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ORIGINAL ARTICLE

Studies on quality characteristics of Kulfi Supplemented with gulkand

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ABSTRACT
Kulfi is an indigenous frozen dairy product having close resemblance with ice cream in composition. Gulkand is prepared from rose petals and is an excellent source of fiber, vitamins and antioxidants. The antioxidant activity of Gulkand is helpful in reducing the process of ageing. The present investigation was undertaken for developing a Gulkand supplemented with kulfi by partial addition of different levels of Gulkand and thereafter evaluated the effect of addition of Gulkand supplemented kulfi. Kulfi supplemented with Gulkand has enhanced nutritional significance and possess more therapeutic properties. The basic aim of this study is to find out the quantity of gulkand that can be supplemented in kulfi on the basis of sensory parameter of Kulfi. The data of kulfi were observed for different aspects and analyzed statistically by using the methods of ANOVA and CD value. Kulfi mix was standardized to 9% milk fat and 14% sugar to obtain 36% total solid. Treatment T0 was the control treatment wherein no gulkand is present. Gulkand was added @ 5% in T1, @10% in treatment T2 and @15% in treatment T3. On the basis of organoleptic evaluation score, it was concluded that T2 was found to be highly acceptable among all combinations and was considered as optimized treatment. The compositional analysis showed that T2 treatment had 10.16% fat, 30.82% carbohydrate, 7.37% protein, 1.91%% ash 48.99%TS, 49.01% moisture, 0.31% (lactic acid) as titratable acidity, melting rate was found to be 25.37(min.), hardness was found to be8.58N, antioxidant activity was observed to be 4.50 (% RSA), and phenolic content was found to be240.0mg GAE respectively.
Keywords: *Gulkand, Buffalo milk, kulfi, organoleptic evaluation, compositional analysis*

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INTRODUCTION

India is world's largest milk producing country. India's total milk production is 176.35 million tonnes in the year 20017-18. Out of this, about 77% milk is sold as liquid milk and 23% milk is converted into dairy products. Kulfi is a frozen dairy product, which has close resemblance to ice cream. Kulfi, ice cream and frozen desserts are being made out of 0.7% of total milk produced in India. The lower and the middle class categories of population in India cannot afford the higher price of the ice cream, which causes the less consumption of it. The other relative term for kulfi is "poormans ice cream". Kulfi can be defined as, frozen mixture of fried and condensed milk with the addition of non-milk products for sweetening and stabilizing [1]. The ice cream consumption of population in India in recent years, it was realized that there is need to increase the indigenous products [2]. For the preparation of kulfi, skimmed milk powder, and other types of milks can be used together with sugar and flavours. Colour and stabilizers can be also added in kulfi. Sweetened and flavoured milk is condensed by heating over low heat with continuous stirring so that the milk does not stick to the walls of the container and this volume is reduced by a half thus concentrating the milk. Lactose and sugar during lengthy heating process gives distinctive caramalzed taste. Tightly sealed molds are then filed with the semi condensed milk mixture. These molds are then submerged in freezing temperatures of ice and salt mixture to speed up the freezing process. The ice and salt mixture with molds filled with kulfi mixture are then transferred into an earthen pot or matkas that provides insulation from the external heat and slows down the process of melting of the kulfi.

Kulfi prepared in such a manner is usually called the 'Matka-Kulfi'. Kulfi prepared by slow freezing gives a unique smooth mouth feel without any formation of ice crystals. Kulfi is frozen dairy product produced of cow and buffalo milk or a combination thereof. According to FSSAI[3] kulfi should have T.S. of minimum 36%, fat not less than 10%, proteins 3.5% and stabilizer 0.5%. The quality of kulfi is known by the its physical, chemical and microbiological properties. The milk content should be less than 80 percent by weight [4].

Buffalo milk contains higher of water, lactose, fat, protein (casein and whey proteins), and minerals. The high demand in value added dairy products made from buffalo milk is due to its high sensory quality and high adaptability of the animals. Buffalo milk is supposed for its richness and creaminess. All of the casein in buffalo milk is present in the micellar form, while in the cow milk, only 90 to 95% of the casein is in the micellar form and remaining part is present in serum phase. Buffalo milk contains higher presence of immunoglobulin, lactoperoxidase, lactoferrin and lysozymes, it makes a good dietary and health food. The buffalo milk is much preferred by the consumer for making valuable dairy products i.e. indigenous dairy products, yogurt, cheese and ice cream. Buffalo milk fat has higher proportions of high-melting triglycerides (9 to 12%) than cow milk (5 to 6%), and as a result, it is thicker. The buffalo milk contents rich source of most water-soluble as well as fat-soluble vitamins. Buffalo milk is known as a better source of fat for kulfi due to its higher emulsifying capacity. Further, Buffalo milk ingredients produce better body and texture of ice cream. The average chemical composition of Buffalo milk is water 83-85%, Fat 6.10%, protein 3.90%, lactose 5.2%, ash 0.80% and Total Solid 16% [5].

Gulkand also popularly known as rose petal jam, is prepared by using rose petals and sugar. It is originated from ancient Indo-Persia territory around 900 B.C. The word gulkand is derived from the word 'gul' meaning flowers in Persia or Kand meaning flowers in Arabic. Almost all varieties of roses used for making gulkand having similar therapeutic actions. There are several health benefits of Gulkand. It is commonly known as a natural coolant and has a cooling effect on the body. Gulkand is a best source of vitamin C. Rose preserve can help protect skin cells from damage. Gulkand also known as to removes toxins from the body and best purifies in our blood. It is also preventing skin problems like blackheads, pimples, acne and rashes. Gulkand not only is a coolant but also has the potential to protect our nervous system. It also reduces stress in the body. Till date, no work has been done on preparation of kulfi supplementation with gulkand and therefore the present study has been undertaken to study the effect of supplementation of gulkand in kulfi on compositional parameters and sensory properties.

MATERIAL AND METHODS

The study entitled, "Studies on quality of kulfi supplemented with gulkand" was carried out in the Laboratory of Dairy Technology, Warner College of Dairy Technology, SHUATS, Prayagraj (U.P.) The control and experimental Kulfi samples was tested and statistically analyzed.

Procurement of raw materials

Buffalo milk was collected from local market of Prayagraj. Gulkandwas procured from Patanjali Food & Product Pvt. Ltd Haridwar (UK). Sugar was procured from the local market of Prayagraj.

Treatment combination

To: Kulfi mix as concentrated milk (100%) with gulkand (0%),14% sugar.
T1:Kulfi mix as concentrated milk (95%) with gulkand (5%), 12% sugar
T2: Kulfi mix as concentrated milk (90%) with gulkand (10%), 10% sugar
T3: Kulfi mix as concentrated milk (85%) with gulkand (15%), 08% sugar

Preparation of Kulfi sample supplemented with Gulkand

Receiving of buffalo milk (BM) and standardized (6%fat &9%SNF) then preheating at 40ºC, filtered it, concentration of milk (2:1) then addition of sugar(14% incontrol,12% in experimental treatments) and heating the content at 72ºC for 30sec, cooling the mix at 30ºC, addition of Gulkand (GK) with different treatment combination T0(100:00::BM:GK), T1(95:5::BM:GK), T2(90:10::BM:GK) and T3(85:15::BM:GK) then filling the content into mould, hardening (Deep Freezer cabinet at -20ºC) and finely stored at -10ºC.

Physico-Chemical and microbiological Analysis

Total carbohydrate was determined by AOAC (1990) (6). Protein was determined by Kjeldahl method. Ash and Total solid content were determined by [6]. The acidity was determined as per procedure of (6) AOAC (1990). The fat content was estimated by using standard Gerber method as described in. [7]. Antioxidative activity was determined as per procedure [8](DPPH method). Determination of crude fibre contents was done as per[9]. The amount of total phenolics in extracts was determined according to the Folin CiOcalteu procedure. Standard Plate Count of sample was determined by in APHA Standard Methods of Food Products [10]. Coliform Count and Yeas & Mould count were determined by 'APHA Standard Methods of Food Products' [10].

Statistical analysis of control and experimental Kulfi was analysed by ANOVA and Critical Difference.

RESULTS AND DISCUSSION

The present study was carried out for supplementation of gulkand in kulfi. Kulfi contains high amount of sugar which restricts the calorie conscious people as well as diabetic person from consuming this product. Incorporation of gulkand is to increase the acceptability of gulkand supplemented kulfi as gulkand is known to have an anti-diabetic effect. The present investigation was carried out to see the possibility of incorporating gulkand in kulfi so that it does not affect the sensory parameters of the kulfi. The results obtained from the analysis are presented in physico-chemical, microbiological and organoleptic characteristics of gulkand supplemented kulfi and to assess the therapeutic value of the developed kulfi.

Effect of gulkand addition on organoleptic scores of kulfi samples

The flavour score of T0, T1, T2 and T3 was found to be 7.70, 7.50, 7.96 and 7.08 respectively. The colour and appearance score of T0, T1, T2 and T3 was found to be 7.52, 7.52, 7.56 and 7.28 respectively. The body and texture score of T0, T1, T2 and T3 was found to be 7.78, 7.74, 7.82 and 7.42 respectively. The melting rate score of T0, T1, T2 and T3 was found to be 7.64, 7.32, 7.60 and 7.10 respectively. The overall acceptability score of T0, T1, T2 and T3 was found to be 7.68, 7.51, 7.69 and 7.20 respectively.

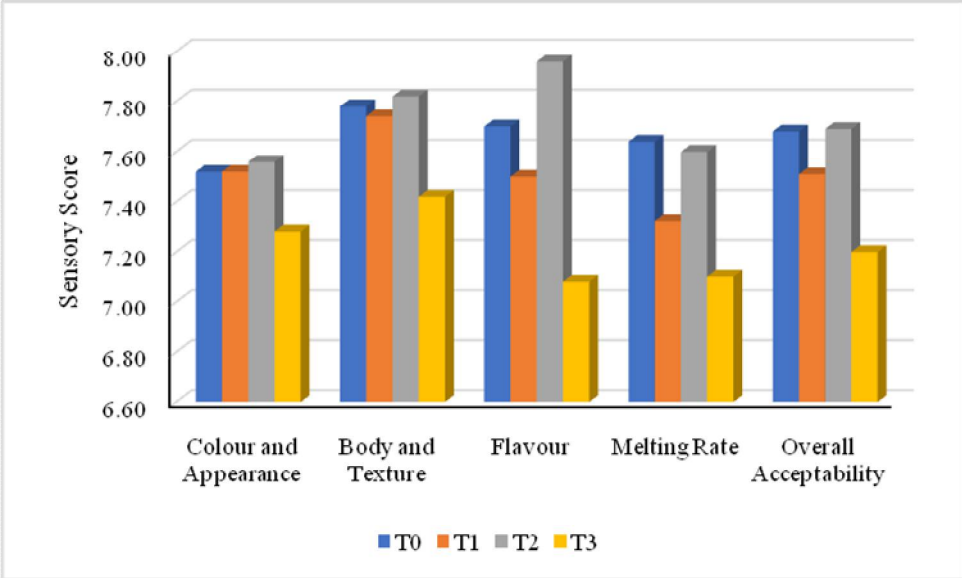

Fig. 1 Graph showing sensory score of kulfi supplemented with gulkand

As can be observed from the graph, the treatment T2 has higher scores for colour and appearance, body and texture, flavour, melting rate and overall acceptability as compared to other treatments, treatment T2 was adjudged as the optimized treatment.

Effect of gulkand addition on chemical composition of kulfi samples

The carbohydrate percentage of kulfi prepared in T1, T2 and T3 was found to be 28.46, 30.82 and 35.99 % respectively. The carbohydrate % in control kulfi sample was found to be 24.04 %. With increase in Gulkand content from 5 to 15%, it can be observed that carbohydrate content increased. The increased carbohydrate content in kulfi samples blended with gulkand was probably due to the presence of sugars in gulkand. Similar finding was observed by [11] for prepared from concentrated cow milk in the range of 17 to 29 percent total solids and 13 per cent sugar by mass of kulfi mix has been shown to increase carbohydrate percentage of final product.

The fat percentage of kulfi prepared in T1, T2 and T3 was found to be 11.00, 10.16 and 10.00 % respectively. The fat % in control kulfi sample was found to be 11.65%. With increase in Gulkand content from 5 to 15%, it can be observed that fat content decreased. Statistically, the differences in fat content of gulkand supplemented kulfi to treatments were significant ($P<0.01$). Similar results were reported by [12] that the fat content of probiotic kulfi decreased with the increase the level of inoculation of mixed culture of the mix. Similar results were found by [13]for the utilization of fat in ice cream production.

The protein percentage of kulfi prepared in T1, T2 and T3 was found to be 6.90, 7.02 and 7.37 % respectively. The protein % in control kulfi sample was found to be 6.61 %. With increase in Gulkand

content from 5 to 15%, it can be observed that protein content increased. Similar results were reported by [14] that the decrease in protein content of Kulfi with increasing levels of fruit pulp may be attributed to very low protein of mango. But Opposite trends were observed by [15] in study wherein the authors worked in fortification of jambhul powder.

The ash percentage of kulfi prepared in T1, T2 and T3 was found to be 1.70, 1.91 and 2.25 % respectively. The ash % in control kulfi sample was found to be 1.49 %. With increase in Gulkand content from 5 to 15%, it can be observed that ash content increased. The increased ash content in kulfi samples blended with gulkand was probably due to the presence of sugars content in gulkand. The ash content in kulfi incorporated with peach pulp of control samples was 1.51 by [16].

The Total Solid percentage of kulfi prepared in T1, T2 and T3 was found to be 45.00, 46.99 and 48.45 % respectively. The Total Solid % in control kulfi sample was found to be 44.01 %. With increase in Gulkand content from 5 to 15%, it can be observed that Total Solid content increased. The Total Solid percentage for gulkand supplemented kulfi were significantly ($p<0.01$) increased from 44.01 to 48.45.

The moisture percentage of kulfi prepared in T1, T2 and T3 was found to be 56.04, 58.01 and 59.55 % respectively. The moisture % in control kulfi sample was found to be 55.99 %. With increase in Gulkand content from 5 to 15%, it can be observed that moisture content increased significantly ($p<0.01$).

The lactic acid percentage of kulfi prepared in T1, T2 and T3 was found to be 0.29, 0.31 and 0.33 % respectively. The lactic acid % in control kulfi sample was found to be 0.26 %. With increase in Gulkand content from 5 to 15%, it can be observed that lactic acid content increased. The increased lactic acid content in kulfi samples blended with gulkand was probably due to the presence of moisture in gulkand. Similar observations were reported by [17] that the effects of different SNF levels (5, 10 and 15 %) 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 TS and Titrable acidity in kulfi increased as SNF level increased.

The antioxidant capacity of kulfi prepared in T1, T2 and T3 was found to be 2.45, 4.50 and 6.50 % RSA respectively. The antioxidant capacity in control kulfi sample was found to be 0.35% RSA. With increase in Gulkand content from 5 to 15%, it can be observed that total antioxidant capacity content increased. Similar observation were reported by[18] that the DPPH radical scavenging activities of about 80% (v/v) acetone extracts by using different levels of HCl of peels and pulps were tested by using Trolox.

The crude fibre of kulfi prepared in T1, T2 and T3 was found to be 0.18, 0.29 and 0.35 g respectively. The crude fibre in control kulfi sample was found to be 0.00 g. With increase in Gulkand content from 5 to 15%, it can be observed that crude fibre content increased. Similar trends were observed by [16].

The Total phenol content (mg)GAE/g of kulfi prepared in T1, T2 and T3 was found to be 123.00, 240.00 and 346.00 respectively. The Total phenol (mg)GAE/g in control kulfi sample was found to be 0.00. With increase in Gulkand content from 5 to 15%, it can be observed that total phenol content increased. Nalkar[19] was observed that the ability of kulfi to oppose the melt down is due to dependent on its phenolic point and compositional properties.

Effect of gulkand addition on physical parameters of kulfi samples

The pH of kulfi prepared in T1, T2 and T3 was found to be 6.33, 6.30 and 6.27 respectively. The pH in control kulfi sample was found to be 6.37. With increase in Gulkand content from 5 to 15%, it can be observed that pH content decreased.

The melting rate of kulfi prepared in T1, T2 and T3 was found to be 25.06, 25.37 and 22.89 minutes respectively. The melting rate in control kulfi sample was found to be 26.16 minutes. With increase in Gulkand content from 5 to 15%, it can be observed that melting rate content decreased. Similar study reported by [20]that the melt-down time of kulfi decreased significantly with the increasing pulp levels in the mix. The differences for meltdown time significantly with the increasing pulp levels in the mix. The ability of kulfi is to resist the melting down is due to the dependent on its melting point, freezing point and the compositional characteristics [19].

The hardness (N) of kulfi prepared in T1, T2 and T3 was found to be 9.17, 8.58 and 7.88 respectively. The hardness (N) in control kulfi sample was found to be 11.19. With increase in Gulkand content from 5 to 15%, it can be observed that hardness content decreased. Similar findings were reported by [21] that the decrease in hardness to increasing level due to decrease in total solids and fat content of kulfi. The hardness properties of mango kulfi was mainly dependent on its composition and melting time of kulfi mix.

Effect of gulkand addition on microbial count of kulfi samples

The Standard Plate Count ($\times 10^4$) (cfu/g) of kulfi prepared in T1, T2 and T3 was found to be 35.80, 36.00 and 45.00 respectively. The Standard Plate Count ($\times 10^4$) (cfu/g) in control kulfi sample was found to be 27.80. With increase in Gulkand content from 5 to 15%, it can be observed that Standard Plate Count

content increased. Similar findings were reported by [22] that developed filled probiotic kulfi by replacing milk fat with vegetable fat.

The Yeast & Mold (per g) of kulfi prepared in T1, T2 and T3 was found to be 2.04, 2.94 and 4.48 respectively. The Yeast & Mold (per g) in control kulfi sample was found to be 2.00. With increase in Gulkand content from 5 to 15%, it can be observed that Yeast & Mold content increased. Similar finding was reported by [18]that the critical points for potential contamination of kulfi were identified as improper heating of milk, utensils, from water, sugar, flavor and also through personnel handling, the microbial quality of most of kulfi samples needs to be monitored in order to avoid any food poisoning and safeguard the health of the consumers.

Coliform count of gulkand supplemented kulfiand control kulfi, highest mean coliform count was recorded nil.

CONCLUSION

In the present investigation, it may be concluded that the kulfi can be prepared by using 10% gulkand. Kulfi supplemented with gulkand was optimized based on sensory evaluation. From the results obtained for gulkand supplemented kulfi related to sensory, physical and chemical and microbiological properties in kulfi, it can be observed that addition of gulkand in kulfi mix increased moisture content significantly in finished product as compare with control. Also addition of gulkand increased carbohydrate content and also increased acidity of kulfi. Addition of gulkand reduced the protein, fat, total solid and ash content significantly in treated samples as compared with control. In kulfi supplemented with gulkand, melt down time decreased and hardness of the product increased. The antioxidant activity, crude fiber as well as phenolic content of kulfi supplemented with gulkand increased significantly as the levels of gulkand increases. The microbiological properties of kulfi supplemented with gulkand tend to increases as the levels of gulkand increases. Addition of gulkand at 15% level in kulfi mix is desirable to obtain the kulfi of good quality with improved sensory quality of kulfi. Addition of 15% gulkand in kulfi mix scored highest score for sensory attributed as compared with control as well as kulfi with 5%, 10% and 20% percent of gulkand and therefore was considered as the optimized treatment.

CONFLICT OF INTERESTS

There is no conflict of interests exist.

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REFERENCES

1. Yerriswamy, K., Atmaram, K., Natarajan, A. M., Anatakrishnan, C. P. (1983). Quality of kulfi manufactured by different methods. *Cheiron*, 121(3), 130-135.
2. Aneja, R.P., Mathur, B.N., Chandan, R.C., Banerjee, A.K. (2002). Process and Product development Technique. Technical Indian Milk Product Publication of Dairy Indian New Delhi.
3. FSSR (2011). Food Safety and Standards Act, Rules and Regulations, Professional Book Publishers, New Delhi, India. 150, 156.
4. Bandyopadhyay, A.K. (1985). Indian Milk Products. A compendium. Cited in Dairy India.117-118.
5. Saksena, R., Deepak D., Khare, A., Sahai, R., Tripathi, L.M., Srivastava, V.M. (1999). A novel pentasaccharide from immune stimulant oligosaccharide fraction of buffalo milk. *Biochimicaet Biophysical Acta*. 1428(2), 433-445.
6. AOAC (1990). Official methods of analysis of AOAC International. Association of official analytical chemists. 16th Edn. Virginia, USA.
7. IS:1479 part II (1961). Method of test for dairy industry rapid examination of milk ISI. Manak Bhawan, New Delhi.
8. Iqbal, Shahid,, Muhammad, Iqbal, Bhanger, Farooq Anwar. (2005). Antioxidant properties and components of some commercially available varietes of rice bran in Pakistan. *Food Chemistry*. 93(2),265-272
9. AOAC (2005). pH of Acidified foods, Association of official Analytical chemists, Washington. 17th:981.12-14.
10. APHA (1992). Standard Methods for Examination of Dairy products. 16th ed., American Public Health Association, Washington DC, USA.
11. Salooja, M.., Balachandran, R. (1982). Studies on production of kulfi .The acceptable level of total milk solids. *Journal of Food Science and Technology*.24(2),116-118.
12. Ashokraju, A. Reddu C.R. (1989). Studies on the prepration and quality of kulfi.*Indian Journal of Dairy Science*.42(1), 127-129.
13. Fedeli, E., Shakhil, S.M. (1976). Fat utilization in ice-cream production, Department of Technology of Fats and Derivatives.5(13), 345-347.

14. Chauhan, S.K., Laln B.B., Joshi, V.K. (1998). Development of protein rich mango beverage. Journal of Food and Science Technology.35(6),521-523.
15. Sharma and Hissaria (2009). Hydrocolides-competent ice cream. Chemical weekly. 193-196
16. Sanki Raimon, Susngi, Anamika Das, Preveneson Dympep, Deepak Kumar Gupta, Binod Kumar Bharti, Suvartan Guatam Ranvi, John David (2019). Studies on development of Kulfi supplemented with Peach pulp. *Journal of Pharmacognosy and Phytochemistry*. 8(5), 985-988.
17. Maurya, S.C., Singh, D.P. (2007). Studies on standardization for preparation of quality Kulfi. *Indian Dairyman*. 59(9), 56-59.
18. Elango, A.V., Jayalalitha, T.R., Pugazhenthi, Dhanalakshmi B. (2010). Prevalence of psychrotrophic bacteria in Kulfi sold in Chennai market. Journal of Dairying, Foods and Home Science. 29(2),97-101
19. Nalkar, S.D. (2012). Preparation of probiotic kulfi with incorporation of mango (Mangifera indica L.) pulp cv. alphonso. Ph.D. Thesis submitted to Department of Animal Husbandry and Dairy Science, Dr. BSKKV, Dapoli, Maharashtra.
20. Rohini, Darade, Seema, Chaudhary., V.G. Atkare (2016). Preparation of Kulfi with incorporation of mango pulp. Food Science Research Journal. 7(2),165-169.
21. Chowdhury, B.R., Chakraborty, R., Raychaudhuri, U. (2016). Study on β-galactocidase enzyme activity of herbal yogurt. *International Journal of Food Science and Nutrition*. 1(7), 2-3.
22. Shivaprakash, A. (2002). Development of filled probiotic Kulfi. M. Sci. Thesis submitted to University of Agricultural Sciences, Bangalore.