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Studies on development of Kulfi supplemented with Peach pulp

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Abstract

Kulfi is an indigenous frozen dairy product which closely resembles ice cream in composition. The present investigation was made with an attempt to develop a peach pulp supplemented kulfi by partial addition of different levels of peach pulp (5%, 10%, 15% and 20%) and thereafter studying the effect of addition of peach pulp supplemented kulfi. Based on physico-chemical evaluation and sensory evaluation the final optimized product contains 15% of peach pulp was found to be highly acceptable among the other combinations. The optimized product contains 10.37% Fat, 24.55% Carbohydrate, 5.97% Protein, 1.34% Ash, 0.27% Titratable Acidity, 58.49 mg/100g ascorbic acid antioxidant activity, 4.23% Crude Fibre and 95.59 mgGAE/100g Phenolic content.

Keywords: Peach pulp, Kulfi, physico-chemical, sensory

Introduction

The domestic market for value added products like-butter, cheese, frozen products including Kulfi and ice cream is galloping at 8-10 per cent per year. Out of total milk production, 77 per cent milk is sold as liquid milk and 23 per cent converted into milk products. Kulfi is a frozen dairy product made by suitable blending and processing of skim milk powder and other milk products, together with sugar and flavour, with or without stabilizer or colour and also with the incorporation of air during the freezing process. A typical compositional range for the components used in Kulfi mix preparation is containing fat 10-16%, solids not fat 9-12%, total solids 36-45%, sucrose 9-12%, corn syrup solids 4-6%, stabilizers/emulsifiers 0-0.5% and water 55-64%. Kulfi is often described in terms of two phases; continuous and dispersed. The continuous phase is a combination of an unfrozen solution, an emulsion and a suspension of solids in liquid. Water, sugar, hydrocolloids, milk proteins and other soluble make up the unfrozen solution suspended in the aqueous phase are insoluble solids, including ice crystals, lactose crystals and milk solids. Its aqueous phase is also forming an emulsion with dispersed milk fat globules. Simple stated, overall goal of designing the ice cream is to incorporate several different insoluble (air bubbles, ice crystals and fat globules) into an aqueous phase in the smallest sizes and greatest number possible, (Sharma and Hissaria, 2009) [12].

Peach fruit pulp may be creamy white to deep yellow; the hue and shade of the color depends on the cultivar. Peach is a fruit of high nutritional and economic value. Carbohydrates, dietary fibers, minerals and organic acids are among the major constituents of peach fruit, which contribute to the nutritional quality of both fresh fruits and juice. Polyphenolic compounds found in peach may play an important role in physiological functions related to human health. Different types of polyphenolics have varied biological activities including antioxidant activity. Peach pulp is low in saturated fat, cholesterol and a source of Vitamin B complex. Red fleshed peaches had equal or greater antioxidant and phenolic activity than blueberries. The glycemic load of an average peach (120 grams) is 5, similar to other low-sugar fruits, (Sansavini *et al.*, 2006) [11].

Materials and Methods

The experiments related to studies on development of Kulfi supplemented with peach pulp was carried out in the Laboratory of Warner College of Dairy Technology, SHUATS, (UP) Prayagraj.

Procurement and Collection of Ingredients

Full cream milk and sugar was collected from the local market of Prayagraj, Uttar Pradesh for the preparation of kulfi with peach pulp. Peach was procured from Rhodes food group Pvt. Ltd.

Treatment Combination

In the present study, Five treatments were formulated viz. T₀, T₁, T₂, T₃ and T₄ where in T₀ is control kulfi (100%K), T₁ was prepared 95% kulfi mix with 5% peach pulp (95%K + 5%P), T₂ was prepared 90% kulfi mix with 10% peach pulp (90%K + 10%P), T₃ was prepared 85% kulfi mix with 15% peach pulp (85%K + 15%P) and T₄ was prepared 80% kulfi mix with 20% peach pulp (80%K + 20%P).

Sensory or Organoleptic Score

The sensory evaluation of kulfi supplemented with peach pulp samples was done by a panel of judge using a 9 point hedonic scale. The experienced Technical staff members of the Warner college of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj served as a judging team and evaluated the samples of different treatment of kulfi supplemented with peach pulp. Numerical score were allocated for flavour, Body and Texture, Colour and appearances and overall acceptability of sample.

Physico-Chemical Properties

Total Solids was determined by gravimetrically as per the procedure for milk laid down in (IS:1479, Part-2(1961)). Fat percentage was determined as per procedure laid down in (AOAC 17 edition, 2000 official method 905.02 fat), Determination of Protein by (Kjeldahl method) was done as per the procedure IS:1479,Part-2(1961), Carbohydrate was determined as per the procedure (By Lane Eynon method, SP:18, Part XI, 1981). (BIS, 1981), ash content was done as per the procedure laid down in IS:10501, (1983), Antioxidant capacity was done as per the procedure by DPPH method. Determination of acidity content was done as per the procedure laid down in IS: 1166-1973, Hardness content was done as per the procedure IS:1479,Part-2(1961),

Determination of melting resistance was done as per the procedure (Giri *et al.*, 2014)^[6].

Microbial Analysis

The Coliform count, Yeast and mold count and Standard Plate Count was determined as per the procedure given by (APHA) standard method for the examination of Dairy products (1992).

Statistical analysis

Data was analyzed using Analysis of Variance (ANOVA) and Critical Difference (CD) in WASP Software and excel software.

Results and Discussion

Effect of addition of Peach pulp on Organoleptic Score of Kulfi samples

The Kulfi samples of different treatments were evaluated for flavour, colour and appearance, body and texture, melting resistance and overall acceptability scores.

The flavour score in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 7.3, 7.2, 7.5, 8 and 7.7 respectively. The colour and appearance score in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 7.0, 7.1, 7.2, 7.3 and 7.4 respectively. The body and texture score in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 7.6, 7.6, 7.4, 7.3 and 7.1 respectively. The melting resistance in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 7.4, 7.3, 7.2, 7.1 and 6.9 respectively. The overall acceptability score in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 7.32, 7.3, 7.32, 7.42 and 7.17 respectively.

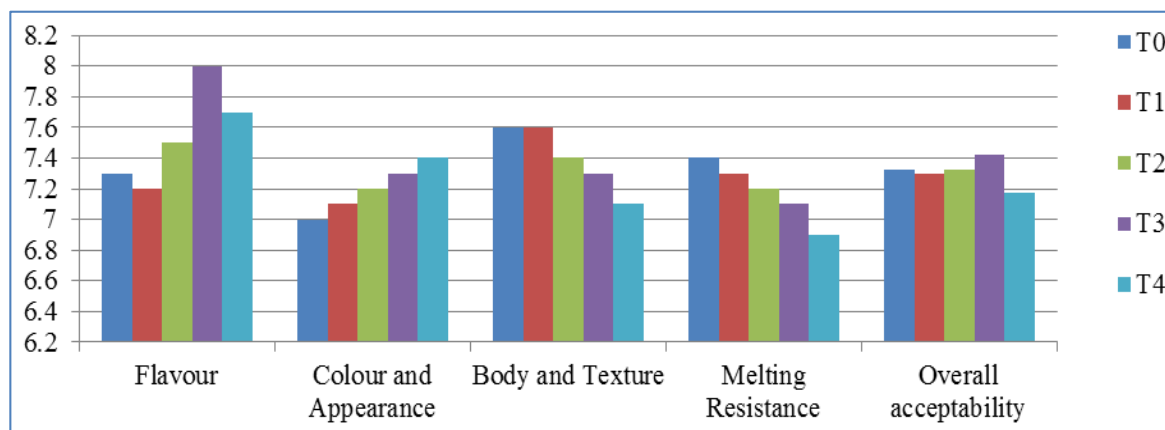


Fig 1: Graph of average organoleptic score of control and experimental peach pulp kulfi

Effect of addition of Peach pulp on Physico-Chemical properties of Kulfi samples

The Kulfi samples of different treatments were evaluated for carbohydrate, fat, protein, ash, titratable acidity, melting resistance, harness, antioxidative activity, crude fibre and phenolic content.

The carbohydrate percentage in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 24.39, 24.42, 24.45, 24.50, and 24.53 respectively. With the increase in peach pulp in kulfi samples, the carbohydrate content increased as peach pulp is high in carbohydrate. Similar observation were made

by Salooja *et al.*, (1982)^[10] who reported that kulfi prepared from concentrated cow milk to 17, 20, 23, 26 to 29 per cent total solids and 13 per cent sugar by the mass of kulfi mix has shown an increase in carbohydrate percentage of the product. The fat content in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 11.82, 11.41, 11.02, 10.23, and 9.64 respectively. With the increase in peach pulp in kulfi samples, the fat content decreased in peach pulp. Similar results were reported by Ashokraju *et al.*, (1989)^[11] who conducted the study that the fat content of the probiotic Kulfi decreased with

the increase in the level of inoculation of mixed culture in the mix.

The protein content in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 6.75, 6.6, 6.0, 5.9, and 5.56 respectively. Increase the concentration of peach pulp in kulfi samples, the protein content decreased in peach pulp.

The ash content in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 1.54, 1.49, 1.42, 1.34, and 1.23 respectively. With the increase in different concentration of peach pulp in kulfi samples, the ash content decreased as peach pulp is low in ash. Similar results were reported by Fedili *et al.*, (2011)^[4] found that ash content to be more in the standard kulfi. With the incorporation of khoa in the standard kulfi, the amount of ash content nearly doubled the amount present in the test kulfi as the test kulfi did not contain khoa but it contained oats which contributed to the high ash content.

The titratable acidity in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 0.22, 0.23, 0.24, 0.26, and 0.28 respectively. With the increase in peach pulp in kulfi samples, the titratable acidity increased as peach pulp is high in acidity. Similar observation were reported by Maurya and Singh (2007)^[8] that the effects of different solids not fat (SNF) levels (10, 15 and 20%) and concentration levels (0, 25 and 50%) on the composition and quality of kulfi, an indigenous frozen milk product in India. It was shown that total solids content and titratable acidity in the kulfi increased as SNF level increased.

The melting resistance in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 26.17, 25.01, 23.26, 22.35, and 20.51 respectively. With the increase in peach pulp in kulfi samples, the melting resistance decreased as peach pulp is high in moisture content.

The hardness in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 10.78, 11.74, 12.42, 13.16, and 13.93 respectively. With the increase in peach pulp in kulfi samples,

the hardness increased. Similar findings were reported by Chaudhary *et al.*, (2016)^[3] that the decrease in hardness with increasing level of pulp may be due to decrease in total solids and fat content of Kulfi with increasing pulp levels. Total solids content of the Kulfi plays an important role in affecting the hardness of Kulfi. Higher the total solid, higher is the hardness and vice-versa, indicating a direct and positive relation between total solids content of Kulfi and hardness. The hardness of mango Kulfi samples was mainly dependent on composition of the Kulfi mix and its melting time.

The antioxidative activity (expressed in terms of mg ascorbic acid) in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 0.33, 2.15, 4.27, 5.49, and 6.08 respectively. Increase in concentration of peach pulp in kulfi samples, the antioxidant content also increased as peach pulp is high in antioxidant. Similar findings were reported by Elango *et al.*, (2010)^[5] that the DPPH radical scavenging activities of 80% (v/v) acetone extracts using different concentrations of HCl of peels and pulps were tested and compared using Trolox.

Crude fibre content in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 0.03, 2.06, 3.52, 4.23, and 5.46 respectively. With the increase in peach pulp in kulfi samples, the crude fibre content increased as peach pulp is high in fibre. Similar observation were made by Cheryl *et al.*, (2007)^[2] that the fiber content of peach pulp, seed and shell were determined to be 2.0, 1.86 and 4.2% in respective parts. The overall peach dietary concentration is excellent and according to is a valuable ingredient for food industry and also it was found that peach dietary fiber has high water holding capacity.

The phenolic content (mg GAE/100g) in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 35.62, 53.83, 76.55, 95.98, and 113.71 respectively. With the increase in peach pulp in kulfi samples, the phenolic content is also increased as peach pulp. Similar findings were made by Gosh, (1991)^[7] that significance of peaches as a source of phenolic compounds, with their content about 7-times higher in peel than in pulp.

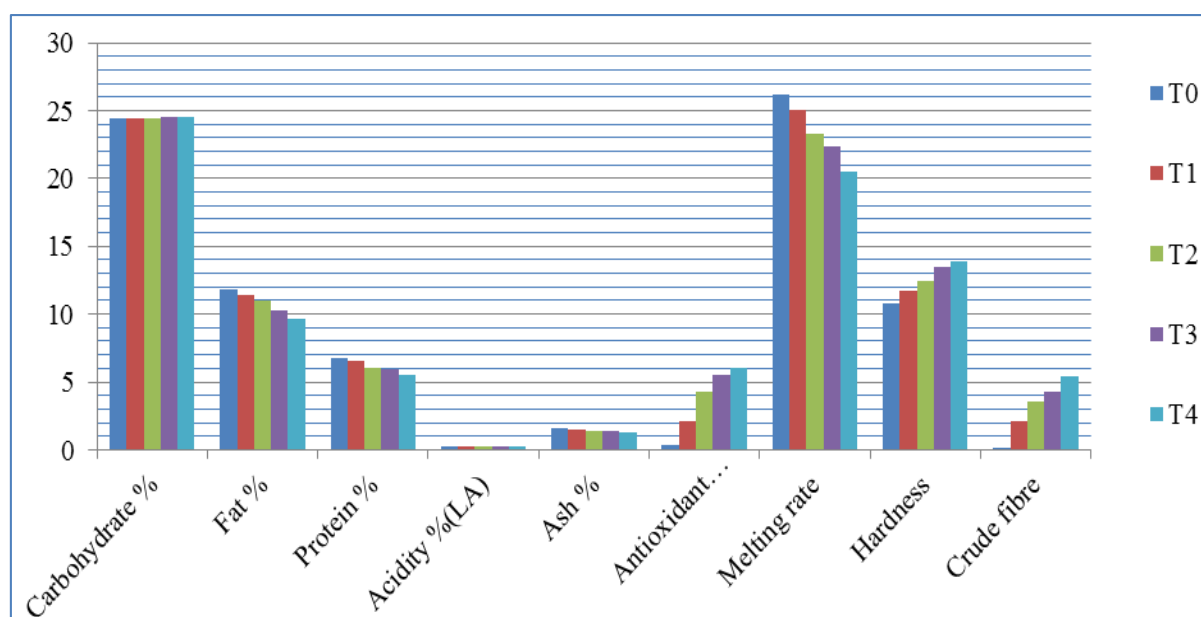


Fig 2: Graph of average physico-chemical analysis of control and experimental sample peach pulp kulfi

Effect of addition Peach pulp on Microbial analysis of Kulfi samples

The Kulfi samples of different treatments were evaluated for standard plate count and yeast and mold count.

Standard plate count in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 14.38, 18.00, 2.00, 23.00 and 29.00 respectively. With the increase in peach pulp in kulfi samples, the standard plate count increased. Similar findings were reported by Parikh (1977)^[9] that developed filled probiotic kulfi by replacing milk fat with the vegetable fat and the effects were seen on the quality. The samples were inoculated with *L. acidophilus* and *B. bifidum*, and these organisms remained viable in large numbers even after four weeks of storage.

Yeast and Mold count in kulfi supplemented with peach pulp samples of different treatments and control are T₀, T₁, T₂, T₃ and T₄ was found to be 1.63, 1.96, 2.50, 3.05 and 4.18 respectively. With the increase in peach pulp in kulfi samples, the yeast and mold count also increased. According to the study made by Yerriswamy *et al.*, (1983)^[13] Kulfi sample prepared from usual method of condensing milk in an open pan was found to contain higher bacterial count than kulfi prepared by the addition of various ingredients the level of psychrotrophic count was found to be more in the road side local vendor samples.

Conclusion

From the study with regards to the effect of different levels of Peach pulp on physico-chemical properties, sensory qualities and microbiological properties in kulfi, it can be concluded that Kulfi supplemented with peach pulp nutritionally better than control kulfi. Based on Organoleptic Score the treatment which was considered to be optimized is T₃ i.e 15% peach pulp. T₃ has 10.37% Fat, 24.55% carbohydrate, 5.97% protein, 1.34% ash, 0.27% titratable acidity, 58.49 mg/100g ascorbic acid antioxidant activity, 4.23% crude fibre and 95.59 mgGAE/100g phenolic content

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