



Effect of pomegranate juice on sensorial quality of Rosogolla

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Abstract

The present investigation was undertaken to study the effect of pomegranate juice incorporation on the sensory quality and overall acceptability of Rosogolla. Rosogolla was prepared from fresh cow milk using the traditional method with slight modifications, and different levels of pomegranate juice were incorporated during the soaking stage. Five treatment levels (T0–T4) were evaluated, with T0 serving as the control. The sensory quality of the prepared Rosogolla was assessed using a 9-point hedonic scale for flavour, taste, colour and appearance. The sensory scores revealed significant differences among the treatments, with the incorporation of pomegranate juice positively influencing the organoleptic characteristics of Rosogolla. Statistical analysis using one-way ANOVA indicated a significant effect of treatment on sensory acceptability ($F = 18.08$, $p < 0.05$). Among the treatments, T3 recorded the highest overall acceptability score of 7.40, followed by T4 (7.30), T2 (7.00), T1 (6.60) and the control T0 (6.30). Treatment T3 also showed superior scores for colour and appearance, while pomegranate incorporation improved flavour and taste. The findings indicate that moderate incorporation of pomegranate juice can enhance the sensory quality and consumer acceptability of Rosogolla. Therefore, T3 may be considered the most suitable formulation for the development of a value-added, fruit-enriched functional dairy sweet with potential for commercial application.

Keywords: Pomegranate juice, Rosogolla, sensory evaluation, flavour, taste, colour, appearance, overall acceptability, value-added dairy product, functional dairy food

Introduction

Rasogulla is a very popular Bengali sweet, which is soft, Juicy & Spongy, made mostly from cow milk, and is the most popular sweet delicacy in Calcutta, as well as in the rest of India and the world (De, 2001). Rasogulla is a syrupy sweet dish from Bengal and Orissa. It is mainly prepared by kneading channa and a small amount of maida. These are rolled into small balls and boiled in a light syrup made of sugar. This process continues until the sugar enters the balls. Rasogolla was invented in Bengal, where it is considered a traditional sweet. Nobin Das, who was a confectioner in Kolkata, is considered as the father of rasogolla. He is famously known as “Rasagolla’s Columbus”. But by the time Nobin Das introduced rasogolla to Kolkata, it had already become a traditional sweet of Orissa

In India, approximately 176.35 million tons of milk were recorded in 2017-18. Among that of the, 46 % is used for fluid purposes, and 54% is used for production of milk products. Among them, the production of coagulated milk products contributes significantly. India ranks fourth among the largest pomegranate producers. Pomegranate production in India was approximately 15,00,000 tones in 2018. The total area under pomegranate cultivation in India is 107.00 thousand hectare, and the production is around 743.00 thousand tons. Maharashtra is the leading producer of pomegranates, followed by Karnataka, Andhra Pradesh, Gujarat, and Tamil Nadu. Pomegranate seeds contain a low quantity of fat and high carbohydrate and protein content (Aloqbi, 2016) ^[1]. It contains an appreciable amount of vitamin C, which is beneficial for blood clotting and the immune system (Viuda-Martos *et al.*, 2010) ^[13]. Potassium, a necessary mineral in the body, is present in this fruit and is required for the normal regulation of blood pressure, muscle

synthesis, and the nerve conduction system. Systolic blood pressure can be significantly reduced by pomegranate juice. Flavonoids are believed to improve memory and delay the onset of Alzheimer’s disease. Pomegranate juice contains the natural compound estrone, which improves mood in menopausal women (Aviram & Rosenblat, 2012) ^[2].

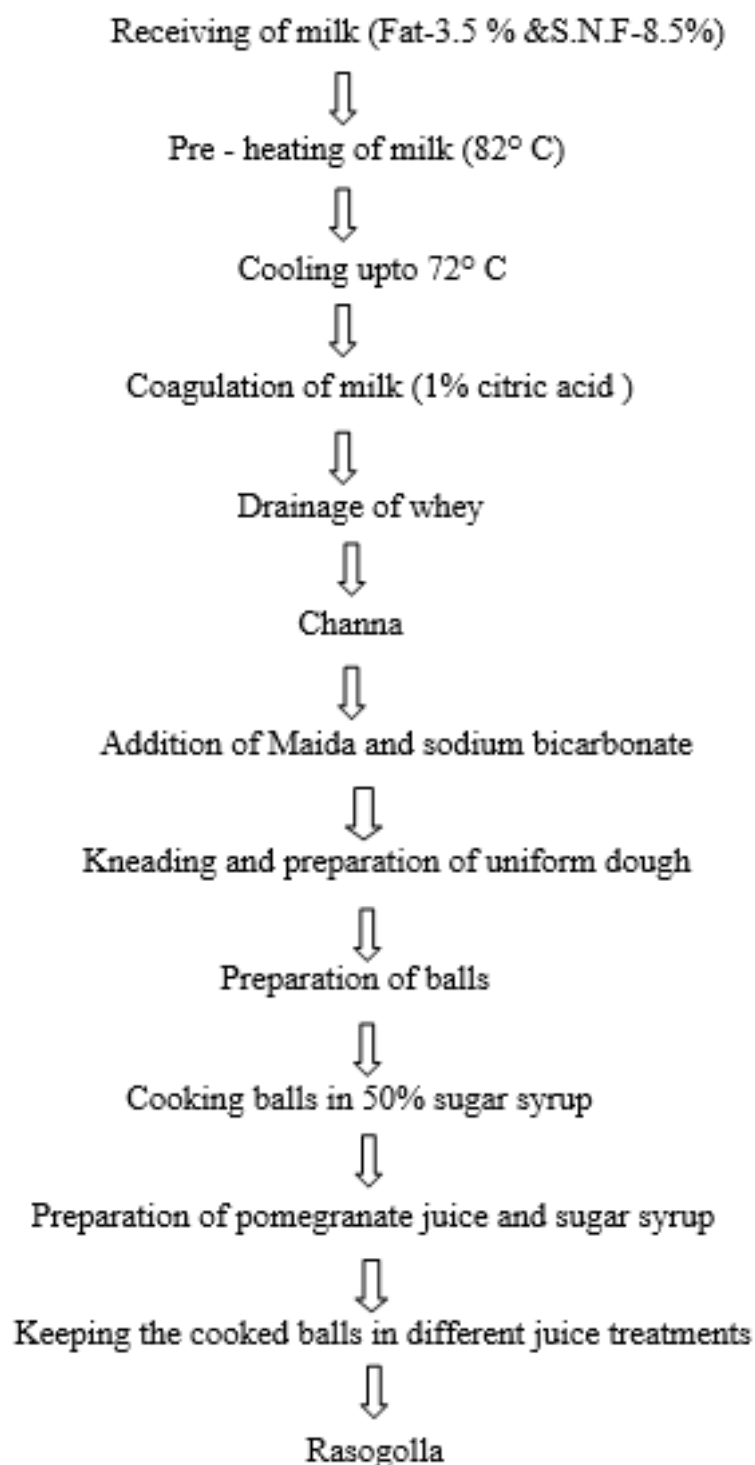
The incorporation of fruit ingredients into dairy products not only improves their nutritional profile but also enhances sensory characteristics such as flavour, colour, texture, and overall acceptability (Hui, 2004) ^[9]. Previous studies have reported that fruit fortification of dairy products increases consumer preference and provides opportunities for the development of novel functional foods (Patel and Prajapati, 2013) ^[10]. The natural pigments present in pomegranates, particularly anthocyanins, contribute an appealing red color that can improve the visual attractiveness of dairy-based sweets (Stone and Sidel 2012, Fawole and Opara, 2013) ^[7, 12].

Therefore, considering the importance of pomegranate juice, the present investigation was carried out to prepare the most popular dairy product with pomegranate juice.

Materials and Methods

The present investigation was carried out at the Department of Dairy Science, Maharashtra Udaygiri College, Udgir. Considering the initial investigation, the effect of five different levels of pomegranate juice on the sensory quality of this product was studied. Rasogolla was prepared as per the method recommended by Bhattacharya and Des (1980) ^[5] with slight modifications.

Flow chart for the preparation of pomegranate juice



Fresh cow milk was collected from a local market. The milk had 3.5 % fat and 8.5% solid not fat (SNF). The milk was heated and coagulated with 1% citric acid, and the whey was removed using a double muslin cloth. The channa obtained after removing the whey was weighed. After weighing the channa, excess moisture was removed, and 1% Maida and a pinch of baking soda were added. After addition, the mixture was kneaded well by hand. Thereafter, small channa balls were prepared by hand. The balls were cooked in a 50% sugar syrup. The balls are cooked until they reach the desired size and shape. The cooked balls were soaked in pomegranate juice and sugar syrup at different levels.

For soaking, the sugar syrup levels were adjusted to 100 ml in T0, 60 ml in T1, 50 ml in T2, 40 ml in T3, 30 ml in T4, and 0 ml in T5 (treatments). The syrup was prepared by adding different levels of pomegranate juice: 0 ml in T0, 40 ml in T1, 50 ml in T2, 60 ml in T3, 70 ml in T4, and 100 ml in T5. Rasogolla prepared without the addition of pomegranate juice served as the control and was compared with the treatments. The sensory evaluation of the product was carried out using a 9 point hedonic scale for attributes, namely, color and appearance, flavor, taste, sweetness, and overall acceptability of fresh rasogolla. The scores given by the panel of expert judges were tabulated and analyzed for statistical analysis as per Snedecor and Cochran (1994)^[11].

Results and Discussion

Overall acceptability of Pomegranate Rasogolla

Treatment	Flavour	Taste	Colour	Appearance
T0	6.6	6	6.2	6.4
T1	6.8	6.4	6.6	6.6
T2	7	7	7	7
T3	7.4	7.2	7.4	7.6
T4	7.6	7.6	7	7

One way ANOVA

Source of Variation	df	SS	MS	F
Treatments	4	3.472	0.868	18.08
Error	15	0.720	0.048	
Total	19	4.192		

Sensory evaluation of pomegranate Rasogolla revealed significant differences among the treatments (T0–T4) in terms of flavor, taste, color, and appearance. The mean sensory scores ranged from 6.30 to 7.40, indicating that the incorporation of pomegranate positively influenced the organoleptic quality of the product. Statistical analysis using one-way ANOVA showed that the treatments differed significantly ($F = 18.08$, $p < 0.05$), indicating that the variation in formulation significantly affected consumer acceptability.

Among the treatments, T3 recorded the highest overall acceptability score (7.40), followed by T4 (7.30), T2 (7.00), T1 (6.60), and T0 (6.30). The superior score obtained for T3 may be attributed to the balanced incorporation of pomegranate, which enhanced the flavor, color, and appearance without adversely affecting the characteristic taste of the product. Similar findings were reported by Meilgaard *et al.* (2016), who stated that flavor and appearance are major determinants of overall consumer acceptance of dairy-based confectionery products.

The flavor scores increased progressively from T0 (6.6) to T4 (7.6), suggesting that pomegranate supplementation improved the aromatic profile and consumer preference. This observation is consistent with the findings of Stone and Sidel (2012) ^[12], who reported that fruit incorporation enhances flavor complexity and positively influences hedonic ratings. Likewise, the improvement in taste scores from 6.0 in T0 to 7.6 in T4 indicates that the natural sweetness and characteristic fruity notes of the pomegranate contributed positively to palatability.

Color is an important quality attribute that influences consumer perception before tasting. The treatments containing pomegranate showed higher color scores than the control, which may be attributed to the attractive red pigments (anthocyanins) present in pomegranate. Similar observations were made by Babar *et al.* (2008) and Viuda-Martos *et al.* (2010) ^[4, 13], who reported that pomegranate-derived pigments enhance the visual appeal and marketability of food products.

Appearance scores followed a similar trend, with T3 receiving the highest score (7.6). The improved appearance may be due to the uniform distribution of pomegranate components and attractive surface characteristics of the product. According to Lawless and Heymann (2010), appearance significantly influences consumer expectations and the overall acceptability of dairy desserts and confectionery products.

The significant increase in overall acceptability from T0 to T3 demonstrates that incorporating pomegranate can successfully improve sensory quality. However, the slight decline in overall acceptability from T3 (7.40) to T4 (7.30) suggests that excessive addition may not proportionally increase consumer preference, possibly due to changes in texture or flavor intensity. Similar trends have been observed in fruit-fortified dairy products, where moderate levels of fruit incorporation yielded the highest sensory scores (Avtade *et al.*, 2010; Bhardwaj & Pandey, 2011) ^[3]. Gaikwad S.M. *et al.* reported that the overall acceptability of fruit pulp increased with an increase in the pulp content; however, the smell score decreased, whereas the taste score increased. Therefore, based on sensory evaluation and statistical analysis, treatment T3 was found to be the most acceptable formulation of pomegranate Rasogolla and may be recommended for product development and commercial applications.

Conclusion

The present investigation concluded that pomegranates can be successfully utilized in the preparation of Rasogolla to improve its sensory attributes and consumer acceptance. The formulation represented by treatment T3 was found to be the most suitable and may be recommended for developing value-added functional dairy products with enhanced market potential.

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