

Research Article

Effect of Microwave Treatment on Extension of Shelf Life of Gulabjamun

S Banupriya*, G Kumaresan and C Kathirvelan

Department of Livestock Products Technology (Dairy Science), Veterinary College and Research Institute,
(Tamil Nadu Veterinary and Animal Sciences University), Namakkal-637 002, Tamil Nadu. India**Abstract**

A study has been carried out to enhance the shelf life of Gulabjamun by microwave treatment. 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, 7th, 21st, 28th 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 microwave treated product than control. It has been concluded that of microwave treatment process in gulabjamun is suggested to enhance the shelf life of the product up to 15 days in room temperature.

Keywords: Microwave treatment, Shelf-life, Gulabjamun, Dairy Products, Sensory evaluation

***Correspondence**

Author: S Banupriya
Email: banupriyalpt@gmail.com

Introduction

Gulabjamun refers to the indigenous dairy product of India, which is eaten in most festivals by all members of the family. Gulabjamun is made from a mixture of khoa and refined flour usually [1]. 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. 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 [2]. From very early time the simplest way to enhance the keeping quality of milk is boiling [3]. Many thermal processes i.e. pasteurization, sterilization and UHT have gained a lot of popularity.

Microwave treatment is an intense thermal process, which is now widely used to extend the shelf life of various food products. It is well established that the microflora of liquid milk could be reduced by microwave treatment [3]. It inactivates enzymes, eliminate microbial growth and retaining the quality attributes of the products. Application of microwave treatment on shelf life extension of dairy products has probably not been attempted. Hence, this investigation is planned to study the efficacy of microwave treatment on shelf life extension of Gulabjamun.

Materials and Method

Gulabjamun were prepared under aseptic conditions in the laboratory (as per the procedure of [4]). All the samples of gulabjamun were packed in 16 glass containers. Eight samples were tyndallized and others were kept as control. Gulabjamun samples were microwave treated at power level of 600Watts for 32 sec for three consecutive 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 [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, 7th, 15th, 28th and onward till they were acceptable based on organoleptic test and consumer acceptance.

Results and Discussion***The effect of Microwave treatment on the microbiological quality***

The effect of Microwave 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 tyndallization process (cfu/gram)	Reduction (%)
1.	Total plate count	8500	450	94.46
2.	Coliform count	12	Not detected	-
3.	Yeast and Mould count	10	Not detected	-

The total plate count in fresh gulabjamun sample was 8.5×10^3 cfu/gm. It was observed that after Microwave treatment the reduction in total plate count was 94.46% for all the samples analyzed. Similar results were observed by [6] in milk and its products where the total plate count decreased due to Microwave treatment.

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 Microwave treatment the per cent reduction in yeast and mold count was 100% in the treated gulabjamun. Similar results were observed by [7] reported that Microwave treatment process reduced the yeast and mould count in milk and its products.

The effect of Microwave treatment on the microbiological quality during storage period

In general, the total plate count increased in both Microwave treated and untreated samples during storage at ambient conditions (30°C) (Table 2). Maximum bacterial growth took place in untreated sample. The total count in fresh gulabjamun was 8.5×10^3 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 3×10^2 cfu/gm) kept at room temperature was extended up to 28 days (8×10^2 cfu/gm)

Table 2 Effect of microwave 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 th day
	Treated	300	Doesn't spoil and the count is 800
Coliform count	Untreated	12	22 at 5 th day
	Treated	Nil	Nil
Yeast and Mould count	Untreated	8	200 at 5 th day
	Treated	Nil	Nil

Growth of coliform was also inhibited due to Microwave treatment. The coliform count of fresh gulabjamun was 12×10^1 cfu/gm. After 5 days of storage at room temperature had spoiled and count increased to 22×10^1 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. [8] reported that coliform growth was inhibited by Microwave treatment in Khoa during preservation. There was a significant effect of microwave 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 8×10^1 cfu/gm to 2×10^2 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. Similarly, [7] observed that no growth of yeast and mould in milk and its products in tyndallisation process.

The effect of microwave treatment on sensory evaluation of gulabjamun

The sensory score for flavour, colour, consistency and appearance of Microwave treatment 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 microwave treated sample. 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 producer's organisms. Microwave treatment gulabjamun have been evaluated against control sample during storage upto 28th days on 9 point Hedonic Scale whereas, untreated sample evaluated only 5 days. Similar results reported by [9] that shelf life extension was noticed in burfi by using mechanised process up to 21 days.



Figure 1 Control (untreated) gulabjamun – Spoiled at 6 days in room storage

1



Figure 2 Microwave treated gulabjamun – shelf life up to 15 days in room storage

Table 3 Sensory evaluation of control and Microwave treatment gulabjamun

Sample	Days	Parameters			
		Colour and Appearance (9)	Body and texture (9)	Taste and Flavour (9)	Overall Acceptability (9)
C	0	9.00 ^b ±0.000	8.97 ^b ±0.030	8.97 ^b ±0.019	9.00 ^b ±0.000
MT	0	9.00 ^b ±0.000	8.97 ^b ±0.019	8.97 ^b ±0.030	9.00 ^b ±0.000
	7	8.95 ^b ±0.031	8.95 ^b ±0.030	8.93 ^b ±0.038	8.95 ^b ±0.032
	15	8.92 ^b ±0.037	8.75 ^a ±0.048	8.66 ^a ±0.047	8.88 ^b ±0.062
	21	8.87 ^b ±0.045	8.71 ^a ±0.066	8.64 ^a ±0.037	8.71 ^a ±0.061
	28	8.75 ^a ±0.120	8.70 ^a ±0.10	8.60 ^a ±0.078	8.63 ^a ±0.110

C- Control MT- Microwave treated
 Values are Mean ±SE of ten observations (n=10)
 Values bearing different superscript in a column differ significantly at (P<0.05)

Conclusion

Microwave 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 microwave treatment of gulabjamun did not affect the body and texture and flavour attributes of the product and increase the shelf life up to 15 days and can be effectively utilized for fulfilling the local rural market demand.

References

- [1] Patel AA, Patil GR, Garg FC, Rajorhia GS.1992. Textural characteristics of market samples of gulabjamun. Indian J. of Dairy Sci. 45(7):356-359.
- [2] Nalawade MR, Shinde AT, Kokare RL, Lingayat NT.2015. Studies on preparation of gulabjamun blended with wheat bran. Research Journal of Ani. Husbandry & Dairy Sci. 6(2):139-144.
- [3] Anon.1989. Microwave food processing, Food Technol. 43(1):17- 19
- [4] Sukumar, De. 1991. Outlines of Dairy Technology.PP:515-517
- [5] FSSAI. 2017. Food Safety and Standard Authority of India. IS 5402:2002/ISO4833:1991/2007
- [6] Brown, JV, R. Wiles and G.A. Prentice. 1979. The effect of a modified tyndillazation process up on the spore forming bacteria of milk and cream. Int. J. of Dairy Technology. Vol 32(2): 78-81
- [7] Dhand, N.K, Joshi, D.V. and Jand, S.K. 2001. Fungal contaminants of milk and milk products and their toxigenicity. Indian Vet. J., 72 (4): 956-957
- [8] Kumar, M., 2013. Up-gradation of Khoa Production and Preservation Technologies- A Review. J. Phys. Sci. Eng. Technol., 4(1):37-47
- [9] Patil, C. and D. Pal. 2005. Studies on mechanised production and shelf life extension of burfi. Indian J. Dairy Sci., 58(1):12-16.

© 2021, by the Authors. The articles published from this journal are distributed to the public under “**Creative Commons Attribution License**” (<http://creativecommons.org/licenses/by/3.0/>). Therefore, upon proper citation of the original work, all the articles can be used without any restriction or can be distributed in any medium in any form.

Publication History

Received	22.11.2020
Revised	13.01.2021
Accepted	15.01.2021
Online	30.03.2021