RESEARCH ARTICLE

# Effect of Coagulants on the Yield and Quality of *Chhana* and *Rasogolla*

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## Abstract

A study was carried out to investigate the effect of different coagulants on the recovery of milk solids, yield and sensory quality of *Chhana* and the resultant *Rasogolla.* Six type of coagulants comprising of sour whey (0.5%, 1.0% acidity), citric acid (0.5%, 1.0% acidity) and blend of sour whey and citric acid (0.5%, 1.0% acidity) were used to prepare *Chhana* followed by sweet meat *Rasogolla*. The non-significant yield of *chhana* was found by the use of different coagulants; however it had a significant influence on the fat and total solids (TS) recoveries ranges from 90.5 to 93.8%; 42 to 44% of milk for *chhana,* respectively. The highest mean yield, fat recovery and TS recovery were recorded for B type *chhana* prepared using 1% sour whey as coagulant. *Rasogollas* prepared using varying coagulants did not have any significant influence on any of the sensory attributes of product studied. *Rasogolla* prepared from *chhana* made using 1% sour whey as coagulant had the highest overall sensory score. It is recommended to employ sour whey with 1.0 % of titratable acidity as coagulating agent in the preparation of *Rasogolla*.

**Key words:** Coagulant, *Chhana*, *Rasogolla*, Yield, Sensory quality

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## Introduction

*Rasogolla* is one of the most popular delicious and nutritious products among all sweetmeats being produced in Bangladesh (Mannan *et al*., 1995). It contains fairly high protein, fat, minerals especially Ca and P together with fat-soluble vitamins A, D, E and K (Prajapati *et al*., 2011). On all festive occasions, *Rasogolla* is the widely consumed sweetmeat by people of all age groups. The social usage of *Rasogolla* bears a great significance in each sphere of life such as the Holy Eid, Puja and the birthday parties; the marriage ceremony cannot be presumed to be held without serving this sweetmeat (Islam *et al*., 2003). In the rural areas of Bangladesh, the *Ghosh* (sweetmeat makers) or milkman prepares and sells *Rasogolla*.

The pre-requisite for producing excellent quality of *Rasogolla* sweetmeat is the availability of high-quality *chhana*. The food value of *Rasogolla* largely depends upon the milk constituents recovered in *chhana* when prepared from milk. In general, cow milk *chhana* is associated with a soft body and smooth texture; such quality is preferred for preparation of high quality *Rasogolla* (De and Ray, 1954; Joshi *et al*., 1991; Ravichandra *et al*., 1997). Several studies have suggested that cow milk with 4.0 % fat is recommended for the preparation of *Rasogolla* compared to other milks; the product obtained from cow milk is soft and spongy (Bhattacharya and Raj, 1980; Soni *et al*., 1980; Bandyopadhyay *et al*., 2005). The hardness of *Rasogolla* is mainly influenced by the fat content of standardized milk, Solids not fat (SNF) of milk, acidity of whey at coagulation and the moisture content of *chhana* (Ravichandra *et al*., 1997).

The type and strength of coagulant used in *chhana* making plays a vital role in determining its quality. Citric acid has been used by most of the investigators for the preparation of *chhana* and resultant *Rasogolla* (Sharma *et al*., 1991; Pandey *et al*., 2004). Sour whey is easily available serving as a low-cost coagulant. It has been used for the production of soft bodied *chhana,* suitable for *Rasogolla* making (Mahanta, 1964; Srinivasan and Anantakrishnan, 1964). Likewise, satisfactory quality *chhana* has been obtained through use of 1.0 % citric acid solution (Kumar *et al*., 2007). The yield of *chhana* depends mainly on the TS content of milk, milk solids recovery in *chhana* and the moisture retention in *chhana* (Ray and De, 1953; De, 1980). Bhattacharya and Raj (1980) recommended keeping 55.0-58.0% moisture in *chhana* to be obtained good quality *Rasogolla.* Therefore, the study was conducted to select the coagulant which performs best in the preparation of good quality *chhana* and resultant *Rasogolla*.

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## Materials and methods

### Milk

Raw cow milk was collected from Bangladesh Agricultural University (BAU) Dairy Farm, Mymensingh, Bangladesh and standardized to 4.0% fat using skim milk separated from the same milk.

### Coagulants

Food grade citric acid (RFCL Ltd., India), sour whey was collected from *Rasogolla* making shop Krishna Cabin, Mymensingh, Bangladesh. In order to standardize the whey up to desired acidity level, both fresh (0.42% acidity) and 3 days old whey (0.61% acidity) was collected. Sour whey was not pasteurized and used directly to make *chhana*. The six types of coagulants were used as follows:

### Wheat flour, Sugar and Cardamom

Soft wheat flour (ACI Pure, Dhaka-Bangladesh) and Cane Sugar (Fresh, Dhaka-Bangladesh) and Cardamom were purchased from local market of Bangladesh.

### *Chhana* Preparation

*Chhana* was prepared according to the method described by De (1980) with few modifications. For *chhana* preparation, 1 L of fresh cow milk (standardized to 4.0 % fat) was heated to 95°C temperature and subsequently cooled to 75-80°C. Afterwards, different coagulants were slowly added to the milk with continuous stirring till complete coagulation occurred as indicated by clear greenish whey. The coagulated mass was kept undisturbed for the complete coagulation of milk and allowed to cool up to 37°C. *Chhana* was then separated from whey by filtering through a muslin cloth for about 2-3 hour for visible cessation of drainage of whey. Finally, the *chhana* obtained from each lot was collected and weighed to note the yield.

**Table 1:** Type strength of coagulants used in preparing *chhana*

| Sour whey | | Citric acid | | Sour whey + Citric acid | |
|---|---|---|---|---|---|
| A | B | C | D | E | F |
| 0.5% | 1.0% | 0.5% | 1.0% | 0.5% | 1.0% |

Per cent indicates titratable acidity as Lactic acid

### *Rasogolla* preparation

*Rasogolla* was prepared according to the method of Bhattacharya and Raj (1980) with few modifications. The *chhana* was mixed with wheat flour (5.0%, w/w) and kneaded properly to make uniform and smooth dough. *Chhana* dough was divided into small pieces of 10±2 g and rolled between the palms to obtain smooth balls, without cracks. Sugar syrup of 60.0% was prepared by dissolving requisite amount of sugar in potable water. In each trial, 1.5 L sugar solution was used for cooking and 1.0 L for soaking. All sugar syrups were clarified by adding some quantity of raw milk during boiling 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. Some quantity of water was sprinkled during continued boiling of sugar syrup to maintain the sugar syrup concentration. Complete cooking of *chhana* balls was accomplished within 20–30 minutes. The balls were swollen to about double the original size. Finally, the balls were transferred to the clarified hot sugar syrup having 40.0 % strength for soaking and 2–3 cardamom pieces were added to the sugar syrup and cooled down to room temperature or below.

### Sensory evaluation of *Rasogolla*

The sensory scoring of product was carried out by an expert panel of six judges from the Department of Dairy Science, Bangladesh Agricultural University, Mymensingh,

**Table 1:** Effect of coagulants and their strength on the chemical composition of *chhana*

| | *Type of chhana* | | | | | | |
|---|---|---|---|---|---|---|---|
| *Parameters* | *A* | *B* | *C* | *D* | *E* | *F* | *CD* |
| Moisture (%) | $57.80^{a} \pm 0.17$ | $56.10^{d} \pm 1.00$ | $57.52^{b} \pm 0.26$ | $56.03^{d} \pm 0.20$ | $57.23^{c} \pm 2.00$ | $56.13^{d} \pm 0.30$ | 1.66 |
| Fat (%) | $21.68^{d} \pm 1.75$ | $22.40^{a} \pm 3.00$ | $21.94^{bcd} \pm 0.81$ | $22.25^{ab} \pm 2.50$ | $21.86^{cd} \pm 0.91$ | $22.05^{bc} \pm 0.50$ | 3.26 |
| Protein (%) | $17.13^{c} \pm 0.38$ | $17.50^{a} \pm 0.56$ | $17.08^{c} \pm 0.80$ | $17.56^{a} \pm 0.60$ | $17.27^{b} \pm 0.80$ | $17.63^{a} \pm 1.35$ | 1.43 |
| Ash (%) | $1.50^{c} \pm 0.26$ | $1.60^{b} \pm 0.40$ | $1.50^{c} \pm 0.66$ | $1.80^{a} \pm 0.56$ | $1.60^{b} \pm 0.40$ | $1.70^{a} \pm 0.70$ | 0.92 |
| Lactose (%) | $1.90^{c} \pm 1.15$ | $2.40^{a} \pm 1.05$ | $2.00^{b} \pm 1.19$ | $2.20^{b} \pm 2.65$ | $2.50^{c} \pm 1.50$ | $2.40^{a} \pm 2.00$ | 3.00 |
| Yield (%) | $16.90 \pm 1.00$ | $16.70 \pm 1.33$ | $16.70 \pm 1.00$ | $16.67 \pm 1.36$ | $16.71 \pm 1.00$ | $16.67 \pm 1.53$ | - |
| Fat recovery (%) | $90.50^{c} \pm 0.19$ | $93.80^{a} \pm 0.61$ | $91.61^{bc} \pm 0.35$ | $92.65^{ab} \pm 0.62$ | $90.54^{c} \pm 1.30$ | $91.87^{b} \pm 0.65$ | 1.26 |
| Total solids recovery (%) | $56.38^{c} \pm 0.34$ | $58.82^{a} \pm 0.34$ | $56.73^{bc} \pm 0.29$ | $58.59^{a} \pm 0.51$ | $57.18^{b} \pm 0.12$ | $58.49^{a} \pm 0.49$ | 0.66 |

NS = Non significant

Values with different superscripts (a, b, c and d) are significantly different at 5% level

A = Sour whey with 0.5% acidity, B = Sour whey with 1.0% acidity, C = Citric acid with 0.5% acidity, D = Citric acid with 1.0% acidity, E = Sour whey + citric acid with 0.5% acidity, F = Sour whey + citric acid with 1.0% acidity

CD = Critical difference

Average TS of milk = 12.5 %

Bangladesh. The samples of *Rasogolla* were scored using 9-point hedonic scale for sensory attributes such as colour and appearance, flavour and taste, body and texture, sweetness and overall acceptability.

### Chemical analysis

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

### Effect of Coagulants on the Chemical Composition of *Chhana*

The moisture content of *chhana* made using different coagulants differed significantly ($p < 0.01$) from each other. The highest and least moisture content was associated with 0.5% SW *chhana* and 1.0 % CA, respectively. The moisture content of *chhana* significantly decreased ($p < 0.01$) with increased strength of coagulants (i.e. 1.0 vs. 0.5%) used in the study. Such observation is in agreement with the findings of Bandyopadhyay *et al*. 2005. The fat content was found higher in the type of *chhana* where the moisture content was lower. The *channa* type B, D and F was showed higher fat content around 22.0 %. In case of protein content of *chhana* differed significantly ($p < 0.01$) among the samples. The highest value was noted in *chhana* prepared using 1% SW + CA. Singh *et al*. 2011 reported protein content of about 18.0 % of *chhana*, irrespective of the type of coagulants used; a similar value as reported in the present investigation. The maximum ash content was accompanied with *chhana* prepared using 1% CA and a time lowest content was found at 0.5% SW. The result slightly differed with the finding of Singh *et al*. (2011) who reported average ash content of 1.95% in *chhana*, irrespective of the type of coagulants used. The level of lactose was found highest for *chhana* prepared using 1% SW + CA and minimum value recorded at 0.5% SW. The yield of *chhana* was not significantly differed among the different coagulants used with different strength. The yield of *chhana* was recorded highest and least for product prepared using 1% SW and 1% CA as coagulants, respectively. De (1952) and Bankar *et al*. (2014) reported that with an increase of 0.1 to 0.13% titratable acidity in the strength of coagulant, there was a steady decline in the yield of *chhana*. Sen and De (1984) reported greater yield of *chhana* when using calcium lactate rather than using citric acid as coagulant. In addition, greater yield of *chhana* was obtained from calcium lactate coagulant than the *chhana* obtained from citric acid coagulant (Kumar *et al*., 2015). Fat as well as TS recovery of *chhana* differed significantly ($p < 0.01$) when using all of the coagulants of varying strength. The fat and TS recovery in *chhana* was highest when using 1% SW. The result regarding fat loss in whey agreed with the *chhana* made using 1% citric acid and 2% lactic acid by other authors (Bandyopadhyay *et al*., 2005; Bankar *et al*., 2014).

### Effect of Coagulants on the Chemical Composition of *Rasogolla*

The chemical quality of *Rasogolla* as affected by utilizing *chhana* obtained using coagulants of varying strength is depicted in Table 2. All the chemical constituents of *Rasogolla* were not significantly ($P > 0.05$) affected by the type of coagulant or their strength except for moisture and carbohydrate content. The highest and least mean values of moisture content were recorded for *Rasogolla* obtained from *chhana* made using CA and SW + CA both at 0.5% strength, respectively. Reddy *et al*. (2016) reported moisture content of 58.09 % for control *Rasogolla*; such value was higher than the moisture content obtained in present investigation. According to Bangladesh Standard and Testing Institution (BSTI, 1993) standard moisture content of *Rasogolla* is 55.0% (max) which is similar to our findings. In addition, Sengupta *et al*. (2017) observed the moisture content of 53.0% in soy-milk based *Rasogolla*-like product utilizing lactic acid as coagulant. Besides, according to Bhattacharya *et al*., 1980 prepared *Rasogolla* with *chhana* having initial moisture content of 40, 45, 50, 55, 58, 60 and 65% and stated about 55–58% moisture

**Table 2:** Effect of coagulants and their strength on the chemical composition of *Rasogolla*

| | *Types of Rasogolla* | | | | | | |
|---|---|---|---|---|---|---|---|
| *Parameters* | *A* | *B* | *C* | *D* | *E* | *F* | *CD* |
| Moisture (%) | $54.24^{b}$±24.90 | $54.67^{b}$±6.85 | $55.33^{a}$±46.35 | $54.30^{b}$±12.80 | $51.67^{c}$±6.80 | $54.49^{b}$±22.90 | 1.02 |
| Fat (%) | 5.27±2.52 | 5.60±4.59 | 5.90±2.00 | 5.47±1.53 | 5.83±1.53 | 5.77±2.52 | - |
| Protein (%) | 7.23±3.05 | 7.55±4.27 | 7.67±2.89 | 7.38±6.33 | 7.53±2.65 | 7.57±4.25 | - |
| Ash (%) | 9.42±0.81 | 9.63±0.37 | 8.82±0.20 | 9.50±0.50 | 8.86±0.26 | 9.69±0.34 | - |
| Carbohydrate (%) | $32.32^{b}$±21.55 | $31.20^{c}$±8.97 | $30.22^{d}$±46.35 | $32.00^{b}$±11.96 | $34.08^{a}$±7.02 | $31.20^{c}$±20.87 | 0.56 |

The values are presented Mean ±SD

A = Sour whey with 0.5% acidity, B = Sour whey with 1.0% acidity, C = Citric acid with 0.5% acidity, D = Citric acid with 1.0% acidity, E = Sour whey + citric acid with 0.5% acidity, F = Sour whey + citric acid with 1.0% acidity

CD = Critical difference

in *chhana* to be optimum for preparation of good quality *Rasogolla* having round shape, soft body, and maximum spongy texture for atmospheric cooking. The highest fat content was noted for *Rasogolla* prepared from *chhana* made using 0.5% CA coagulants. According to both BSTI standard (1993) and Indian Standard (IS, 1967) fat content of *Rasogolla* should be minimum 5.0 %, which was more or less similar to the result of present investigation. The maximum and minimum protein content was noted for *Rasogolla* obtained from *chhana* coagulated using 0.5% CA and 0.5% SW, respectively. The maximum ash content was associated with *Rasogolla* prepared from *chhana* made using 1% SW+CA. Thakur *et al*. (2015) recorded 1.63% ash for *Rasogolla* made from *chhana* prepared using 0.5% CA coagulant. The maximum and minimum carbohydrate content was noted for *Rasogolla* prepared from *chhana* obtained using 0.5% SW+CA and 0.5% CA as coagulant respectively. As per BSTI specification (1993), the carbohydrate content of *Rasogolla* cannot exceed 45.0 %.

### Effect of Coagulants on the Sensory Quality of *Rasogolla*

The results regarding the sensory quality of *Rasogolla* as affected by *chhana* prepared using different coagulants are collated in Table 3. All the individual sensory attributes of *Rasogolla* studied were found to be at par with each other, irrespective of the coagulants used for *chhana* preparation. It was revealed from Table 3 that there was no significant difference in color and appearance scores of different *Rasogolla* samples obtained from varying coagulants. The colour and appearance score was recorded as highest and least for *Rasogolla* prepared from *chhana* made of using 1% SW+CA as coagulant. Kumar *et al*., 2015 did not notice any marked difference in the colour and appearance score of *Rasogolla* samples prepared from *chhana* obtained using varying coagulants such as lactic acid, citric acid as well as calcium lactate.

Superior flavour and taste score was associated with *Rasogolla* sample prepared from *chhana* made using 1% CA. *Rasogolla* prepared from *chhana* coagulated by 1.0% of acidity irrespective of coagulant obtained more flavour and taste score than *Rasogolla* made from *chhana* coagulated by 0.5% acidity irrespective of coagulant. Kumar *et al*. (2015) observed there was no significant difference in the sweetness of different *Rasogolla* samples obtained from varying coagulants (lactic acid and calcium lactate). The *Rasogolla* prepared from *chhana* made using 1% SW had superior flavour score. Bankar *et al*. (2014) stated that the *chhana* made with 1.0% citric acid and 2.0% lactic acid had similar flavor scores. The *Rasogolla* prepared from *chhana* coagulated with 1% SW was soft and flimsy which split into pieces when mangled in the mouth. Kumar *et al*. (2012) did not notice any significant difference in the flavor scores of *Rasogolla* samples prepared from *chhana* made using varying coagulants (citric acid, lactic acid and sour whey).

With respect to body and texture, the highest score was associated with *Rasogolla* made from *chhana* coagulated using 1% SW. Kumar *et al*. (2015) noted that a highly significant difference ($p < 0.01$) in body and texture score of *Rasogolla* was obtained when using varying coagulants (amount of standardized blend = 1 kg; strength of coagulants: lactic acid and citric acid = 1 % solution; calcium lactate = 4 %). Bankar *et al*. (2014) noted superior score for body and texture for *Rasogolla* made using 1.0% and 2.0% lactic acid as coagulant, followed by 1.0% citric acid. Their finding does not match the findings of the present investigation.

The overall sensory score was found highest for *Rasogolla* prepared from *chhana* made using 1% SW coagulant. Bankar *et al*. (2014) observed overall acceptability of *chhana* made with 1.0% citric acid and 2.0% lactic acid recorded significantly higher score as compared to other coagulants and their strength. Furthermore, Rao *et al*. (1989) reported that *Rasogolla* obtained from cow milk *chhana* made with 1.0 % citric acid compared to calcium lactate and lemon water as a coagulant is most acceptable.

## Conclusion

Sour whey is the predominantly used coagulant in preparation of *chhana* based sweetmeats by the sweetmeat manufacturers in Bangladesh. Based on the present investigation, as far the yield of *chhana* is concerned, there was no significant difference among the groups. Although, sour whey having 1.0% lactic acid is a highly suitable coagulant for obtaining *chhana* which yielded *Rasogolla* having desired sensory quality conforming to the standards for chemical composition.

**Table 3:** Effect of coagulants and their strength on the sensory scores of *Rasogolla*

| | *Types of Rasogolla* | | | | | | |
|---|---|---|---|---|---|---|---|
| *Score for* | *A* | *B* | *C* | *D* | *E* | *F* | *CD* |
| Colour and appearance | 10.75 ± 1.25 | 12.13 ± 1.87 | 11.50 ± 1.00 | 12.13 ± 0.62 | 11.50 ± 0.50 | 12.38 ± 0.12 | - |
| Flavour & Taste | 7.25 ± 0.50 | 8.75 ± 1.29 | 7.50 ± 0.50 | 8.00 ± 0.49 | 7.13 ± 0.62 | 8.50 ± 0.50 | - |
| Body and texture | 22.75 ± 3.50 | 26.33 ± 3.76 | 22.88 ± 2.87 | 24.88 ± 2.87 | 23.75 ± 2.00 | 25.63 ± 0.62 | - |
| Total score | 75.42 ± 6.50 | 86.04 ± 10.64 | 77.46 ± 5.81 | 83.26 ± 5.56 | 76.88 ± 4.30 | 85.18 ± 1.23 | - |

Value indicated as Mean ±SD

A= Sour whey with 0.5% acidity, B = Sour whey with 1.0% acidity, C = Citric acid with 0.5% acidity, D = Citric acid with 1.0% acidity, E = Sour whey + citric acid with 0.5% acidity, F = Sour whey + citric acid with 1.0% acidity

CD = Critical difference

## References


Aggarwala AC, Sharma A 1961: A laboratory manual of milk inspection. 4th edn. Asia Publishing House, Bombay, Calcutta, New Delhi, India. p. 345.

AOAC 2003: Official Methods of Analysis (10thedn.). Association of Official Agricultural Chemists. Washington, DC, USA.

Bandyopadhyay M, Chakraborty R, Raychaudhuri U 2005: The effect of coagulants on the texture of chhana (an acid and heat coagulated product made from milk). International Journal of Food Science and Technology 40(8) 799-810.

Bangladesh Standard and Testing Institution (BSTI) 1993: Bangladesh Standard Specification for Rasogolla. BDS 1309. p. 1-5.

Bankar SS, Raziuddin M, Zanjad PN 2014: The influence of different coagulants on yield and sensory quality of cow milk chhana. Indian Research Journal of Extension and Education 14(4) 61-64.

Bhattacharya DC, Raj D 1980: Studies on the production of Rasogolla. Part II. Pressure cooker method. Indian Journal of Dairy Science 33(4) 479-483.

IS: 4079-1967.Specification for canned rasogolla. Indian Standards Institution, New Delhi. De S 1952: Study on desiccation and coagulation of milk in the manufacture and storage of indigenous milk products. M.Sc. Thesis, Bombay University, Mumbai.

De S 1980: Outlines of dairy technology. Oxford University Press, Delhi. p. 517.

De S, Ray SC 1954: Studies on indigenous method of chhana making. Indian Journal of Dairy Science 7 113-116.

Islam MZ, Rahman SMR, Alam MM, Mannan AKMA 2003: Manufacture of Rassomalai and its quality attributes: An indigenous milk sweetmeat of Bangladesh. Pakistan Journal of Nutrition 2(5) 300-304.

Joshi SV, Majgaonkar SV, Toro VA 1991: Effect of different coagulants on yield and sensory quality of chhana prepared from milk of cow, buffalo and goat. Indian Journal of Dairy Science 44(6) 380-383.

Kumar J, Gupta VK, Kumar B, Kumar S 2012: The influence of varying degree of coagulation temperature on sensory and texture characteristics of chhana butter milk and buffalo milk. Indian Journal of Dairy Science 65(2)129-134.

Kumar J, Gupta VK, Kumar S, Kumar S 2015: Effect of coagulants on the quality of Chhana and rasogolla obtained from admixture of buffalo milk and butter milk. Journal of Food Science and Technology 52(3) 1736-1741.

Kumar S, Dwivedi HB, Yadar SP, Yadav RN 2007. Use of chemical and herbal coagulants in Chhana production from cow milk. Progressive Research 2(1/2) 150.

Mahanta KC 1964: Handbook of Dairy Science, Kitabstan, Allahabad, India. p. 386.

Mannan AK, Hossain MS, Islam MM 1995: Standard of traditionally made Chamcham, Moonda, Rasogolla, Monda, effects of different coagulants milk for Chhana making. Bangladesh Agricultural University, Research Progress 9 306-310.

Prajapati PS, Chavan RS, Jana A, Chavan SR 2011: Rasogolla - Ambrosia of Indian: A Review. Beverage and Food World 45(3) 27-30.

Rao MS, Rao MR, Ranganadham M, Rao BVR 1989: Studied on the preparation of chhana from buffalo milk and its suitability for Rasogolla manufacture. Indian Journal of Dairy Science 42(4)810-816.

Ravichandra MN, Mishra HN, Das H 1997: Optimization of process parameters for the production of Rasogolla from cow milk. Journal of Food Science and Technology (Mysore) 34(1) 46-49.

Ray SC, De S 1953: Indigenous dairy products of India-III Chhana. Indian Dairyman 5 15.

Reddy GMM, Arora P, Chandra R, Singh SS 2016: Production and quality evaluation of Rasogolla prepared from milk with different levels of fat. International Journal of Scientific and Engineering Research 7(8)2084-2086.

Sen DC, De S 1984: Studies on calcium lactate as chhana coagulant. Journal of Food Science and Technology 21 243-244.

Sengupta S, Samanta A, Bhowal J 2017: Effect of different types of coagulating agent on physico-chemical and organoleptic properties of non-dairy rasgolla (Cheese ball). Journal of Microbiology, Biotechnology and Food Sciences.

Sharma DK, Reuter H 1991: A new method of chhana making by ultrafiltration technique. Indian Journal of Dairy Science 44 89-95.

Singh PK, Singh OP, Kumar R, Singh AK, Singh NK 2011: Quality of chhana prepared from cow milk by chemical and herbal coagulants. Journal of Dairying, Foods and Home Science 30(3) 155-159.

Soni K, Bandyopadhyay AK, Ganguly NC 1980: Manufacture of Rasogolla from buffalo milk. Indian Journal of Dairy Science 33(3) 357-365.

Srinivasan MR, Anantakrishnan CP 1964: Milk products of India. Indian Council of Agricultural Research, New Delhi.p. 9.

Thakur SN, Kant R, Chandra R 2015: Studies on preparation of rasogollafrom blend of cow milk and soya milk. The Allahabad Farmer LXX (2) 6-9.