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Microbiological Quality Analysis and Shelf Life Evaluation of Dahi Available in Kashmir

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ABSTRACT

Four commercially produced dahi samples were stored under 0°C, 10 °C and 20 °C temperatures subjected to microbiological examination, pH, titrable acidity and sensory attributes at various temperatures for a period of seven days. The results indicated an increase in microbial activity parameters and titrable acidity with increase in temperature and storage period. pH of dahi samples decreased with an increase in temperature and storage period indicating increase in acidity. The studies for microbiological studies shows increase in TPC along with the increase in days of storage. Similar case was found in Yeast and mould as well as in Coliform count. The TPC at refrigerated storage was observed as $(1.69\pm0.58)10^6$ to $(5.0\pm0.68)10^6$ while as at 20°C temperature it was observed as $(1.5\pm0.35)10^6$ to $(4.5\pm0.12)10$. Similarly the Yeast and mould count at refrigerated storage was observed as $(1.0\pm0.92)10^6$ while as at 20 °C temperature it was observed as $(1.5\pm0.36)10^6$.The different samples of dahi were analysed for various sensorial attributes for their acceptance by using 9 point hedonic scale. The scores obtained with respect to colour, flavour, taste and aroma show good results and overall acceptability. Overall acceptability was also found to decrease significantly ($p < .05$) with increase in days of storage under refrigerated conditions. The results of the storage studies indicated the significant ($p < .05$) decrease in pH with the days of storage under different temperature conditions.

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Introduction

Dahi is the most popular fermented milk products which results from the lactic acid fermentation of milk. Dahi is the prime source of proteins, vitamins and calcium which are more digestible than when they are present in fresh condition. Dahi is the curd resulting from lactic acid fermentation of milk. Dahi is very much popular among the people. Dahi contains 85-88% water, 5-8% fat, 3.2-3.4% protein, 4.6-5.2% lactose, 0.5-1.1% lactic acid, 0.7-0.75% ash and 0.12-0.14% calcium (Laximinarayana et al., 1952) (Laximinarayana et al., 1952) and though cows are the main source of milk supply in the world but buffaloes are also second source of milk supply in the world. Buffalo milk fat has less cholesterol and more tocopherol. Dahi is a very popular food product everywhere and is produced commercially in the United States by controlled fermentation of cow's milk by two species of bacteria *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Tamime and Robinson, 1989). Many researchers have recognized the nutritional and therapeutic aspects of consuming fermented milk products because they contain significant levels of organic acids, among other substances, which may help in the cure of illness (Deeth and Tamime, 1983).

With the advent of health foods, dahi is valued for controlling the growth of intestinal bacteria and incurring disease like constipation diarrhoea and dysentery. Dahi is also found effective in lowering the blood cholesterol level (Mann and Sperry 1947). Dahi is an excellent growth medium for wide range of microorganisms. As dahi is stored for 8 days, the microbial growth increases which leads to increase in acidity, decrease in pH and there is decrease in microbial growth after 21 days. The various microorganisms including *E.coli, Salmonella species* and *Pseudomonas species* which produces toxins and unfortunately decreases the shelf life of the product. The objectives of the present investigation were: (a) To study the shelf life of Dahi; (b) Sensory evaluation; and (c) Physico chemical analysis.

Materials and Methods

Four samples of dahi were selected from different markets Kashmir and were taken for analysis. Each sample was analysed for different microbial counts, various physicochemical characteristics and sensory profile.

Proximate Composition Analysis

Total ash content (%) and titrable acidity (%) was determined by AOAC methods (2004).

Microbial Analysis

Total plate count (TPC), Coliform count and Yeast and mould count of the dahi samples were determined under aseptic conditions

Sensory analysis

The sensory evaluation of the dahi sample were carried for attribute, namely texture, colour, texture, colour, taste, aroma, mouth feel, and overall acceptability by a panel of 5 trained members based on a 9-point hedonic scale. The sensory scores obtained with respect to colour, flavour, taste, aroma and overall acceptability are presented in table 20 and 21 respectively. The sensory evaluation was carried on 0th, 3th, 5th and 7th day.

Storage studies

The pH, titrable acidity, microbial parameters and sensory attributes of the dahi were analysed at regular intervals of 0th, 3rd, 5th and 7th days during refrigerated storage.

Statistical Analysis

The data obtained for each parameter was statistically analysed. Statistical analysis was done using OPSTAT software.

Results and Discussion

Total plate count in Dahi during refrigerated storage

Total plate count is the most common microbiological test that gives a quantitative idea about the presence of microorganisms in a sample. Total plate count of Dahi samples namely Snowcap, Haleeb, Zum Zum and Khyber are shown in Table 1 at refrigeration temperature during the storage period at 0-7 days. The highest plate count was observed on 7th day of storage. The lowest plate count is observed on 0th day of storage. TPC increased during the storage period. It may be due to increase in acidity (Neve et.al., 1988). An increasing trend in titrable acidity might be due to growth of microorganisms during storage or it may be due to the conversion of lactose into lactic acid.

Table 1: Tpc (Cfu/G) Of Different Samples of Dahi At Refrigerated Temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.69\pm0.58)10^{6c\ B}$	$(1.0\pm0.63)10^{6c\ C}$	$(4.1\pm0.70)10^{6c\ A}$	$(0.5\pm0.74)10^{6d\ D}$
03	$(4.4\pm0.14)10^{6b\ B}$	$(3.0\pm0.42)10^{6b\ D}$	$(5.0\pm0.21)10^{6b\ A}$	$(4.0\pm0.37)10^{6c\ C}$
05	$(5.0\pm0.81)10^{6a\ B}$	$(5.0\pm0.35)10^{6\ a\ B}$	$(5.5\pm0.07)10^{6a\ A}$	$(5.0\pm0.30)10^{6b\ B}$
07	$(5.0\pm0.68)10^{6a\ B}$	$(5.0\pm0.28)10^{6\ a\ B}$	$(5.5\pm0.14)10^{6a\ A}$	$(5.5\pm0.37)10^{6a\ A}$

Data represents mean± standard deviation (n=3). Means followed by capital letter superscript in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Total plate count (TPC) in dahi at 10℃ temperature

TPC of the Dahi samples namely Snowcap, Haleeb, Zum Zum, and Khyber at 10°C is shown in Table 2 .The lowest plate count was observed on 0th day of storage. The highest plate count is observed on 07th day of storage. The reason for the highest plate count is due to increase in number of storage days as well as increase in temperature.

Table 2: TPC (cfu/g) in different samples of Dahi at 10℃ temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.5\pm0.50)10^{6cB}$	$(1.0\pm0.12)10^{6cC}$	$(1.0\pm0.12)10^{6bC}$	$(2.0\pm0.81)10^{6cA}$
03	$(1.5\pm0.32)10^{6cB}$	$(1.0\pm0.12)10^{6cC}$	$(1.0\pm0.15)10^{6bC}$	$(2.0\pm0.87)10^{6cA}$
05	$(2.0\pm0.95)10^{6bC}$	$(4.0\pm0.18)10^{6bB}$	$(4.5\pm0.39)10^{6aA}$	$(4.0\pm0.87)10^{6bB}$
07	$(3.5\pm0.26)10^{6aC}$	$(5.0\pm0.69)10^{6aA}$	$(4.5\pm0.40)10^{6aB}$	$(5.0\pm0.58)10^{6Aa}$

Data represents means standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Total plate count in Dahi at 20℃ temperature

TPC of the Dahi samples namely Snowcap, Haleeb, Zum Zum, Khyber at 20°C are shown in Table 3. The highest plate count was observed on 07th day of storage. With the increase in storage period more and more organic acids like lactic acid would have got accumulated in the Dahi. This would lead to increase in total plate count during storage.

Table 3: TPC (Cfu/g) of different samples of Dahi at 20℃ temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.5\pm0.35)10^{6cA}$	$(1.0\pm0.73)10^{6dB}$	$(1.5\pm0.34)10^{6cA}$	$(1.5\pm0.38)10^{6dA}$
03	$(1.5\pm0.19)10^{6cC}$	$(2.0\pm0.83)10^{6cB}$	$(1.5\pm0.42)10^{6cC}$	$(2.5\pm0.43)10^{6cA}$
05	$(2.5\pm0.31)106^{bB}$	$(2.5\pm0.29)106^{bB}$	$(2.0\pm0.82)106^{bC}$	$(3.0\pm0.75)106^{bA}$
07	$(4.5\pm0.12)106^{aC}$	$(5.0\pm0.61)10^{6aA}$	$(5.0\pm0.67)10^{6aA}$	$(4.5\pm0.43)10^{6Ab}$

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Yeast and mould count in Dahi at refrigerated storage

Yeasts are the major cause of spoilage of Dahi which may be due to low pH that provides selective environment for their growth. Yeast and mould count were highest in the Dahi samples collected from vendors. (Saravankumar et al., 2007).Results are presented in Table 4. The reason is that the yeast and mould growth mainly occur due to prolonged storage period.

Table 4: Yeast and Mould count (cfu/g) of different samples of Dahi at refrigerated temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.0\pm0.92)10^{6dA}$	$(1.0\pm0.27)10^{6cA}$	$(1.0\pm0.85)10^{6dA}$	$(1.0\pm0.74)10^{6dA}$
03	$(3.3\pm0.12)10^{6cB}$	$(3.2\pm0.43)10^{6bC}$	$(3.6\pm0.17)10^{6cA}$	$(1.5\pm0.14)10^{6cD}$
05	$(4.4\pm0.67)10^{6bB}$	$(5.0\pm0.84)10^{6aA}$	$(4.2\pm0.71)10^{6bC}$	$(3.5\pm0.47)10^{6bD}$
07	$(5.2\pm0.12)10^{6aB}$	$(5.0\pm0.22)10^{6aC}$	$(5.5\pm0.44)10^{6aA}$	$(4.1\pm0.64)10^{6aD}$

Data presented are Mean± standard deviation. (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letters and superscripts in a column differ significantly ($p\leq0.05$).

Yeast and mould count in Dahi at 10℃ temperature

The results for yeast and Mould count of Dahi samples namely are shown in Table 5. The lowest count was observed on 0th day and consequently higher count was observed at 07th day of storage.

Table 5: Yeast and Mould count (cfu/g) in different samples of Dahi at 10℃ temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(3.5\pm0.30)10^{6cA}$	$(1.0\pm0.27)10^{6bC}$	$(1.5\pm0.36)10^{6cB}$	$(1.0\pm0.10)10^{6dC}$
03	$(4.0\pm0.87)10^{6bA}$	$(1.0\pm0.14)10^{6bD}$	$(3.5\pm0.37)10^{6bB}$	$(1.5\pm0.37)10^{6cC}$
05	$(4.0\pm0.81)10^{6bB}$	$(1.0\pm0.105)10^{6bD}$	$(4.5\pm0.37)10^{6aA}$	$(3.5\pm1.37)10^{6bC}$
07	$(5.5\pm0.44)10^{6aA}$	$(3.0\pm0.78)10^{6cD}$	$(4.5\pm0.46)10^{6aC}$	$(5.0\pm0.83)10^{6Ab}$

Yeast and mold at 10℃ temperature, values are expressed as mean standard deviation (n=3).The mean in the same row with different letters and superscript were significantly different.

Yeast and mould count in dahi at 20℃ temperature

The yeast and mould count of dahi during the storage period of 0-7 days respectively are presented in Table 6. The lowest count was observed on 0th day and the highest count was observed on the 07th day of storage.

Table 6: Yeast and Mould count (cfu/g) of different samples of Dahi at 20℃ temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.5\pm0.36)10^{6cB}$	$(1.5\pm0.45)10^{6cB}$	$(2.0\pm0.85)10^{6dA}$	$(1.5\pm0.37)10^{6Db}$
03	$(1.5\pm0.43)10^{6cC}$	$(1.5\pm0.12)10^{6cC}$	$(3.5\pm0.32)10^{6cA}$	$(2.5\pm0.36)10^{6cB}$
05	$(2.5\pm0.33)10^{6bD}$	$(5.0\pm0.25)10^{6bA}$	$(4.5\pm0.35)10^{6bB}$	$(3.0\pm0.83)10^{6bC}$
07	$(3.0\pm0.84)10^{6aD}$	$(5.5\pm0.19)10^{6aA}$	$(5.2\pm0.38)10^{6aB}$	$(4.0\pm0.14)10^{6Ac}$

Yeast and mould count at 20℃ temperature values are expressed as mean ± standard deviation (n=3).The mean in the same row with different letters and superscript were significantly different.

Coliform count (cfu) in Dahi at refrigerated storage

Coliform count is a reflection of faecal load present in the dairy products. The presence of Coliform bacteria in dairy products is suggestive of unsanitary conditions or practices followed during production and processing and storage (Speck, 1984).The Coliform count of Dahi samples is presented in Table 7.The highest Coliform count was observed on the 07th day of storage .The lowest was observed on the 0th day of storage. The reason for the highest Coliform count may be due to unhygienic conditions of the environment. The Coliform count increased during the storage period. The Coliform count present in Dahi is due to the presence of faecal load present in dahi.

Table7: Coliform count (cfu/g) of different samples of Dahi at refrigerated temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(2.0\pm0.14)10^{3dA}$	$(1.0\pm0.04)10^{3bB}$	$(1.0\pm0.93)10^{3cB}$	$(1.0\pm0.67)10^{3bB}$
03	$(3.0\pm0.61)10^{3cA}$	$(1.0\pm0.07)10^{3bB}$	$(1.0\pm0.14)10^{3cB}$	$(1.0\pm0.04)10^{3bB}$
05	$(4.1\pm0.14)10^{3bA}$	$(1.0\pm0.07)10^{3bD}$	$(2.2\pm0.67)10^{3aB}$	$(2.0\pm0.67)10^{3aC}$
07	$(5.0\pm0.07)10^{3aA}$	$(1.3\pm0.87)10^{3aC}$	$(2.0\pm0.67)10^{3bB}$	$(2.0\pm0.07)10^{3aB}$

Values are expressed as mean standard deviation (n=3).the mean in the same row with different letters and superscript were significantly different.

Coliform count in Dahi at 10℃ temperature

The Coliform count of Dahi is presented in table 8. The lowest count was observed in 0th day of storage while as highest count was observed in 07th day of storage.

Table 8: Coliform count (cfu/g) of different samples of Dahi at 10℃ temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.5\pm0.94)10^{3Ab}$	$(2.0\pm0.07)10^{3cA}$	$(1.2\pm0.17)10^{3bC}$	$(1.1\pm0.07)10^{3cD}$
03	$(1.5\pm0.97)10^{3aB}$	$(2.5\pm0.97)10^{3bA}$	$(1.0\pm0.07)10^{3cC}$	$(1.5\pm0.61)10^{3bB}$
05	$(1.2\pm0.17)10^{3bC}$	$(2.5\pm0.97)10^{3bA}$	$(1.2\pm0.17)10^{3bC}$	$(1.7\pm0.71)10^{3aB}$
07	$(1.2\pm0.27)10^{3bC}$	$(3.5\pm0.97)10^{3aA}$	$(1.5\pm0.97)10^{3aB}$	$(1.5\pm0.21)10^{3Bb}$

Data represents means ±SD (n=3).means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small superscripts in a column differ significantly ($p\leq0.05$).

Coliform count in dahi at 20℃ temperature

The Coliform count in the Dahi samples The Coliform count in the dahi was due to the presence of faecal load present in it which increase with the increase in temperature.

Table 9: Coliform count (cfu/g) of different types of Dahi samples at 20℃ temperature

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	$(1.0\pm0.670)10^{3dB}$	$(1.0\pm0.070)10^{3dB}$	$(1.0\pm0.041)10^{3dB}$	$(2.0\pm0.412)10^{3dA}$
03	$(2.0\pm0.370)10^{3cB}$	$(2.0\pm0.070)10^{3cB}$	$(2.0\pm0.341)10^{3cB}$	$(2.5\pm0.012)10^{3cA}$
05	$(3.2\pm0.170)10^{3bD}$	$(3.5\pm0.170)10^{3bC}$	$(5.0\pm0.641)10^{3bA}$	$(4.5\pm0.970)10^{3bB}$
07	$(5.0\pm0.670)10^{3aB}$	$(5.0\pm0.770)10^{3aB}$	$(5.5\pm0.941)10^{3aA}$	$(5.0\pm0.670)10^{3bA}$

Data represents means ±SD (n=3).Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small superscripts in a column differ significantly ($p\leq0.05$).

Effect of refrigerated (4±°C) storage on acidity of Dahi

The titrable acidity of Dahi samples significantly increased with the advancement of the storage period. It was observed that titrable acidity increased sharply from 0th to 07th days of storage (Yuksel et al., 2004) and Santhyal et al., 1986).The acidity of dahi samples at refrigeration temperature are shown in table 10. An increasing trend in titrable acidity was found during 0 to 07 days of storage. The increase in acidity might be due to continued fermentation process of lactic acid bacteria that transform sugar into lactic acid, acetaldehyde, formic acid, the accumulation of all these fermentation products corresponds increasing of acid level during the storage period. With the increase in number of storage days acidity increases.

Table 10: Effect of refrigeration temperature on acidity of dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0 day	0.71 ± 0.091^{Da}	0.52 ± 0.014^{dC}	0.65 ± 0.021^{dB}	0.53 ± 0.007^{dC}
03 day	0.73 ± 0.007^{cA}	0.55 ± 0.014^{cC}	0.66 ± 0.014^{cB}	0.55 ± 0.007^{cC}
05 day	0.76 ± 0.007^{bA}	0.57 ± 0.007^{bC}	0.67 ± 0.007^{bB}	0.57 ± 0.007^{bC}
07 day	0.82 ± 0.014^{aA}	0.58 ± 0.074^{aC}	0.69 ± 0.007^{aB}	0.58 ± 0.007^{Ac}

Data represents means ±SD (n=3).Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and mean followed by same small superscripts in a column differ significantly ($p\leq0.05$).

Effect of 10℃ temperature on the acidity of Dahi

The acidity of Dahi samples is presented in table 11.

Table 11: Effect of 10°C temperature on acidity of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	0.82 ± 0.007^{dA}	0.98 ± 0.007^{dA}	0.78 ± 0.007^{dD}	0.86 ± 2.519^{dB}
03	0.96 ± 0.007^{cB}	1.13 ± 0.014^{cA}	0.88 ± 2.36^{cC}	0.95 ± 0.042^{cB}
05	1.13 ± 0.014^{bC}	1.24 ± 0.014^{bA}	0.98 ± 0.007^{bD}	1.16 ± 0.021^{bB}
07	1.28 ± 0.014^{aB}	1.32 ± 0.014^{aA}	1.10 ± 2.463^{aD}	1.22 ± 0.014^{aC}

Data represents means ±SD (n=3).Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small superscripts in a column differ significantly ($p\leq0.05$).

Effect of 20 °C temperature on the acidity of Dahi

The acidity of the Dahi samples are presented in table 12. The acidity increases from the 0-7th days due to increase in storage days along with temperature. Increase in acidity might be due to growth of acid producing microorganisms during storage.

Table 12: Effect of 20 °C temperature on the acidity of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	1.20±0.201^{cB}	1.34±0.014^{dA}	1.11±0.014^{dC}	0.98±0.007^{dD}
03	1.29±0.035^{bB}	1.45±0.028^{cA}	1.22±0.021^{Cc}	1.17±0.007^{cD}
05	1.42±0.028^{aB}	1.58±0.056^{bA}	1.45±0.028^{Bb}	1.36±0.117^{bC}
07	1.45±0.219^{aB}	1.65±0.235^{aA}	1.64±0.007^{aA}	1.56±0.028^{aB}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p \leq 0.05$) and means followed by same small letter superscripts in a column differ significantly ($p \leq 0.05$).

Effect of refrigerated storage on the pH of Dahi sample

The data presented in table 13 shows pH of the Dahi samples namely Snowcap, Haleeb, Zum Zum and Khyber at refrigerated storage during the storage at 07 days. The rate of pH slightly decreases during the increasing days of storage. (Farnsworth 2006 & Bonisch et al., 2007).

Table 13: Effect of refrigerated storage on pH of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	4.13±0.014^{aC}	4.73±0.014^{aB}	4.94±0.070^{aA}	4.94±0.042^{aA}
03	3.92±0.091^{bD}	4.48±0.033^{bB}	4.59±0.042^{bA}	4.32±0.148^{bC}
05	3.92±0.021^{bC}	4.19±0.049^{cA}	3.70±1.523^{cD}	4.15±0.021^{cB}
07	3.84±0.042^{cB}	4.02±0.021^{dA}	3.68±0.098^{cC}	3.85±0.028^{dB}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p \leq 0.05$) and means followed by same small letter superscripts in a column differ significantly ($p \leq 0.05$).

Effect of 10 °C temperature on the pH of Dahi

The effect on pH of the dahi samples namely Snowcap, Haleeb, Zum Zum, and Khyber at 10℃ are shown in tables 14 for storage period of 0th to 7th day

Table14: Effect of 10°C temperature on the pH of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	4.15±0.014^{aC}	4.68±0.014^{aB}	4.95±0.056^{aA}	4.02±0.007^{aD}
03	3.85±0.028^{bB}	3.98±1.88^{bA}	3.75±0.042^{bC}	3.87±0.028^{bB}
05	3.75±0.042^{cB}	3.96±0.014^{bA}	3.64±0.042^{cC}	3.66±0.021^{cC}
07	3.75±0.042^{cA}	3.77±.063^{cB}	3.54±1.930^{dC}	3.59±0.049^{Dc}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p \leq 0.05$) and means followed by same small letter superscripts in a column differ significantly ($p \leq 0.05$).

Effect of 20 °C temperature on pH of Dahi

pH of the Dahi samples namely Snowcap, Haleeb, Zum Zum and Khyber at 20℃ temperature are presented in table 15.

Table 15: Effect of 20 °C temperature on pH of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	4.15±0.014^{aC}	4.68±0.014^{aB}	4.95±0.056^{aA}	4.02±0.007^{aD}
03	3.85±0.028^{bB}	3.98±1.88^{bA}	3.75±0.042^{bC}	3.87±0.028^{bB}
05	3.75±0.042^{cB}	3.96±0.014^{bA}	3.64±0.042^{cC}	3.66±0.021^{cC}
07	3.75±0.042^{cA}	3.77±.063^{cB}	3.54±1.930^{dC}	3.59±0.049^{Dc}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p \leq 0.05$) and means followed by same small letter superscripts in a column differ significantly ($p \leq 0.05$).

Effect of refrigerated storage on the moisture content of Dahi

Moisture content is the amount of water present in the food sample available for chemical biochemical reactions to occur. The moisture content of the Dahi samples are present in table 16.

Table 16: Effect of refrigeration temperature on the moisture content of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	80.2 ± 0.141^{dC}	79.4 ± 0.070^{dD}	82.4 ± 0.070^{cB}	85.2 ± 0.070^{dA}
03	81.3 ± 0.070^{cC}	79.6 ± 0.070^{cD}	82.6 ± 0.141^{bB}	85.6 ± 0.070^{cA}
05	81.4 ± 0.070^{bC}	79.8 ± 070^{bD}	82.6 ± 0.070^{bB}	85.7 ± 0.070^{bA}
07	81.8 ± 0.070^{aC}	80.2 ± 0.070^{aD}	82.7 ± 0.070^{aB}	86.0 ± 0.212^{aA}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Effect of 10 °C temperature on the moisture content of Dahi

The moisture content of Dahi samples during the storage at 0-7 days respectively. The results of the moisture content at 10 °C temperature are presented in table 17.

Table 17: Effect of 10 °C temperature on the moisture content of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	81.1 ± 1.484^{dC}	79.5 ± 0.070^{dD}	82.5 ± 0.141^{dB}	85.7 ± 0.282^{dA}
03	82.6 ± 0.424^{Cc}	80.8 ± 0.141^{cD}	83.2 ± 0.212^{cB}	86.5 ± 0.212^{cA}
05	83.7 ± 0.282^{bC}	82.5 ± 0.282^{bD}	84.7 ± 0.282^{bB}	87.0 ± 0.141^{bA}
07	84.7 ± 0.212^{aC}	83.4 ± 0.282^{aD}	86.5 ± 0.282^{aB}	87.6 ± 0.282^{aA}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Effect of refrigeration temperature on the ash content of Dahi

Microorganisms require certain nutrients for growth and maintenance of metabolic functions. The ash content of the dahi samples is presented in table 18. The highest ash content was observed in sample stored at refrigeration temperature as compared to 20 °C temperature. The ash content is decreased from 0 to 07th day of storage .This is due to the growth of microorganisms is increased from 0 to 07th day of storage ,with advancement in growth of microorganisms they need more and more nutrients due to which ash content is decreased.

Table 18: Effect of refrigeration temperature on the ash content of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	0.73 ± 0.007^{Ad}	0.81 ± 0.007^{aC}	0.84 ± 0.014^{aB}	0.91 ± 0.021^{aA}
03	0.72 ± 0.021^{Ac}	0.80 ± 0.007^{bB}	0.81 ± 0.007^{bB}	0.89 ± 0.007^{bA}
05	0.67 ± 0.021^{Bd}	0.78 ± 0.007^{cC}	0.80 ± 0.014^{bB}	0.86 ± 0.007^{cA}
07	0.66 ± 0.007^{bD}	0.75 ± 0.014^{dC}	0.78 ± 0.014^{cB}	0.85 ± 0.014^{cA}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Effect of 10 °C temperature on the ash content of Dahi

The ash content of the Dahi samples namely Snow cap, Haleeb, Zum Zum, Khyber at 10 °C temperature are presented in table 19.

Table 19: Effect of 10 °C temperature on the ash content of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	0.73 ± 0.007^{Ad}	0.81 ± 0.007^{aC}	0.84 ± 0.014^{aB}	0.91 ± 0.021^{aA}
03	0.72 ± 0.021^{Ac}	0.80 ± 0.007^{bB}	0.81 ± 0.007^{bB}	0.89 ± 0.007^{bA}
05	0.67 ± 0.021^{Bd}	0.78 ± 0.007^{cC}	0.80 ± 0.014^{bB}	0.86 ± 0.007^{cA}
07	0.66 ± 0.007^{bD}	0.75 ± 0.014^{dC}	0.78 ± 0.014^{cB}	0.85 ± 0.014^{cA}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p\leq0.05$) and means followed by same small letter superscripts in a column differ significantly ($p\leq0.05$).

Effect of 20 °C temperature on the ash content of Dahi

The ash content of the Dahi samples namely Snow cap, Haleeb, Zum Zum, Khyber at 20 °C temperature during the storage at 0-7 days are presented in table 20.

Table 20: Effect of 20℃ temperature on the ash content of Dahi

Storage days	Snowcap	Haleeb	Zum Zum	Khyber
0	0.88± 0.007^{Ab}	0.89± 0.007^{aB}	0.93± 0.014^{Aa}	0.93±0.007^{aA}
03	0.86 ±0.014^{bB}	0.84±0.014^{bC}	0.88 ±0.007^{bA}	0.88±0.007^{bA}
05	0.83 ±0.007^{Ca}	0.82±0.021^{cA}	0.84 ±0.007^{cA}	0.83±0.014^{cA}
07	0.80 ±0.014^{Da}	0.79 ±0.007^{dB}	0.82 ±0.014^{dA}	0.80± 0.014^{dA}

Data represents mean ±standard deviation (n=3). Means followed by capital letter superscripts in a row differ significantly ($p \leq 0.05$) and means followed by same small letter superscripts in a column differ significantly ($p \leq 0.05$).

Sensory evaluation

The different samples of dahi were analyzed for various sensorial attributes for their acceptance by using 9 point hedonic scale. The scores obtained with respect to colour, flavour, taste, aroma and overall acceptability are presented in Table 20, 21 and 22 respectively.

Table 21: Effect of refrigerated storage on organoleptic quality of Dahi

Dahi	Storage period (days)	Color	Flavor	Aroma	Taste	Overall acceptability
Snowcap	0	9	9	8.5	8.1	8.75
	3	8.5	8.0	8.1	7.5	8
	5	7.5	7.5	7.5	7.0	7.3
	7	7.0	6.5	7.0	6.5	6.5
Haleeb	0	9	9	9	8.8	8.9
	3	8.8	8.5	8.5	8.5	8.5
	5	8.0	8.0	8.0	8.0	8
	7	7.8	8.0	7.5	7.8	7.7
Zum Zum	0	9	8.9	7.5	8.7	8.5
	3	8.5	8.6	7.0	8.5	8.1
	5	8.0	8.3	6.5	8.0	7.7
	7	7.5	7.9	6.0	7.5	7.2
Khyber	0	9	9	9	9	9
	3	8.8	8.8	8.5	8.8	8.7
	5	8.6	8.6	8.3	8.7	8.5
	7	8.4	8.4	8.0	8.5	8.3

Table 22: Effect of 10 °C temperature storage on organoleptic quality of dahi

Dahi	Storage period(days)	Colour	Flavor	Aroma	Taste	Overall acceptability
Snowcap	0	9	9	8.0	8.0	8.5
	3	7.8	7.0	7.3	7.0	7.2
	5	7.3	6.8	6.5	6.9	6.8
	7	6.4	6.3	6.2	6.3	6.3
Haleeb	0	9.0	9	9	9	9
	3	8.3	7.3	7.2	7.0	7.4
	5	7.3	6.5	6.9	6.4	6.7
	7	6.4	6.0	6.2	6.0	6.1
Zum Zum	0	8.5	8.0	8.5	8.0	8.2
	3	7.7	7.6	7.3	7.2	7.4
	5	6.3	6.4	6.2	6.4	6.3
	7	6.0	6.0	6.0	6.1	6.0
Khyber	0	8.0	8.5	9	8.5	8.5
	3	6.8	7.2	8.3	7.6	7.4
	5	6.3	6.6	7.4	6.4	6.6
	7	6.0	6.1	6.0	6.2	6.0

Table 23: Effect of 20 °C temperature on organoleptic quality of Dahi

Dahi	Storage period(days)	Colour	Flavor	Aroma	Taste	Overall acceptability
Snowcap	0	8	8	8.5	7	7.8
	3	7.0	7.1	7.3	6.9	7.0
	5	5.3	5.1	5.3	5.4	5.2
	7	5.0	5.0	5.1	5.0	5.0
Haleeb	0	8.0	8.0	8.0	7.8	7.9
	3	6.9	6.3	7.2	6.4	6.7
	5	5.6	5.4	6.4	5.9	5.8
	7	5.0	5.1	5.3	4.4	4.9
Zum Zum	0	8.0	8.5	8.0	7.8	8.0
	3	6.3	6.4	6.7	6.1	6.3
	5	5.7	5.3	5.4	5.3	5.4
	7	5.0	5.2	5.0	4.8	5
Khyber	0	8.5	8.0	8.2	8.0	8.1
	3	6.9	6.4	6.6	6.8	6.6
	5	5.2	5.3	5.1	5.4	5.2
	7	4.9	4.8	4.5	4.7	4.7

Conclusion

Dahi samples stored at high temperature along with the increasing days of storage are not feasible for consumption. Also during the days of storage the TPC, Yeast Mold count and the coliform count increased.

Conflict Of Interest

The authors don't have any conflict of interest.

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