Bang. J. Anim. Sci. 2010, 39(1&2) : 134 – 143 ISSN 0003-3588

COMPARISON OF THE ROSSOGOLLA (BALISH) PREPARED IN THE LABORATORY AND COLLECTED FROM MARKET OF NETROKONA DISTRICT

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Abstract

This experiment assessed the quality of Rossogolla (Balish) manufactured in the laboratory and collected from Netrokona district. Four types of Rossogolla, (A) Laboratory made Rossogolla, (B) Rossogolla from Mukti Mistanno vander, (C) Rossogolla from Gwyneth Mistanno vander, (D) Rossogolla from Khan Mistanno vander were used in this experiment. Quality of Rossogolla were evaluated by physical, chemical and microbiological tests. From the physical examinations it appears that quality differed among different Rossogolla. Significant differences within flavour score, body and texture, colour and appearance and taste among the four different preparations of Rossogolla ($P<0.05$) were seen. The chemical analysis score implies that Total solids, Protein, Fat, Carbohydrate, Ash and microbial status varied significantly among four different types of Rossogolla of Netrokona district. Overall Physical, Chemical and Microbial status indicate that the type (A) Laboratory made Rossogolla was superior in comparison with others.

Key words: Rossogolla, Laboratory, Local market

Introduction

Bangladeshi people consume daily various dairy food products among them; Rossogolla is very important one. Rasogollla is nothing but milk-derivative product and it is also very delicious, spongy, sweet and palatable. That is why; the Rossogolla is acceptable to Bangali and Indian people are fond of this product. The word Rossogolla is sometimes replaced by local name such as Balish which is popular in Netrokona district of Bangladesh. Balish (special type of Rossogolla) is one of the most important pleasant and charming foods to most of the people of in Netrokona District. It is extensively used, chiefly alone with other foods due to their flavour and high food value. Sweetmeats are nature's most important contribution to civilization. The first pre-requisite for producing excellent quality of sweetmeats is the availability of high quality chhana. Efforts have been made to manufacture Rossogolla from buffalo milk with only limited success and market specimens do not possess the desired body texture (Kanwal *et al.,* 1980). Cow milk is exclusively used for chhana preparation by always it yields a superior and acceptable quality product suitable for

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(Received: August 29, 2009)

Rossogolla making (Suguna Rao *et al*., 1989). In most of the markets of Bangladesh Rossogolla are more or less available but the quality of Rossogolla of various places varies due to different in manufacturing procedure in different places. Kanwal *et al*. (1980) showed the variation in Rossogollas composition which obtained from laboratory and market. In the laboratory scientific methods are followed to manufacture the Rossogolla. That is why, the quality of laboratory made Rossogolla were superior. Not only laboratory but also have some manufacturer who tries to maintain the quality and also try to develop their quality to keep their goodwill. Although some research works have been done sporadically by different workers to monitor the quality of Rossogolla available in local markets but no works has yet been done by any scientist to evaluate the special type of Rossogolla popularly known as Balish found in Netrokona district. For these reasons the present experiment was conducted to compare physical chemical and microbiological quality of Balish Rossogolla collected from Netrokona and prepared in the laboratory and to recommended sweetmeat makers about the appropriate methods of manufacturing Balish Rossogolla.

Materials and Methods

Period of experiment

This experiment was conducted at the Bangladesh Agricultural University, Dairy Science Laboratory during the period from September 20 to November 15, 2008. Chemical analysis was done at the Dairy Science Laboratory and Animal Science Laboratory of Bangladesh Agricultural University, Mymensingh.

Collection of Rossogolla

For this experiment 3 samples of special type Rossogolla (Balish) from three different shops of Netrokona district were collected. Six Rossogolla from each shop were taken and three replications were made for each sample. Rossogolla samples were collected from following shops Mukti Mistanno vander (B), Gayanath Mistanno vander (C), Khan Mistanno vander (D), Netrokona district. Eighteen samples were prepared in the Laboratory under proper hygienic condition and designated as ‘A’ Rossogolla. Balish Rossogolla was collected from the above mentioned shops and taken to the Dairy Technology Laboratory. Those were kept in refrigerator at 4°C for organoleptic evaluation and chemical analysis.

Preparation of Rossogolla in the laboratory

For making chhana, cow milk was collected from Bangladesh Agricultural University (BAU) Dairy Farm. Before making chhana, milk samples were analyzed in the laboratory to know their fat and solids-not-fat (SNF) content. During each trial, 3 liters cow milk was boiled in a stainless steel pan for ten minutes and was slightly cooled. Six hundred milliliter whey was added in 3 liters of fresh milk at a temperature of 70°C. Lumps of casein were formed as soon as the whey was added to the boiled milk, which is generally known as chhana. The contents were allowed to cool down at room temperature (about 25°C) for 30 minutes and then the coagulum was transferred to a muslin cloth. When the loosely bound whey was

completely drained out, the muslin cloth were tied together then the coagulum was hung for about one and half an hour to complete drainage of whey. The coagulum was then carefully removed and weighed. The ingredient composition of Rossogolla preparation is shown in Table 1.

Table 1. The ingredients used for preparation of Rossogolla

Ingredients	Amounts		
	1st preparation	2nd preparation	3rd preparation
Channa (g)	590	610	595
Flour (g)	75	80	75
Sugar (g)	3000	3000	3000
Water (ml)	2500	2500	2500

Chhana and flour were weighed separately, mixed and kneaded. Then the kneaded mash was converted into an oval shape with proper consistency to avoid the crack on the surface. About 3 kg of sugar was dissolved in 2.5 litres of water in an iron pan and the solution was boiled. After some times of boiling the scum was labeled out for obtaining clean syrup. The syrup was kept in a suitable sized pan with a depth of 20 cm. The chhana of desired size (Balish) was made by hand. When all the Balish Rossogolla were made they were put gently in the boiling sugar syrup for cooking. Care was taken that the newly prepared rosogalla (Balish) were not over crowded in the pan and there was enough space for moving freely especially when they swelled. The heat was so controlled that the Rossogolla were constantly covered with foam. To control the density of the sugar syrup throughout the cooking period water was sprinkled at a regular interval. In about 10-15 minutes the Rossogolla were swelled and after 10 minutes of swelling the colour of the Rossogolla become light were dark. Then the Rossogolla were allowed to stay for sometimes to become cool. After 3 hours Rossogolla were suitable for consumption.

Analysis of the samples

Some physical and chemical Tests were conducted to monitor the quality of dahi samples. The Physical tests (sensory and organoleptic evaluation) were flavour score, body and texture, colour and appearance, taste score, total physical score and chemical tests were determination of acidity, pH, moisture contents, total solids content, protein contents, fat contents, carbohydrate contents and ash contents. The physical tests were performed organoleptically with the help of an expert panel of judges by using a score card. The chemical tests of samples of the different sources of Rossogolla were determined according to AOAC (2003). Carbohydrate was determined by calculation method. Acidity was determined by the titrating with N/10 sodium hydroxide solution using the procedure of Aggarwala and Sharma (1961) and pH was measured with help of pH meter-215 (Ciba Corning Diagnostic Ltd. Sudhury, Sufolk, England Co.106D).

Statistical analysis

In this experiment all experimental materials were completely homogenous and for this reason data were analyzed by using one way analysis of variance test (CRD) as per MSTATc program. The differences among sample means were compared by calculating LSD value with the help of a Least Significant Difference test (Goimez and Gomez, 1984).

Results and Discussion

Physical Parameters

Flavour score

Flavour score of all four sources of Balish Rossogolla are presented on Table 2. The statistical analysis showed significant difference ($P<0.05$) between laboratory and market Rossogolla Flavour score of all market Rossogolla samples were almost similar but laboratory Rossogolla showed highest score. The result indicates that the laboratory made Rossogolla were superior to others. Bhattacharya and Raj (1980) indicated that flavour of Rossogolla was enhanced by cooking. Flavour may differ with source of milk. Joshi *et al.* (1991) revealed that, chhana from cow and buffalo milk had acceptable flavour where as that from goat milk had acidic flavour.

Table 2. Comparison of average score of various physical parameters (organoleptic characteristics) of Rossogolla

Parameters	Sources of Rossogolla (Balish)				LSD	Level of Sig.
	A	B	C	D		
Flavour score (45)	$42.17^{a}\pm2.48$	$40.42^{ab}\pm2.87$	$39.67^{ab}\pm2.42$	$38.17^{b}\pm2.79$	2.912	**
Body and texture (30)	$28.00^{a}\pm1.35$	$26.75^{ab}\pm2.22$	$26.33^{b}\pm2.46$	$25.50^{b}\pm1.83$	1.655	*
Colour and appearance (15)	$13.41^{a}\pm0.90$	$13.00^{ab}\pm0.95$	$12.33^{b}\pm1.07$	$12.17^{b}\pm1.34$	0.881	*
Taste score (10)	$8.84^{a}\pm0.83$	$8.08^{ab}\pm0.90$	$8.00^{ab}\pm0.85$	$7.33^{b}\pm1.78$	0.955	*
Total physical score (100)	$92.76^{a}\pm4.45$	$87.58^{ab}\pm5.09$	$85.58^{b}\pm7.74$	$83.16^{b}\pm6.41$	6.656	**

A = Laboratory made Balish Rossogolla; B = Rossogolla (Balish) from Mukti Mistanno vander; C = Rossogolla (Balish) from Gayanath Mistanno vander; D = Rossogolla (Balish) from Khan Mistanno vande

^{a,b,c} Mean with different superscripts in a row very significantly

* = Significant at 5 % level ** = Significant at 1% level

Body and texture score

The body and texture score for A, B, C and D sources Rossogolla are presented in Table 2. Statistical analysis showed that there were significant difference ($P<0.05$) within the body and texture score of different sources of Rossogolla samples (Laboratory made Rossogolla and market Rossogolla). According to Gupta *et al.* (1993) textural quality of market Rossogolla was significantly correlated with moisture, fat, protein and calcium contents such a result has also been reported by Bhattacharya and Raj (1980).

Colour and appearance score

There was significant difference (P<0.01) within the colour and appearance score of different sources of Rossogolla Table 2. The highest score of (14.01) colour and appearance was recorded for laboratory made Rossogolla than other Rossogolla samples collected from markets, According to Mini *et al.* (1995) Rossogolla prepared from whole milk score higher than the skim milk for colour and appearance. Tambat *et al.* (1992) showed fat and moida levels gave acceptable colour and appearance when Rossogolla were prepared. Some times cooking time might enhance the colour of Rossogolla (Bhattacharya and Raj, 1980).

Taste score

Higher taste score was noticed for laboratory made in comparison with market Rossogolla. During preparation of Rossogolla in laboratory all of the ingredients used as standard levels. Actually taste of Rossogolla depends on the ingredients used. Due to addition of fresh ingredient taste of laboratory made Rossogolla increased significantly.

Total physical score

As the all physical parameters for laboratory made Rossogolla were higher than the market Rossogolla that is why total physical score gone highest and this highest value indicated that the laboratory made Rossogolla was superior to the market sources. Total score for market Rossogolla were near for each. The difference between the laboratory made Rossogolla and market were highly significant (P<0.01). Total physical score of Rossogolla may vary with different factors. According to Puranik *et al.* (1997) for pure recombined milk chhana was not acceptable and according to Mini *et al.* (1995) milk sources (whole milk, skim milk, coconut milk) were responsive for overall quality of Rossogolla and in this case they showed control Rossogolla gave higher score than the others. Tarafdar et.al. (1988) found that overall quality scores of Rossogolla prepared with mechanically kneaded chhana were 7.5% lower than those market Rossogolla.

Chemical parameters

Chemical parameters are also important indicators of quality measures of Rossogolla. Results obtained for different parameters are presented in Table 3.

Acidity percentage

The acidity percentage of different sources of Balish Rossogolla samples are shown in Table 3. It was found that statistically the average acidity for A, B, C and D sources Rossogolla differed significantly (P<0.01). Acidity of market Rossogolla samples was higher than that of laboratory prepared Rossogolla. Haque (2000) showed the acidity of Rossogolla were 0.75, 0.70 and 0.71% which were prepared from cow, buffalo and equal mixture of cow and buffalo milk. Chanda (1999) observed acidity of Rossogolla were 0.60, 0.70, 1.10 and 1.40% respectively which were prepared from cow milk chhana, 10% soya chhana, 20% soya chhana and 30% soya chhana respectively. The result obtained by this research work was more or less similar with the result obtained by Haque (2000) and Chanda (1999). Arora *et al.* (1995) observed that the acidity increased during the storage. Laboratory made

Rossogolla were not stored whereas market Rossogolla may be stored, that is why, acidity of laboratory made Rossogolla was relatively lower in acidity value than market Rossogolla.

Table 3. Comparison of average chemical composition of various sources of Rossogolla

Parameters	Sources of Rossogolla (Balish)				LSD	Level of Sig.
	A	B	C	D		
Acidity (%)	0.08^{b}±0.00	0.09^{a}±0.00	0.08^{b}±0.00	0.09^{a}±0.01	0.008	**
pH	6.76^{a}±0.06	6.46^{b}±0.06	6.66^{a}±0.06	6.43^{b}±0.06	0.150	**
Moisture (g/kg)	394.50^{a}±5.80	336.23^{b}±9.53	349.03^{b}±9.38	342.17^{b}±12.61	26.400	**
Total solids (g/kg)	605.50^{b}±5.80	663.70^{a}±9.53	650.97^{a}±9.38	657.80±12.67	26.450	**
Protein (g/kg)	62.00±1.00	61.33±6.66	67.16±1.04	58.36±2.12	8.800	**
Fat (g/kg)	51.83^{b}±1.04	49.10^{bc}±0.85	59.00^{a}±1.00	45.33^{c}±2.52	4.143	**
Carbohydrate (g/kg)	485.43^{c}±5.41	550.90^{a}±9.71	519.03^{b}±8.50	548.23^{a}±14.81	27.900	**
Ash (g/kg)	6.23^{a}±0.15	5.40^{c}±0.10	5.76^{c}±0.15	5.87^{ab}±0.20	0.424	**

A = Laboratory made Balish Rossogolla; B = Rossogolla (Balish) from Mukti Mistanno vander; C = Rossogolla (Balish) from Gayanath Mistanno vander; D = Rossogolla (Balish) from Khan Mistanno vander

^{a,b,c} Mean with different superscripts in a row very significantly

** = Significant at 1% level

pH value

The average pH value of different Balish Rossogolla samples are presented in Table 3. Statisticaly analysis showed that there were significant differences ($P<0.01$) within the pH value of different sources of Rossogolla samples. The pH of laboratory made Rossogolla and market Rossogolla were within the accepted level whereas pH of laboratory made Rossogolla was slightly higher than market samples. Haque (2000) reported pH of Rossogolla made from cow and buffalo milk was 6.60 and 6.73 respectively and Chanda (1999) reported the pH of Rossogolla within the range of 5.92 to 6.36 these results are more or less similar with the present study.. Considering the chemical properties the laboratory made Rossogolla were superior to market Rossogolla from any point of view. As the laboratory made Rossogolla was prepared with special cares. So, the factor of preparation contributed to make the laboratory made Rossogolla good in quality.

Moisture content

Statistically there were significant differences ($P<0.01$) between the moisture of different sources of Rossogolla (Table 3). Higher moisture content was noticed in laboratory made Rossogolla whereas market Rossogolla samples rot iced lesser amount of moisture. Bhattacharya and Raj (1980) reported that acceptable quality Rossogolla contain 49.85 to 53.80% moisture. The higher amount of moisture indicate good quality Rossogolla and sometimes it may give good flavour in the products whereas chhana containing 62.5 and 63.5% moisture. Gupta *et al.* (1993) said overall textural quality was significantly correlated

with moisture. Hardness of Rossogolla also influenced by moisture contains and this type of comments was drowned by Ravichandra *et al*. (1997).

Total solids content

The total solids content for A, B, C and D sources of Balish Rossogolla are presented on Table 3. Statistical analysis showed that three were significant differences ($P<0.01$) within the total solids content of laboratory made Rossogolla and market Rossogolla. Sur *et al*.(1999) reported standard total solids for Rossogolla 60.50% which was more or less similar with the laboratory made Rossogolla (605.50 g/kg). The total solids contents of market Rossogolla were higher than laboratory Rossogolla indicating inferiority of the sources. Kanwal *et al*. (1980) also showed total solids of 63.0% for laboratory made Rossogolla and 64.8% for market Rossogolla which also indicated higher percent of total solids content in market Rossogolla. So the results obtained by the scientists are more or less agreed with the result of present experiment.

Protein content

Protein contents of different sources of Balish Rossogolla are presented in Table 3. Statistical analysis showed that protein content of Rossogolla samples varies significantly ($P<0.01$). Laboratory made Rossogolla contain higher protein level as compare to market Rossogolla though all this sources (Laboratory made Rossogolla and market Rossogolla) content protein level according to BSTI. As per the Bangladesh Standard Testing Institute (BSTI, 1993) specification of minimum protein content of Rossogolla should be 5%. Higher protein percent increase the quality of Rossogolla.

Fat content

The mean fat contents of A, B, C and D sources Balish Rossogolla sample are demonstrated in Table 3. Differences were highly significant ($P<0.01$) among those mean values (Table 3). From this result it was observed that laboratory made Rossogolla had significantly highest amount of fat and market Rossogolla had the lowest amount of fat. Quality of Rossogolla mainly influences by the quality of milk Bhattacharya and Raj (1980) reported in a study that use of high fat milk leads to a higher fat content in the Rossogolla which softness the body and improve the texture. Kanwal *et al.* (1980) studied that laboratory made Rossogolla and market Rossogolla contain 4.2 and 4.65 had respectively. In another study Sur *et al.* (2000) showed that fat percent of Rossogolla was 5.39 when Rossogolla was prepared from buffalo milk. So the result obtained by this research was almost satisfactory in relation to fat content.

Carbohydrate content

Statistical analysis indicated that there were significant difference ($P<0.01$) within the carbohydrate content of different sources of Rossogolla samples. Market sample of

Rossogolla may might adulterated and most of the ingredients which are used in Rossogolla as adulterated materials generally content higher amount of carbohydrate that give the market Rossogolla higher levels of carbohydrate content. Adhikari *et al.* (1992) said that chhana content with higher percent of lactose contributed this higher percent of lactose within the Rossogolla when Rossogolla was prepared from that chana. Kanwal *et al.* (1980) indicated that Rossogolla prepared in laboratory had sucrose of 51.90% whereas market Rossogolla had 53.60% sucrose. In another study Sur *et al.* (2000) noted 32.13% sucrose in Rossogolla which were prepared from buffalo milk. Carbohydrate content of laboratory made Rossogolla obtained by this study was close to noted by Sur *et al.* (2000).

Ash content

Statistical analysis showed that there were significant differences ($P<0.01$) within the ash content of different sources of Rossogolla samples. Laboratory made Rossogolla had higher levels of ash as compared to market Rossogolla, Sur *et al.* (2000) mentioned that 0.33% ash in Rossogolla prepared from buffalo milk. Katra and Bhargava (1990) said higher ash and total carbohydrate decreased the sponginess.

Microbiological status

The microbiological status of the Balish Rossogolla sample was determined by total viable count and coliform count using standard plate count (S.P.C) method.

The numbers of viable bacteria and coliform count of A, B, C and D Rossogolla sample are demonstrated in Table 4 and there was significant difference within the total viable count of different Rossogolla sample. Table 5 indicates then the Rossogolla sample had lower total viable count. Low bacterial content of laboratory made Rossogolla indicates that strict hygienic condition was maintained at the laboratory during manufacturing time. It was found that coliform bacteria were absent in laboratory made Rossogolla but present in collected Rossogolla sample. Coliform bacteria are the indicators of hygienic conditions applied during manufacturing time. So, coliform count indicates that strict hygienic measures were taken during Rossogolla preparation.

Table 4. Comparison of average score of various microbiological status of Rossogolla sample made in laboratory and collected from Netrokona town

Bacterial parameters	Samples				Level of Sig.
	A	B	C	D	
Total viable count (log value) CFU/g	3.54±0.02	5.75±0.02	5.80±0.02	5.79±0.02	**
Coliform count/g (log count)	0.00±0.06	1.66±0.06	1.48±0.06	1.49±0.06	**

** = Significant and 1% level; A = Laboratory made Rossogolla; B = Mukti Mistanno Vander; C = Gayanath Mistanno Vander; D = Khan Mistanno Vander

Conclusion

From the results of all parameters (physical, chemical and microbial) it was observed that the laboratory made Rossogolla was better than the Rossogolla collected from Netrokona.

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