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Nutritional evaluation of dairy products incorporated with bael pulp and stevia

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Abstract
Sweet milk products gajrela and burfi were prepared by incorporating bael pulp and stevia. The sensory evaluation of these products revealed that incorporation of fresh bael pulp in burfi and gajrella, at 40 and 20 per cent level respectively was found highly acceptable. Percentage of sugar reduced in burfi was 60 and gajrela was 40 by using stevia powder in milk based bael products. The products with most acceptable level of Bael pulp and stevia were analyzed for their proximate composition. The modified recipe of gajrela had 60.31g of moisture, 4.90g of protein, 4.04g of fat, 29.43g of carbohydrates and provided 173Kcal of energy. Similarly value added burfi contained 21.58g of moisture, 14.86g of protein, 17.71g of fat, 40.72g of carbohydrates and provided 381Kcal of energy. Sweet milk products using bael and stevia powder are low in calories as compared to the basic recipe.

Keywords: Gajrela, burfi, proximate composition, incorporation, calories

Introduction
An attempt has been made to use *aegle marmelos* and stevia powder in making nutritious and medicinally useful products. *Bael*, also known as *shri phal*, is one of the important under utilized fruits of Indo-Malaysian region. Bael is known in India quite from prehistoric times and mentioned in the ancient medicine system. The usefulness of *bael* fruits lies in its curative, pesticidal and nutritive characteristics. Ripe fruits are laxative and unripe fruits are recommended for treatment of diarrhea and dysentery and have a great demand in Ayurvedic system of medicine (Agarwal 1997) [2]. The different parts of this plant contain number of coumarins, alkaloids, sterols and essential oils. Various parts of this plant such as leaves, fruit and seed possess hypoglycaemic, hypolipidemic and blood pressure lowering property (V.B.Lmbole *et al* 2010) [5]. The peel of the fruit which is a very hard shell and green to brown in color depends on ripening stage. The appearance of yellow or orange edible pulp is like a boiled pumpkin, possesses a slightly sweet taste and a characteristic floral, terpene-like aroma, very fragrant and pleasantly flavored. Seeds are surrounded by slimy transparent mucilage (C.Suvimol and A.Pranee, 2008) [6].
Stevia is an ancient South American plant with immense potential as an agricultural crop for the production of a high-potency natural sweetener. Because of its proximate composition and its content of health-promoting phytochemical constituents, it is a suitable raw material for the extraction and production of functional food ingredients. And is used as a sweetener in many parts of Central and South America, where this species is indigenous, as well as in Japan (Goyal *et al* 2010) [4]. The leaves of Stevia naturally contain a complex mixture of eight sweet diterpene glycosides, including stevioside, steviolbioside, rebaudiosides (A, B, C, D, E) and dulcoside A (Abou-Arab *et al*., 2010) [1].

Material and Methods
All the prepared products with bael and stevia were organoleptically evaluated on nine point hedonic rating scale by two panels of judges comprising 10 members each. The one being the semi trained panel of department of food and nutrition and other being the diabetics. All the products were found to be highly acceptable at different levels by the semi-trained panel of judges as well as by diabetics. Sweet milk products using bael and stevia powder are low in calories as compared to the basic recipe. Gajrela was prepred by adding 20% bael pulp and incorporating 40% stevia and 60% sugar (40 per cent of sugar was replaced by stevia). Similarly in burfi 40 percent bael pulp was added and amount of sugar reduced by adding stevia was 60 per cent. The most acceptable products were then analysed by using standard AOAC methods for proximate and mineral content.

Results and Discussion

Gajrela

The proximate composition of gajrela BS2 (80% carrot + 20% bael pulp + 40% stevia) is presented in table 1. The moisture content of BS2 was 60.31 per cent that was observed to be non significantly higher than control i.e. 54.58 per cent. The protein content of C (5.26 per cent) was significantly higher than that of BS2 (4.90 per cent). The crude fat content of C (4.23 per cent)) was non significantly higher than BS2. Total ash content was significantly higher for BS2 (1.08 per cent) as compared to C (0.82 per cent). Crude fibre content was observed to be lower for C (0.18 per cent) than BS2 (0.24 per cent) but the diff was found to be statistically significant (p<0.05). There was a significant decrease in carbohydrate and energy content of BS2 as compared to C (p<0.01) as depicted in Fig. 4.16 & 4.17. The mean scores for carbohydrate and energy content of BS2 were observed to be 29.43 per cent and 173.81 kcal as compared to C i.e., be 39.94 per cent and 218.52 kcal. A significant difference in C and BS2 was observed for all the parameters of proximate composition except for moisture and crude fat.

Burfi

The proximate composition of C and acceptable treatment of *burfi* incorporated with bael pulp and stevia powder is presented in table 1. Significant difference in moisture, crude protein, crude fat, crude fibre and energy content of control and test sample was observed while the total ash and carbohydrate content showed a non significant difference. BS3 (21.58 per cent)) had a significantly higher moisture content than control i.e., 16.54 per cent). Crude protein content of C (17.23 percent) is higher than that of BS3 (14.86 per cent) which is statically significant (p<0.05). A significantly higher fat content was observed in C (20.81 per cent)) than BS3 (17.71 per cent). A slight increase is total ash content of BS3 (3.16 per cent) was observed as compared to C (3.14 per cent) with a non significant difference. There was an increase in fibre content of BS3(1.87 per cent)) as compared to C (0.13 per cent)) due to addition of bael powder with a significant difference. A non significant decrease is carbohydrate content of BS3 (40.72 per cent) was observed against control (42.10 per cent). BS3 showed a significant decrease in Kcal energy content as compared to C i.e., 381.68 and 424.53 Kcal respectively (p<0.01). The steviol glycosides are used as a sweetener in a number of industrial foods, such as soft drinks or fruit drinks (Goyal *et al*., 2010) [4], desserts, sauces, delicacies, cold confectionery, biscuits, sweet corn, breads, table-top sweetener. They are used to replace saccharose, for example in ready-to-eat cereals (Wallin, 2007) [7], yoghurt (Amzad-Hossain *et al*., 2010 [3]; candies (Goyal *et al*., 2010; Koyama *et al*., 2003) [4, 8].

Table 1: Proximate composition of the developed products (DW basis)

Products	Moisture (%)	Crude Protein (%)	Crude Fat (%)	Total Ash (%)	Crude Fiber (%)	Carbohydrate (%) (by differences)	Energy (Kcal/100g)
Gajrela (control)	54.58±2.33	5.26±0.03	4.23±0.05	0.82±0.03	0.18±0.01	39.94±0.76	218.52±2.71
Acceptable	60.31±0.03	4.90±0.06	4.04±0.04	1.08±0.05	0.24±0.01	29.43±0.06	173.81±0.51
t-value	2.45 NS	5.03**	2.59 NS	4.75**	4.36*	13.73**	16.22**
Burfi (control)	16.54±0.60	17.27±0.46	20.81±0.27	3.14±0.21	0.13±0.01	42.10±1.34	424.53±1.16
Acceptable	21.58±0.39	14.86±0.29	17.71±0.33	3.16±0.07	1.87±0.06	40.72±0.31	381.68±2.37
t-value	7.04**	4.41*	7.26**	0.09 NS	29.55**	1.01 NS	16.25**

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

Table 2: Mineral content of milk based developed products

Products	Calcium (mg/100g)	Phosphorus (mg/100g)	Iron (mg/100g)	Zinc (mg/100g)	Potassium (mg/100g)	Sodium (mg/100g)
Gajrela (control)	64.74±0.91	141.58±0.88	0.72±0.03	.01±.005	74.21±0.58	34.87±1.41
Acceptable	63.10±0.48	137.69±0.98	0.92±0.02	.03±.005	96.27±0.51	29.78±0.41
t-value	1.62 NS	2.95*	6.50**	6.32 NS	28.39**	3.45*
Burfi (control)	685.99±1.79	305.69±1.46	0.10±0.02	-	85.97±0.30	48.58±0.68
Acceptable	672.55±1.50	2.88±0.85	0.24±0.02	--	102.51±1.82	46.26±0.61
t-value	5.76**	10.33**	5.86**	-	8.95**	2.55 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

Calcium

Calcium content of value added products is presented in table 2. A statistically non-significant increase in calcuim content of Gajrela in control was observed as compared to test samples. The calcium content in control for burfi was observed to be 685.99 as compared to test sample score of 672.55 mg/100. The increase in calcium content of burfi was found to be statistically significant (p<0.01).

Phosphorous and Zinc

Phosphorous content of value added products is presented in Table 2. The statistical data revealed that the phosphorous content of control was significantly higher than test samples *Burfi*,. It was observed to be 69mg/100g for burfi in control while in test samples phosphorous content was 288mg/100g for burfi. The phosphorous content of Gajrela in control was found to be significantly higher to the test sample i.e. 141.58 and 137.69 mg/100g respectively. Zinc content present in Gajrela was found to be of non-significant difference

Iron

A small but statistically significant increase in iron content of test samples (Table 2) i.e., burfi and gajrela was observed in comparison to control (p<0.01).

Potassium

The result for potassium content of value added milk based product is presented in table 2. The potassium content of both the developed products showed the significant increase as compared to control. Potassium content of burfi in test

samples was observed to be 102.51 mg/100gm which is significantly higher than the control i.e. 85.97 mg/100gm respectively (p<0.01). Similarly high potassium content was observed which was significantly different between test samples and control in gajrela.

Sodium

The result for sodium content of products is presented in table 2. The sodium content of *burfi* and *gajrela* for test samples showed a decrease in sodium content as compared to control. However, this decrease in sodium content was found to be of non significant difference.

Vitamin C and Carotene content of milk based developed products

A low but significantly different increase in vitamin C content of gajrela was observed as compared to control as represented in table 3. Increase in carotene content of *burfi* was found to be of non significant difference.

Table 3: Vitamin C and Carotene content of developed products

Products	Vitamin C (mg)	Carotene (µg)
Gajrela (control)	1.53±0.05	1035.0±5.77
Acceptable	2.10±0.04	1027.7±1.33
t-value	8.94**	1.24 ^{NS}
Burfi (control)	1.91±0.01	585.82±0.41
Acceptable	2.29±0.02	593.81±3.44
t-value	15.95**	2.31 ^{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

Conclusion

Incorporation of bael pulp (20-40%) and substitution of 40-60% sugar with stevia is recommended in value added sweet products. 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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