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## Effect of tyndallisation process on microbial quality and shelf life of Gulabjamun

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### Abstract

A study has been carried out to enhance the shelf life of Gulabjamun by tyndallization. Gulabjamun were prepared under aseptic conditions in the laboratory as per standard procedure. All the samples of gulabjamun were packed in 16 glass containers. Eight samples were tyndallized and others were kept as control. Standard Plate Count, Coliform Count and Yeast and Mould Count analysis were carried out in tyndallized and control gulabjamun. Sensory evaluation on a nine point Hedonic Scale was done for treated and untreated products stored at ambient condition (30 °C) at 0 day, 7<sup>th</sup>, 21<sup>st</sup>, 28<sup>th</sup> and till they were acceptable based on organoleptic test and consumer acceptance. It was observed that the shelf life of gulabjamun was extended by 28 days and beyond at room temperature. The different microbial count also within the permissible limit in tyndallized product than control. It has been concluded that of tyndallization process in gulabjamun is suggested to enhance the shelf life of the product up to 28 days in room temperature.

**Keywords:** Tyndallization, shelf-life, Gulabjamun, dairy products, sensory evaluation

### 1. Introduction

Gulabjamun is a khoa based sweet popular throughout the Country. Gulabjamun refers to the indigenous dairy product of India, which is eaten in most festivals by all members of the family. Almost all the states of the country use Gulabjamun as one of the essential and most commonly consumed sweets. Gulabjamun is made from a mixture of khoa and refined flour usually (Patel *et al.*, 1992) <sup>[9]</sup>. As defined by Prevention of Food Adulteration Act, khoa is an indigenous milk product obtained from cow or buffalo milk or a combination thereof by rapid drying. The moisture in khoa shall not exceed 28 per cent, and milk fat content shall not be less than 20 per cent of the product. Dhap khoa having 40-45 per cent moisture is normally used for the preparation of Gulabjamun. Like other sweets, the manufacture of Gulabjamun is also largely in the hands of halwais who adopt small scale batch method. Though there is large variation in the sensory quality of gulabjamun, the most liked product should have brown colour, smooth and spherical shape, soft and slightly spongy body free from lumps and hard central core, uniform granular texture, mildly cooked and oily flavour, free from doughy feel and fully succulent with sugar syrup (Nalawade *et al.*, 2015) <sup>[8]</sup>.

From very early time the simplest way to enhance the keeping quality of milk is boiling (Anon., 1989) <sup>[1]</sup>. Many thermal processes i.e. pasteurization, sterilization and UHT have gained a lot of popularity.

Tyndallization, is a form of sterilization that involves boiling goods in cans or jars for about 20 minutes a day, for three days in a row. Tyndall's method is relatively simple but somewhat time-consuming. Food is placed in a can or heat-proof storage container, which is then boiled for about 15 to 20 minutes each day, for three days in a row. The rest of the time, it just sits on the counter at room temperature. The boiling temperature must be at least the boiling point of water, or 100 degrees Centigrade (212 degrees Fahrenheit). The idea behind this is that any microorganisms that don't get killed by the first day's boiling session will germinate from the warmth and get released from their spore coatings, and then get killed in the next day's boiling session, or, if they survive that one, then on the third day's boiling session. Hence, this investigation is planned to study the efficacy of tyndallization process on shelf life extension of Gulabjamun.

### Materials and Method

Gulabjamun were prepared under aseptic conditions in the laboratory (as per the procedure of Sukumar De (1991) <sup>[11]</sup>). All the samples of gulabjamun were packed in 16 glass containers.

Eight sample were tyndallized and others were kept as control. Gulabjamun samples were tyndallized on the day of preparation and subsequently for 3 days. The treated samples were kept under ambient temperature (30 °C). Standard Plate Count, Coliform count, Yeast and Mold count were analysed according to the methods of FSSAI (2017) [5] and sensory evaluation on a nine point Hedonic Scale was done for each product i.e. treated and untreated products stored at ambient condition at 0 day, 7<sup>th</sup>, 15th, 28th and onward till they were

acceptable based on organoleptic test and consumer acceptance.

## Results and Discussion

### The effect of tyndallized treatment on the microbiological quality

The effect of tyndallized treatment on the microbiological quality of Gulabjamun was presented in Table 1.

**Table 1:** Effect of tyndallized treatment on Gulabjamun microbial quality

Sl. No	Parameter	Before tyndallization process (cfu/gram)	After tyndallisation process (cfu/gram)	Reduction (%)
1.	Total plate count	8500	300	96.47
2.	Coliform count	12	Not detected	-
3.	Yeast and Mould count	10	Not detected	-

The total plate count in fresh gulabjamun sample was  $8.5 \times 10^3$  cfu/gm. It was observed that after tyndallization treatment the reduction in total plate count was 96.47% for all the samples analyzed. Similar results were observed by Brown *et al.* (1999) [2] in milk and its products where the total plate count decreased due to tyndallization process.

The coliform count of fresh sample of gulabjamun was 12 cfu/gm (Table-1). Reduction in coliform count by microwave treatment was 100% in gulabjamun for the samples analyzed.

Yeast and mold count of gulabjamun were 10 cfu/gm. It was observed that after tyndallization the per cent reduction in yeast and mold count was 100% in the treated gulabjamun. Similar results were observed by Dhand *et al.* (2001) [4] reported that tyndallization process reduced the yeast and

mould count in milk and its products.

### The effect of tyndallized treatment on the microbiological quality during storage period

In general, the total plate count increased in both tyndallized treated and untreated samples during storage at ambient conditions (30 °C) (Table 3). Maximum bacterial growth took place in untreated sample. The total count in fresh gulabjamun was  $8.5 \times 10^3$  cfu/gm. After 5 days of storage, at 30 °C untreated product was not acceptable organoleptically. Whereas, the shelf life of treated gulabjamun ((initial count  $3 \times 10^2$  cfu/gm) kept at room temperature was extended up to 28 days  $8 \times 10^2$  cfu/gm)

**Table 2:** Effect of Tyndallized treatment on the microbiological quality of Gulabjamun during storage

Parameter	Sample (at room temp.)	Count at 0 day	Count at the day of spoilage
Standard plate count	Untreated	8500	12500 at 5 <sup>th</sup> day
	Treated	300	Doesn't spoil and the count is 800
Coliform count	Untreated	12	22 at 5 <sup>th</sup> day
	Treated	Nil	Nil
Yeast and Mould count	Untreated	8	200 at 5 <sup>th</sup> day
	Treated	Nil	Nil

Growth of coliform was also inhibited due to tyndallization treatment. The coliform count of fresh gulabjamun was  $12 \times 10^1$  cfu/gm. After 5 days of storage at room temperature had spoiled and count increased to  $22 \times 10^1$  cfu/gm. Whereas, the treated product does not show any growth thereby the shelf life of treated gulabjamun kept at room temperature was extended upto 28 days Kumar (2013) [7] reported that coliform growth was inhibited by tyndallisation process in Khoa during preservation. There was a significant effect of tyndallisation treatment on yeast and mold count in controlling their growth during storage. Yeast and mold count increase in untreated sample during storage. In case of gulabjamun increased count observed in untreated sample was  $8 \times 10^1$  cfu/gm to  $2 \times 10^2$  cfu/gm after 5 days at room temperature and treated sample, when it stored under ambient condition does not show any growth until 28 days of storage. Dhand *et al.* (2001) [4] observed that no growth of yeast and mould in milk and its products in tyndallisation process.

### The effect of tyndallisation on sensory evaluation of gulabjamun:

The sensory score for flavour, colour, consistency and appearance of tyndallisation treated gulabjamun (Table 3) samples were observed to be same as compared to untreated products. On the basis of organoleptic evaluation it was observed that the quality of gulabjamun before and after treatment were almost same. During storage the overall acceptability of control sample was decreased to a greater extent than those of tyndallized treated sample. Similar findings were observed by Claudia *et al.* (2015) [3] in honey tyndallisation process. During storage flavour and taste badly deteriorated than body, texture, colour and appearance of gulabjamun. The cause may be due to the growth of more acid producers organisms. Tyndallized treated gulabjamun have been evaluated against control sample during storage upto 28<sup>th</sup> days on 9 point Hedonic Scale whereas, untreated sample evaluated only 5 days. Patil and Pal (2005) [10] reported that shelf life extension was noticed in burfi by using mechanised process up to 21 days.

**Table 3:** Sensory evaluation of control and tyndallisation treated gulabjamun

Sample	Days	Parameters			
		Colour and Appearance (9)	Body and texture (9)	Taste and Flavour (9)	Overall Acceptability (9)
C	0	9.00 <sup>b</sup> ±0.000	8.97 <sup>b</sup> ±0.030	8.97 <sup>b</sup> ±0.019	9.00 <sup>b</sup> ±0.000
T	0	9.00 <sup>b</sup> ±0.000	8.99 <sup>b</sup> ±0.031	8.95 <sup>b</sup> ±0.046	9.00 <sup>b</sup> ±0.000
	7	8.93 <sup>b</sup> ±0.038	8.92 <sup>b</sup> ±0.060	8.93 <sup>b</sup> ±0.061	8.95 <sup>b</sup> ±0.031
	15	8.92 <sup>b</sup> ±0.050	8.90 <sup>b</sup> ±0.047	8.91 <sup>b</sup> ±0.060	8.93 <sup>b</sup> ±0.061
	21	8.90 <sup>b</sup> ±0.091	8.88 <sup>b</sup> ±0.037	8.90 <sup>b</sup> ±0.058	8.92 <sup>b</sup> ±0.028
	28	8.80 <sup>ab</sup> ±0.103	8.72 <sup>a</sup> ±0.093	8.61 <sup>a</sup> ±0.073	8.67 <sup>a</sup> ±0.096

C- Control T- Tyndallization

Values are Mean ±SE of ten observations (n=10)

Values bearing different superscript in a column differ significantly at ( $P < 0.05$ )

### Conclusion

Tyndallized treated Gulabjamun samples were evaluated for 28 days at room temperature and Control sample of untreated gulabjamun was evaluated for 5 days. During storage, colour and appearance, smell and body and texture of untreated product was slightly affected than that of treated products. It has been concluded that tyndallization treatment of gulabjamun did not affect the body and texture and flavour attributes of the product and increase the shelf life up to 28 days and can be effectively utilized for fulfilling the local rural market demand.

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