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STUDIES ON METHOD OF PREPARATION AND PRESERVATION OF KHEER

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Kheer is an Indian dessert prepared by partial dehydration of whole milk in open pan over direct fire with sugar and usually rice or other cereals, which is relished by one and all throughout the country. Although Davis (1940) and Srinivasan and Anantakrishnan (1964) have written about its method of preparation and gross composition, no scientific work has been carried out so far on any aspect of kheer in this country. Hence it was desired to conduct studies on standardization of the method of preparation, chemical composition and methods of preservation of this product.

The following materials were used in the preparation of kheer : (a) Equipment—(i) Processing kettle of stainless steel and steam-jacketed, (ii) Stirrer-cum-scraper of iron; (b) Milk—Raw cow milk from the Institute herd, stored in a bulk tank cooler at $5\pm 1^{\circ}\text{C}$ for 4-20 hr; its pH was 6.5-6.6 (T.A. 0.13-0.14%), fat 4.1-4.4% and SNF 8.7-8.9%; (c) Rice—*Basmati* quality from the local market, washed with cold water just before use; and (d) Sugar-refined (as in IS : 1151-1969).

The following broad technique of preparation of kheer was adopted on the basis of preliminary trials :

The standardized milk, after straining through muslin cloth, was taken in pre-determined amounts (8-10 kg) in the processing kettle and boiled vigorously for 3-5 min with constant stirring and scraping. The calculated amount of cleaned and washed rice was now added. Gentle boiling was hereafter maintained, accompanied by thorough stirring-cum-scraping of the kettle contents. When the ratio of concentration of the mixture reached 1.8, as judged by a pre-calibrated scale, the calculated amount of clean sugar was added. Further heating with stirring-cum-scraping was continued for further 3-5 minutes. Steam intake was stopped in time so that the final ratio of concentration was maintained at 1.9-2.0. The kheer (300 g) was then filled hot up to brim in pre-sterilized cans, which were covered immediately with similarly treated lids and sealed. Care was taken to thoroughly mix the kettle-contents every time before individual canning.

The sampling of milk was done as in IS-1961 and kheer as in IS-1966. The analysis of milk was done as in IS-1961, and that of kheer as follows: Fat, T.S. (moisture), protein and sucrose as in IS-1973, lactose by picric acid method (Perry and Doan, 1950), and ash as in IS-1967.

The judging panel consisted of 5 to 7 experienced senior staff members of the Dairy Technology Division, who adopted standard technique for judging kheer samples for their sensory quality and acceptability.

The shelf-life of control, sterilized and Nisaplin-added cans of kheer at $37 \pm 1^\circ\text{C}$ and $4 \pm 1^\circ\text{C}$ was determined. The sterilization of filled and sealed cans was done by completely submerging them in a boiling water-bath at $98 \pm 2^\circ\text{C}$ for 20 minutes, while turning the cans up side down every 5 min. The Nisaplin (NISIN) was obtained from U.K. and added @ 2 g per 10 kg kheer; the calculated amount of Nisaplin was dissolved in a minimum

amount of potable water, sprinkled over the hot kheer after production and mixed thoroughly into it before canning.

A total of 30 regular trials were carried out for standardization of the method of preparation of kheer, 10 each for the following variables: (i) fat percent of milk, (ii) rice percent of milk, and (iii) sugar percent of milk. The average results are presented in Table below.

TABLE

Fat per cent of milk	Kheer			
	Colour	Body	Flavour	Acceptability
←—————average score*—————→				
3	7	5	5	5
4	8	9	9	9
5	8	8	8	8

Rice per cent of milk	Colour	Body	Flavour	Acceptability
	Colour	Body	Flavour	Acceptability
←—————average score*—————→				
2	8	5	5	5
2.5	8	9	9	9
3	8	8	8	8

Sugar per cent of milk	Colour	Body	Flavour	Acceptability
	Colour	Body	Flavour	Acceptability
←—————average score*—————→				
4	8	5	5	5
5	8	9	9	9
6	8	8	8	8

*Poor: 1-2, Fair: 3-5, Good: 6-7, Excellent: 8-9, Perfect-10.

It will be observed from the Table that kheer made from 4.0% fat milk with 2.5% rice and 5.0% sugar obtained the highest point score for colour, body, flavour and acceptability from the judging panel.

The average results of the chemical analysis of 20 samples of the standardized product (made from 4% fat, 2.5% rice and 5% sugar in the initial milk with a final ratio of concentration of 1.9 to 2.0 in the finished product (...)) showed the following composition: Moisture—67.02%, Fat—7.83%; Protein—6.34%, Lactose—8.45%, Ash—1.41% and Sugar (Sucrose)—8.95%.

A total of 24 trials were conducted for preservation studies of the standardized product. It was observed that at $37 \pm 1^\circ\text{C}$, the control samples had a shelf-life of 23 days, sterilized ones 3-4 days and Nisaplin-added one 8-10 days. On the other hand, at $4 \pm 1^\circ\text{C}$, the control samples showed a shelf-life of 10-15 days, sterilized ones 60-70 days and Nisaplin-added ones 100-150 days. It is evident, therefore, that while sterilization treatment of the canned product showed considerable increase in the shelf-life under refrigerated storage, addition of Nisaplin showed remarkable increase under similar conditions of storage.

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