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Effect of source of milk on sensory and textural quality of Chhana and Rasagulla

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Abstract: The study was carried out to know the effect of source of milk on the sensory and textural attributes of *Chhana* and *Rasagulla.* Highest sensory scores were allotted for Rasagulla prepared from cow milk followed by goat milk and lowest sensory scores were observed for Rasagulla obtained from buffalo milk due to poor body and texture. The textural attributes viz hardness, chewiness, gumminess, cohesiveness, and springiness of Rasagulla prepared from cow, buffalo and goat milk were ascertained, Rasagulla prepared from buffalo milk had lowest springiness and highest hardness, gumminess and chewiness as compared to cow and goat milk Rasagulla.

Key words: *Chhana, Rasagulla, Buffalo* milk, *Cow* Milk and *Goat* Milk, sensory attributes, textural characteristics.

I. INTRODUCTION

Cow milk is generally preferred for preparation of Chhana and Rasagulla than buffalo milk, as it produces soft, sponge and juicy Rasagulla. Even though, buffalo milk is rich source of nutrients and has many therapeutic health benefits is not preferred for preparation of Chhana and Chhana based products. Goat milk is a rich source of nutrients, having special physico-chemical characterises with respect to its components, but goat milk is also not being used adequately to quench nutritional deficient problems. But utilisation of buffalo and goat milk for production of Rasagulla is not being exploited even though these milks are nutritionally rich with therapeutic benefits.

The reason for not being utilised buffalo milk for Chhana and Rasagulla preparation is because of its inherent physico-chemical characteristics associated with buffalo milk, which results in poor quality Chhana and Rasagulla with an unacceptable sensory scores and textural values. Therefore, in this investigation an attempt has been made to understand the effect of different milk source on sensory and textural attributes of Chhana and Rasagulla using buffalo milk and goat milk. in comparison with cow milk Rasagulla as standard.

II. MATERIALS

Milk: Cow milk, Buffalo milk and Goat milk, Citric acid, Sugar, Steel utensils and Muslin cloth

III. METHODS

Sensory evaluation of *Rasagulla*

The sensory quality of *Rasagulla* samples were evaluated by a panel of five judges using 9-point hedonic scale (Annexure -1) for color and appearance, body & texture, flavor and overall acceptability as prescribed by Nelson and Trout (1964).

Textural analysis of *Chhana* and *Rasagulla*

The textural profile analysis of *Chhana* samples was done using texture analyser TA.XT2i, supplied by Stable Micro Systems, UK, attached with a sprit chart recorder and a printer to record uni-axial double cycled compression. Cylindrical sample of *Chhana* and *Rasagulla* samples of 19 mm diameter and 15 mm height were held at 20 °C and subjected to linear compression through a stroke length of 4 mm fitted with 100 N load cell and operated in two bite deformation cycle with a cross head speed of 50 mm/min and a chart speed of 100 mm/min. The force distance curve thus obtained was used to work out various textural profile parameters, namely hardness, cohesiveness, springiness, gumminess, adhesiveness and chewiness (Bourne, 1978). Based on relevant literature and several experimental trials, 26.70 %compression was selected for the present study.

The rheological properties of Cow, Buffalo, Goat and admixture of Buffalo and Goat milk *Rasagulla* samples were analysed for textural characteristics like hardness, gumminess, chewiness and springiness, using texture analyser model

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number TAHDI (manufactured by stable micro system, U.K.) fitted with a 25 kg load cell was used under two bites linear compression as per the method suggested by Sanyal *et al.,* (2011).

Hardness (N):
Amount of maximum force that is exerted on the *Rasagulla* sample to attain a given deformation that is the highest point of the peak in the first bite curve at 25 % compression.

Cohesiveness:
The extent to which a material can be deformed before it ruptures. It is the ratio of the area under the second peak to that under the first peak (A2/A1).

Springiness (mm):
It is the height that the sample recovers between the first and second compression.

Gumminess (N):
It is the energy required to masticate a sample to a state ready for swallowing. It is a product of hardness (N) and cohesiveness multiplied by 100.

Chewiness (Nmm):
The energy required to masticate a food to a state ready for swallowing. It is a product of hardness (N), cohesiveness and springiness (mm).

IV. RESULTS

The effect of source of *Chhana* on the sensory characteristics of *Rasagulla* was studied and the results are presented in Table (1) and Fig (1). The sensory scores for color and appearance, flavour, body and texture and overall acceptability for *Rasagulla* prepared from Buffalo milk were 7.65, 7.92, 5.25, and 5.00 respectively, these scores observed to be significantly lesser as compared to Cow and Goat milk *Rasagulla* which scored 8.70, 8.75, 8.80 and 8.75 and 8.00, 6.25, 7.15 and 6.00 respectively.

Among the three samples of Cow, Buffalo and Goat milk, the highest scores were awarded for Cow milk *Rasagulla* followed by Goat milk *Rasagulla*. There was a significant difference between Cow milk and Buffalo milk *Rasagulla* with respect to flavour, body and texture and overall acceptability. There was also a significant difference noted between Cow milk and Goat milk *Rasagulla* with respect of flavour and overall acceptability.

Table 1: Effect of source of *Chhana* on sensory characteristics of *Rasagulla*

Source of *Chhana*	Colour& appearance	Flavour	Body & texture	Overall acceptability
	Score awarded on 9-point hedonic scale			
Cow milk	8.70^{a}	8.75^{a}	8.80^{a}	8.75^{a}
Buffalo milk	7.65^{b}	7.92^{b}	5.25^{b}	5.00^{b}
Goat milk	8.00^{c}	6.25^{c}	7.15^{C}	6.00^{C}
CD (p<0.05)	**0.38**	**0.34**	**0.51**	**0.38**

- All the values are average of three trails.
- Similar superscripts indicate non-significant at corresponding critical difference (CD)

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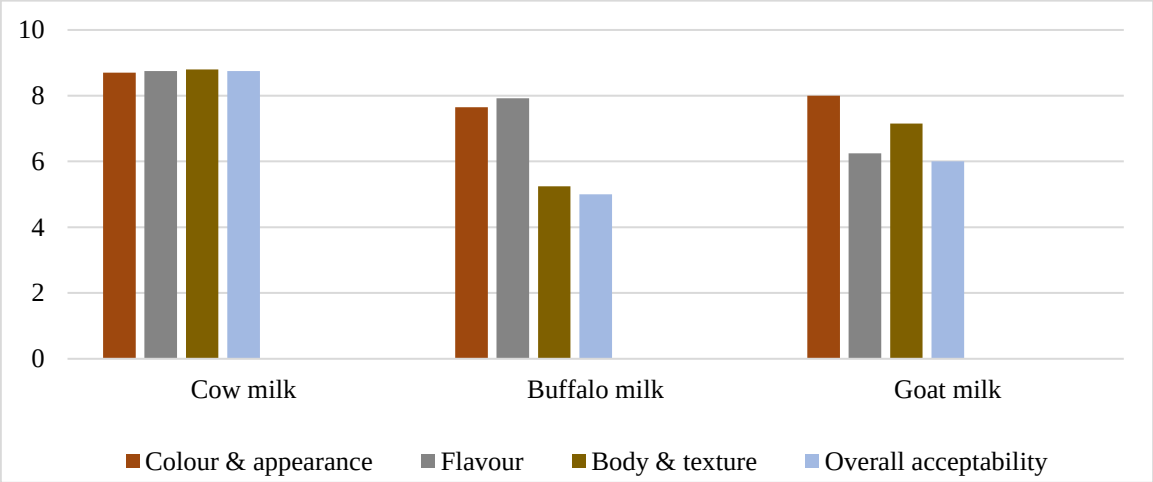

Fig. 1. Effect of source of *Chhana* on sensory characteristics of *Rasagulla*

Effect of sources of *Chhana* on textural characteristics of *Rasagulla*

The *Rasagulla* prepared from Cow, Buffalo and Goat milk *Chhana* were subjected to textural quality attribute studies. The results are presented in Table 2.

Textural characteristics of *Rasagulla* prepared from three different sources of *Chhana* were measured in terms of hardness, gumminess, springiness, chewiness and cohesiveness and results are depicted in Table (2). The *Rasagulla* prepared from *Chhana* obtained from Buffalo milk had shown higher values for hardness (5.15N) as compared to Cow milk *Rasagulla* (1.34N) and Goat milk *Rasagulla* (1.62N).

Hardness of *Rasagulla* prepared from Buffalo milk was significantly higher as compared to *Rasagulla* prepared from other two sources. Buffalo milk *Rasagulla* had significantly higher gumminess (4.58N) as compared to Cow's milk *Rasagulla* (1.42N) and Goat milk *Rasagulla* (1.50N).

Buffalo milk *Rasagulla* had shown significantly lower springiness (0.30mm) as compared to Cow's milk *Rasagulla* (1.62mm) and Goat milk *Rasagulla* (1.45mm). Similarly, the chewiness of Buffalo milk *Rasagulla* was significantly higher (4.30) as compared to Cow's milk *Rasagulla* (1.14) and Goats milk *Rasagulla* (1.54).

On the contrary Buffalo milk *Rasagulla* had significantly higher cohesiveness. The respective cohesiveness values for Buffalo, Cow's and Goat milk *Rasagulla* were 1.58, 0.82 and 1.20. There was no significant difference between Cow's milk *Rasagulla* and Goat's milk *Rasagulla* with respect to all textural parameters.

Table 2: Effect of sources of *Chhana* on textural characteristics of *Rasagulla*

Sources of *Chhana*	Hardness (N)	Gumminess (N)	Springiness (mm)	Chewiness (N-mm)	Cohesiveness
Cow milk	1.34^{a}	1.42^{a}	1.62^{a}	1.14^{a}	0.82^{a}
Buffalo milk	5.15^{b}	4.58^{b}	0.30^{b}	4.30^{b}	1.58^{b}
Goat milk	1.62^{ac}	1.50^{ac}	1.45^{ac}	1.54^{ac}	1.20^{ac}
CD ($p<0.05$)	**0.54**	**0.62**	**0.56**	**0.54**	**0.49**

- All the values are average of three trails.
- Similar superscripts indicate non-significant at corresponding critical difference (CD)

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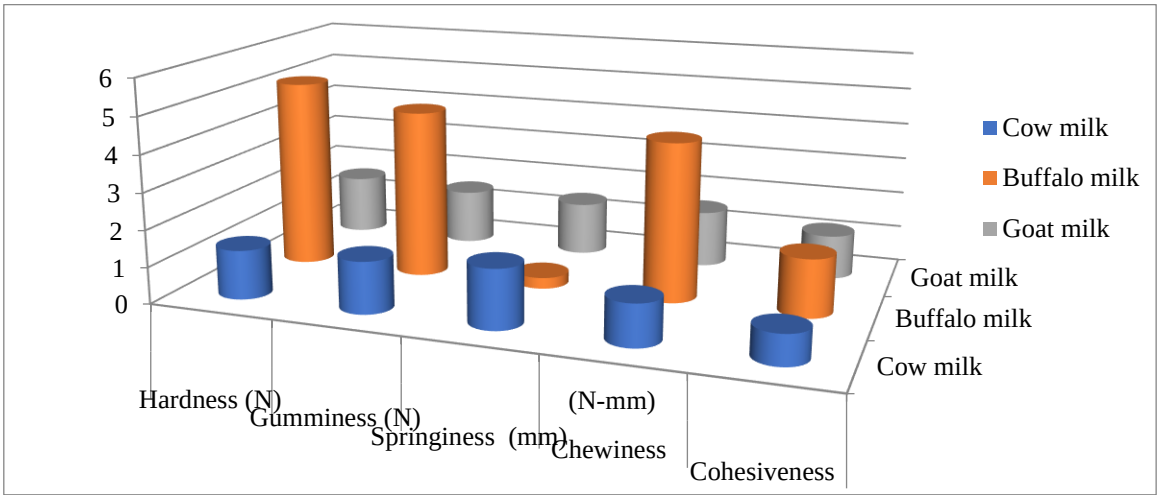

Fig. 2. Effect of sources of *Chhana* on textural characteristics of *Rasagulla*

V. DISCUSSION

Rasagulla prepared from the standardized Cow, Buffalo and Goat milk *Chhana* were subjected to sensory evaluation by using 9-point Hedonic Scale. Higher sensory scores were awarded to *Rasagulla* obtained from Cow's milk *Chhana* as compared to both Buffalo and Goat milk *Chhana.* The least score of 5.00 for overall acceptability attribute was noted for *Rasagulla* made from Buffalo milk *Chhana*, as compared to Cow's milk *Rasagulla* (8.75) and Goat milk *Rasagulla* (6.00). These results are in conformity with the findings of earlier workers (Adhikari *et al*., 1993; Desai *et al*., 1993; Haque *et al*., 2003 and Eman *et al*., 2017).

The least overall acceptability scores for Buffalo milk *Rasagulla* could be mainly attributed for poor textural characteristics as reflected from the least scores awarded for body and texture attributes (5.25) as compared to Cows' milk *Rasagulla* (8.80) and Goat milk *Rasagulla* obtained from milk (7.15). Poor body and textural characteristics of *Rasagulla* prepared from Buffalo milk has been reported by earlier workers (Agnihotri *et al.,* 2003, Alam *et al.,* 2003; Haque *et al*., 2003 and Chavan *et al.,* 2011, 2019). This poor quality could be ascribed to its higher calcium, protein and large size casein micelles in Buffalo milk.

The textural profile of Cow, Buffalo and Goat milk *Rasagulla* was assessed by using TXT1 n textural analyser. The results could be seen in Table (2). Buffalo milk *Rasagulla* had shown higher values for hardness (5.15 N) as compared to *Rasagulla* obtained from Cow's milk (1.34 N) and Goat milk (1.62N). Higher hardness, gumminess, chewiness, and lower springiness could be ascribed for poor textural characteristics of *Rasagulla* obtained from Buffalo milk. The reason for poor textural scores could be ascribed to higher casein and calcium content of Buffalo milk which may have produced hard body, rubbery and coarse texture. The texture values obtained for *Rasagulla* prepared from Buffalo milk and Cow's milk are in agreement with findings of earlier worker (Desai *et al.,* 1993; Alam *et al.,* 2003; Chavan *et al*., 2011, 2019 and Eman *et al*., 2017). However, there are no reports on the textural characteristic of *Rasagulla* prepared from Goat milk.

VI. CONCLUSION

Buffalo milk *Rasagulla* had hard body and texture evaluated by panel of judges using 9-point hedonic scale. Highest sensory scores were awarded for *Rasagulla* obtained from Cow milk *Chhana* followed by Goat and Buffalo milk *Chhana* in respect of all sensory attributes. While lower scores were awarded for body and texture and overall acceptability of *Rasagulla* obtained from Buffalo milk, thus indicating that Buffalo milk as such is not suitable for *Rasagulla* preparation. Effect of source of *Channa* on textural characteristics of *Rasagulla* was studied and analysed by texture analyser. *Rasagulla* prepared from Buffalo milk had shown higher hardness (5.15 N), gumminess (4.58 N), chewiness (4.30 N-mm) and lower springiness (0.30 mm) as compared to Cow and Goat milk *Rasagulla*. Thus indicating, that Buffalo milk as such produces *Rasagulla* having hard, coarse, and rubbery body and texture as compared to Cow milk *Rasagulla* indicating that is not suitable for *Rasagulla* preparation.

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