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A delicious sweet *pantua* prepared with non sucrose: A hopeful sweet for Diabetes

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Abstract

People with diabetes increasing day by day. The recent survey conducted by medical association have declared that about 31.7 million are pioneered to diabetic as on 2000 further it is projected to 79.4 million by 2030. So to overcome such problems replacing cane sugars with natural sweeteners are very essential. Sucralose is the only non-calorie sweetener made from sugar. Its unique combination of sugar like taste and excellent stability allow sucralose to be used as a replacement for sugar in various foods and beverages. Pantuais a local confection of eastern India and Bangladesh. It is a traditional Indian sweet made of deep-fried balls of Khoa, chhana, Maida, oil and sugar syrup. *Pantuas* range in colour from pale brown to nearly black depending on how long they are fried. It is also popularly known as Bengali sweet because of the chhana composition which gives the product very tender, tasty and richness. Pantua resembles like gulabjamun which is a very famous dish in every functions in India. Apart from gulabjamun, Pantua has many nutritional and functional characteristics due to its composition of both Khoa and chhana as a base material. Keeping in view the above factors, research has been carried to replace cane sugar with low calorie sweeteners and obtained optimum results.

Keywords: Pantua, sucralose, low calorie, sugar etc.

Introduction

India has the unique tradition of producing a variety of indigenous milk products. About 50-55 per cent of total milk produced in India is utilized to manufacture of indigenous dairy products. The important traditional milk products in India are khoa and khoa based sweets, and channa and channa based sweets. Pantua resembles like gulabjamun which is a very famous dish in every functions in India. Apart from gulabjamun, Pantua has many nutritional and functional characteristics due to its composition of both khoa and chhana as a base material. Pal (2000) [8] opined that "Khoa, an important Indian milk product, is prepared by continuous boiling of milk until desired concentration of solids and texture is achieved. Chhana with soft body and smooth texture produced by low acid strength was found to be suitable for rasgolla preparation. However chhana produced with high acid strength posses hard body with smooth texture suitable for sandesh preparation. There was a significant effect of level of khoa and chhana on the sensory quality of pantua. The average sensory score of pantua increases with the increase in the proportion of khoa than chhana but at the same time any increases in the amount of chhana above 50 per cent imparted chewy and rubbery characteristics to pantua and the product did not absorb sufficient sugar syrup. Gulhati *et al.*, (1992) [7] showed the gulabjamun prepared from buffalo milk khoa as a base was significantly superior in quality with 20 per cent refined wheat flour. Refined wheat flour at a level of 8 per cent, increased browning index (20-22 per cent) during heat treatment in both cow and buffalo milk based gulabjamun (Gothwal and Shukla, 1995) [6]. The best quality gulabjamun was obtained from a formulated skim milk powder (SMP) base mix consisting of 25 per cent maida (Ghosh *et al.*, 1984) [5]. Saxena *et al.*, (1996) [10] found that inclusion of 10 per cent maida by weight of khoa resulted in good quality gulabjamun premix and ready to serve gulabjamun mix. Gulabjamun prepared from unhomogenised milk khoa with 0.08 per cent baking powder showed good quality, whereas 0.11 per cent baking powder reduced the acceptability due to increase in porosity of gulabjamun (Deshmukh *et al.*, 1993) [4]. Rangi *et al.*, (1985) [10] friedgulabjamun in a steam-jacketed kettle by hydrogenated oil at 125-130° C for 15 min gave the best results. The vegetable ghee in a frying pan was heated to 140° C for frying of gulabjamun, which resulted in good acceptability (Deshmukh *et al.*, 1993) [4]. In the preparation of ready to serve soya flour gulabjamun, the balls were fried at 140 °C for 10 min (Saxena *et al.*, 1996) [10].

Devaraja (2005) [3] experimented the microwave treated enriched gulabjamun were fried in oil for about 140° C/8min. The acceptability of gulabjamun was increased when it was properly soaked in sugar syrup. It was found that soaking the balls in 60 per cent hot syrup at 60° C for 2h was highly acceptable (Ghosh *et al.*, 1984) [5]. Keeping all the above factors in view, replacement of sugar with sucralose has been tried.

Materials and Methods

All food grade materials are used in this study.

Process optimization to standardize the processing parameters for the preparation of Pantua

To standardize the enriched and low calorie Pantua different combinations of Khoa, Chhana and Maida were tried to see the acceptability of the product over the control prepared. The resultant standardized combinations were served to panel of judges along with control to adjudge the overall acceptability. Based on the sensory evaluation the best one was selected and used for the further studies. The following ingredients were standardized to the processing parameters for the preparation of Low Calorie Pantua.

Process optimization of low calorie Pantua utilizing Sucralose

Sucralose is the first sugar alternative made from sugar and tastes like sugar but does not have all the calories of sugar. By utilizing Sucralose a low calorie sugar syrup was prepared to soak the standardized Pantua. The three different combinations of sugar, sucralose and Jaggery were tried i.e., 30:30:40, 30:40:30, 25:50:25 respectively. The best one was selected through panel of judges and selected for further studies.

Results

Influence of sugar, sucralose and Jaggery on the sensory quality of pantua

The sugar syrup was prepared with different combinations of sugar, sucralose and Jaggery *viz.*, 25:50:25 designated as 1st, 30:40:30 2nd and 30:30:40 3rd treatment respectively along with control sugar syrup (60 per cent sugar syrup) and served to panel of judges to adjudge the product. Thus, results pertaining to the effect of sugar, sucralose and Jaggery on sensory quality of pantua were presented in the Table 1.

Table 1: Influence of sugar, sucralose and Jaggery on the sensory quality of Pantua.

Treatment	Colour & Appearance	Body and Texture	Flavour	Overall acceptability
0	8.43	8.40	8.40	8.46
1	8.43	8.33	8.43	8.43
2	8.16	8.10	8.06	8.16
3	8.13	8.06	8.03	8.06
C D	0.31	0.51	0.31	0.41

Note: Values are average of three trials

0: 60 per cent sugar syrup

1. Sugar, sucralose and Jaggery is added in the ratio of 25:50:25 to obtain 60 per cent syrup

2. Sugar, sucralose and Jaggery is added in the ratio of 30:40:30 to obtain 60 per cent syrup

3. Sugar, sucralose and Jaggery is added in the ratio of 30:30:40 to obtain 60 per cent syrup

Colour and appearance: It was observed from the Table 6 that there was a decrease in the sensory scores with increase in Jaggery level. The control pantua had recorded 8.43 against 8.43, 8.16 and 8.13 out of 9.0 point hedonic scale with respect to 1st, 2nd, and 3rd treatments. The pantua prepared with 25:50:25 of sugar, sucralose and Jaggery had secured highest score of 8.43 out of 9 due to less Jaggery than other two treatments. Statistical analysis showed there was a significant difference between the control with 1st 2nd and 3rd treatments on colour and appearance of low calorie pantua prepared.

Body and texture: The sensory scores with respect to body and texture for control sample of pantua was 8.40 against 8.33, 8.10 and 8.06 out of 9.0 point hedonic scale with 1st, 2nd and 3rd treatment respectively. It could be seen from the Table 6 that, increase of Jaggery per cent there was a decrease in the mean sensory scores of treatments. Statistical analysis also proved that there was significant difference between control with 1st, 2nd and 3rd treatments on body and texture.

Flavour: The control sample of pantua had secured the sensory score of 8.40 against 8.43, 8.06 and 8.03 out of 9.0 point hedonic scale with respect to 1st, 2nd and 3rd treatments respectively. The increase in Jaggery per cent decreased the mean sensory score from 8.43 to 8.06 in 2nd treatment, and 8.06 to 8.03 in 3rd treatment. Thus statistical analysis also confirmed that there was a significant difference between treatments.

Effect on overall acceptability: The overall acceptability scores awarded for control pantua was 8.46 against 8.43, 8.16, 8.06 for other different levels sugar, sucralose and Jaggery at 1st, 2nd and 3rd treatment respectively. The 1st treatment secured highest marks compare to other two treatments of sugar, sucralose and Jaggery. This showed that, as the Jaggery composition increases, the sensory scores decreases. Statistically, significant difference was noticed between control and other combinations of sugar, sucralose and Jaggery with respect to its overall acceptability. Thus, from this study an optimum levels of 25:50:25 of sugar, sucralose and Jaggery composition respectively was selected for further trials.

Influence of sugar, sucralose and Jaggery on sensory quality of pantua

Colour and appearance: The sensory score for colour and appearance attribute of Pantua decreased as the sucralose level decreased. The 50 per cent replacement of cane sugar with sucralose has secured similar marks (8.43) compare to other two treatments against control (8.43).

Body and texture: The sensory scores with respect to body and texture of Pantua decreased as sucralose level decreased and Jaggery level increased due to thick consistency of syrup when Jaggery level increased. i.e., from 8.40 to 8.33, 8.10 and 8.06 at 0, 25, 30 and 40 per cent Jaggery respectively. However, 50 per cent replacement of cane sugar with sucralose has secured highest marks (8.33) compare to other treatments.

Flavour: The scores secured with respect to flavour of Pantua reveals that the 1st treatment that is 25:50:25 of sugar, sucralose and Jaggery levels respectively scored highest

marks (8.43) compare to control (8.40) and other treatments. Which is evident that 50 per cent replacement of sugar with sucralose was beneficial.

Overall acceptability: It was clear from the results that

overall acceptability scores also on par with the scores of other sensory attributes in the same table. Thus overall acceptability scores reveals that 50 per cent replacement of sugar with sucralose was beneficial.

Table 2: Influence of sucralose and Jaggery on the rheological quality of Pantua

Treatment	Hardness (N)	Co-hessiveness	Springiness	Gumminess (N)	Chewiness (N)
0	617.43	0.4357	0.7618	367.08	302.08
1	1183.83	0.5192	0.7683	515.87	480.09
2	1355.13	0.5944	0.8225	703.75	536.08
3	1865.87	0.6101	0.9306	1138.41	874.81
C D	100.40	0.042	0.06	74.77	85.20

Note: All the values are average of three trials

0: 60 per cent sugar syrup

1: sugar, sucralose and jaggery is added in the ratio of 25:50:25 to obtain 60 per cent syrup

2: sugar, sucralose and jaggery is added in the ratio of 30:40:30 to obtain 60 per cent syrup

3: sugar, sucralose and jaggery is added in the ratio of 30:30:40 to obtain 60 per cent syrup

Influence of sugar, sucralose and jaggery on rheological quality of pantua

The results pertaining to the influence of sugar, sucralose and jaggery on rheological properties such as Hardness, Cohesiveness, Springiness, Gumminess and Chewiness values were presented in the Table 2.

Hardness: The control pantua recorded average hardness of 617.43N. Further there was increase of hardness in all the treatments. On 1st treatment the hardness of enriched low calorie pantua increased from 617.43 to 1183.83, on 2nd treatment 1183.83 to 1355.13 and on 3rd treatment 1355.13 to 1865.87N. Thus it showed that there was a increase in hardness with respect to increase in jaggery and decrease in sucralose content. Statistical analysis revealed that there was a significant difference between control and different treatments of enriched low calorie pantua.

Cohesiveness: The Table 2 reveals that there was a increase in internal cohesive strength as the jaggery content increased and sucralose content decreased. Control pantua recorded cohesiveness about 0.4357 against 0.5192, 0.5944 and 0.6101 on 1st, 2nd and 3rd treatments respectively. Statistical analysis also confirmed that there was a significant difference between control and different treatments of enriched low calorie pantua.

Springiness: The springiness value of control pantua was 0.7618 further there was a increase in the value about 0.7618 to 0.7683 on 1st treatment, from 0.7683 to 0.8225 on 2nd treatment and from 0.8225 to 0.9306 on 3rd treatment respectively. This was due to increase in jaggery and decrease in sucralose content of enriched low calorie pantua. Statistical analysis also revealed that there was a significant difference between control and different treatments.

Gumminess: The gumminess value of control pantua was recorded 367.08 N against 515.87, 703.75 and 1138.41N on 1st, 2nd and 3rd treatment respectively. It had observed that there was a increase in gumminess value with the increase in jaggery and decrease in sucralose content. Statistical analysis confirmed that there was a significant difference between control pantua and different treatments of enriched low calorie pantua.

Chewiness: Increase in chewiness value was observed from Table 2 as the jaggery content increased. The control pantua was recorded chewiness value of 302.08 N further there was a increase of value from 302.08 to 480.09 on 1st treatment, 480.09 to 536.08 and 536.08 to 874.81 on 2nd and 3rd treatment respectively. This increased value statistically confirmed that there was a significant difference between control and different treatment.

Influence of sugar, sucralose and jaggery on sensory quality of pantua

Colour and appearance: The sensory score for colour and appearance attribute of Pantua decreased as the sucralose level decreased. The 50 per cent replacement of cane sugar with sucralose has secured similar marks (8.43) compare to other two treatments against control (8.43).

Body and texture: The sensory scores with respect to body and texture of Pantua decreased as sucralose level decreased and jaggery level increased due to thick consistency of syrup when jaggery level increased. i.e., from 8.40 to 8.33, 8.10 and 8.06 at 0, 25, 30 and 40 per cent jaggery respectively. However, 50 per cent replacement of cane sugar with sucralose has secured highest marks (8.33) compare to other treatments.

Flavour: The scores secured with respect of flavour of Pantua reveals that the 1st treatment that is 25:50:25 of sugar, sucralose and jaggery levels respectively scored highest marks (8.43) compare to control (8.40) and other treatments. Which is evident that 50 per cent replacement of sugar with sucralose was beneficial.

Overall acceptability: It was clear from the results that overall acceptability scores also on par with the scores of other sensory attributes in the same table. Thus overall acceptability scores reveals that 50 per cent replacement of sugar with sucralose was beneficial.

The results pertaining to the rheological attributes like Hardness, Cohesiveness, Springiness, Gumminess and Chewiness of Pantua were discussed here.

Hardness: The progressive increase in the hardness of Enriched low calorie pantua against control can be seen that is

from 617.43 to 1183.83, 1355.13 and 1865.87 with the increase of jaggery content by 0, 25, 30 and 40 per cent level respectively. This is due to thick syrup obtained when jaggery level increased this thick syrup makes the product hard by not absorbing the syrup till inner core.

Cohesiveness: It was clear that there was a significant increase of cohesive force between control from 0.4357 to 0.5192, 0.5944 and 0.6101 as jaggery level increased and sucralose level decreased. Which is due to increase in TS contents which leads to hard body and texture. Similar observations are reported by Prajapati *et al.*, 2009 prepared rasgolla with different level (1, 2 and 3) of fat per cent where cohesive force increased as the fat per cent level increased in rasgolla.

Springiness: The results reveals that there was a progressive increase in springiness values as the sucralose content decreased and jaggery content increased. Control pantua recorded springiness value of 0.7618 further 0.7683, 0.8225 and 0.9306 on 1st, 2nd and 3rd treatment respectively. This is may be rubbery texture of Enriched Low Calorie Pantua.

Gumminess and Chewiness: The increase of gumminess and chewiness values was seen. This reveals that an significant increase of gumminess and chewiness in the Enriched Low Calorie Pantua might be due to increase of protein level in the product. The similar observation was reported by Prajapati *et al.*, 2009 he prepared rasgolla with different levels of fat (1, 2 and 3 per cent) and reported that gumminess and chewiness gradually increased with increase of protein level in rasgolla. The technology developed can be applied to the existing method of continuous gulabjamun manufacture and production of this low calorie pantua can be undertaken by the organized dairy sector for commercialization.

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