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Development and quality assessment of herbal kulfi prepared with different levels of Giloy juice

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Abstract
The demand for functional meals has increased as a result of the higher trend in nutritional and health consciousness that has been seen in the new millennium. The goal of the current experiment was to construct herbal kulfi made with various amounts of Giloy juice by adding small amounts of each, and then to determine how adding herbal kulfi made with various amounts of Giloy juice affected its nutritional quality. For the control T_0, the kulfi mix was standardised to contain 12% fat, 10% sugar, and 0.3% stabilizing agent, yielding 41.56% total solids. In experimental, Treatment T_1 was standardised to contain 12% fat, 95:05 milk and Giloy juice with 0.3% stabilizing agent, Treatment T_2 was standardised to contain 12% fat, 90:10 milk and Giloy juice with 0.3% stabilizing agent, Treatment T_3 was standardised to contain 12% fat, 85:15 milk and Giloy juice with 0.3% stabilizing agent. To establish its Nutritional makeup, chemical analysis varieties were performed on samples of kulfi from several experimental and control treatments (Protein, pH, Fat, Total Solids, Titratable acidity, carbohydrate, ash). Additionally, trained panellists evaluated the organoleptic qualities using a 9-point hedonic scale (Flavour and Taste, body and texture, melting resistance, colour and appearance). The highest value was observed in treatment T_2 containing milk and Giloy juice (90:10). In microbiological analysis, the best treatment T_2 was selected with minimum SPC (Standard Plate Count) and Coli form test.

Keywords: Giloy juice kulfi, physio-chemical properties, organoleptic evaluation

Introduction
About 0.7% of the total milk produced in India converted into frozen desserts such as ice-cream and kulfi. Kulfi is traditional frozen milk product of India, prepared through concentrating the whole milk by boiling and adding sugar and dry fruits in concentrated milk. It is after that filled into aluminum or plastic molds and freeze into an earthen pot having a mixture of ice and salt. Ice-creams are basically popular due to their easy catch-up efficiency and wide availability in many flavors (Deshmukh *et al*., 2006) [2]. Kulfi is frozen dairy product prepared by suitable blending and processing of SMP and other milk products, with sugar and flavour, with or without stabilizer and color. A common range for the components used in kulfi are milk fat 10-16%, milk solid not fat 9-12%, corn syrup solids 4-6%, stabilizers/emulsifiers 0-0.5%, total solids 36-45% and 55-64% (Sharma and Hissaria, 2009) [6]. Standardized the method of production of kulfi and that use of milk with 26% TMS gives kulfi with better body, texture and overall acceptability, kulfi contain 13-20% sugar which is an obstacle to relish for diabetic people. Salloja *et al.* (1982) [9].

FSSAI Standards of Kulfi
Ice cream, Kulfi and Chocolate Ice cream means frozen products derived from or from the milk of cow or buffalo or a combination thereof, and/or other milk products, with or without cane sugar, [dextrose, liquid glucose and dried liquid glucose), maltodextrin, eggs, fruit, fruit juice, preserved fruit, nuts, chocolate, edible flavorings and permitted food colors. The permitted stabilizers and emulsifiers may not exceed 0.5 percent by weight. The mixture must be heated suitably before solidification. The product must contain at least 10.0 percent milk fat, 3.5 percent protein and 36.0 percent total solids. Omitted [Starch may be added to a maximum extent of 5.0 per cent under a declaration on the label referred to in sub-rule (2) of rule 43. Standard enemy ice cream would also apply to soft ice cream]. In the case of ice cream, where the chocolate or similar covering portion forms a separate layer, only the ice cream portion shall confirm to the ice cream standards.

Giloy Juice

Tinospora cordifolia (Thunb.) Miers (Family: Menispermaceae) is commonly known as "Amrita" Or "Guduchi" of "Giloy" available a climbing bush all over India. Roots and stems include multiple secondary metabolites that are having therapeutic virtue. The species is endemic to India and common in tropical and subtropical Area at an altitude of 600 m plants distributed 1,200 m across the entire tropical region of India above sea level from Kumaon to Assam, in the North West Bengal, Bihar extending through Deccan, Kankan, Karnataka and Kerala. Ashish Kumar *et al*., (2017) [1].

This plant has immense potential for developing useful medicines. The extracts of the leaves have shown anti-HIV1 activity. Thus, it can be said that the organic extract from this plant will definitely be helpful in protecting and treating various viral diseases in humans. T. cordifolia has value in traditional Ayurvedic medicine used for centuries in the treatment of fever, chronic diarrhea, cancer, jaundice, dysentery, bone fractures, pain, asthma, skin diseases, poisonous insects, snake bites, eye disorders. The dried bark of T. cordifolia has anti-spasmodic, antipyretic, anti-allergic, anti-inflammatory and anti-leprosy properties.

It has been compared to the "Nectar of Immortality" or "Amrita" and mentioned in Hindu mythology as a magical rejuvenating herb, "body protector" and "heavenly nectar". The Hindi and Sanskrit name Amrita is derived from Indian scriptures where Amrita was used to bring back the dead to life and to protect the heavenly body from disease and to bring vitality to youth due to its potential age, Gawhare *et al*., (2013) [3]; Singh *et al*., (2003) [7]; Upadhyay *et al*., (2011) [8]. Different types of plant-compounds which were isolated and their complex arrangements were studied. These compounds are owned by different categories, *viz*., glycosides, di-terpenoids, alkaloids, steroids, phenolic-compounds, sesquiterpenoids, aliphatic-compounds, carbohydrate-hydrates and lactones. The leaves of this plant are a good source of phosphorus, calcium and protein (11.2%), Singh *et al*., (2003) [7].

Health benefits of Giloy

- Giloy *(Tinospora cordifolia)* helps in actively fighting against various pathogens. It is a part of Indian medicine from a very long time.
- Giloy helps in managing the sugar level by assisting in the production of insulin. Giloy can also burn excess glucose and reduce the level of blood sugar. Giloy works in this regard due to its hypoglycemic effects.
- Giloy can prevent the onset of recurrent fever. Also, it can reduce the symptoms of some deadly diseases like dengue, malaria, swine flu etc.
- Giloy is naturally dosed in antioxidants that can help us fight off free radicals and disease-causing germs. It can help our body in removing toxins, purifying blood, combat liver disease, and urinary tract infections.

Materials and Methods

The experiment "Development and Quality assessment of herbal Kulfi prepared with different levels of Giloy Juice" was conducted in Dairy Technology Laboratory. Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P). Control and experimental Kulfi samples were tested and statistically analyzed.

Milk: Whole milk was purchased from local market of Prayagraj.

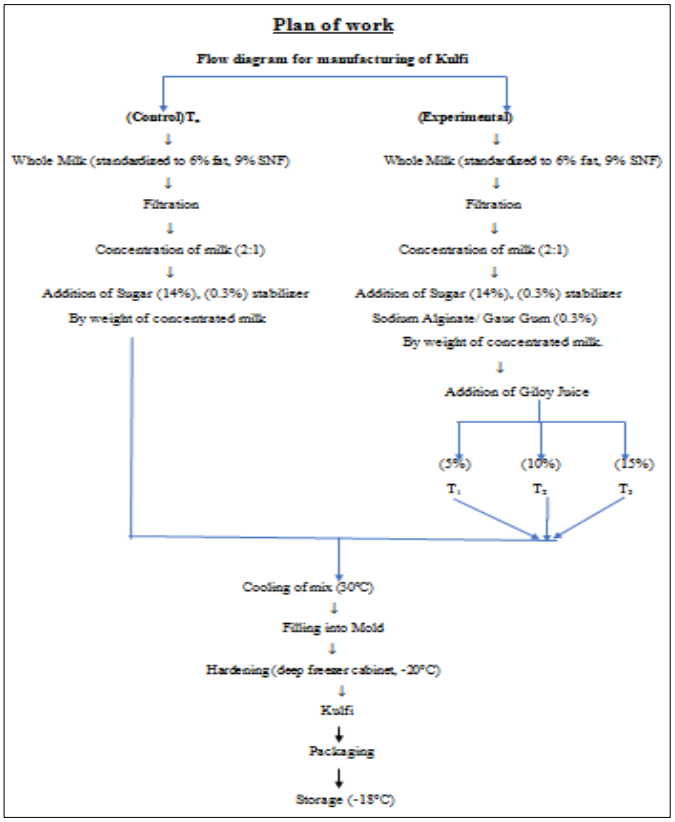
Sugar: Sugar was purchased from the local market of Prayagraj.

Giloy juice: Giloy juice was purchased from Patanjali store of Prayagraj.

Stabilizer: Guar gum was purchased from the local market of Prayagraj.

Treatment Combination

T_0 – Kulfi prepared with sugar without Giloy juice (100:00)
T_1 – Kulfi prepared with sugar: Giloy juice (95: 05)
T_2 - Kulfi prepared with sugar: Giloy juice (90: 10)
T_3 - Kulfi prepared with sugar: Giloy juice (85: 15)



Preparation of kulfi

Here, in a steel pan with a wooden plunger, 1 kg of whole milk (Standardized to 6% fat and 9% MSNF) was inserted. The pan was then heated by setting the water filled container (double jacketed vat arrangement) immediately on fire. In control (T_0) and experimental treatments T_1, T_2 and T_3, milk was thickened in a ratio of 2:1 by adding the specified amounts of liquid ingredients and dry ingredients such as sugar and stabilizer. The mixture was heated up at 68 ºC for 30 minutes to be pasteurized and cooled to 42 ºC with several variations of giloy juice to fulfil PFA requirements. After that, the mixture was cooled to 5 ºC. Later, the mixture will be frozen in a batch freezer, transferred to kulfi moulds, and allow to firm overnight.

Result and Discussion

The analyzed data is presented in this chapter under the following headings:

1. Chemical characteristics
2. Microbial characteristics

3. Organoleptic characteristics
4. Statistical characteristics
5. Estimation of cost of production

Table 1: Physico-chemical Analysis

Parameters	Treatments				
	T_0	T_1	T_2	T_3	C.D Value
Physico-chemical Analysis					
Total solids %	41.56	44.48	47.21	50.06	0.42
pH	6.32	6.25	6.21	6.15	0.03
Fat %	12.00	11.80	11.42	11.15	0.04
Protein %	6.80	6.88	6.95	7.02	0.04
Carbohydrate %	22.00	24.48	26.96	29.45	0.43
Ash %	0.76	1.32	1.88	2.44	0.11
Acidity in L.A %	0.30	0.32	0.34	0.36	0.02

Table 2: Organoleptic scores (9 Point Hedonic Scale)

Parameters	Treatments				
	T_0	T_1	T_2	T_3	C.D value
Organoleptic scores (9-point hedonic scale)					
Color & appearance	8.22	8.44	8.56	8.14	0.15
Body & Texture	8.26	7.90	8.68	7.88	0.08
Flavor & Taste	8.44	8.34	8.60	8.14	0.19
Melting resistance	7.90	8.50	8.10	8.00	0.17

Table 3: Microbiological analysis

Parameters	Treatments				
	T_0	T_1	T_2	T_3	C.D value
Microbiological Analysis					
SPC ($x10^3$ cfu/ml)	3.0	3.2	2.8	3.8	0.65
Coli form	Nil	Nil	Nil	Nil	-

Table 4: Cost analysis

Parameters	Treatments				
	T_0	T_1	T_2	T_3	C.D value
Cost Analysis					
Per Kg Kulfi (In rupees)	61.14	67.14	73.14	79.14	-

Summary and Conclusion

Physico-Chemical analysis

Total solids

The highest mean of total solids was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_3 (50.06) followed by T_2 (47.21), T_1 (44.48) and T_0 (41.56). The difference in these values of total solids percent T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

pH

The highest mean of pH was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_0 (6.32) followed by T_1(6.25), T_2(6.21) and T_3(6.15). The difference in these values of pH T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Fat

The highest mean of fat was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_0 (12.00) followed by T_1(11.80), T_2(11.42) and T_3(11.15). The difference in these values of fat percent T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Protein

The highest mean of protein was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_3 (7.02) followed by T_2(6.95), T_1(6.88) and T_0(6.80). The difference in these values of protein percent T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Carbohydrate

The highest mean of carbohydrate was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_3 (29.45) followed by T_2(26.96), T_1(24.48) and T_0(22.00). The difference in these values of carbohydrate percent T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Ash

The highest mean of Ash was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_3 (2.44) followed by T_2(1.88), T_1(1.32) and T_0(0.76). The difference in these values of Ash percent T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Acidity

The highest mean of acidity was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_3 (0.36) followed by T_2(0.34), T_1(0.32) and T_0(0.30). The difference in these values of acidity percent T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Sensory evaluation of kulfi

Color and appearance: The highest mean of color and appearance was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_2 (8.56) followed by T_1(8.44), T_0(8.22) and T_3(8.14).

Body & Texture

The highest mean of body and texture was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_2 (8.68) followed by T_0(8.26), T_1(7.90) and T_3(7.88).

Flavor & taste

The highest mean of flavor and taste was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_2 (8.60) followed by T_0(8.44), T_1(8.34) and T_3(8.14).

Melting resistance

The highest mean of total solids was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_1 (8.50) followed by T_2(8.10), T_3(8.00) and T_0(7.90).

Microbiological analysis

Standard Plate Count

The highest mean of standard plate count was recorded in the herbal kulfi prepared with different levels of Giloy juice sample of T_3 (3.8) followed by T_1(3.2), T_0(3.0) and T_2(2.8). The difference in these values of standard plate count T_0-T_1, T_0-T_2, T_0-T_3, T_1-T_2, T_1-T_3 & T_2-T_3 were significant.

Coliform Count

The coli form Count in control and herbal kulfi prepared with different levels of Giloy juice were found to be absent.

Cost

The highest mean of cost count was recorded in the herbal

kulfi prepared with different levels of Giloy juice sample of T_3 (79.14) followed by T_2(73.14), T_1(67.14) and T_0(61.14).

Conclusion

In view of the experimental results obtained during the present investigation, it may be concluded that the herbal kulfi prepared with different levels of Giloy juice can be successfully prepared by using whole milk, sugar and Giloy juice. Kulfi made with Giloy juice of treatment T_2 were best in organoleptic characteristics and received highest score in organoleptic evaluation (color & appearance, body & texture, Flavor & taste). T_2 was best in microbial characteristics (minimum SPC), sample of treatment T_1 were best in maximum melting resistance. Sample of treatment T_1 is best the cost of preparation of herbal kulfi prepared with different levels of Giloy juice in treatment T_1 was found to be Rs. 67.14 per kg of mix.

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