

Sensory and Microbiological Quality of Kulfi sold in Hyderabad city, India

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Abstract

Sensory and microbiological quality of kulfi samples from cooperative sector, branded private sector and unbranded sector, sold in and around Hyderabad city was carried by taking 20 from each source. The pH, titratable acidity and melting rate was 6.72,0.15 and 38.4 in cooperative sector,6.7,0.16 and 38.2 in branded private and 6.55,0.20 and 33.25 in unbranded samples respectively. The SPC, psychotropic, psychrophilic, Coliform, Yeast and mould counts from cooperative sector are 2.65×10^6 , 4.55×10^2 , 2.58×10^3 , 2.45×10^1 , 1.56×10^1 , Branded Private 4.86×10^6 , 6.52×10^2 , 4.56×10^4 , 7.76×10^1 , 7.56×10^1 , unbranded sector samples 3.56×10^7 , 8.54×10^3 , 3.58×10^5 , 2.56×10^3 , 6.56×10^2 respectively. The E.coli, Staphylococcus, salmonella, listeria counts from cooperative sectors are 2.68×10^2 , 3.92×10^3 , 2.5×10^1 , 1.2×10^1 , Branded private sectors are 4.72×10^2 , 4.56×10^4 , 3.6×10^1 , 5.6×10^1 , unbranded sectors are 3.65×10^4 , 8.65×10^5 , 2.56×10^2 , 2.68×10^2 respectively. The sensory and microbiological quality was good with cooperative sector samples, least with unbranded samples and in between branded private samples.

Keywords—Kulfi,Sensory,Microbiological Quality

I. INTRODUCTION

Kulfi is a 500-year-old popular frozen dessert of Indian origin, and it occupies a privileged position among traditional Indian dairy products (1). It is also known as quilfi, Kulaf, kulphy etc. It should contain minimum 36% total solids ,10% milk fat and 3.5% protein (2). Kulfi is produced by concentrating whole milk to about two folds followed by addition of sugar and freezing in aluminium or plastic conical mould.

There are many causes for microbial contamination and adulteration of kulfi being mainly quality of ingredients, improper processing, improper sanitization of equipment and improper storage of finished product (3). Majority portion of kulfi in India is prepared under unorganised sector

without brand, selling at cheaper price in most of the recreation places. Now the organised sector, both cooperative and branded private entered in kulfi production resulting improvement in microbiological quality. Much work was not undertaken on sensory and microbiological quality in India, present work was undertaken to evaluate the sensory and microbiological quality of kulfi sold in and around Hyderabad, Telangana state.

II. MATERIALS AND METHODS

Sixty kulfi samples, 20 each from cooperative sector, branded private and unbranded local vendors were collected from the markets. The samples were packed in icebox and transported to the laboratory, department of Veterinary Public health and

Epidemiology College of Veterinary Science Rajendranagar Hyderabad.

The sensory evaluation of kulfi samples was done by 5 experienced judges following 100 points scorecard (flavour- 45, body and texture -30, bacteria- 15, colour and package- 5 and melting quality -5) to determine the acceptability level of the product. The pH of kulfi was measured using digital pH meter. The titrable acidity was determined by titramic method (4). Melting rate was determined by emptying the kulfi samples from the mouths on an iron mesh (9 SG per linear inch) placed over a glass funnel having 10 centimetres outside diameter. The whole assembly was kept over a pre -weighed glass measuring cylinder of 100 ml capacity and placed in an oven maintained at 30@centigrade without air circulation. The weight of the sample melted after 30 minutes is expressed as melting rate in gram per 30 minutes.

The standard plate count, psychotropic and psychrophilic counts were estimated as per the method described in IS: 5550-2005 using Nutrient Agar. Coliform and yeast and mould counts are estimated using MacConkey agar, Potato dextrose agar (APHA, 1960). E.coli, staphylococcus, salmonella and listeria were determined using EMB agar, MSA agar ,BGA agar and Falcon agar.

III. RESULTS AND DISCUSSION

The sensory evaluation of kulfi samples collected from cooperative branded private and unbranded sectors in and around Hyderabad city was presented in table 1.

The sensory score of kulfi samples from cooperative sectors was high (94.75) followed by little less in branded private sector (92.5) and less in samples from unbranded sector (84.3). The flavour, body and texture, bacteria, colour and package and melting quality are high in cooperative sector followed by branded private sector and least in unbranded sector samples. The overall acceptability of kulfi was reported by different scientists (6 and 7) as 7.88 and 6.88 under 9 hedonic scale respectively.

Table 1 Sensory Quality of kulfi samples collected from different sources

Character	Cooperative sector	Branded private sector	Unbranded sector
Flavour (45)	43.25	42.75	39.5
Body and Texture (30)	29.25	28.75	27.0
Bacteria (15)	13.0	12.0	10.0
Colour & Package (5)	4.5	4.5	4.0
Melting Quality (5)	4.75	4.5	3.8
Total (100)	94.75	92.5	84.3

The Physicochemical properties (pH, acidity and melting rate) of the kulfi samples collected from different sources was presented in Table- 2. The pH was 6.72, 6.70 and 6.5 in the samples collected from cooperative sector, branded private and unbranded sector samples respectively in the present study. The pH of the samples from cooperative sector (6.72), branded private sector (6.70) in the present study was almost similar to the observed in different studies (6,8) reported lesser (6.4) pH value in the kulfi samples prepared with Chana addition, which was slightly lesser than the pH observed in the unbranded sector sample (6.5) in the present study. Lower pH values (6.17) was also reported (7).

The titratable acidity in the kulfi samples from cooperative sectors was 0.15 percentage LA, slightly higher (0.16% LA) in the samples from branded private and very high (0.20% LA) in the samples from unbranded sector in the present study. An acidity of 0.16% LA which was similar to the acidity observed in the branded private samples in the present study was reported (6). High acidity of 0.27% LA in kulfi samples prepared with addition of Chana was observed (8). Higher acidity of 0.25%

LA and 0.26% LA were reported by different scientists (18).

The melting rate was almost similar in the samples from cooperative sector (38.4) and branded private samples (38.2) which were almost similar to the values (38.56) observed in another study (6). The melting rate in the present study was least (33.2) in the samples collected from unbranded sector which was higher than the melting rate (17.76) reported by other scientists (9). Higher melt down rate was also reported in different markets (7)

Table 2. Physicochemical properties (pH, acidity and melting rate) of the kulfi samples

Source	Cooperative sector	Branded private sector	Unbranded sector
PH	6.72	6.70	6.55
Acidity	0.15	0.16	0.20
Melting rate	38.40	38.20	33.25

The SPC, psychotropic, psychrophilic, coliform and yeast and mould counts of kulfi samples collected from different sources was presented in Table 3.

Table 3. SPC, psychotropic, psychrophilic, coliform and yeast and mould counts of kulfi samples collected from different sources

Source	Cooperative sector	Branded private sector	Unbranded sector
SPC	2.65×10^6	4.86×10^6	3.56×10^7
Psychotropic	4.5×10^2	6.52×10^2	8.54×10^3
Psychrophilic	2.45×10^2	7.76×10	2.56×10^3
Coliform	1.56×10^1	7.56×10	6.56×10^3
Yeast and mould	2.58×10^3	4.56×10^4	3.58×10^5

The standard plate count are 2.65×10^6 , 4.86×10^6 and 3.56×10^7 per gram in the kulfi samples collected from cooperative, branded private and unbranded sector respectively in the present study. The SPC was high in samples from unbranded sector and almost similar in the samples in cooperative and branded private sectors.

SPC counts of 10^6 per gram in the kulfi samples collected from small scale sectors(10,8) which was similar to the counts observed in cooperative and branded private sector samples in the present study. Lower counts ($1.5 - 8.2 \times 10^5$ /gram) in the kulfi samples collected from organised sector was also reported(10,11). Lower count of 10^4 /gram was also reported in the laboratory samples (6) and in the market samples (12). Higher counts of $10^7- 10^8$ / gram was reported in the kulfi samples sold in Tamil Nadu (13).

The psychotropic counts were 4.55×10^2 , 6.52×10^2 , 8.54×10^3 / gram in the samples collected from cooperative sectors, branded private sectors and unbranded sectors respectively. The counts observed in unbranded sectors in the present study was similar to the counts reported in local vendor sample and small scale producer samples (10). The counts observed in the samples of cooperative sectors and branded private sectors in the present study was similar to the counts reported (10). Water contamination and uncleaned equipments were the major sources of psychotropic count in kulfi samples(14,15).

The psychrophilic counts in the kulfi sample were high (3.58×10^5) in the samples collected from unbranded sector, low (2.58×10^3) in cooperative sectors and in between (4.56×10^4) in branded private sector samples. Psychrophilic counts of $10^3 - 10^4$ /gram in the sample sold in higher class areas in Bikaner city(11) was similar to the counts observed in cooperative and branded private sectors in the present study. The higher counts observed in the unbranded samples in the present study was almost similar to the counts in the market samples in slum areas in Bikaner (11).

The coliform count was 2.5×10^3 /gram in the samples from unbranded sectors in the present study and almost similar counts of 1.8×10^3 CFU

/gram and 7×10^3 CFU/ gram in Bikaner city (11) and in market samples in Tamil Nadu (10) respectively. No coliform count were observed in the laboratory prepared kulfi samples (6). Coliform count of 70 CFU/ gram (12) and 77 CFU/ gram (10) observed in organised sector samples, was almost similar to the counts (75.6 CFU /gram) observed in the samples from Branded private sectors in the present study. Lower count (24.5CFU/ gram) was observed in the samples from cooperative separation in the present study.

The Yeast and mould counts were 1.56×10^1 , 7.56×10^1 and 6.56×10^2 CFU/gram in the samples from cooperative, branded private and unbranded sectors respectively in the present study. The counts of 10/ gram (8,10), and 13-33CFU/gram (16) reported were almost similar to the Counts observed in cooperative samples in the present study. Yeast and moulds of 10 CFU /gram (6) reported in organised sector samples,was almost similar to the counts observed in corporative and branded sectors in the present study. A count of 10^2 in the market samples in Chennai (13) was almost similar to the counts observed in unbranded samples in the present study.

The incidence of pathogenic microorganisms in kulfi samples collected from different sources was presented in the table 4

Table 4Incidence of pathogenic microorganisms in kulfi samples collected from different sources

Organism	Cooperativ e sector×	Brande d private sector	Unbrande d sector
E coli	8 (40%)	10 (50%)	20 (100%)
Staphylococcus	12(60%)	13 (65%)	20 (100%)
Salmonella	2 (10%)	2 (10%)	6 (30%)
Listeria	3 (15%)	4 (20%)	5 (25%)

The incidence of E.coli was 100% in unbranded samples, 50% in branded private samples and least 40% in cooperative sample. The incidence of staphylococcus in kulfi samples was 60%, 65% and 100% in corporative, branded private and

unbranded samples respectively. The incidence of salmonella was 10% in corporative and branded private samples and 30% in unbranded samples. The incidence of listeria was 15% ,20% and 25% in samples collected from cooperative, branded private and unbranded sector samples respectively. The counts of pathogenic microorganisms in kulfi sample were presented in Table 5

Table 5The counts of pathogenic microorganisms in kulfi samples.

Organism	Cooperativ e sector	Brande d private sector	Unbrande d sector
E coli	2.68×10^2	4.72×10^2	3.65×10^4
Staphylococcus	3.92×10^3	4.56×10^4	8.65×10^5
Salmonella	2.5×10^1	3.6×10^1	2.56×10^2
Listeria	1.2×10^1	5.6×10^1	2.68×10^2

The E.coli count was high(3.65×10^4 CFU/gram) in kulfi samples from unbranded sector, least and samples from cooperative sectors(2.68×10^2 CFU/gram) and in between(4.72×10^2 CFU/gram) in branded private sector samples. E.coli count of 4×10^4 CFU /gram observed in the market samples of Rajasthan(11) was almost similar to the counts observed in the present study and samples from unbranded sectors whereas a count of 0.7×10^2 CFU/gram reported (10) was almost similar to the counts observed in the cooperative sector samples in the present study. Higher counts of 18.8×10^4 - 34.5×10^5 CFU/gram was reported (17) was higher than the kulfi samples from all the sources in the present study.

The counts of staphylococci in kulfi samples were 3.92×10^3 CFU/gram and 4.56×10^4 CFU/gram and 8.65×10^5 CFU/gram respectively in the samples from cooperative, branded private and unbranded sectors in the present study. Staphylococcus count of 8×10^3 CFU/gram(11) and 14×10^3 CFU/gram(19) were almost similar to the

counts observed in the samples from cooperative sectors in the present study.

The counts of salmonella was high (2.56×10^2 CFU/gram) in the samples from unbranded sector, (3.6×10^1 CFU/gram) in the samples from branded private sector and the least (2.5×10^1 CFU/gram) in the samples of cooperative sectors in the present study.

The counts of listeria in the kulfi samples were 1.2×10^1 , 5.6×10^1 and 2.68×10^2 CFU/gram in the samples from cooperative, branded private and unbranded sectors respectively in the present study. Listeria counts observed (3) in the branded private samples in the present study was almost similar to the counts were observed in the present study.

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