3	7.7	7.56
B2	7.6	7.6	7.7	7.7	7.5	7.62
B3	8	7.8	8.1	7.9	7.95	7.95
B4	6.9	7.1	6.9	6.8	6.5	6.84
χ^2	20.587**	6.684*	17.285**	23.158**	25.977**	26.790**

** Significant at 1% level of significance ($p < 0.01$)

NS - Non significant

*Significant at 5% level of significance ($p < 0.05$)

- C – Control (100% cheese)
- B1-5% bael powder
- B2- 10% bael powder
- B3- 15% bael powder
- B4- 20% bael powder

The mean scores of acceptability trials by judges on nine-point hedonic rating scale are presented in Table 3. The results revealed that the highest scores for all the sensory parameters among test samples were obtained by B3 treatment (15per cent bael powder). The overall acceptability of B3 treatment was found to be higher i.e. 7.95 than C i.e. 7.87, for all the parameters followed by B2 (10%), B1 (5%) and B4 with a score of 7.62, 7.56 and 6.84 respectively. Statistical results revealed that there was a significant difference between the B3 treatment and control sample for appearance, colour, texture, flavour and taste. The overall acceptability was also found to be significantly higher in the B3 treatment in relation to control and other treatments.

BS1- 25% stevia + 75% sugar

BS2-50% stevia + 50% sugar

BS3- 75% stevia +25% sugar

BS4- 100% stevia

The recipe of the product with most acceptable level of bael powder and stevia powder

Sandesh

Ingredients: Fresh cottage cheese/channa-85g, Bael powder-15g, Sugar-10g and stevia powder-50mg.

Method: Kneaded the moist cheese with hands and made it smooth. Added sugar to it and kneaded again. Transferred the prepared mixture to a heavy bottomed non stick pan. Cooked it over low flame for 3-4 minutes stirring continuously. Removed from flame and cooled. Added bael and stevia powder and kneaded again. Mixture was divided into small portions and made balls from it. Gently pressed the prepared balls to flatten them. Cooled in refrigerator and served.

Sensory evaluation of Sandesh incorporated with bael powder by semi-trained panel:

Five samples were prepared using channa/cottage cheese as control and test samples were prepared by incorporating bael powder at different levels i.e. 5, 10, 15 and 20 per cent.

Sensory evaluation of Sandesh incorporated with bael and stevia powder by semi-trained panel

Sandesh with different levels of stevia powder were developed and standardized along with addition of bael powder from the first standardization. Control (C) sample was the acceptable treatment from the first standardization, prepared using bael powder and channa at the ratio of 15:85. Other four levels were prepared with addition of 25, 50, 75 and 100 per cent of stevia powder. They were then subjected to sensory evaluation to select the acceptable level of stevia powder in Sandesh. The mean scores of acceptability trials of Sandesh with different levels of stevia powder are presented in Table 4 and fig.1. The treatment BS2 obtained the highest score of 8.02 with regard to all the sensory parameters. The highest mean scores for different sensory parameters like appearance, colour, texture, flavor, taste and overall acceptability of Sandesh among the treatments stevia powder were observed for BS2(50 per cent stevia and 50 per cent sugar). The overall acceptability scores for the control C were observed to be 7.8 followed by BS1, BS3 and BS4 with a score of 7.64, 7.18 and 6.93 respectively.

Table 4: Mean sensory scores for Sandesh incorporated with bael and stevia powder by semi trained panel

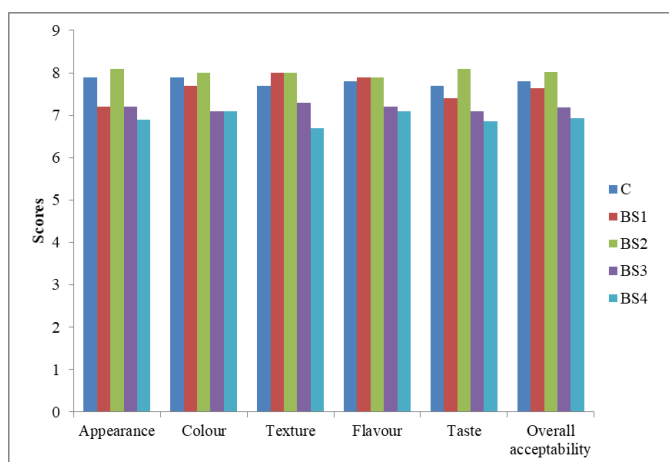
Samples	Parameters					
	Appearance	Colour	Texture	Flavour	Taste	Overall acceptability
C	7.9	7.9	7.7	7.8	7.7	7.8
BS1	7.2	7.7	8	7.9	7.4	7.64
BS2	8.1	8	8	7.9	8.1	8.02
BS3	7.2	7.1	7.3	7.2	7.1	7.18
BS4	6.9	7.1	6.7	7.1	6.85	6.93
χ^2	19.797**	15.942**	22.618**	19.718**	17.598**	28.598**

** Significant at 1% level of significance ($p < 0.01$)

NS - Non significant

*Significant at 5% level of significance ($p < 0.05$)

- C – Control (85% cheese+ 15% bael powder+ 100% sugar)
- BS1- 25% stevia + 75% sugar
- BS2-50% stevia +50% sugar
- BS3- 75% stevia + 25% sugar
- BS4- 100% stevia

**Fig 1:** Mean sensory scores for Sandesh incorporated with bael and stevia powder by semi trained panel

An increase in the concentration of stevia powder in the treatments reduced the score with regard to all the sensory

parameters. Hence BS4 with 75 per cent stevia and 25 per cent sugar received the lowest acceptability score of 6.93. Statistical analysis revealed a significant difference in all the treatments for all the sensory parameters. The scores for appearance, colour, texture, flavor and taste for BS3 was significantly higher than control and other treatments.

Sensory evaluation of Sandesh incorporated with bael powder and stevia powder by diabetics

Table 5 presented the mean scores for acceptability of Sandesh incorporated with 15% bael powder and different levels of stevia by the diabetic panel. The overall acceptability score ranged from 6.73 to 8.18. The highest overall acceptability score was gained by BS2 followed by BS1 and Control. The lowest score for the same was scored by BS4. The statistical analysis revealed that the sensory scores for appearance, colour, texture, flavor and taste were significantly different for the treatments of Sandesh incorporated with different levels of stevia powder. The overall acceptability, BS2 (50 per cent stevia and 50 per cent sugar) scored the highest of 8.18 which was statistically significant when compared to the other treatments. The highest mean scores for different sensory parameters of Sandesh were observed for control BS2 followed by BS1 and C. BS4 received the least scores for all the parameters with an overall acceptability of 6.73 because of the bitter taste contributed by stevia powder.

Table 5: Mean sensory scores for Sandesh incorporated with bael and stevia powder by diabetics

Samples	Parameters					
	Appearance	Colour	Texture	Flavour	Taste	Overall acceptability
C	7.2	7.8	7.7	7.9	7.7	7.66
BS1	7.3	8.3	8	8.05	8.2	7.97
BS2	7.8	8.4	8.2	8.2	8.3	8.18
BS3	7.9	7.9	7.9	7.7	7.9	7.86
BS4	6.5	7	6.9	6.75	6.5	6.73
χ^2	18.643**	14.385**	13.556**	13.089*	23.947**	27.544**

** Significant at 1% level of significance ($p < 0.01$)

NS - Non significant

*Significant at 5% level of significance ($p < 0.05$)

- C – Control (85% cheese+ 15% bael powder+ 100% sugar)
- BS1- 25% stevia + 75% sugar
- BS2-50% stevia +50% sugar
- BS3- 75% stevia + 25% sugar
- BS4- 100% stevia

Proximate composition of Sandesh: Table 6 represents the proximate composition of Sandesh C and BS2. A significantly high moisture content was observed for BS2 i.e., 51.31 per cent as compared to C i.e., 46.24 per cent ($p < 0.01$). Protein content of control (16.88%) was non significantly higher than

BS2 (16.69%). Crude fat content of C and BS2 was observed to be 16.88 and 14.31 per cent respectively. There was a significant decrease in crude fat content of BS2 (0.01%). A non significant increase in total ash content of BS2 (2.49%) was observed as compared to C (2.41%). Crude fibre content of C was lower than BS2 i.e., 0.04 and 0.24 per cent respectively. This slight increase in crude fibre content was statistically significant ($p < 0.01$). A nonsignificant decrease in carbohydrate i.e 14.96 in BS2 was observed as compared to C i.e., 17.60 per cent. A non significant decrease in energy content of BS2 in comparison to C was observed i.e., 255.43 and 289.86 Kcal respectively ($p < 0.01$). Except for crude

protein, total ash and carbohydrate content all parameters of protein content showed a significant difference in C and test sample. Rai et al (1999) revealed that stevia added at three levels in the experimental Sandesh while sugar was used in control product. It was found that 25 mg of stevia in experimental Sandesh was acceptable as compared to the control. The experimental Sandesh had 67.40 g of moisture, 18.84 g of protein, 1.77g of fat, 8.37g of carbohydrates and provided 125 Kcal of energy per 100 g of product. Sandesh where sucrose has been substituted by low calorie sweeteners like sorbitol. Bandyopadhyay *et al.* (2007b) assessed the antioxidant activities of beet (*Beta vulgaris*), mint (*Mentha spicata* L.) and ginger (*Zingiber officinale* L.) alone and in combination in Sandesh. Addition of all these herbs at final stage of Sandesh preparation showed highest antioxidant level than their addition at the initial stage of Sandesh preparation. Comparative evaluations of the proximate composition of herbal Sandesh with the control Sandesh showed that herbal Sandesh were more or less similar with control Sandesh except in fat and moisture content. But according to sensory characteristics, Sandesh containing beet, ginger or combination of beet with ginger or mint was more acceptable to panelist than control Sandesh. Results of the study indicate that herbal Sandesh is more value added health food than control Sandesh.

Table 6: Proximate composition of Sandesh

Sandesh	Control	Acceptable	t-value
Moisture (%)	46.24±0.42	51.31±0.86	5.31**
Crude Protein (%)	16.88±0.55	16.69±0.17	0.32 ^{NS}
Crude Fat (%)	16.88±0.29	14.31±0.30	6.15**
Total Ash (%)	2.41±0.21	2.49±0.23	0.26 ^{NS}
Crude Fiber (%)	0.04±0.01	0.24±0.02	7.55**
Carbohydrate (%) (by differences)	17.60±0.89	14.96±1.13	1.84 ^{NS}
Energy (Kcal/100g)	289.86±2.76	255.43±3.37	7.91**

Mineral content of Sandesh: The calcium content in control for Sandesh was observed to be 164.50 as compared to test sample score of 152.41mg/100g. The increase in calcium content of Sandesh was found to be statistically significant ($p<0.01$). A non significantly higher phosphorous content was observed in control in comparison to test centre i.e. 104.15 and 99.32mg/100gm for Sandesh. A small but statistically significant increase in iron content of test samples in, Sandesh was observed in comparison to control ($p<0.01$). High potassium content was observed which was significantly different between test samples and control in Sandesh (Table 7). The sodium content of Sandesh, for test samples showed a decrease in sodium content as compared to control but, this decrease in sodium content was found to be of non significant difference.

Table 7: Mineral content of Sandesh

Sandesh	Control	Acceptable	t-value
Calcium (mg/100g)	164.50±2.25	152.41±1.20	4.74**
Phosphorus (mg/100g)	104.15±2.09	99.32±0.40	2.27 ^{NS}
Iron (mg/100g)	0.03±0.00	0.38±0.01	19.68**
Zinc (mg/100g)	0.02±0.00	0.21±0.01	12.75**
Potassium (mg/100g)	17.93±1.50	47.44±1.04	16.16**
Sodium (mg/100g)	25.55±1.45	21.51±0.84	2.41 ^{NS}

Values are given as Mean ±SE*Significant at 5% level of significance ($p<0.05$)

**Significant at 1% level of significance ($p<0.01$) NS- Non significant

Vitamin C and total carotene content of Sandesh

The vitamin C content was found to be high in Sandesh i.e.,6.63mg/100g when incorporated with bael powder. Carotene content increased in test samples of Sandesh i.e., 71.91µg/100g as compared to control i.e., 71.91µg/100g (Table 8)

Table 8: Vitamin C and total Carotene content of Sandesh (DW basis)

Products	Vitamin C (mg)	Carotene (µg)
Sandesh(control)	2.07±0.11	64.76±0.86
Acceptable	6.63±0.19	71.91±0.82
t-value	20.29**	6.02**

Values are given as Mean±SE*Significant at 5% level of significance ($p<0.05$)

**Significant at 1% level of significance ($p<0.01$)NS- Non significant

The vitamin C content was found to be high in Sandesh i.e.,6.63mg/100g when incorporated with bael powder. Carotene content increased in test samples of Sandesh i.e., 71.91µg/100g as compared to control i.e., 71.91µg/100g respectively

Conclusion: Incorporation of bael pulp powder (15%) and substitution of 50% sugar with stevia is recommended in value added Sandesh. People should be encouraged to use bael and stevia powder in sweet products as they are natural, safe and have many therapeutic benefits.

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