



Chhana binders effects on the quality of Rosogolla

J Begum, MN Islam, MH Rashid, S Begum, MZ Islam, AL Shekh and MSR Siddiki✉

Department of Dairy Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.
Gouripur Govt. College, Mymensingh, Bangladesh, ²District Election Officer, Netrokona, Bangladesh.

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Correspondence:

MSR Siddiki

✉:msrsiddiki@bau.edu.bd

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ABSTRACT

A study was carried out to investigate the effect of different levels of *Chhana* binder on the sensory and chemical quality of *Rosogolla*. Therefore, two (02) types of *Chhana* binders in different percentage such as 3, 5 and 7% wheat flour as well as 3, 5 and 7% rice flour (w/w) were used to prepare *Rosogolla* to find out a suitable *Chhana* binder for manufacturing good quality *Rosogolla*. Based on sensory evaluation, the highest score was obtained from 5% wheat flour and lowest score was from 5% rice flour, might be due to wheat flour contain gluten. From chemical analysis, the protein and carbohydrate content among the samples differed significantly ($p < 0.01$) and the highest values were noted for 7% wheat flour and rice flour, respectively. The highest and least mean values of moisture content were recorded for *Rosogolla* obtained from 3% wheat flour and 7% rice flour, respectively. Among different *Chhana* binder, 5% wheat flour was found best suitable for quality *Rosogolla* making.

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Introduction

Rosogolla, a soft and spongy syrupy dessert famous and popular in Indian subcontinent and South Asia is made from chhana by cooking and soaking in sugar syrup (Gurveer and Goswami, 2017). The milk and milk products are important human foods that are well recognized since Vedic times, among them *Rosogolla* is one of the most popular delicious, very nutritious among all sweetmeats in Bangladesh also (Mannan et al., 1995). It is nutritious due to its digestibility and adequately high protein, fat, mineral especially Ca and P and also fat soluble vitamin A and D (Prajapati et al., 2011). In addition to adequate shelf life and public health safety, the social usage of *Rosogolla* have been considered as important meal item in different festival of life like, Eid, Puja, birthday, marriage ceremony in our country and being meaningless without serving this sweetmeat to all ages (Islam et al., 2003). In any party or any kind of

entertainment either in domestic or national level, *Rosogolla* is used as one of the famed and demandable items. The quality of this type of sweetmeat depends on the method of chhana preparation, quality of chhana, use of an appropriate proportion and type of binding material and other process parameters and the binding material play important role in the body and texture of it (Gurveer and Goswami, 2017). The methodology of this chhana based product is still in the hands of petty sweetmeat makers who keep the method of preparation as trade secret leading to quality variations. *Rosogolla* prepared without refined wheat flour showed dull white color, cracks on the outer surface, undesirable soft body and loose texture with a sticky surface (De, 1980; Tambat et al., 1992). Gluten also helps retain moisture, which helps with prolonging the shelf life in the backed item. This is why gluten-free items tend to go state more quality than gluten-containing ones. Flour adds volume, texture, and taste to food recipes.

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The higher protein and gluten content make wheat flour drastic. Because rice has no gluten, its dough will not rise unless mixing it with wheat flour or gluten. Any alternation in the percentage of flour added to *chhana* could greatly affect the quality and finish of the final product. When boiled in sugar syrup flour forms glutinous substances that bind the *chhana* and helps the *Rosogolla* to take proper round shape, but, excessive use of flour may also be considered as an adulteration to the product. Binder used in *Rosogolla* preparation namely the wheat flour, rice flour has unique functional properties for maintain structural consistency, and provided an optimal taste, texture, firmness and deliver an appealing appearance. It is very essential to determine the addition of optimum level of *chhana* binders in the preparation of *Rosogolla* and the main objectives of this research works were to establish optimum level of *chhana* binders and their level for manufacturing good quality *Rosogolla*.

Materials and Methods

Preparation of Chhana

Chhana was prepared according to the method described by De (1980) with little modifications. For *chhana* preparation, 6 liters of fresh cow milk (standardized to 4.0 % fat) was heated to 95°C temperature and subsequently cooled to 75-80°C to get approximately 167.50±1.33 gm channa/kg milk used. Afterwards, coagulant (sour whey with 1.0% acidity) was slowly added to the milk with continuous stirring till as indicated by clear greenish whey and undisturbed complete coagulation occurred. The coagulated curd mass was allowed to cool up to 37°C and was then separated from whey by filtering through a muslin cloth for about 2-3 h for visible expel free whey. Finally, the *chhana* obtained was collected and weighed the yield.

Preparation of Chhana Balls

Total collected *chhana* was divided into six equal proportion and *chhana* balls were prepared by using different levels of wheat flour (WF) and rice flour (RF) as the *chhana* binder. Each binder had three levels and different types of *Rosogolla* were prepared. Six part of *chhana* were kneaded well with different types of *chhana* binder. *Chhana* ball was prepared thereafter and *Rosogolla* was prepared

separately from each combination of *chhana*. Different types of *chhana* binder were used namely 3% WF (A), 5% WF (B), 7% WF (C), 3% RF (D), 5% RF (E), 7% RF (F).

Preparation of Rosogolla

Rosogolla was prepared according to the method of Bhattacharya and Raj (1980) with few modifications. The *chhana* was mixed with wheat flour/rice flour and kneaded properly to make uniform and smooth dough. Kneaded *chhana* dough was divided into small pieces of 10±2 g, rolled between the palms until smooth balls without cracks on surface. Sugar syrup (60%) was prepared by dissolving requisite amount of sugar in potable water heated upto boiling point. In every trial, 1.5 L sugar solution was used for cooking and 1.0 L for soaking. The boiled sugar syrups were clarified by adding some quantity of raw milk and filtered through a muslin cloth. Previously formed *chhana* balls were gently dropped into the boiling syrup contained in *Karahi*. After a few seconds, the foam was formed which covered the floating balls. The mild temperature was regulated as the balls were constantly covered with foam. The hot water was sprinkled during continued boiling of sugar syrup for maintaining syrup concentration. The *chhana* balls was boiling for cooking completely within 20 to 30 min. until swollen to about double the original size. Finally, the balls were then transferred to the clarified hot sugar syrup (40% strength) for soaking, and added 2-3 cardamom pieces to the sugar syrup and cooled down to room temperature and stored at below 10°C.

Sensory evaluation of Rosogolla

The sensory score of product was given by an expert sensory panel consisting of 6 judges from the Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh for sensory attributes such as color and appearance, flavor and taste, body and texture, sweetness and overall acceptability.

Chemical Analysis

The moisture, fat, carbohydrate and ash content of milk, *chhana* and *Rosogolla* were determined as per AOAC, 2003 method. The protein content of the products was determined by Kjeldhal method and the acidity was

analyzed by acid-base titration method (Aggrawala and Sharma, 1961).

Statistical Analysis

Data collected on different parameters were subjected to statistical analysis. Analysis Variance (ANOVA) test was done to find out the statistical differences between different groups with the help of wasp2 (Web Agri Stat Package, version 2.0) computer program.

Results and Discussion

Chhana binders effect on the sensory characteristics of Rosogolla

Flavour and taste

The sensory evaluation of *Rosogolla* was depicted in Table 1. Average flavour and taste score of *Rosogolla* samples prepared by using different *chhana* binder showed significant differences ($p < 0.01$) among *Rosogolla* samples.

Parameters	Types of <i>Rosogolla</i>						CD
	Wheat flour			Rice flour			
	A	B	C	D	E	F	
Colour and appearance	13.38±0.12	13.71±0.41	12.88±0.62	12.63±0.62	12.71±0.70	12.50±0.75	-
Flavour and taste	50.63 ^b ±0.25	51.56 ^a ±0.62	49.13 ^c ±0.25	48.26 ^d ±0.12	45.00 ^e ±0.12	44.88 ^b ±0.37	0.61
Body and texture	25.38 ^{bc} ±0.37	26.92 ^a ±0.81	25.88 ^{ab} ±0.87	25.00 ^{bc} ±0.75	24.63 ^c ±0.12	24.75 ^{bc} ±0.75	1.20
Total sensory score	89.39 ^b ±0.62	92.38 ^a ±1.36	87.89 ^c ±0.38	85.89 ^d ±0.13	82.47 ^e ±0.86	81.26 ^e ±1.00	1.48

Table 1: *Chhana* binders effect on the sensory characteristics of *Rosogolla*

The mean values are represented as mean±SD; Values with different superscripts (a, b, c and d) are significantly different at 5% level; A = 3% wheat flour, B = 5% wheat flour, C = 7% wheat flour, D = 3% rice flour, E = 5% rice flour, F = 7% rice flour, CD = Critical difference

Table 2: *Chhana* binders effect on the chemical composition of *Rosogolla*

Parameters (%)	Type of <i>Rosogolla</i>						CD
	Wheat flour			Rice flour			
	A	B	C	D	E	F	
Moisture	56.73 ^a ±31.09	53.43 ^b ±9.58	51.54 ^{bc} ±8.61	52.30 ^{bc} ±16.71	51.08 ^{bc} ±4.06	49.76 ^c ±5.75	27.78
Fat	5.25±7.50	5.58±5.20	5.75±2.50	5.16±1.44	5.42±1.44	5.75±2.50	-
Protein	6.12 ^d ±1.25	6.65 ^b ±1.45	7.15 ^a ±1.33	6.02 ^d ±0.25	6.45 ^c ±0.62	6.80 ^b ±0.39	1.78
Ash	1.40±0.18	1.51±0.04	1.63±2.42	1.37±1.47	1.44±0.99	1.50±0.50	-
Carbohydrate	30.58 ^c ±24.66	33.83 ^{bc} ±12.82	34.00 ^{ab} ±7.30	35.13 ^{ab} ±16.84	35.60 ^a ±3.99	36.20 ^a ±9.00	25.23

The mean values are represented as mean±SD; Values with different superscripts (a, b, c and d) are significantly different at 5% level; A = 3% wheat flour, B = 5% wheat flour, C = 7% wheat flour, D = 3% rice flour, E = 5% rice flour, F = 7% rice flour, CD = Critical difference

Highest score was obtained from B type and lowest score was found in F type binder. It was found that average highest flavour and taste scores were recorded for 5% wheat flour. Shelke *et al.* (2003) found pleasant flavour in both 3% wheat and 3% rice starch (w/w of chhana) used as binding material. Basak *et al.* (2007) found 5% flour added *Rosogolla* obtained highest flavor score.

Body and texture

The body and texture scores of *Rosogolla* samples prepared by using different level of wheat flour and rice flour were significantly differ ($p < 0.05$). The highest score was obtained

from 5% wheat flour and lowest score was from 5% rice flour. It might be due to wheat flour contain gluten. When the gluten in wheat are stretched out through the kneading or mixing process, they form little pocket and at the time cooking the *chhana* ball expands or rise. The gluten of wheat flour allows holding *Rosogolla* shape and since gluten is a protein, it becomes harder when it is heated. This hardening gives it its firm texture. Rice flour does not have gluten. The higher protein and gluten content make wheat flour elastic. It can be formed into shapes that stay in shape, and it will maintain during rising and cooking process.

Colour and appearance

Average colour and appearance scores of *Rosogolla* were not significantly differ among different samples. Highest score was obtained from 5% wheat flour *Rosogolla* and lowest score was from 7% rice flour *Rosogolla*. Basak et al. (2007) worked to determine the addition of optimum level of flour in the preparation of *Rosogolla* and found there were no significant difference in color and appearances of different types of *Rosogolla* samples.

Total sensory score

Total sensory score of *Rosogolla* showed that there were significant differences ($p < 0.01$) among the total sensory scores of different types of *Rosogolla* samples (Table 1). Highest score was obtained from 5% wheat flour *Rosogolla* followed by A, C, D and E *Rosogolla* (Table 1) and lowest score was obtained from 7% rice flour *Rosogolla*. This finding also similar to Basak et al. (2007) who found *Rosogolla* containing 5% wheat flour scored highest overall score on the basis of flavor, body and texture, colour and appearance and taste. Present research findings partially similar to Tambat et al. (1992) who mentioned that 4% flour was sufficient for preparation of *Rosogolla*. He also mentioned that, addition of flour above 4% caused rough appearance, hard body and coarse texture with flour taste and off flavor. Shelke et al. (2003) admired cow milk *chhana* with 3% refined wheat and rice and found the *Rosogolla* with rice starch was most acceptable with uniform surface whereas wheat starch was more acceptable with white and uniform surface.

Chhana binder effect on the chemical composition of Rosogolla

The chemical quality of *Rosogolla* as affected by utilizing different *chhana* binder is depicted in Table 2. All the chemical constituents of *Rosogolla* were significantly ($P > 0.05$) affected by the type of *chhana* binder used except for fat and ash content. The highest and least mean values of moisture content were recorded for *Rosogolla* obtained from 3% wheat flour and 7% rice flour, respectively. Reddy et al. (2016) reported moisture content of 58.09 % for *Rosogolla*; such value was higher than the moisture content obtained in present investigation corresponds to Bangladesh

Standard and Testing Institution (BSTI, 1993) standard moisture content of *Rosogolla* 55.0% (max).

In addition, Sengupta et al. (2017) observed in *Rosogolla*-like product utilizing lactic acid as coagulant the moisture content of 53.0%. Besides, according to Bhattacharya and Raj (1980) prepared *Rosogolla* with *chhana* having initial moisture content of 40, 45, 50, 55, 58, 60 and 65% and stated about 55-58% moisture in *chhana* to be optimum for preparation of good quality *Rosogolla* having round shape, soft body, and maximum spongy texture for atmospheric cooking.

The highest fat content was noted for *Rosogolla* prepared from 7% WF and 7% RF but the other values were non-significant. According to both BSTI standard (1993) and Indian Standard (IS, 1967) fat content of *Rosogolla* should be minimum 5.0 %, which was more or less similar to the result of our investigation. Rice flour contains slightly less fat content than wheat flour. Basak et al. (2007) observed *Rosogolla* prepared by using 1% of flour contained the highest amount of fat than the other *Rosogolla* samples, this was due to the fact that *Rosogolla* prepared using 1% flour contained higher amount of *chhana* which in turn contributed more fat. This result was not agreed with present investigation. Bhattacharya and Raj (1980) reported that use of high fat milk leads to a higher fat content in the *Rosogolla* which influence the body and improve the texture. Desai et al. (1993) also reported 5.4% fat might be recommended to manufacture better quality *Rosogolla*. The maximum and minimum protein content was noted for *Rosogolla* obtained from 7% WF and 3% RF, respectively. The maximum ash content was associated with *Rosogolla* prepared from 7% WF containing *chhana*. Thakur et al. (2015) recorded 1.63% ash for *Rosogolla* made from *chhana* prepared using 0.5% citric acid coagulant. The maximum and minimum carbohydrate content was noted for *Rosogolla* prepared from 7% RF and 3% WF *chhana*. As per BSTI specification (1993), the carbohydrate content of *Rosogolla* cannot exceed 45.0 %.

Conclusion

Wheat and rice flour are the mostly used *chhana* binders in preparation of sweetmeats

especially *Rosogolla* by the sweetmeat manufacturers in Bangladesh. So far, the quality of *Rosogolla* is concerned; there was significant difference among the types of *Rosogolla* samples. In conclusion, 5% wheat flour was found to be the best suitable for quality *Rosogolla* preparation which yielded *Rosogolla* having desired sensory quality as well as conforming to the standards for chemical composition.

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