

# Studies on the Production of *Kulfi* Part—I. The Acceptable Level of Total Milk Solids

M. K. SALOOJA AND R. BALACHANDRAN

National Dairy Research Institute, Karnal, India

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*Kulfi* is an indigenous frozen dessert. Composition of *Kulfi* as sold in market varies widely. A study has been taken up to standardize the composition of *Kulfi*. The acceptable level of total milk solids in *Kulfi* prepared from raw milk was determined by sensory evaluation by a panel of judges. On the basis of trials, the concentration of milk to 26 % T. S. is found to yield *Kulfi* with better body, texture and overall acceptability.

*Kulfi* is an indigenous frozen milk product and like icecream it is palatable and nutritious. The involvement of equipment and machinery in the manufacture of *Kulfi* is minimum. Due to its palatability and comparatively low cost, *Kulfi* is popular in many parts of the country. Very little work has been reported on standard method of preparation and factors that affect the quality of *Kulfi* in terms of chemical composition or on consumer's preference. The method of producing *Kulfi* varies widely resulting in variation in composition, quality and cost of the product. Due to non availability of standardised process for its manufacturers, very few organisations are manufacturing on a commercial scale. Another drawback on large scale production is that PFA regulations do not differentiate between plain icecream and *Kulfi* with regard to its composition. Manufacture of *Kulfi* has been described by various workers.<sup>1-3</sup> However, detailed study such as the effect of total solids on textural qualities and overall acceptability have not been worked out. The present investigation was therefore, undertaken to standardise the method for the production of *kulfi* on commercial scale and evaluate the product by sensory methods.

## Materials and Methods

**Cow milk:** Pooled raw cow milk obtained from NDRI experimental dairy was standardised to a fat content of 3.5%.

**Sugar:** White crystalline sugar was used as sweetening agent and it was presumed to contain 100 per cent total solids.

**Freezing mixture:** Ice and coarse salt in the ratio of 4:1 was used for preparation of freezing mixture for freezing *Kulfi*.

***Kulfi* cones:** Aluminium cone, with screw type lid of 100-120 ml. capacity was used in the experiments.

**Pitcher:** Earthen pot of 29.1. capacity was used for freezing *Kulfi* cone with ice-salt mixture

**Heating and concentration unit:** Stainless steel jacketted steam kettle and laddle for stirring were used.

**Standardization and concentration of mix:** Raw cow milk standardised to 3.5% fat and 8.5 per cent SNF was concentrated in an open pan jacketted steam heated vessel with constant stirring until the required solids content was attained. Slow heating was done to avoid burnt particles in final product. *Kulfi* mix was then filled in *Kulfi* cones. The filled cones were immersed in freezing mixture contained in earthen pot and frozen with intermittent shaking according to method of Salooja.<sup>4</sup> In all the trials, 2-5 kg. of *Kulfi* mix of desirable composition was prepared. The details of various steps in *Kulfi* preparation are

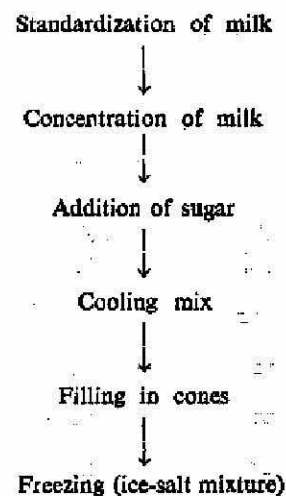


Fig. 1. Flow chart for *Kulfi* preparation.

presented in the flow chart (Fig. 1). The *Kulfi* mix was prepared from standardized cow milk concentrated to following total milk solids levels: 17 per cent (T 1), 20 per cent (T 2), 23 per cent (T 3), 26 per cent (T 4) and 29 per cent (T 5). These levels of concentration were arbitrarily chosen. In all trials, sugar was maintained at 13 per cent level.

**Sensory evaluation:** A panel consisting of six judges evaluated *Kulfi* samples for body, texture and overall quality by a 9-point hedonic scale. The panelists were familiar with the characteristics of the product.

**Statistical analysis:** The data were subjected to analysis of variance according to procedure outlined by Snedecor and Cochran.<sup>5</sup>

### Results and Discussion

Table 1 gives the composition of *Kulfi* prepared with different levels of milk solids. The average fat and solids-non-fat (SNF) contents of *Kulfi* increased with the increase in total milk solids. For instance, when mix was concentrated to 29 per cent total milk solids, the fat content of *Kulfi* increased from the initial value of 3.5 to 8.7 per cent. The increase in fat and SNF per cent in *Kulfi* mixes increased in proportion to the concentration of standardised cow milk used in these trials. Data pertaining to sensory evaluation of *Kulfi* are presented in Table 2.

**Body:** The average scores for body attribute were 5.19, 6.17, 6.90, 7.20 and 6.99 for 17, 20, 23, 26 and 29 per cent total solids respectively. The different treatments were observed to be significantly different ( $P < 0.05$ ). *Kulfi* with 26 per cent total solids was rated superior by panelists. *Kulfi* with 29, 26 and 23 per cent T. S. scored almost same values indicating that the body of *Kulfi* with these total solids was almost similar in quality.

The reason for comparatively low rating for higher

TABLE 1. FAT, SNF AND TOTAL MILK SOLIDS CONTENT OF *KULFI* PREPARED FROM DIFFERENT LEVELS OF MILK SOLIDS

Milk solids content (%)	Fat (%)	SNF (%)	Total solids (%)
	Mean $\pm$ SE	Mean $\pm$ SE	Mean $\pm$ SE
17	5.18 $\pm$ 0.066	11.98 $\pm$ 0.066	17.16 $\pm$ 0.051
20	6.12 $\pm$ 0.049	14.26 $\pm$ 0.194	20.38 $\pm$ 0.225
23	7.02 $\pm$ 0.049	16.22 $\pm$ 0.16	23.24 $\pm$ 0.150
26	7.88 $\pm$ 0.037	18.30 $\pm$ 0.152	26.18 $\pm$ 0.139
29	8.68 $\pm$ 0.020	20.52 $\pm$ 0.065	29.22 $\pm$ 0.120

TABLE 2. SENSORY EVALUATION OF *KULFI*

Milk solids content (%)	Body	Texture	Overall acceptability
17	5.19	4.99	4.76
20	6.16	6.39	5.70
23	6.90	6.73	6.76
26	7.20	7.36	6.86
29	6.99	7.13	6.59

total solids (29 per cent) may be due to heavy and soggy body in *Kulfi*. Ice cream with higher total solids content also gives a heavy and soggy product.<sup>6</sup> Less total solids in *Kulfi* on the other hand give weak and crumbly body. Hence, optimum level of total solids are desirable to have good body characteristics.

**Texture:** The average scores for texture were 4.99, 6.39, 6.73, 7.36 and 7.13 for 17, 20, 23, 26 and 29 per cent total solids respectively. It is also seen that the texture scores for different total solids content were also significant ( $P < 0.05$ ); highest score for texture was obtained for *Kulfi* containing 26% total solids. Sommer<sup>7</sup> reported that an increased total solids content resulted in apparent improvement of texture, which was due to incomplete freezing of product. This may be the reason for insignificant difference in critical difference.

In case of ice cream, higher total solids help to improve the smoothness. That the highest solids level under present study (29 per cent) had scored less in terms of texture, may be due to presence of coarse denatured particles in *Kulfi* on account of heating and concentration of milk.

**Over all quality of the product:** The average score for over all quality for T 1, T 2, T 3, T 4 and T 5 were 4.76, 5.70, 6.76, 6.86 and 6.59 respectively. The overall quality scores for different treatments were not significantly different. Highest average score (6.76) was for *Kulfi* with 26% total solids. *Kulfi* with 23, 26 and 29 per cent total solids gave almost similar average scores.

The present study has shown that if cow milk with 3.5% fat and 8.5% SNF is used in the preparation of *Kulfi*, the concentration of milk to 26 per cent total solids is expected to yield *Kulfi* of better body texture and over all quality. But at this level of total milk solids, the *Kulfi* is expected to have an average of 7.9% fat. But this *Kulfi* sample will fall short of statutory regulation (minimum of 10%) with regard to fat content.

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