

PANTUA- The Famous Bengali Sweet, Enriched and Sweetened for Diabetic People

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Abstract: The increasing trend towards obesity, and its associated risks, provides incentive and opportunity for the food industry to develop foods that are reduced in calories. The goal to produce low-calorie foods that meet consumer expectations is a major market opportunity today. In this perspective several new ingredients are available to support the growing market demand. Among these specialized functional ingredient low calorie sweeteners are in the forefront. Keeping in view these facts, an attempt has been made to develop Enriched and Low calorie Pantua. In this study to make the product dietetic and low calorie an replacement of cane sugar with sucralose was done with different levels that is 25:50:25 1st, 30:40:30 2nd and 30:40:30 3rd sugar, sucralose and jaggery respectively. These levels were given to panel of judges to adjudge the product. The highest sensory score was recorded to the 1st combination of sugar, sucralose and jaggery. The product of this combination was tender, soft and with pleasant cooked flavour thus from the investigation this 1st combination was selected for further trials.

Keywords: Pantua, Sucralose, Jaggery.

I. INTRODUCTION

Pantua is 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. 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.

Alternative sweeteners have number of advantages and provide fewer calories than sugars don't promote tooth decay, enhance flavour and are synergistic effect. A study conducted found that 84 per cent of adult Americans use low-calorie, reduced-sugar, sugar-free foods and beverages (O' Brien, 2004).

1.a. Sucralose: Sucralose occurs as anhydrous, white, crystalline, orthorhombic needle like crystals with an intensely sweet taste. It is a chlorinated sucrose derivative that is 500-600 times sweeter than sucrose. It has no calories and is exceptionally stable. ADI (Allowance Daily Intake) is 5mg/kg body weight/day (Lawson, 2000).Portopinto *et al.*, (2003) used Sucralose in the manufacture of low calorie dairy mousses. Chocolate flavoured desserts were most acceptable and containing Sucralose had a 31 per cent lower calorie content and acceptability of 79.2 per cent compared with 8.99 per cent for the conventional chocolate product. Hence Sucralose is suitable for use in formulations. The sensory properties and shelf life for low calorie peach compotes made by partially substituting sugar with Sucralose, showed no differences at the end of the storage period (Mendonca *et al.*, 2005).

1.b Medicinal sugar: Jaggery is the sugarcane based traditional Indian sweetener. At present, 24.5 per cent of the cane produced in India is being utilized for producing jaggery.

Jaggery is nutritious and easily available to the rural people. Compared to white sugar, it requires low capital requirement in production and is manufactured at the farmer's individual units itself. Of the total world production, more than 70 per cent of the jaggery is produced in India. To meet the future sweetener requirement, the scope of jaggery seems to be promising (Das, 2007). Jaggery is very rich in iron and prevents anemia. jaggery supplements the requirement of iron and calcium in women and children and also increases vitality in men and help in digestion. Nerkar, 2004 found the micronutrients present in jaggery have antitoxic and anti carcinogenic properties. Its dietary intake can prevent the atmospheric pollution related toxicity and the incidence of lung cancer. Jaggery is also used to preserve or as a natural food preservation process, in some areas of tamilnadu jaggery is used to preserve gingelly oil and to overcome rancidity.

Objectives: Keeping in view of all these, the proposed research paper is aimed at following objectives:

- Influence of sugar, sucralose and jaggery on the sensory quality of Pantua.
- Influence of sugar, sucralose and jaggery on microbiological quality of pantua.
- Influence of sugar, sucralose and jaggery on rheological quality of pantua.

II. PROCESS OPTIMIZATION OF ENRICHED LOW CALORIE PANTUA UTILIZING SUCRALOSE AND JAGGERY

Sucralose is the first sugar alternative made from sugar and tastes like sugar but does not have all the calories of sugar. Jaggery is a pure, wholesome, unrefined whole sugar which contains the natural minerals and vitamins also called as "Medicinal Sugar". By utilizing these two components a low calorie sugar syrup was prepared to soak the standardized and enriched 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.

2.a. 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 6.

Colour and appearance: It was observed from the Table 1 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.

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	8.4	8.4	8.46
1	8.43	8.33	8.43	8.43
2	8.16	8.1	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

2.b. Influence of sugar, sucralose and jaggery on microbiological quality of pantua.

The control and enriched low calorie pantua of different treatments made were subjected to microbiological analysis such as Total Bacterial Count(TBC), Coliform count and Yeast and Molds count the obtained results were presented in the Table 7.

Total Bacterial Count (TBC)

The total bacterial count was increased as jaggery per cent increased. The control pantua recorded log₁₀ cfu/g TBC count of 2.616. Further there was a increase in the counts in 1st, 2nd and 3rd treatment about 2.7655 to 2.7862 and 2.8722 respectively. Statistical analysis also revealed that there was a significant difference between control and other treatments.

Coliform counts

The control pantua had recorded coliform count (log₁₀ cfu/g) of 1.366 against 1.7869, 1.7993 and 1.8022 on 1st, 2nd and 3rd treatment respectively. This showed that coliform counts increased as jaggery per cent increased. But statistical analysis revealed that there was no significant difference between control and different treatments.

Yeast and Mold counts

There was no yeast and mold growth in the control and different treatments of enriched low calorie pantua.

Table 2: Influence of sucralose and jaggery on the microbiological quality of Pantua

Treatment	TBC	Coliforms	Yeast and molds
	log ₁₀ cfu/g		
0	2.616	1.366	0
1	2.765	1.786	0
2	2.786	1.799	0
3	2.872	1.802	0
C D	0.002	0.001	0

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

2.c. 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 8.

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 8 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 3 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 treatments.

Table 3: Influence of sucralose and jaggery on the rheological quality of Pantua.

Treatm ent	Hardn ess (N)	Co-hessiven ess	Springin ess	Gummin ess (N)	Chewin ess (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	100.4	0.042	0.06	74.77	85.2

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

SUMMARY AND CONCLUSION

To make the product dietetic replacement of cane sugar with sucralose and Jaggery was done and found that 25:50:25 combination of sugar, sucralose and jaggery was optimum. The technology developed can be applied to the existing method of continuous gulabjamun manufacture and production of this enriched low calorie pantua can be undertaken by the organized dairy sector for commercialization. The product has very good nutritional, therapeutic and functional properties and it could be recommended for diabetic patients.

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