

Evaporation Rate of Moisture from Dahi (Yogurt) During Storage at Refrigerated Condition

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Abstract: Different types of dahi were prepared by using banana juice and the prepared dahi samples were divided into two group having all types of dahi in each group. One group was covered with paper on the top of the cup and another group was without covered and were kept inside the refrigerator having a temperature of approximately 50 °C for a 16 days storage period. The removal of moisture percentage was measured every four days of interval during storage. The evaporation rate (gm/d) of dahi samples was also calculated by how much amount of water was removed per day during storage. The removal of moisture percentage and evaporation rate (g/d) of dahi samples of with cover group was lower than that of dahi samples of without cover group and evaporation rate of dahi samples of both with cover and without cover group was increased gradually due to incorporation of banana juice.

Key Words : Evaporation rate, fermented milk, plain dahi, banana juice mix 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. It is very healthy and nutritious dairy product. It is valued for controlling the growth of bacteria and incuring intestinal disease like constipation, diarrhoea and dysentery (Shahani and Chandan, 1974). Anticarcinogenic effect of dahi has been reported by Ayebo and Shahani (1980). Dahi or yogurt is also effective in lowering the blood cholesterol. Arsenic poisoning may be cured by taking dahi (Anonymus, 1997). In Bangladesh it is a common practice to store dahi in refrigerator after preparation. Usually the humidity percentage of refrigerator is lower than that of the normal humidity of air. For this reason food materials kept in the refrigerator loss weight due to the dehydration of water. But we do not know exactly how much water is removed from the dahi and what is the evaporation rate when dahi is kept at refrigeration condition. This information is very important for the people who are involved in milk products (like dahi) business and sale their products on the basis of weight. Because, when they keep dahi in the refrigerator for several days, the product (dahi) loss its weight, which is undesirable to a businessman. No research work has yet been done in our country in this line. For this reason, this piece of research work was undertaken to get some idea about the evaporation rate(gm/d) and removal of moisture percentage of dahi when they are stored in the refrigerator and also to know

the effect of using cover on the cup of dahi during storage.

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 times 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 37 °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 a following proportions:

Banana juice (*Musa sepientum*) 10% denoted as A type dahi. Banana juice (*Musa sepientum*) 20% denoted as B type dahi. Banana juice (*Musa sepientum*) 30% denoted as C type dahi.

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Table 1 : Comparison of average evaporation rate (gm/d) of dahi samples of with cover and without cover group

Parameters	10% level of banana dahi (A)	20% level of banana dahi (B)	30% level of banana dahi(C)	Plain/ Control dahi (D)	Level of significance
Without cover group (gm/d)	1.40± 0.001	1.48± 0.001	1.55 ± 0.001	1.33± 0.001	**
With cover group (gm/d)	1.05± 0.001	1.20± 0.001	1.28± 0.001	0.96± 0.001	**
NS = Non significant C= 30% banana dahi	** = Significant at 1% level D= Plain/control dahi		A= 10% banana dahi	B= 20% banana dahi	

Table 2 : Comparison of removal of moisture percentage of dahi samples of with cover and without cover group

Parameters	10% level of banana dahi (A)	20% level of banana dahi (B)	30% level of banana dahi(C)	Control / plain dahi (D)	Level of significant
Without covered	83.20 ^b ±1.01	84.61 ^b ±1.01	87.95 ^a ±1.01	82.90 ^b ±1.01	**
With covered	62.79 ^c ±0.47	68.49 ^b ±0.47	72.52 ^a ±0.47	59.98 ^d ±0.47	**
NS = Not significant C= 30% banana dahi	** = Significant at 1% level D= Plain/control dahi		A= 10% banana dahi	B= 20% banana dahi	

Banana juice (*Musa sepientum*) 0% denoted as D type dahi (plain/control dahi).

Each portion of milk was inoculated with desirable proportion of culture (2%) which was collected from local market. The anato color (seed) was incorporated into different portions of milk. Samples from each portion were taken in a different plastic cups. The samples were incubated at 37 °C until the complete coagulation (8-12 hrs). After completion of the coagulation the dahi samples (A, B, C, D type) were divided into two group having all four types of dahi in each group. One group of dahi samples were kept at refrigeration temperature (5 °C) without using any cover on the top of the cup and another group of dahi samples were kept at same refrigeration temperature by using cover with paper on the top of the cup for a 16 days of storage period. From a previous study it was found that plain dahi could kept at refrigerated condition for consumption up to 16 days. Here, 16 days period was selected on the basis of previous findings. The samples were weighted initially and there after every four days interval there weights were taken to calculate the loss of moisture during storage due to evaporation.

All experiment materials were completely homogenous and statistical analysis was done as per Steel and Torrie (1980) by using Completely Randomized Design. Analysis of variance test was done to find out the statistical difference between the treatments. In case of significant difference, the difference among treatment means were compared by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

Results and Discussion

Evaporation rate (gm/d): The evaporation rate (gm/d) of different types of dahi samples during the storage period in the refrigerator are shown in Table 1. It was observed that water from all samples evaporated and the

evaporation rate was high in samples which had cover on the top of the cup. From the table it is evident that evaporation rate of water from A, B, C and D type samples were 1.40±0.001, 1.48±0.001, 1.55±0.001 and 1.33±0.001 (gm/d) respectively when samples were kept without any cover on the cup. Statistically the difference between them were significant (P<0.01). On the other hand evaporation rate from the samples having cover on the top of the cup were 1.05±0.001, 1.20±0.001, 1.28±0.001 and 0.96±0.001 respectively. Statistically the difference between them were significant (P<0.01). From the table it is also found that C type dahi samples of without cover and cover group had the highest evaporation rate (gm/d) and D type samples (plain dahi) of both group had the lowest evaporation rate (gm/d). The evaporation rate of A, B and C type dahi samples of both cover and without cover group might have increased gradually due to incorporation of banana juice. The highest evaporation rate in without cover group was due to the effects of cover. Cover on the top of the cups prevents evaporation and for this reason evaporation rate was low in cover group. Information is very limited on the evaporation rate of dahi during storage in refrigerator. Hence it was not possible to compare the findings of this study with other workers. Broker *et al.* (1974) found that external resistance to vapour removal from product surface is much higher compared to internal resistance to moisture transport to product surface. Uddin and Islam (1985) observed that temperature profoundly influences drying rate and that the temperature, the higher is the rate of drying.

Removal of moisture percentage : Table 2 shows that the removal of moisture percentage from total moisture content of different kinds of dahi samples (A, B, C and D type) of without cover group are 83.20±1.01, 84.61±1.01, 87.95±1.01 and 82.90±1.01 and with cover group are 62.79±0.47, 68.49±0.47, 72.52±0.47 and 59.98±0.47

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respectively. Table 2 also indicate that there was a significant differences ($p < 0.01$) among the dahi samples of without cover group and with cover group. From the table it is also found that C type dahi sample of with cover and without cover group has the highest removal moisture percentage and D type dahi sample of with cover and without cover group has the lowest removal moisture percentage. The moisture percentage of A, B, and C type dahi samples of with cover and without cover group might have increased gradually due to incorporation of banana juice. On the other hand, Table 2 reveals that the moisture percentage of different kinds of dahi samples (A, B, C and D type) of with cover group are lower than that of dahi samples of without cover group. It was mentioned previously that very limited information has been found on the evaporation rate of dahi during storage in refrigerator. So it was not possible to compare the findings of this study with other workers. But other related works in support of the present findings. Islam (1990) noted that 69% water lost when banana juice was stored at a refrigerated condition. similarly Howkes and Flinks (1978) observed that 72% water was lost when fruit slices were stored in refrigeration.

Conclusion: In both covered and uncovered condition water was removed from all dahi samples. All samples lost weight due to removal of water by evaporation. More water was removed when the samples were put uncovered condition than that of covered condition. So,

it is wise to put cover on the top of the container when dahi stored at refrigeration condition.

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