

STUDIES ON THE SHELF-LIFE OF SOME SWEETS CONTAINING INDIAN MULTIPURPOSE FOOD

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Recently a process for the preparation of a highly nutritious protein food known as Indian multipurpose food, has been developed by Subrahmanyam *et al*¹⁻³. The food is designed to be used as a low-cost protein supplement to the diets of the poorer classes of the population whose diets are deficient in proteins. The food consists of a blend of low-fat groundnut flour and Bengal gram flour and fortified with vitamins and minerals. As a result of extensive trials carried out at this Institute, several common recipes incorporating the food at different levels have been standardised⁴. It was at the same time felt desirable to prepare some sweets which could be stored for some months and transported over long distances. Such preparations will have the advantage in that they can be prepared on a large scale in some selected centres and distributed all over India for use as supplements to the diets of children. The present paper deals with studies on the shelf-life of four varieties of sweets containing Indian multipurpose food.

Experimental

The following sweets (1) rose burfee (2) chocolate (3) sugar bars and (4) jaggery bars were prepared according to the methods described earlier⁴. The proportion of different ingredients in the sweets is given in Table I. In the preliminary trials, it was observed that all the samples of sweets having more than 9 per cent of initial moisture content underwent microbial spoilage. In order to get over this defect, the following precautions were taken: (1) the sweets were prepared so as to have as low a moisture content as possible and (2) they were packed in butter paper and heated at 75°C for 1 and 2 hours to sterilise the surface. The control and heated samples were packed in alkathene bags, (6 sweets in each bag). The bags were heat-sealed and

TABLE I. *Composition of different sweets containing Indian multipurpose food*

Ingredients	Rose burfee %	Chocolate %	Sugar bar %	Jaggery bar %
Indian multipurpose food (unseasoned)	24	20	30	30
Sugar ...	50	40	60	...
Jaggery ...	...	...	...	60
Skim milk powder ...	12	18	...	...
Vanaspati ...	14	20	10	10
Cocoa ...	...	2	...	...

Rose essence was added to rose burfee, sugar and jaggery bars and vanilla to chocolate for flavouring.

packed in cans which were hermetically sealed (3 bags in each tin). The cans were stored at 37°C for a period of six months. Another lot of cans were stored at 0°C to serve as control.

The initial moisture content of the control and heated samples were determined and these values are given in Table II. The sweets were analysed periodically for (1) organoleptic quality (2) development of rancidity of the fat and (3) microbial spoilage. Acidity and peroxide values of the fat were determined according to A.O.A.C.

TABLE II. *Effect of heat treatment on the moisture content of different sweets*

Sweet	Heated at 75°C for					
	Initial		1 hour		2 hours	
	Min. %	Max. %	Min. %	Max. %	Min. %	Max. %
Rose burfee ...	7.5	8.8	7.0	8.2	6.6	7.6
Chocolate ...	7.7	8.4	7.1	7.9	6.4	7.1
Sugar bar ...	8.0	9.8	7.3	9.0	7.0	8.5
Jaggery bar ...	8.9	11.1	8.1	10.2	7.5	9.3

TABLE III. The shelf-life of different sweets (stored at 37°C)

Sweet	Period of heating (hours)	Initial			1 month			2 months			4 months			5 months			6 months		
		P.V.	A.V.	O.A.	P.V.	A.V.	O.A.	P.V.	A.V.	O.A.	P.V.	A.V.	O.A.	P.V.	A.V.	O.A.	P.V.	A.V.	O.A.
Rose burfee	0	1.4	0.9	A	1.4	1.0	A	...	...	M.S.	...	...	M.S.	...	...	M.S.	...	...	M.S.
	1	1.5	0.9	A	1.5	1.1	A	1.5	1.8	A	2.3	2.8	A	3.5	3.5	A.B.	3.7	4.1	A.B.H.
	2	1.4	0.9	A	1.5	1.2	A	1.9	1.6	A	2.1	3.1	A	2.6	3.5	A.B.	3.5	4.3	A.B.H.
Chocolate	0	1.2	1.2	A	1.2	1.2	A	...	...	M.S.	...	...	M.S.	...	...	M.S.	...	...	M.S.
	1	1.1	1.1	A	1.1	1.4	A	1.1	1.6	A	1.9	3.9	A	2.5	3.9	A	2.7	4.1	A.H.
	2	1.1	1.2	A	1.1	1.2	A	1.5	1.6	A	2.4	2.8	A	2.4	2.9	A	2.5	3.0	A.H.
Sugar bar	0	1.1	1.2	A	1.1	1.9	A	...	...	M.S.	...	...	M.S.	...	...	M.S.	...	...	M.S.
	1	1.0	1.1	A	1.3	2.1	A	2.3	2.1	A	2.8	3.8	A	3.0	4.0	A.B.	3.2	4.4	A.B.H.S.
	2	1.3	1.4	A	1.6	2.2	A	2.8	2.8	A	2.9	3.5	A	3.0	3.8	A.B.	3.1	4.0	A.B.H.S.
Jaggery bar	0	1.0	1.4	A	1.1	1.6	A	1.8	2.6	A	2.4	3.4	A	3.0	4.0	A	3.5	4.8	A.H.S.
	1	1.1	1.2	A	1.1	1.4	A	2.0	2.4	A	2.7	3.4	A	3.0	4.2	A.H.	3.5	5.0	A.H.S.
	2	1.3	1.2	A	1.4	1.6	A	1.9	2.3	A	2.5	3.5	A	2.5	4.0	A.H.	3.6	4.6	A.H.S.

A = Acceptable
H = Hard

M. S. = Microbial spoilage
B = Brown colour

S = Sour

P. V. = Peroxide value

A. V. = Acid value

O. A. = Organoleptic acceptability

methods⁵. The results of these studies are presented in Table III.

Organoleptic evaluation: The products which were free from microbial spoilage were subjected to organoleptic evaluation periodically by a panel of six judges. The judges examined the products for colour change, texture, taste and overall acceptability. The results are given in Table III.

Results and Discussion

Moisture content: The initial moisture content of the different batches of the same sweet varied only to a slight extent. The jaggery bars had a somewhat higher moisture content than other sweets. It was found that heating the sweets at 75°C for 1 and 2 hours resulted in an appreciable reduction of moisture content.

Colour change: Rose burfee and sugar bars developed slight brown colour at the end of 4 months of storage at 37°C. The colour change was not noticed in the case of chocolate and jaggery bars, because of their initial brown colour. The colour change in rose burfee and sugar bars may be due to Maillard reaction.

Development of rancidity: There was an appreciable increase in the peroxide and acid values of the fat in the different sweets during storage.

Microbial spoilage: The sweets stored at 0°C were free from microbial spoilage during the storage period of six months. Among the sweets stored at 37°C, all the control samples except jaggery bars underwent microbial spoilage, within a storage period of 2 months. On the other hand, the sweets subjected to heat treatment for 1 and 2 hours were free from microbial spoilage during a storage period of six months.

Organoleptic quality: All the sweets subjected to heat treatment were acceptable up to the end of 5 months of storage at 37°C. At the end of 6 months of storage at 37°C, rose burfee and chocolate were acceptable. But sugar bars and jaggery bars were not quite acceptable after 5 months storage as they were somewhat hard and had developed slight sour taste.

All the sweets stored at 0°C were found to be acceptable throughout the storage period. All the control samples except jaggery bars stored at 37°C were unacceptable because of visible microbial spoilage at the end of a storage period of 2 months.

The results reported in the present paper, show that heating the sweets at 75°C even for one hour, prevented the microbial spoilage during storage. The sweets subjected to the heat treatment had a good shelf-life and were acceptable even at the end of 5 months of storage at 37°C.

Summary

Investigations on the shelf-life of four varieties of sweets, (rose *burfee*, chocolate, sugar bars and jaggery bars) containing Indian multipurpose food were carried out. The sweets subjected to heat treatment at 75°C for 1 and 2 hours were packed in cans.

The results showed that the sweets subjected to heat processing for 1 and 2 hours were free from microbial spoilage in a storage period of six months and were acceptable. On the other hand, control sweets not subjected to heat treatment, underwent microbial spoilage in a period of 2 months when stored under similar conditions.

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