

Shelf Life of Different Types of Dahi at Room and Refrigeration Temperature

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Abstract: Two types of dahi were prepared. One type was prepared by using 10, 20 and 30% banana juice with whole milk and another one (plain dahi) was prepared by using whole milk only. Dahi samples were stored both in room temperature and refrigeration temperature until deterioration. During storage samples were analyzed for getting the organoleptic quality (Smell and Taste, Body and Consistency, Colour and Texture), percentage of acidity and pH value. Organoleptic quality and pH value of different types of dahi samples decreased but acidity percentage increased during storage at both room and refrigeration temperature. Plain dahi was in good condition up to 3 days of storage period and banana juice based dahi was up to 2 days only at room temperature. On the other hand, at refrigeration temperature plain dahi was suitable for consumption up to 12 days and banana juice based dahi was up to 8 days. Keeping quality of banana juice based dahi was lower than that of plain dahi both under room and refrigeration temperature.

Key words: Fermented milk, banana juice based dahi, plain dahi

Introduction

One of the most popular and oldest fermented milk product in Indian subcontinent is dahi or yogurt which results from lactic fermentation of milk. People of all ages like it. In Bangladesh it is a common practice to keep dahi either at room temperature or refrigeration temperature before consumption. But we have limited or no scientific information about the shelf life of plain dahi or fruit based dahi during storage. Some works have been done in India on the storage of dahi (Kohl, 1976; Zobkona and Plish, 1979; Shukla, 1982) but their results are not directly applicable in Bangladesh context. Hence, this piece of research work was under taken to get some idea on the shelf life of plain dahi or fruit based dahi when they are kept at room and refrigeration temperature.

Materials and Methods

This experiment was conducted at the Dairy Science and Poultry Science Laboratory of Bangladesh Agricultural University during the period from 1st July to October 30th 2000. The following steps were taken in conducting the study. Whole milk was collected from Bangladesh Agricultural University, Mymensingh, Dairy Farm. Juice from the banana fruit (*Musa sapientum*) was prepared in the laboratory and kept in the refrigerator. Whole milk was boiled in a pan for some time to reduce about 20-25% of its original volume. Sugar was added to the milk at the rate of 10% during boiling. During heating milk was stirred thoroughly with the help of a stirrer. After desired heating, milk pan was taken out from the heater and allowed to cool. Banana juice was taken out from the refrigerator and kept in the room temperature for melting. When the temperature of milk became about 40 °C then the milk was divided into four equal portions. For the preparation of different types of dahi, banana juice was

added into each portion of milk in following proportions:

- * Banana juice (*Musa sapientum*) 10% denoted as A type dahi.
- * Banana juice (*Musa sapientum*) 20% denoted as B type dahi.
- * Banana juice (*Musa sapientum*) 30% denoted as C type dahi.
- * Banana juice (*Musa sapientum*) 0% denoted as D type dahi (plain/control dahi).

Each portion of milk was inoculated with desired proportion of culture (2%) which was collected from local market. The anato color (seed) was incorporated into different portions of milk to enrich the colour of dahi. Samples from each portion were poured in 20 different small type (150ml capacity) plastic cups and a total of 80 plastic cups were filled from four different groups. All cups were incubated at 37 °C and after 8-10 hours they coagulated completely and dahi was prepared. Initial physical and chemical qualities of all dahi samples were determined in the laboratory. Physical parameters (mainly smell and test, body and consistency, colour and texture) were measured with the help of an expert panel of judges from the Teachers of the Dairy Science Department of Bangladesh Agricultural University. A score card of total 100 points was used in which maximum 50 points for smell and taste, 30 points for body and consistency, 10 points for colour and 10 points for Texture. Chemical tests (mainly Acidity and pH.) were done as per method described in A. O. A. C. (1982); Agarwala and Sharma (1961).

After the initial (0 days) analysis of physical and chemical parameters dahi samples were divided in to two groups having all four types of dahi in each group. One group was kept at room temperature and another group was stored at refrigeration temperature. Parameters

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Table 1 : Sensory scores of the different types of dahi under room temperature

| Storage Intervals (Days) | Smell and Taste 50 | | | | Body and Consistency 30 | | | | Colour 10 | | | | Texture 10 | | | |
|--------------------------|--------------------|-------------------|-------------------|-------------------|-------------------------|-------------------|-------------------|----------------|--------------------|-------------------|-------------------|---------------|-------------------|-------------------|-------------------|-------------------|
| | Dahi samples | | | | Dahi samples | | | | Dahi samples(days) | | | | Dahi samples | | | |
| | 10%(A) | 20%(B) | 30%(C) | Plain (D) | 10%(A) | 20%(B) | 30%(C) | Plain (D) | 10%(A) | 20%(B) | 30%(C) | Plain (D) | 10%(A) | 20%(B) | 30%(C) | Plain (D) |
| 0 | 38.97± 1.43 | 37.63± 2.86 | 36.45± 3.13 | 37.54± 1.58 | 23.75± 0.75 | 24.56± 1.17 | 25.60± 1.61 | 24.44± 0.94 | 6.24± 0.66 | 5.71± 0.71 | 5.87± 0.44 | 5.87± 0.78 | 7.33± 0.76 | 7.15 ± 0.78 | 7.11± 0.27 | 6.82± 0.29 |
| 1 | 32.91± 1.43 | 31.81± 2.81 | 31.41± 3.13 | 32.12± 1.52 | 19.74± 0.75 | 21.54± 1.17 | 21.61± 1.61 | 21.88± 0.94 | 5.94± 0.60 | 5.07± 0.71 | 4.91± 0.44 | 5.08± 0.78 | 6.80± 0.33 | 6.68 ± 0.71 | 6.71± 0.27 | 6.08± 0.29 |
| 2 | 27.94± 1.41 | 26.59± 2.78 | 26.40± 3.12 | 27.02± 1.32 | 16.81± 0.75 | 17.51± 1.15 | 17.84± 1.63 | 18.81± 0.91 | 5.01± 0.90 | 4.28± 0.72 | 4.21± 0.41 | 5.01± 0.71 | 5.53± 0.31 | 5.98± 0.72 | 6.01± 0.21 | 5.88± 0.21 |
| 3 | 24.99± 1.40 | Sample spoiled | Sample spoiled | 23.24± 1.22 | 13.01± 0.71 | 13.52± 1.16 | 13.06± 1.61 | 15.81± 0.92 | 4.24± 0.61 | 3.77± 0.71 | 4.01± 0.41 | 4.60± 0.78 | 5.12± 0.31 | 5.15 ± 0.71 | 5.23± 0.21 | 5.12± 0.21 |
| 4 | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | 13.92± 0.91 | Sample spoiled | Sample spoiled | Sample spoiled | 4.08± 0.71 | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled |

Table 2 : Sensory scores of the different types of dahi under refrigeration temperature

| Storage Intervals (days) | Smell and Taste 50 | | | | Body and Consistency 30 | | | | Colour 10 | | | | Texture 10 | | | |
|--------------------------|--------------------|-------------------|-------------------|-------------------|-------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | Dahi samples | | | | Dahi samples | | | | Dahi samples | | | | Dahi samples | | | |
| | 10%(A) | 20%(B) | 30%(C) | Plain (D) | 10%(A) | 20%(B) | 30%(C) | Plain(D) | 10%(A) | 20%(B) | 30%(C) | Control(D) | 10%(A) | 20%(B) | 30%(C) | Plain (D) |
| 0 | 38.97± 1.43 | 37.63± 2.68 | 36.49± 3.13 | 37.54± 1.58 | 23.75± 0.75 | 24.56± 1.17 | 25.60± 1.60 | 24.44± 0.94 | 6.56± 0.78 | 6.24± 0.66 | 5.71± 0.71 | 5.87± 0.44 | 7.33± 0.76 | 7.15± 0.78 | 7.11± 0.24 | 6.82± 0.29 |
| 2 | 36.62± 1.43 | 34.48± 2.68 | 33.71± 3.33 | 35.51± 1.58 | 21.78± 0.75 | 22.87± 1.17 | 23.78± 1.60 | 22.81± 0.94 | 6.01± 0.71 | 5.89± 0.66 | 5.02± 0.78 | 5.07± 0.44 | 6.86± 0.75 | 6.60± 0.78 | 6.51± 0.26 | 5.02± 0.29 |
| 4 | 34.01± 1.62 | 31.48± 2.61 | 31.21± 3.13 | 31.28± 1.52 | 20.01± 0.74 | 20.98± 1.86 | 21.86± 1.62 | 20.91± 0.82 | 5.50± 0.68 | 5.01± 0.56 | 4.56± 0.70 | 4.80± 0.42 | 5.80± 0.73 | 5.97± 0.68 | 5.97± 0.26 | 4.66± 0.24 |
| 6 | 32.21± 1.62 | 28.51± 2.13 | 28.01± 2.22 | 28.14± 1.68 | 18.23± 0.78 | 18.46± 1.78 | 19.02± 1.62 | 18.91± 0.81 | 4.88± 0.61 | 4.80± 0.52 | 3.98± 0.68 | 3.98± 0.48 | 5.01± 0.73 | 5.90± 0.60 | 4.98± 0.24 | 4.01± 0.31 |
| 8 | 29.80± 1.62 | 26.13± 2.13 | 26.19± 2.22 | 25.01± 1.62 | 16.78± 0.78 | 16.87± 1.64 | 17.80± 1.65 | 17.01± 0.71 | 4.01± 0.56 | 4.01± 0.42 | 3.02± 0.66 | 3.40± 0.48 | 4.60± 0.72 | 3.98± 0.60 | 4.01± 0.24 | 3.89± 0.30 |
| 10 | 27.39± 1.41 | Sample spoiled | Sample spoiled | 23.08± 1.62 | 15.56± 0.71 | 14.97± 1.65 | 15.98± 1.68 | 16.03± 0.78 | 3.03± 0.41 | 3.50± 0.46 | 2.86± 0.62 | 3.01± 0.48 | 3.68± 0.70 | 3.86± 0.56 | 3.60± 0.22 | 3.60± 0.26 |
| 12 | Sample spoiled | Sample spoiled | Sample spoiled | 21.02± 1.62 | 13.65± 0.71 | 13.85± 1.65 | 14.90± 1.68 | 15.03± 0.81 | 2.40 ± 0.41 | 2.38± 0.46 | 2.12± 0.62 | 2.98± 0.48 | 2.41± 0.70 | 2.30± 0.56 | 2.20± 0.22 | 3.55± 0.26 |
| 14 | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | 13.94± 0.81 | Sample spoiled | Sample spoiled | Sample spoiled | 2.50± 0.48 | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled |
| 16 | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled | Sample spoiled |

(physical and chemical) to monitor the shelf life of dahi were measured every day at room temperature stored samples and after every two days in refrigerated

stored samples until the samples became unfit for human consumption. Statistical analysis was carried out as per Steel and Torrie (1980) using Completely

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Table 3 : Acidity (%) and pH value of the different types of dahi under room temperature

| Storage Intervals (days) | Acidity (%) | | | | pH value | | | |
|--------------------------|--------------|----------------|----------------|-----------|--------------|----------------|----------------|-----------|
| | Dahi samples | | | | Dahi samples | | | |
| | 10% (A) | 20% (B) | 30% (C) | Plain (D) | 10% (A) | 20% (B) | 30% (C) | Plain (D) |
| 0 | 0.82±0.01 | 0.081±0.01 | 0.78±0.01 | 0.92±0.01 | 4.05±0.06 | 4.05±0.07 | 4.01±0.01 | 4.16±0.07 |
| 1 | 1.05±0.02 | 1.03±0.08 | 1.02±0.04 | 1.08±0.04 | 4.04±0.06 | 4.04±0.07 | 4.01±0.01 | 4.10±0.03 |
| 2 | 1.20±0.02 | 1.18±0.07 | 1.16±0.04 | 1.20±0.05 | 4.02±0.03 | 4.03±0.05 | 4.00±0.01 | 4.08±0.02 |
| 3 | 1.29±0.03 | Sample Spoiled | Sample Spoiled | 1.42±0.03 | 4.01±0.01 | Sample Spoiled | Sample Spoiled | 4.05±0.01 |

Table 4 : Acidity (%) and pH value of the different types of dahi under refrigeration temperature

| Storage Intervals (days) | Acidity (%) | | | | pH value | | | |
|--------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | Dahi samples | | | | Dahi samples | | | |
| | 10% (A) | 20% (B) | 30% (C) | Plain (D) | 10% (A) | 20% (B) | 30% (C) | Plain (D) |
| 0 | 0.82±0.01 | 0.81±0.01 | 0.78±0.01 | 0.92±0.01 | 4.05±0.06 | 4.05±0.07 | 4.01±0.01 | 4.16±0.07 |
| 2 | 0.84±0.01 | 0.80±0.01 | 0.80±0.01 | 0.92±0.01 | 4.04±0.05 | 4.05±0.07 | 4.01±0.01 | 4.14±0.05 |
| 4 | 0.85±0.03 | 0.82±0.01 | 0.82±0.02 | 0.92±0.03 | 4.04±0.05 | 4.03±0.06 | 4.01±0.01 | 4.12±0.05 |
| 6 | 0.86±0.02 | 0.85±0.02 | 0.85±0.02 | 0.93±0.02 | 4.02±0.03 | 4.00±0.01 | 3.92±0.01 | 4.10±0.04 |
| 8 | 0.88±0.01 | 0.86±0.02 | 0.85±0.01 | 0.93±0.03 | 4.01±0.02 | 3.80±0.01 | 3.81±0.01 | 4.08±0.04 |
| 10 | 0.88±0.01 | Sample Spoiled | Sample Spoiled | 0.94±0.01 | 4.00±0.01 | Sample Spoiled | Sample Spoiled | 4.02±0.0112 |
| 12 | Sample Spoiled | Sample Spoiled | Sample Spoiled | 0.94±0.01 | Sample Spoiled | Sample Spoiled | Sample Spoiled | 3.91±0.01 |
| 14 | Sample Spoiled | Sample Spoiled | Sample Spoiled | Sample Spoiled | Sample Spoiled | Sample Spoiled | Sample Spoiled | Sample Spoiled |

Randomized Design (CRD). Analysis of variance test was done to find out the statistical difference between treatment means.

Results

Table 1 and 2 show the organoleptic quality (smell and taste, body and consistency, colour and texture) of 10, 20 and 30% banana juice based dahi samples (A, B, and C type) and plain dahi samples (D type) decreased during storage at both room (approx. 25 °C) and refrigeration temperature (approx. 5 °C).

Smell and taste : It is observed from the Table 1 that smell and taste score of A and D type dahi samples were acceptable up to 3 days but B and C type dahi samples were acceptable up to 2 days during storage at room temperature. On the other hand, at the refrigeration temperature smell and taste score of B and C type dahi samples was acceptable up to 8 days but A and D type dahi samples were acceptable up to 10 and 12 days respectively (Table 2).

Body and consistency : Body and consistency score was acceptable up to four days for D type dahi and up to three days for A, B and C type dahi samples when stored at room temperature (Table 1). On the other hand, Table 2 reveals that when dahi samples were stored at refrigeration temperature body and consistency score was acceptable up to 14 days for D type dahi and 12 days for

A, B and C type dahi samples.

Colour : Table 1 shows that colour score of A, B and C type dahi samples were acceptable up to 3 days but D type is acceptable up to 4 days during storage at room temperature. In refrigeration temperature colour score of A, B and C type samples was acceptable for 12 days and D type samples was acceptable for 14 days (Table 2).

Texture : During storage at room temperature texture score was acceptable up to 4 days for D type dahi and 3 days for A, B and C type dahi samples (Table 1) but at refrigeration temperature texture was acceptable up to 12 days for A, B, C and D type dahi Samples.

Acidity : From the Table 3 and 4 it is found that acidity percentage of A, B, C and D type dahi samples increases both at room and refrigeration temperature during storage. In this case, A and D type dahi samples were acceptable for consumption up to 3 days whereas B and C type dahi samples were acceptable up to 2 days when stored at room temperature (Table 3). On the other hand, Table 4 shows that B and C type dahi samples were suitable for consumption for 8 days whereas A type dahi sample was acceptable for 10 days and D type dahi sample was acceptable for 12 days when stored in refrigeration temperature.

pH value : Table 3 and 4 indicates that during storage

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average pH value of A, B, C and D type dahi samples decreased both in room and refrigeration temperature. Average pH value of A and D type dahi samples was acceptable up to 3 days and for B and C type dahi samples were acceptable up to 2 days at room temperature (Table 3). In refrigeration temperature average pH value of B and C type dahi samples were acceptable up to 8 days whereas for A type dahi sample was acceptable up to 10 days and for D type dahi sample was acceptable for 12 days (Table 4).

Discussion

From the result of organoleptic evaluations it was observed that score for all parameters studied (smell and taste, body and consistency, Colour and Texture) deteriorated under both room and refrigeration temperature. Quality of dahi deteriorated rapidly at room temperature than that of the dahi samples stored at refrigeration temperature. At room temperature plain dahi and 10% banana juice added dahi were fit for human consumption up to 3 days but 20 and 30% banana juice added dahi were acceptable for consumption up to 2 days. On the other hand keeping quality was more at refrigeration temperature. At refrigerated condition plain dahi was suitable for consumption up to 12 days, 10% banana juice added dahi was for 10 days whereas 20 and 30% juice added samples were suitable for consumption up to 8 days. However, at refrigerated temperature body and consistency, colour and texture score of plain dahi was acceptable up to 14 days. As smell and taste is the major component of organoleptic evaluations, so it's score was given more emphasis to determine the storage life of dahi both at room and refrigerated temperature. Same pattern of result was seen in chemical tests also. Acidity of all samples increased gradually but the increase was more in fruit juice added dahi than that of the plain dahi. Acidity development was rapid at room temperature than that of refrigerated condition. As acid value increased pH value was decreased in all samples and the deterioration was more at banana juice added dahi than that of plain dahi. Deterioration in pH value was very rapid at room temperature stored samples than that of the refrigerated stored samples.

Slightly low keeping quality of juice added dahi was due to rapid fermentation. Addition of banana juice might have initiated quick fermentation and for this reason storage life was lower than that of plain dahi. The result of this study agrees with the findings of Shukla (1982) who found that 10% fruit yogurt (dahi) could be stored just for 2 days at room temperature, whereas at refrigeration it could be stored up to 10 days without deterioration. Similarly Osborne and Pritchard (1974) observed that yogurt

containing 12.5% fruit had a shelf life up to 14 days at 5 °C, 6 days at 8-10 °C and 2 days at ambient temperature. High keeping quality of refrigerated samples were due to temperature effort. As the temperature of the refrigerator was not suitable for the growth of acid producing bacteria, so the acid production was slow and resulting in high shelf life of dahi. But room temperature suitable for rapid growth of microbes, as a result, acid production was rapid and the product was deteriorated quickly. The results of high acid production and decreased pH agree with the findings of Kondratenko *et al.* (1978); Zobkona and Plish (1979). Results also agree with Eckles *et al.* (1952), who reported that when acid production increased then quality of dairy products was deteriorated.

Judging from the results of all parameters studied it was found that quality of dahi samples, stored in room temperature, deteriorated rapidly than dahi samples, stored in refrigeration temperature. So it might be concluded that plain dahi is suitable for consumption up to 3 days and banana juice based dahi is acceptable for consumption up to 2 days when stored in room temperature. On the other hand, at refrigeration temperature plain dahi is suitable for consumption up to 12 days and banana juice based dahi is acceptable for consumption up to 8 days.

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