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**Sujata Patil**  
Department of Animal  
Husbandry and Dairy Science,  
College of Agriculture, Latur  
Latur, M.S, India

**PV Padghan**  
Department of Animal  
Husbandry and Dairy Science,  
College of Agriculture, Latur  
Latur, M.S, India

**RA Patil**  
Department of Animal  
Husbandry and Dairy Science,  
College of Agriculture, Latur  
Latur, M.S, India

## Physico-chemical properties of *gulabjamun* prepared from khoa of buffalo milk blended with sweet corn milk

Sujata Patil, PV Padghan and RA Patil

### Abstract

An attempt was made to improve the nutritional quality of desert '*Gulabjamun*' with supplementation of carbohydrate rich sweet corn in the levels of 20%, 30% and 40% and control. Fat, protein, ash, total solid content of *Gulabjamun* decreased with increase in the sweet corn milk and increased in total sugar, moisture content. *Gulabjamun* from *khoa*, prepared by using 30% sweet corn milk in combination of buffalo milk is appreciable for its physico-chemical properties and acceptability.

**Keywords:** Buffalo milk, sweet corn milk, *Gulabjamun*, Physico-Chemical composition

### Introduction

*Gulabjamun*, a popular *khoa* based sweet of India, is prepared from *khoa*, the traditional method of preparation involves blending of *khoa*, refined wheat flour (*Maida*) and baking powder to a homogeneous mass to obtain smooth dough along with small amounts of water. It made by frying *khoa* balls in *ghee* or vegetable oil and then dipping in sugar syrup of optimum concentration. Because of low shelf life and non-availability of *khoa* throughout the year, attempts were made to find out its substitute in the preparation of *gulabjamun*. (Rajorhia, 1989) [8]. The *gulabjamun* made from the commercial mixes is smooth and soft which finds some acceptance with consumers. But, the product lacks typical *gulabjamun* flavour and texture of the *khoa* based product. Many attempts were made to enhance the quality of *gulabjamun* made from the mixture of dairy and non dairy ingredients like WPC, WMP, SMP, *Khoa* powder *Maida*, Wheat flour, Soymilk etc. (Yawale and Rao, 2012) [13]. When the *gulabjamun* is prepared from *khoa* generally *Maida*, Wheat flour and *suji* are used as a binding material in different proportion in *gulabjamun* mix. However, all these mixes are the source of protein, low in carbohydrates and fibrous material. According to a recently conducted survey by BM Birla Heart Research Institute (Chakarvarti, 2005) [4].

India is fast emerging as the country with the highest number of cardiac cases in the World. Reduced fat formulations need to be developed for such individuals, while preserving their basic food selection patterns. Researchers and medical boards have considered milk fat is a more saturated as compared to vegetable oils containing PUFA. Excessive fat (saturated) intake is a major causative factor in high blood pressure, coronary heart disease and has been linked to a number of other disorders as well. Reports revealed that high dietary fat intake shortens clotting time of blood. High intake of fat increase risk of heart attack because of high proportions of saturated fats in the diet. Many nutritionists believe that if fat intake is reduced to provide less than 30 per cent of the calories through fats and oil dietary fat would not be risk factor at all in heart disease (Sandhya, 2010) [10]. In view of the increasing occurrence of coronary complications there is considerable interest to reduce the milk fat in the *gulabjamun* with addition of corn solid. Under these circumstances, utilization of food solids from the vegetable sources (like sweet corn) offers great promise to boost *gulabjamun* production on one hand and to lower its cost of production on the other hand. And, there also a further scope of improvement in the flavour and texture of the *gulabjamun* by incorporating sweet corn milk in natural milk before preparing the *khoa*. There were no such studies in this direction earlier. However, Singh *et al.* (2009) [11] reported that use of defatted soy flour supplement for the preparation of *gulabjamun* and its impact on quality parameters. However, no reports exist on the preparation of *gulabjamun* using sweet corn milk in *khoa* making as such. Bingardive *et al.* (2012) [3] studied on the *Gulabjamun* prepared by blending dates in buffalo milk *khoa* @ 10, 20, 30, and 40 %. She examined the physico-chemical and sensory parameters of *Gulabjamun*. In this project, a *khoa* will be prepared by using sweet corn milk in different level with combination with buffalo milk and used for the preparation of *gulabjamun*. The developed *gulabjamun* will be subjected for sensory, physico-chemical parameters and rheological aspects.

### Correspondence

**Sujata Patil**  
Department of Animal  
Husbandry and Dairy Science,  
College of Agriculture, Latur  
Latur, M.S, India

Since as such *khoa* less binding ability to getting *gulabjamun* texture, it is expected to improve the yield and texture of *gulabjamun* by using sweet corn milk, however, it may result in problems such as low cohesiveness. This has to be overcome by adding *Maida* or other binders. Thus consumers can be provided with better quality *gulabjamun*. The finding of this research may provide sufficient basis to conclude that use of modern processing technology for suitable filled products of acceptable quality and cheaper price as compared to whole milk products could be manufactured and marketed in India. Possibility of reducing the price of milk and milk products is to replace the commercially expensive milk products in part or whole by using cheaper edible of non-milk origin ingredients. The non-dairy solids can be successfully substituted in place of milk solid for preparing milk products. Such production will be comparatively cheap and within the purchasing power of the weaker sections of society who normally cannot purchase milk products. Efforts were made to develop *gulabjamun* using a combination of sweet corn milk and buffalo milk.

#### Material and methods

The whole fresh and clean buffalo milk required for present study was collected from Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur. Milk was

clarified before use to remove dirt and other extraneous matter. Fresh sweet corn variety, Masti (F<sub>1</sub> Hybrid) of Nuziveedu seeds Pvt. Ltd, will be purchased from local market of Latur city. Sugar, refined wheat flour (*maida*), baking powder, cardamom and vegetable oil.

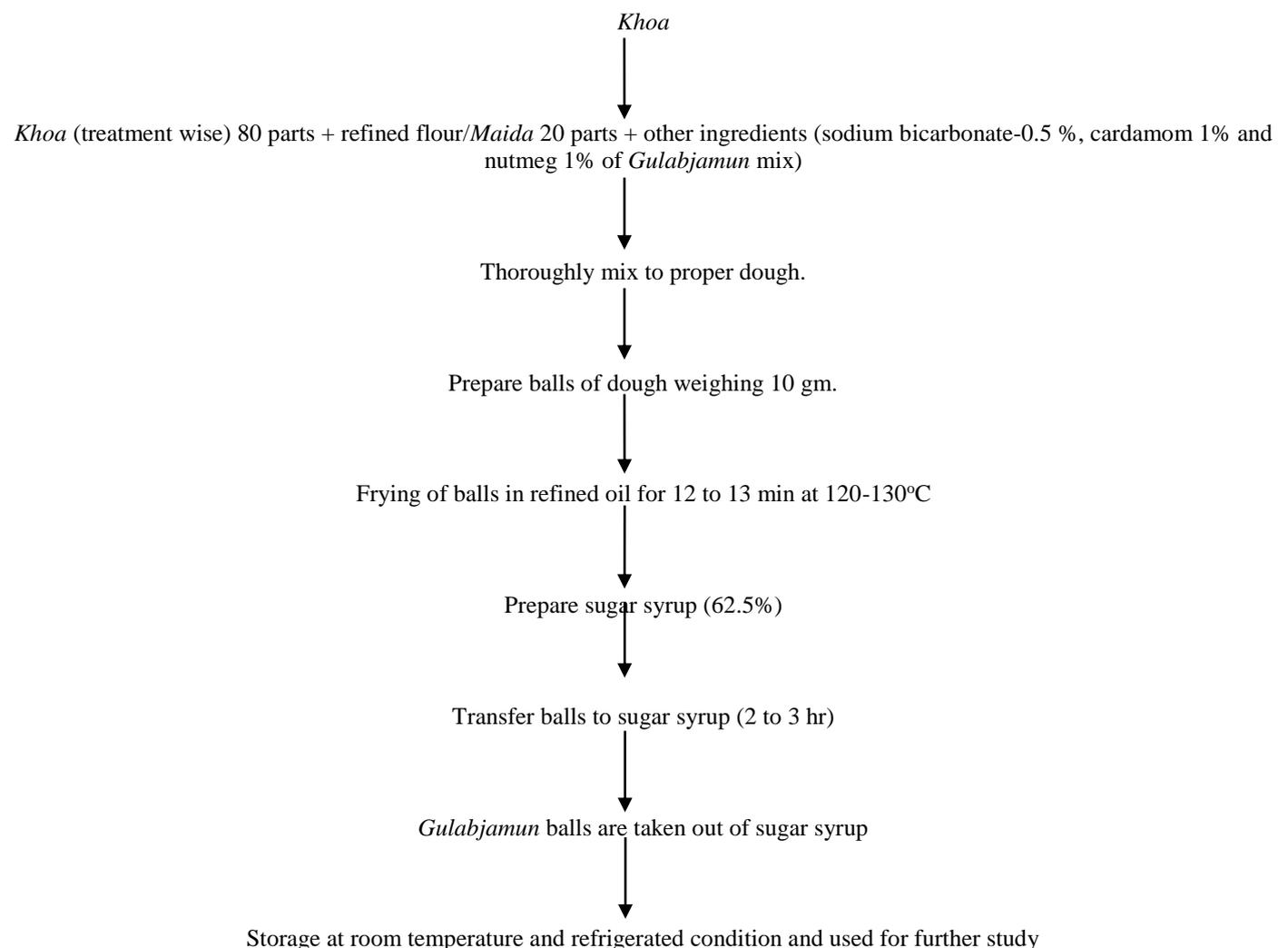
#### Methods

##### Preparation of Sweet Corn Milk

First we received fresh sweet corn Masti (F<sub>1</sub> Hybrid) of Nuziveedu seeds Pvt. Ltd from local market of Latur. Then dehusked the cobs and removed silks. Mature dough stage corn was sorted out. Corns were peeled and shelled. Water added in the proportion 1: 2. Grinding of grains in mixer till complete paste. Paste filtered through muslin cloth and milk collected in beaker.

##### Preparation of *khoa* from buffalo milk blended with sweet corn

Standardized buffalo milk and sweet corn milk were taken. Both of them were mixed well. Then taken to iron *karahi*. Boiling of milk in *karahi* on fire with continuous stirring cum scarping. Heating up to pat formation stage. Then heat off. Spreading of mass on inner sides of *karahi*. *Khoa* collected.



**Fig 1:** Preparation of *gulabjamun* from *khoa* prepared by blending buffalo milk with sweet corn milk by Aneja *et al* (2002)

## Analysis of *gulabjamun*

### A) Determination of Fat

Fat content of *Gulabjamun* will be determined by 'Soxhlet's Extraction Method' as per the procedure described in A.O.A.C. (1965)<sup>[1]</sup>.

### B) Determination of Protein

Protein content of *Gulabjamun* will be determined by Mikrokjeldahl method as described in IS: SP (Part XI) 1981.

### C) Determination of Total Sugar

Total sugar content will be determined by the volumetric (lane-Eynon) method described in IS: SP (Part XI) 1981.

### D) Determination of Moisture

The moisture will be determined by standard procedure as described in IS: SP (Part XI) 1981.

### E) Determination of ash

The ash content will be determined as per the method given by IS: SP (Part XI) 1981.

### F) Determination Of Total Solids

The total solids will be determined by the method described in IS: SP (Part XI) 1981.

## Results and discussion

### Effect of sweet corn milk on fat content

The average fat per cent in *Gulabjamun* blended with sweet

corn milk was decreased from 14.98 per cent (T<sub>0</sub>) to 10.26 per cent (T<sub>3</sub>). The fat content was highest in T<sub>0</sub> (14.98 per cent) and was lowest in T<sub>3</sub> (10.26 per cent). This decreasing trend must have been due to very less amount of fat in sweet corn milk (1.05 per cent). Minhas *et al.* (1985)<sup>[1]</sup> prepared *gulabjamun* and studied the effect of mix formulation (containing 70, 80 and 90 per cent of *khoa* and 30, 20 and 10 per cent of wheat flour), frying temperature (130, 140 and 150<sup>0</sup> C) and soaking time (2 and 4 hr.) fat content was in the range of 16.7, 9.9, 11.5.

### Effect of sweet corn milk on protein content

The average protein content of *Gulabjamun* prepared by blends of buffalo milk with sweet corn milk were found to be 8.49, 7.85, 7.31 and 6.87 per cent for the treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively. The protein content was highest in T<sub>0</sub> (8.49) and lowest in T<sub>3</sub> (6.87). All the treatments were found to be significantly differed with each other at 5 % level of significance, means sweet corn milk was able to make change in protein content in *gulabjamun* when changed its proportion in blend at the rate of 10 percent. The protein content of product decreased significantly from treatment T<sub>0</sub> to T<sub>3</sub>. This might be due to increasing level of sweet corn milk having very less amount of protein (2.56 per cent) protein. Ghosh *et al.* (1986)<sup>[6]</sup> cited the chemical composition of *gulabjamun*. He found the protein content in the range of 6 to 7.6. Prajapati *et al.* (1991) studied different characteristics of *gulabjamun*. He reported protein from unconcentrated and concentrated milk *gulabjamun* were 10.17 and 8.38 respectively.

**Table 1:** Chemical composition of *Gulabjamun* prepared from *khoa* of sweet corn milk and buffalo milk.

Treatments	Fat	Protein	Total sugar	Moisture	Ash	Total solids
T <sub>0</sub>	14.98 <sup>a</sup>	8.49 <sup>a</sup>	47.30 <sup>a</sup>	34.21 <sup>a</sup>	1.10 <sup>a</sup>	65.78 <sup>a</sup>
T <sub>1</sub>	13.66 <sup>b</sup>	7.85 <sup>b</sup>	48.56 <sup>b</sup>	34.71 <sup>b</sup>	1.01 <sup>b</sup>	65.28 <sup>b</sup>
T <sub>2</sub>	12.10 <sup>c</sup>	7.31 <sup>c</sup>	50.95 <sup>c</sup>	35.51 <sup>c</sup>	0.90 <sup>c</sup>	64.43 <sup>c</sup>
T <sub>3</sub>	10.26 <sup>d</sup>	6.87 <sup>d</sup>	51.32 <sup>d</sup>	35.86 <sup>d</sup>	0.81 <sup>d</sup>	64.13 <sup>d</sup>

The values are average of four replications

### Effect of sweet corn milk on total sugar content

The Total sugar content of *Gulabjamun* prepared by blends of buffalo milk with sweet corn milk obtained in the different treatments. The total sugar content was highest in T<sub>3</sub> (51.32) and lowest in T<sub>0</sub> (47.30). It was clear that total sugar content were found to be in increasing order from T<sub>0</sub> to T<sub>3</sub> as 47.30, 48.56, 50.95 and 51.32, continuously even though reducing rate of sugar absorption. This might be due to increasing level of sweet corn milk having more carbohydrates (12.37 per cent) as compared to lactose content of buffalo milk. The values recorded for total sugar content in the present investigation were more with the findings of Rajrohia *et al.* (1987) noted wide variation in fat, protein, sugar and moisture content of *gulabjamun*.

### Effect of sweet corn milk on moisture content

It is observed from table that the average moisture content of the product was found to be 34.21, 34.71, 35.51 and 35.86 per cent for treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively. All treatments were significantly differed from each other. The moisture content was highest in T<sub>3</sub> (35.86) and lowest in T<sub>0</sub> (34.21). It was also observed that the moisture content was in increasing order from treatment T<sub>0</sub> to T<sub>3</sub>. This might be due to the gel like structure prepared by between interaction maize, milk and *maida* protein and more hydrophilic property of that. Rastogi *et al.* (1966)<sup>[9]</sup> reported the chemical composition of

*gulabjamun*. He observed the moisture content as 25.58-31.10.

### Effect of sweet corn milk on ash content

The ash content of *Gulabjamun* blended with sweet corn milk as influenced by different proportions of sweet corn milk is presented in Table 4.9. The ash content in the finished product was found to be 1.10, 1.01, 0.90 and 0.81 per cent for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively. The highest value was recorded in control as compared to blended treatments. The ash content was highest in T<sub>0</sub> (1.10) and lowest in T<sub>3</sub> (0.81). The decreasing trend in ash content of *gulabjamun* blended with sweet corn milk might be due to less ash content that is 0.63 per cent in corn milk. Ghosh *et al.* (1986)<sup>[6]</sup> cited the chemical composition of *gulabjamun*. They observed ash content in the range of 0.9 to 7.6.

### Effect of sweet corn milk on Total solid content

Total solids content of the product is the counter part of the moisture content parameter of the product. Moisture content directly influenced the total solids percentage, decrease in moisture content of product increase the total solids content. The total solids content of the finished product were found to be 65.78, 65.28, 64.43 and 64.13 per cent for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively. The highest total solids content was recorded for treatment T<sub>0</sub> (65.78 per cent). The lowest total

solids contents was recorded for treatment T<sub>0</sub> (64.13 per cent). It was clear that total solid content were found to be in decreasing order from T<sub>0</sub> to T<sub>3</sub>. This might be due to increasing level of sweet corn milk in successive treatments content less total solids as compared to buffalo milk (12.90 of corn milk <16.00 of buffalo milk). Deshmukh *et al.* (1993)<sup>[5]</sup> carried out studies on the effect of baking powder on chemical properties and quality of *gulabjamun* manufactured from unhomogenized and homogenized milk. He observed total solid content as 68 to 75.3 and 68.9 to 75.4 from homogenized and unhomogenized milk respectively.

### Conclusion

The product obtained was subjected for chemical analysis and organoleptic evaluation by panel of judges. It was observed that as the blending of sweet corn milk increased, there was decrease in fat, protein, ash, total solid and increase in total sugar, moisture content.

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