

Research Article

Characterization of Quality Attributes Of Market Samples of Chhanabara of Berhampur City

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Abstract

Chhanabara, an Indian milk sweet, popular in West Bengal, particularly in Berhampur city of Murshidabad District. It is a chhana based, fried delicacy having a juicy, white inner part surrounded by a black outer coating. It is prepared by deep-fat frying of balls of dough made of chhana, wheat flour (atta) and cane sugar, and subsequent dipping in sugar syrup. It is almost similar to Kalojam or Blackjamun, prepared from chhana or khoa or both of them. Despite the fact that it is a very popular traditional dairy product in that area but scanty or no scientific information is available about it. All samples were evaluated for its sensory, physico-chemical and textural parameters. Except ash content, acidity all other sensory and physico-chemical parameters were significantly ($p < 0.05$) different. Besides sensory analysis, samples were also evaluated for textural characteristics profile which would be helpful in standardization of technology for mechanized production of chhanabara in bulk.

Keywords: Traditional chhana based sweet, chhanabara, market survey, sensory analysis, texture profile

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Introduction

Sweets preparation is an ancient tradition in India and Indian dairy sweets are ubiquitous part of every festival, wedding, religious ritual and are symbol of pride and happiness. About 50-55% of milk produced is converted into traditional Indian dairy products (TIDP) like paneer and paneer based products, chhana and chhana based products, khoa and khoa based sweets and desserts. The market for TIDPs is the second highest after fluid milk both in value and volume. It is valued at more than Rs. 100,000 crore [1]. West Bengal is one of the major states where various types of traditional milk and milk based sweetmeats are available since centuries.

Chhanabara is one of the main attractions of Berhampur in West Bengal but unfortunately confined to this area. Even the other part of the Murshidabad district is not so familiar with this traditional delicacy. It is a chhana based, fried delicacy having a juicy, white inner part surrounded by black outer coating. It is prepared by deep-fat frying of balls of dough made of chhana, wheat flour (atta) and cane sugar. This product is dipped in high concentration sugar syrup for its characteristics features. It is almost similar to Kalojam or Blackjamun, prepared from chhana or khoa or both of them. The manufacturing process of chhanabara is little tricky and confined to the local traditional halowais.

Despite the fact that it is a popular product with very little scientific information about its average composition and product characteristics including sensory and physico-chemical properties. Further, wide variation in sensory and physico-chemical attributes of market samples is usually observed which could be attributed to variation in composition and processing parameters of products from one shop to another. Keeping in view the above facts, present study was planned and conducted to assess the extent of variation among various samples collected from famous sweet shops in Berhampur city, West Bengal. The outcomes of this study would be helpful in standardization of ingredients as well as process parameters and thereby development of a suitable technology for bulk and mechanized production of this popular product.

Experimental

Sample Collection

Samples were collected from four different and locally famous sweet shops (Shop A, B, C and D) in Berhampur city, West Bengal. The samples were collected hygienically and stored at 25°C for 3-4 hours to avoid any chance of

variation in results due to difference in storage temperature/ conditions across the shops, followed by sensory, physico-chemical, and texture analysis. Samples were analysed in triplicate.

Sensory Analysis

A sensory panel consisting of five semi-trained panelists were selected from the faculty and students of West Bengal University of Animal and Fishery Sciences to evaluate the samples of chhanabara for sensory attributes. Each panelist was served all the four samples of chhanabara at a time and requested to judge the samples for sensory attributes such as colour and appearance, body and texture, flavour and overall acceptability on 9 point hedonic scale [2].

Physico-chemical analysis

Physico-chemical properties like moisture, fat, protein, ash and acidity were analysed using standard procedures [3]. Chemicals were obtained from Himedia and were of analytical grade.

Textural profile analysis (TPA) of chhanabara was carried out using Texture Analyser TA-XT Plus (M/s Stable Micro Systems, Surrey, UK) fitted with 50 kg load cell. 75 mm compression plate was used for texture profile analysis of samples. The product was subjected to compressive force by probe up to the distance of 10 mm twice. The conditions set in the Texture Analyser for measuring textural properties were as follows: Pre-Test Speed, 1 mm/s; Post-Test Speed, 5 mm/ s; Test speed, 5 mm/s; Trigger force, 5.0 g; Time, 5.0 s. A two-bite test force distance compression curve [4] was obtained and from the resulting force-time curves, numerical values of product height, hardness, fracturability, adhesiveness, springiness, chewiness obtained using the Exponent software (version 6.1.1.0). All measurements were done in quadruplicate.

Statistical analysis

All determinations were carried out in triplicate and data was subjected to analysis of variance. In the experiments, one way and two ways analysis of variance (ANOVA) with a subsequent difference ($P > 0.05$) in the mean values was conducted as described by Snedecor and Cochran [5].

Results and Discussion

Sensory quality

Chhanabara is characterized by a juicy, white inner part surrounded by a Jed black outer coating. Average sensory scores with for all sensory attributes were shown in **Figure 1**. Average sensory scores for colour and appearance were found to be 7.9, 8.3, 7.5 and 8.06 for sample A, B, C and D, respectively. All four samples varied significantly ($p < 0.05$) (**Table 1**). Whereas, sample A and D did not vary significantly in terms of their colour and appearance scores (Figure 1). Sample B was most enjoyed by the sensory panelists for its colour and appearance which was intently followed by sample D and sample A.

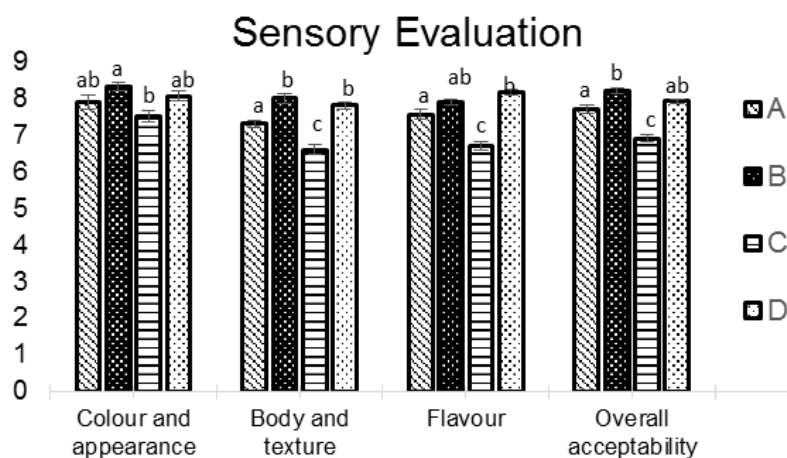


Figure 1 Sensory score of market samples of Chhanabara (Mean \pm SE, n=5). A, B, C, D are the four popular sweet shop of Berhampur city, West Bengal. Superscripts (lowercase letters) within a graph are significantly different ($p < 0.05$)

Table 1 Analysis of variance (ANOVA) for sensory, physico-chemical, and textural attributes of market samples of chhanabara

Parameters	Degree of freedom (df)	MS	F value
Colour and appearance	3	0.5653*	5.105
Body and texture	3	2.335**	25.94
Flavour	3	2.405**	38.48
Overall acceptability	3	1.864**	43.25
Moisture content	3	3.151**	14.11
Fat	3	37.13**	6905
Total carbohydrate	3	70.33**	641.9
Protein	3	1.852**	6.395
Ash	3	0.001 ^{ns}	2.957
Acidity	3	0.004 ^{ns}	0.6525
Hardness	3	58270**	124.4
Fracturability	3	22850**	62.19
Adhesiveness	3	0.014 ^{ns}	1.03
Springiness	3	0.226**	13.1
Chewiness	3	100.21**	12.98

*. Significant at p<0.05 level (2-tailed)
 **. Significant at p<0.01 level (2-tailed), ns Non-significant

Body and texture is one of the most important sensory parameters to judge the product like chhanabara. The average body and texture scores of four samples ranged from 6.6 to 8.0 (Figure 1). Sample B and D were preferred sample amongst the panelists for its textural attributes followed by sample A and C, respectively. Body and texture scores were significantly varied among the samples. High total carbohydrate with low moisture and fat content may led to hard body and texture which eventually decreased the score for sample C. Flavour score varied in the range from 6.7 to 8.15. Sample D was the most preferred sample. Significant ($p < 0.05$) variation in flavour score may be attributed to the compositional differences among the different samples collected. Overall acceptability score was ranging from 6.9 to 8.2. Overall acceptability scores for sample B was significantly ($p < 0.01$) higher than other samples, which may be due to superior textural and flavour attributes of sample B over other three samples. Our results were in agreement with Singh *et al.* [6] who found significant differences in various sensory attributes of three different dal pinni market samples collected from Ludhiana city.

Physico-chemical analysis

Physico-chemical parameters like moisture, fat, protein, ash and acidity are presented in **Figure 2(a, b)**. Significant ($p < 0.01$) difference was found in fat, moisture and total carbohydrate content between the samples (Table 1). Generally, fat is responsible for mellow texture and pleasant flavour. Optimum fat content is essential for good quality of chhanabara. Higher fat content may leads to greasy texture while lower fat content may results in gritty or hard texture of the product. Sample B was most preferred by sensory panelists as it possessed superior texture and better flavour than other samples. Optimum fat content (9.97%) in the product may be the reason for better product quality which eventually increased the score. Our results were supported the by the findings of Saxena *et al.* [7] who reported in their study on the preparation, packaging and storage of pinni and Patel [8] in his study on analysis of market samples of plain peda. The moisture content varied significantly ($p < 0.05$) (Table 1). The probable reasons for wider variation in moisture content of samples could be due to difference in processing parameters, in-house storage conditions of samples and freshness of samples. Similar findings were also reported by Singh *et al.* [6] that moisture content significantly varied in different market samples of *dal pinni* collected from Ludhiana. Besides fat and moisture, total carbohydrate is another important constituent of chhanabara, which play a pivotal role in texture of the product. There was significant ($p > 0.01$) difference in the total carbohydrate content of the samples (Table 1 and Figure 2a). Result depicted in Table 1 and Figure 2b reported that there was significant ($p > 0.05$) difference in the ash content among the samples. However, the result was non-significant ($p > 0.05$) in case of acidity among the samples. Similar results were also reported by Ray *et al.* [9] and Patel *et al.* [8] for market sample of peda and Chawla *et al.* [10] for market samples of doda burfi.

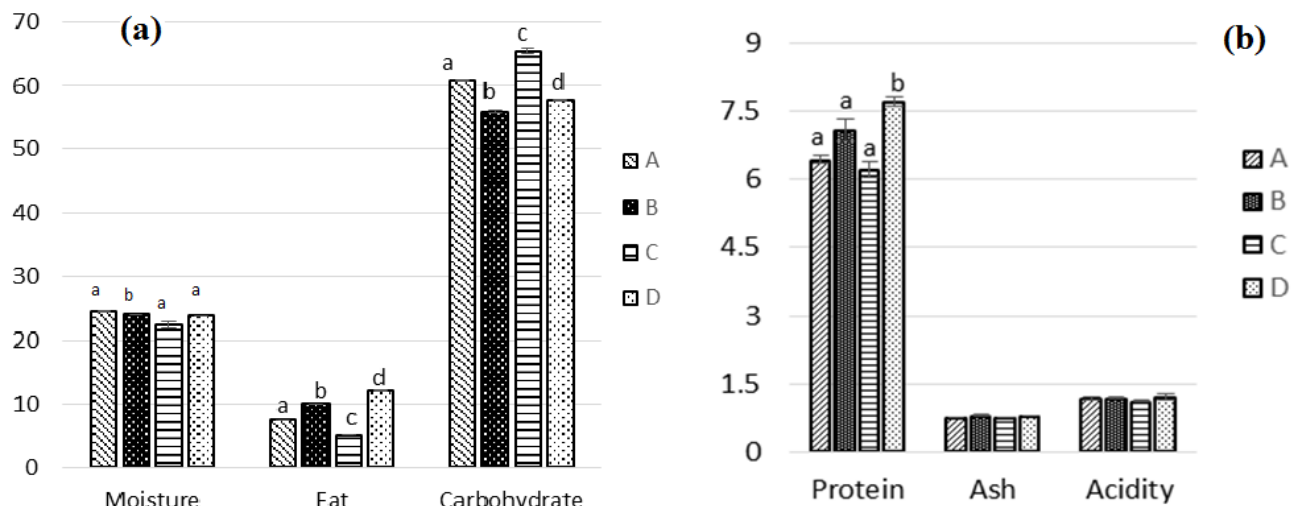


Figure 2 (a) Physico-chemical attributes (moisture, fat and carbohydrate content) of market samples of Chhanabara (Mean \pm SE, n=4). A, B, C, D are the four popular sweet shop of Berhampur city, West Bengal. Superscripts (lowercase letters) within a graph are significantly different (p<0.05). (b) Physico-chemical attributes (protein, ash and acidity) of market samples of Chhanabara (Mean \pm SE, n=4). A, B, C, D are the four popular sweet shop of Berhampur city, West Bengal. Superscripts (lowercase letters) within a graph are significantly different (p<0.05)

Textural profile analysis (TPA)

Texture is one of the most important physical parameters which categorizes the food products on the basis of various attributes *viz.* hardness, adhesiveness, springiness, gumminess and chewiness. Texture of all samples of chhanabara was measured in terms of Textural Profile Analysis (TPA) and results obtained are presented in **Figure 3**. Significant (p<0.05) variation (Table 1) was observed in case of hardness among the samples, the range being 2795- 3409 g. Usually fat and moisture content are the two most important parameters which affect the hardness prominently. However, some other factors like heating, stage and mode of sugar addition and ball formation methods also affect the hardness of chhanabara. Hardness value of sample C was found to be higher than other samples which may be attributed to lower fat as well as higher carbohydrate content in sample C as compare to others (Figure 3). Similar results were also reported by Chawla *et al.* [10] for market samples of doda burfi and Renuka *et al.* [11] for gulab jamun.

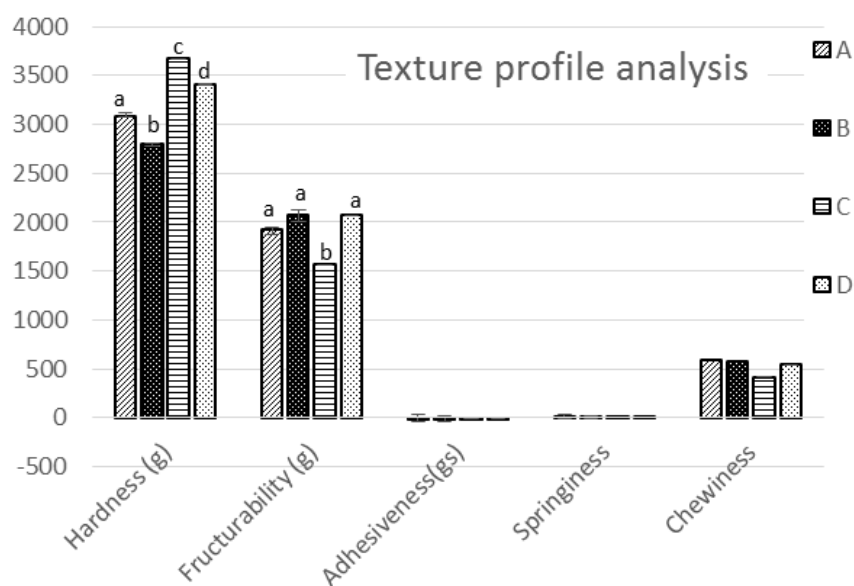


Figure 3 Texture profile analysis of market samples of Chhanabara (Mean \pm SE, n=4). A, B, C, D are the four popular sweet shop of Berhampur city, West Bengal. Superscripts (lowercase letters) within a graph are significantly different (p<0.05)

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