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Studies on sensory quality of kulfi prepared from cow milk blended with different levels of date (*Phoenix dactylifera*) pulp

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ABSTRACT

The present study was conducted at Department of Animal Husbandry and Dairy Science, Post Graduate Institute, Dr. P. D. K. V. Akola. Kulfi is a traditional frozen dairy-based dessert prepared by concentrating cow milk with sugar and flavour. Treatment combinations were used (T_1) control 85% concentrated milk with 15% sugar, 85% concentrated milk with 10% sugar and 5 % date pulp (T_2), 85% concentrated milk with 5% sugar and 10 % date pulp (T_3) and 80% concentrated milk with 5% sugar and 15 % date pulp (T_4). The samples of kulfi prepared were evaluated for sensory evaluation such as flavour, colour and appearance, body and texture, taste and overall acceptability using 9 point hedonic scale by a panel of judges. The data was analyzed by using completely randomized design. The overall acceptability scores of date pulp kulfi in treatment T_1 , T_2 , T_3 , and T_4 were 8.10, 8.18, 8.43, and 8.04. The cost of production of 1 kg kulfi ranged from Rs. 112.45 to Rs. 184.0. The cost of production of different treatment combinations were Rs.112.45, Rs.166.49, Rs.177.99, Rs. and Rs.184 for treatment T_1 , T_2 , T_3 , and T_4 respectively. It is concluded from the present studies that, the good quality of kulfi could be prepared by using 10 per cent Date pulp with 5 per cent sugar.

Keywords: Kufi, Date pulp, Cow milk, Cost structure of kulfi, Sensory evaluation

Introduction

Kulfi is a traditional Indian frozen dessert prepared from milk much like than standard ice cream, it offers a refreshing, nutrient-rich treat that is widely enjoyed by consumers. At its core, it is created by freezing a blend of milk, cream, milk solids, and condensed milk, enhanced taste with sweetening agents, stabilizers, and extra flavors (Yerriswamy *et al.*, 1983) [1]. Demand for ice cream across India has surged significantly in both metropolitan hubs and smaller urban areas. Over time, dairy industry experts recognized the importance of modernizing and expanding native dairy offerings, given their strong and established market demand throughout the country (Aneja *et al.*, 2002) [2]. Kulfi is widely consumed across India in various flavours such as mango, saffron, rose, pistachio and seasonal fruits. Due to its affordability, rich taste and simple preparation method, kulfi continues to be favoured among urban and rural consumers alike (Singh *et al.*, 2017; Naik & Londhe, 2011) [4, 3].

Dates (*Phoenix dactylifera*) are packed with essential nutrients and elevated levels of natural sugars like glucose and fructose. These sugars deliver a fast energy boost, making them especially helpful for young children and manageable for individuals with diabetes. Additionally, dates offer important minerals including potassium, calcium, and iron, alongside dietary fiber and protective antioxidants (Amiri *et al.*, 2014; USDA, 2006) [5, 6]. Using whole fruits as natural sweeteners in recipe development is a smart approach to lower refined sugar consumption. Because of this, dates serve as an excellent alternative to added sugars and form a foundational part of daily diets across arid regions (Jain, 2012) [7]. They are frequently incorporated into various products, including fruit juices, syrups, and sweet spreads (El Hadrami *et al.*, 2012) [8].

Dates (*Phoenix dactylifera* L.) are nutrient-rich functional foods serve as high carbohydrate levels (40–80% dry weight), mainly composed of easily absorbed sugars such as glucose and fructose, along with a significant dietary fiber content of 2.7 to 8% . In addition to supplying macronutrients, they provide key minerals including potassium, magnesium, copper, and selenium alongside B-vitamins and active plant compounds like flavonoids, polyphenols, and carotenoids. The fiber presence moderates sugar digestion, resulting in a low-to-moderate glycemic impact that aids in managing blood sugar levels, enhancing digestive regularity, and protecting against heart disease by dampening oxidative strain and inflammation (Barakat *et al.*, 2023) [9].

Numerous studies highlighted that dates and date-derived ingredients can boost both the nutritional profile and sensory characteristics of dairy items. Vyawahare (2022) [10] found that adding 30% date paste to burfi notably increased its sensory appeal and overall consumer acceptance when measured against standard for

mulations. Likewise, Yangilar (2015) [11] highlighted the benefits of incorporating date fiber into ice cream, observing that low concentrations (1–2%) enhanced texture, viscosity, melt resistance, and mineral density. Collectively, these research outcomes validate the use of date components to craft functional, health-focused dairy products that appeal to consumers.

Materials and Methods

The kulfi was prepared from cow milk, Date pulp and sugar. Kulfi prepared with (T_1) control 85% concentrated milk with 15% sugar, 85% concentrated milk with 10% sugar and 5 % date pulp (T_2), 85% concentrated milk with 5% sugar and 10 % date pulp (T_3) and 80% concentrated milk with 5% sugar and 15 % date pulp (T_4) used for experimental study.

The samples of Date pulp kulfi were evaluated for sensory quality in respect of flavour, colour and appearance, body and texture taste and overall acceptability.

The sensory evaluation was carried out by using 9 point hedonic scale as prescribed by Nelson and Trout (1964). The data obtained in the present investigation was statistically analysed by CRD as prescribed by Amble (1975).

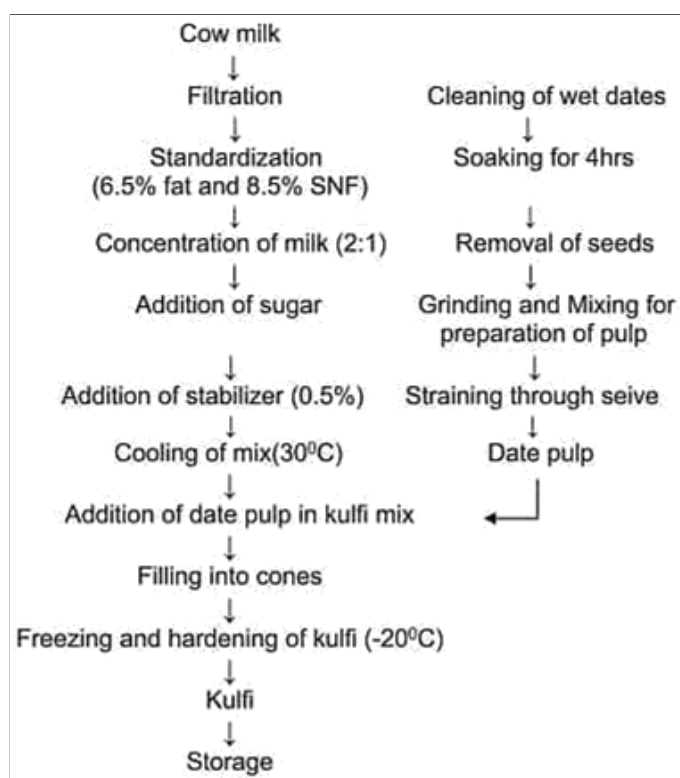


Figure 1. Flow chart for preparation of date pulp kulfi

Results and Discussion

Sensory evaluation

The data obtained in respect to sensory parameters i.e. Flavour, Colour and appearance, Body and texture and Overall acceptability was statistically analysed and presented in the Table 1.

Flavour

The date pulp kulfi was subjected to sensory evaluation by panel of judges using 9 point hedonic scale. The flavour score obtained 8.12, 8.23, 8.45, 8.01 for kulfi prepared under T_1 , T_2 , T_3 and T_4 treatment, respectively. The highest score is obtained for the flavor for T_3 (8.45) containing 10 per cent date pulp and 5 per cent sugar whereas the lowest score obtained for T_3 blended 20 date pulp with reduced proportionate 5 per cent sugar. It was observed that treatment T_3 was found significantly superior over T_1 , T_2 , and T_4 .

It was clear from present finding that 10 per cent date pulp with 5 per cent sugar used for preparation of kulfi is observed acceptable in respect of flavour parameter.

The findings of the present study are consistent with those reported by V. C. Kedaree *et al.* (2021) [12], who evaluated the sensory quality of kulfi prepared with different levels of pineapple pulp. They observed flavour scores of 8.20, 7.68, 7.43, and 7.68 for treatments T_1 , T_2 , T_3 , and T_4 , respectively. The most acceptable flavour was obtained at the 15 per cent pineapple pulp level, with T_3 receiving the highest sensory score of 8.20, while kulfi containing 5 per cent pineapple pulp recorded the lowest flavour score of 7.20

Colour and appearance

Overall colour and appearance score of date pulp kulfi in treatment T_1 , T_2 , T_3 , and T_4 were 8.05, 8.12, 8.43, and 8.02, respectively. Blending of 10 percent date pulp in kulfi mix was preferred by the judges than the control sample and other treatments as far as colour and appearance parameter are concerned. It was observed as level increases the colour is become dark in the product so the score goes on decreasing in subsequent levels.

VC Kedaree *et al.* (2021) [13] reported that the 5% guava powder blend (T_1) scored highest for visual appeal at 8.5, whereas the plain control (T_0) rated lowest at 6.35 to 6.95. Other guava kulfi ratios (T_2 to T_4) scored between 6.87 and 8.50

Body and texture

The average sensory score for body and texture under treatment T_1 , T_2 , T_3 , and T_4 were 8.08, 8.13, 8.34, and 8.05, respectively. It was noticed that the treatment T_3 was significantly superior over treatments T_1 , T_2 , T_3 and T_4 . The above observation clearly indicates that, the highest liking was towards the T_3 for body and texture concerned compared with treatment T_1 , T_2 and T_4 were also acceptable for panel of judges and Thomas *et al.* (2019) [14] when evaluated dietary fiber-enriched kulfi for body and texture, the sensory ratings for formulations were 0%, 2%, 4%, and 6% oat flour were 7.90, 8.04, 7.85, and 7.73, respectively. The sample prepared with 2% oat flour attained the highest score, demonstrated superior textural quality compared to all other treatment groups.

Taste

Overall score of taste of date pulp kulfi for treatment T_1 , T_2 , T_3 , and T_4 were 8.15, 8.27, 8.48 and 8.09, respectively. Blending 10 per cent date pulp with 5 percent sugar taste score significantly high due to addition of date pulp in proper ratio. Similar findings reported by Sonawane *et al.* (2013) [15] found that adding 3% jambhul powder gave kulfi the best taste (6.7) and flavor (6.4) scores, beating the plain control version. But when they added more powder (6% and 9%), the taste scores dropped to 6.03 and 5.53 because the kulfi became too bitter and astringent.

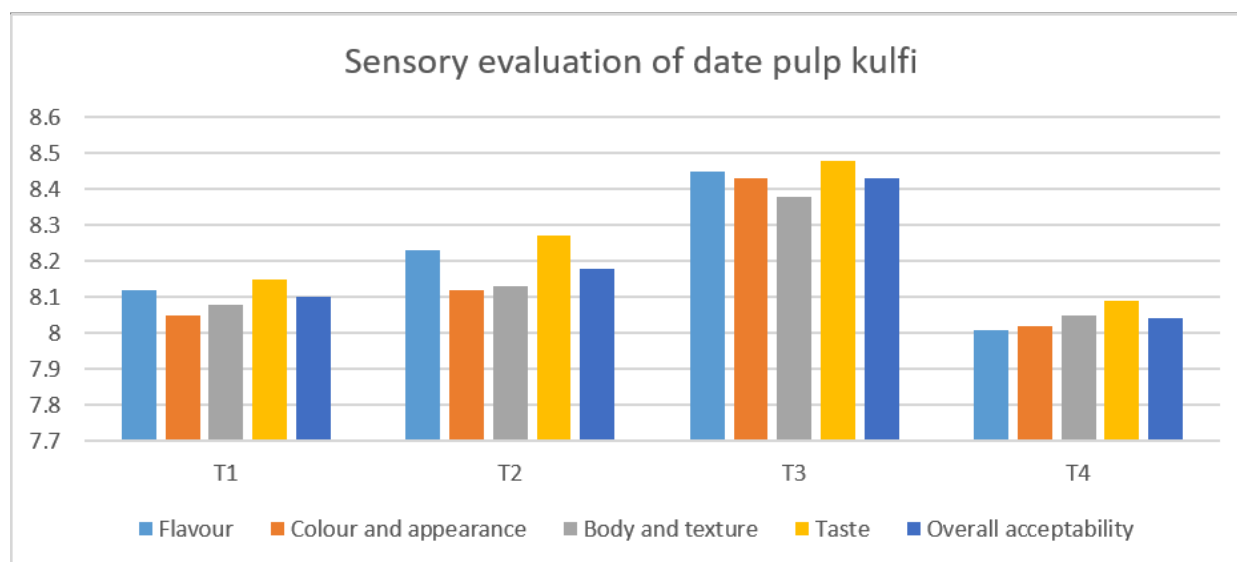
Overall acceptability

Overall score of acceptability of date pulp kulfi for treatments T_1 , T_2 , T_3 , and T_4 were 8.10, 8.18, 8.43, and 8.04, respectively. It was reported that treatment T_3 was significantly superior over all treatment. T_4 which had the lowest mean score than other treatments. The treatment T_3 had comparatively higher mean overall score than the T_1 , T_2 , and T_4 . The lowest overall acceptability score i.e. 8.04 was found in treatment T_4 which was due to increase level of date pulp blended which decreased flavour, colour and appearance and body and texture, hence overall acceptability score was less as compared to other treatments.

The present findings are in line with Elizabeth Thomas *et al.* (2019) [14] assessed kulfi made with varying levels of lactose-hydrolyzed milk. Overall acceptability scores were 7.75 (0%), 8.23 (70%), 7.83 (75%), and 7.55 (80%). The 70% lactose-hydrolyzed milk formulation achieved the highest rating, proving to be the most preferred by consumers.

Table 1. Sensory evaluation of date pulp Kulfi

Treatments	Flavour	Colour and appearance	Body and texture	Taste	Overall acceptability
T ₁	8.12	8.05	8.08	8.15	8.10
T ₂	8.23	8.12	8.13	8.27	8.18
T ₃	8.45	8.43	8.38	4.48	8.43
T ₄	8.01	8.02	8.05	8.09	8.04
S.E(m)+	0.009	0.010	0.009	0.013	0.026
C.D at 5 %	0.028	0.014	0.013	0.041	0.080



Conclusion

Good quality Kulfi could be prepared by using 10 % date pulp, offering a pleasant natural flavour, smooth body and texture, and appealing colour. Kulfi prepared with the addition of 10 % date pulp (T₃) was found superior over all other treatments. The addition of date pulp significantly increased the moisture, protein, ash, and total sugar content while slightly adjusting the total solids and fat levels. The 10 % Date pulp blending kulfi could serve the consumer acceptance due to value addition and may fetch higher price and fulfill the nutritional demand.

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