

Review Article

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Effect of microwave treatment on the extension of shelf life of Rasagolla**S. Banupriya^{1*}, G. Kumaresan¹ and C. Kathirvelan²**¹Department of Livestock Products Technology (Dairy Science), Veterinary College and Research Institute, Namakkal-637 002, Tamil Nadu, India.²Department of Animal Nutrition, Veterinary College and Research Institute, Udumalpet- 642 205, Tamil Nadu, India.**ABSTRACT**

Rasagolla (a sweet syrup cheese ball) most popular in the regions of South Asia, manufactured from Channa (a precipitate obtained by heat and acid coagulation of milk). The shelf life of Rasagolla at ambient temperature, in sugar syrup is 2 days. The most serious constraint for shelf life enhancement is the activity of microorganisms. A study has been carried out to enhance the shelf life of Rasagolla by microwave treatment. Rasagolla was prepared under aseptic conditions in the laboratory as per the standard procedure. All the samples of Rasagolla 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 Rasagolla. Sensory evaluation on a nine-point Hedonic Scale was done for treated and untreated products stored at ambient conditions (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 Rasagolla was extended by 28 days and beyond at room temperature. The different microbial counts are also within the permissible limit in microwave products than control. It has been concluded that the microwave treatment process in Rasagolla is suggested to enhance the shelf life of the product up to 15 days in room temperature.

Keywords: Microwave treatment, Shelf-life, Rasagolla, Dairy Products, Sensory evaluation, Tyndallisation, Microbial count

Introduction

Rasagolla refers to the indigenous dairy product of India, which is eaten in most festivals by all members of the family. 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 [1]. It inactivates enzymes, eliminate microbial growth and retains the quality attributes of the products. The 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 the shelf life extension of Gulabjamun.

Materials and Method

Rasagolla was prepared under aseptic conditions in the laboratory (as per the procedure of [2]). All the samples of Rasagolla were packed in 16 glass containers. Eight samples were tyndallized and others were kept as control. Rasagolla 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 Mould count were analyzed according to the methods of [3] and sensory evaluation on a nine-point Hedonic Scale was done for each product i.e. treated and untreated products stored at the ambient condition at 0 day, 7th, 14th, 21st, 28th and onward till they were acceptable based on organoleptic test and consumer acceptance.

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

The effect of Microwave treatment on the microbiological quality of Rasagolla was presented in Table 1.

The total plate count in fresh Rasagolla sample was 10.5×10^3 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 [4] in milk and its products where the total plate count decreased due to Microwave treatment.

The coliform count of the fresh sample of Rasagolla was 12 cfu /gm (Table-1). Reduction in coliform count by microwave treatment was 100% in Rasagolla 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 Rasagolla. Similar results were observed by [5] reported that the 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). After 3 days of storage, at 30 °C untreated product was not acceptable organoleptically. Whereas, the shelf life of treated Rasagolla kept at room temperature was extended up to 15 days.

Table 1: Effect of microwave treatment on Rasagolla microbial quality

Sl.No	Parameter	Before microwave process (cfu/gram)	After microwave process (cfu/gram)	Reduction (%)
1.	Total plate count	10500	450	94.46
2.	Coliform count	12	Not detected	-
3.	Yeast and Mould count	10	Not detected	-

Table 2: Effect of microwave treatment on the microbiological quality of Rasagolla during storage

Product	Parameter	Storage period in days					
		Sample	0	7	14	21	28
Rasagolla	Standard Plate Count (Log ¹⁰ value)	C	3.93 \pm 0.16	--	--	--	--
		MT	1.18 \pm 0.14	2.49 \pm 0.15	3.77 \pm 0.18	4.49 \pm 0.14	4.82 \pm 0.11
	Coliform Count (Log ¹⁰ value)	C	1.08 \pm 0.28*	--	--	--	--
		MT	0	0	0	0	0
	Yeast and Mould Count (Log ¹⁰ value)	C	1.01 \pm 0.20*	--	--	--	--
		MT	0	0	0	0	0

Growth of coliform was also inhibited due to Microwave treatment. After 3 days of storage, the untreated product at room temperature had spoiled. Whereas, the treated product does not show any growth thereby the shelf life of treated Rasagolla kept at room temperature was extended upto 15 days. [6] 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 mould count increase in the untreated sample during storage at room temperature and in treated sample, does not show any growth until 15 days of storage. Similarly, [7] observed that no growth of yeast and mould in milk and its products in Tyndallization process.

The effect of microwave treatment on sensory evaluation of Rasagolla

The sensory score for flavour, colour, consistency and appearance of Microwave treatment (Table 3) samples were observed to be the same as compared to untreated products. On the basis of organoleptic evaluation it was observed that the quality of Rasagolla before and after treatment were almost same. During storage the overall acceptability of control sample was decreased to a greater extent than those of the microwave treated sample. During storage, flavor and taste badly deteriorated than body, texture, colour and appearance of Rasagolla. The cause may be due to the growth of more acid producer's organisms. Microwave treatment been evaluated against control sample during storage up to 15th days on 9 point Hedonic Scale whereas, untreated sample evaluated only 5 days. Similar results reported by [7] that shelf life extension was noticed in burfi by using mechanised process up to 21 days.

Table 3: Sensory evaluation of control and Microwave treatment Rasagolla

Product	Sample	Days	Parameters			
			Colour and Appearance (9)	Body and Texture (9)	Taste and Flavour (9)	Overall Acceptability (9)
Rasagolla	C	0	8.98 ^b \pm 0.015	8.98 ^b \pm 0.015	9.00 ^b \pm 0.00	9.00 ^b \pm 0.000
		0	8.97 ^b \pm 0.019	8.95 ^b \pm 0.031	8.97 ^b \pm 0.019	9.00 ^b \pm 0.000
	MT	7	8.93 ^b \pm 0.038	8.92 ^b \pm 0.060	8.95 ^b \pm 0.031	8.90 ^b \pm 0.062
		15	8.88 ^b \pm 0.076	8.71 ^a \pm 0.047	8.65 ^a \pm 0.047	8.83 ^b \pm 0.099
		21	8.85 ^b \pm 0.077	8.69 ^a \pm 0.076	8.55 ^a \pm 0.087	8.72 ^a \pm 0.09
		28	8.75 ^a \pm 0.020	8.65 ^a \pm 0.050	8.50 ^a \pm 0.018	8.63 ^a \pm 0.090

C- Control MT- Microwave treated

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

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

Conclusion

Microwave-treated Rasagolla samples were evaluated for 28 days at room temperature and a Control sample of untreated Rasagolla was evaluated for 5 days. During storage, colour, appearance, smell and body and texture of untreated products was slightly affected than that of treated products. It has been concluded that microwave treatment of Rasagolla did not affect the body and texture and flavour attributes of the product and increases the shelf life up to 15 days and can be effectively utilized for fulfilling the local rural market demand.

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**Fig 1: Control (untreated) gulabjamun – Spoiled at 6 days in room storage**



Fig 2: Microwave treated gulabjamun - shelf life up to 15 days in room storage

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