

Effect of different combinations of buffalo milk and soymilk on the quality of Kulfi

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● ABSTRACT ●

Soy milk is used in kulfi to reduce the cost and to make the kulfi more acceptable to the consumer. Considering the availability of soybean on cheaper rate and to divert soybean towards other purposes, the present investigations was undertaken in order to find out the effect of the different levels of soymilk on the quality of kulfi. The standard techniques of preparation of soymilk and kulfi were used at three different levels of soybean for replacing buffalo milk *i.e.* 25%, 50 %, and 75%. The kulfi samples were analyzed for various parameters *viz.*, pH, acidity, melting time and sensory properties like flavour, body and texture, melting quality, palatability and cost structure. Increase in the replacement of buffalo milk by soymilk had no effect on pH, acidity and melting quality of kulfi. Consumer's acceptability was also determined on the basis of various methods. The highest score for flavour (9.88) and palatability (10) were recorded in treatment T2 having 25% buffalo milk replacement by soymilk. Addition of soymilk up to 25% had no effect on body and texture and melting quality of kulfi, but cost of production decreased as level of replacement of soymilk increased.

KEY WORDS : Kulfi, Soymilk, Buffalo milk

Bharad, P.M., Shelke, R.R. and Sammanwar, R.D. (2010). Effect of different combinations of buffalo milk and soymilk on the quality of Kulfi, *Res. J. Animal Hus. & Dairy Sci.*, 1 (2) : 73-76.

● INTRODUCTION ●

Milk is an ideal food for both infants and patients. Taking into consideration the growing population of India, low milk production from Indian animals, increasing demand for milk and milk products, which resulted in the shortage and higher cost of milk, so it is absolutely necessary to conserve the available milk through the application of modern technology. Indian scientists have diverted their work to find out a suitable substitute for milk to overcome the above problem under Indian conditions. Processed soymilk and its products partly solve this problem. Milk is partly substituted by soymilk for the preparation of milk products will not only favour low cost but will help in maintaining the nutritional status of the products. Soymilk is cheapest source of beneficial alkaline in nature vegetable

protein and essential amino acids. It contains 1.60 to 2.30 per cent fat, 0.90 to 1.50 per cent carbohydrates and 6.50 to 8.00 per cent total solids. Soymilk has also medicinal and therapeutic values. It stimulates growth and is highly digestible and found quite effective in curing gastric troubles. It is highly energetic food and an effective brain tonic and helpful for persons suffering from diabetes, blood pressure, kidney troubles, general weakness and diseases related to malnutrition in children and pregnant women.

Kulfi is a popular indigenous frozen product where as ice-cream is western frozen product. Composition of kulfi mix was variable and it is manufactured on small scale by crude indigenous method. Kulfi prepared from 15 % soymilk and skim milk solids in the ratios of 50 :50 was very much appreciated. Out of 150 consumers, 127 liked it very much (Rajor and Vani, 1990). In India, there is little work done on kulfi and hence meagre literature on kulfi is available especially on partly substitution of buffalo milk with soymilk. Therefore, the present investigation was undertaken with the main objective to investigate the acceptable level of soymilk and to find out whether substituting buffalo milk by soymilk is economical.

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● MATERIALS AND METHODS ●

The present investigation was undertaken in the

Department of Animal Husbandry and Dairying, Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola. This study was undertaken with a view to use the soymilk as substitute to natural milk and to investigate its acceptability in kulfi preparation in different combinations with buffalo milk.

Preparation of soymilk :

As per method suggested by Arora and Mital (1991) for preparation of soymilk, soybean was soaked in water containing one per cent sodium hydroxide overnight at room temperature in the ratio 1:4 (w/v). After soaking, the husks were removed by rubbing with hand. The clean soybean (200g) were ground in mixture with lukewarm water (1000ml). The resulting suspension was filtered through a double layer muslin cloth.

Analysis of soymilk /ingredients:

Soymilk was analyzed for total soluble solids as per method recommended by Indian Standards Institution in IS : 2802 – 1964 and fat content of soymilk, buffalo milk and cream by Gerber method as IS:1224(1958). Buffalo milk, soymilk, cream and skim milk powder were judged organoleptically as per the method of IS:1329(Part I)1960.

Preparation of kulfi:

The details of experimental procedure followed are presented below:

Collection of kulfi mix ingredients:

Buffalo milk as well as after separation cream was obtained from Department of Animal Husbandry and Dairying, Akola. I.S.I. grade skim milk powder (Anik Spray) was used for adjusting the total solids. Soymilk prepared as above and cane sugar was used as a sweetening agent. The sodium alginate was used as stabilizer and cardamom was also used as flavouring material.

Cleaning of appliances:

A common detergent *viz.*, Odopic was used for the cleaning of earthen pot and aluminum cone using clean water heated to 80^o C temperature by adequate rinse with clean warm water at 60^o C temperature.

Preparation and standardization of kulfi mix:

The composition of available (buffalo milk, soymilk, skim milk powder and cream) was estimated. The quantity of ingredients for standard mix was calculated by algebraic methods (De, 1980). Different combinations of buffalo milk and soy milk were formulated as follows:

Treatments	Combinations
T ₁	100 % buffalo milk
T ₂	75 % buffalo milk + 25 % soymilk
T ₃	50 % buffalo milk + 50 % soymilk
T ₃	25 % buffalo milk + 75 % soymilk

The kulfi mix was formulated as , Total solids – 38.5% fat-12%, MSNF-13%, sugar-13%, stabilizer-0.5% and essence (cardamom) – 5g /kg of mix.

Pasteurization and cooling of kulfi mix:

After proper mixing of all the ingredients and filtration of kulfi mix, it was heated up to 71^o C for 30 minutes with constant stirring in double jacketed vessel. The pasteurized kulfi mix was cooled immediately to 10± 1^o C by dipping the vessels in chilled water. During this process care was taken to avoid formation of skin on the top surface of the mix.

Filling and freezing of kulfi mix:

Kulfi mix was placed in aluminium cones of 80ml volume. The cones were closed by screw cap aluminium tops and edges made airtight with wheat dough and frozen in earthen pot containing a mixture of ice and salt in the ratio of 4:1. Tyre was used as a buffer under the earthen pot to avoid its breakage during agitation / freezing.

Analysis of kulfi mix:

The kulfi mix was analyzed for the following properties pH of the mix was determined by systronic pH meter (Type 322) using the method of ISI in IS:5741(1970). Acidity was determined by method described in ISI hand book of food analysis SP:18 part XI (1981).

Analysis of kulfi:

Melting point of kulfi was determined by placing 75 g of the kulfi on wire net and time required for melting was noted as per recommendation of Thomas and Combs (1944). The evaluation of the quality of kulfi was carried out by judging the samples by the panel of trained six judges. The standard score card was prepared for the quality of kulfi.

Statistical analysis and cost structure of the kulfi:

The observations were analyzed as per the Randomized Block Design, in which four treatment factors were replicated six times. Data were analyzed by giving the statistical treatments to the findings. Interference were drawn by putting the data in standard methods “ Analysis of Variance” described by Panse and Sukhatme (1985). Cost was calculated as per prevailing rates.

● RESULTS AND DISCUSSION ●

In the present investigation, effect of three different levels of soymilk for replacing buffalo milk (25%, 50% and 75%) on the quality of kulfi was seen. The observations recorded during the course of investigation were statistically analyzed and the results were tested for statistical significance. From the results and discussion, the following conclusions were drawn.

Properties of kulfi :

The observations recorded for all the four treatments and six replications were statistically analyzed on the basis of mean values as shown in Table 1.

pH :-

Increase in the replacement of buffalo milk by soymilk had no effect on pH values of kulfi mix. pH values were same for all the treatments (T₁, T₂, T₃ and T₄) statistically these are non-significant.

Acidity :

There was no change in acidity percentage of kulfi mix with increase in the soymilk content. Variation between the treatment regarding the acidity levels were non-significant, pair wise comparison CD values showed that

Table 1 : Effect of different combinations of buffalo milk and soymilk on pH, acidity and melting time of kulfi

Treatments	pH	Acidity	Melting time (minutes)
T ₁	6.42	0.1810	42.16
T ₂	6.42	0.1810	42.92
T ₃	6.43	0.1808	42.58
T ₄	6.43	0.1812	42.41
S.E. (m) ±	0.0133	0.00111	0.243
C.D. (P=0.01)	0.0392	0.0032	0.716
C.D. (P=0.05)	0.0283	0.0024	0.518

On the basis of mean values of six replications

treatment T₁ (control) was similar to treatments T₂, T₃ and T₄ containing 25 %, 50% and 75% soymilk, respectively.

Melting point :

The melting time required for 25% soymilk replacement was more (42.92 minutes) as compared to T₁, T₃ and T₄. Treatments. T₂ was superior over T₁ in respect of melting time, pair wise comparison with CD values showed that treatment difference was non-significant. It means treatment T₁, T₂, T₃ and T₄ were having equal effect.

Judging of the kulfi-

The observations recorded for judging of various parameters obtained from the panel of judges for all the four treatments and six replications were statistically analyzed on the basis of mean values as shown in Table 2.

Flavour :

Flavour preference showed that the kulfi having 25% buffalo milk replaced by soymilk had scored highest *i.e.* 9.88 marks out of 10 marks. It was followed by control sample (100% buffalo milk). Differences among the treatments were significant, pair wise comparison with CD showed that treatments were highly significant.

Body and texture :

Kulfi prepared from control treatment scored 9.05 marks out of 10 marks while lowest score was 8.91 for kulfi containing 75% soymilk. All the samples were having good body and texture because statistically treatment differences were non-significant.

Melting quality (Score) :

Sensory evaluation of melting quality of kulfi showed that all the treatments secured equal marks. Statistically

Table 2 : Effect of different combinations of buffalo milk and soymilk on quality and cost of kulfi (Mean values of six replications)

Treatments	Flavour*	Body and texture *	Melting quality*	Palatability*	Overall acceptability**	Cost structure ***
T ₁	8.69	9.05	8.99	9.80	35.89	13.68 (1.05)
T ₂	9.88	9.02	8.97	10.00	37.89	13.19 (1.01)
T ₃	6.30	8.94	8.97	6.08	30.30	12.91(0.99)
T ₄	5.02	8.91	8.97	5.05	28.03	12.55(0.96)
S.E. (m) ±	0.0893	0.0819	0.0187	0.0602	0.154	--
C.D. (P=0.01)	0.263	0.180	0.041	0.177	0.453	--
C.D. (P=0.05)	0.190	0.240	0.055	0.128	0.328	--

(* marks obtained out of 10 marks, ** marks obtained out of 40 marks, *** For cost of kulfi mix 1.0 kg in Rs. and in figures in parenthesis are cost of single kulfi in Rs.)

treatment variations were non-significant.

Palatability :

Sensory evaluation of palatability of kulfi showed that kulfi having 25% buffalo milk replacement by soymilk scored highest marks (10 out of 10 marks). This was followed by control, 50 % and 75% buffalo milk replacement by soymilk treatments. Treatments variation were highly significant, pair wise comparison with CD showed kulfi having 25% buffalo milk replacement by soymilk was superior over control 0%, 50% and 75% buffalo milk replacement by soymilk.

Overall acceptance :

The overall acceptance of the kulfi showed that the kulfi having 25% buffalo milk replacement by soymilk scored highest marks (37.89 out of 40). It was followed by kulfi having 0%, 50% and 75% buffalo milk replacement by soymilk.

Cost structure :

As the level of soymilk was increased the cost structure of kulfi decreased. Highest cost Rs. 1.05 per kulfi and Rs. 13.68 per kg mix was found in treatment T1 having only buffalo milk followed by treatment having 25%, 50% and 75% buffalo milk replacement by soymilk.

Conclusion:

– Various properties of mix such as pH, acidity and melting time remained unchanged with the increase in the levels of soymilk.

– Kulfi having 25% buffalo milk replacement by soymilk was evaluated as the best organoleptic qualities among all the treatments. Hence, kulfi having 25 % buffalo

milk replacement by soymilk is recommended without affecting the quality of the kulfi as well as low cost as compared to pure buffalo milk kulfi.

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