



Study of Flavoured Dahi Incorporated with Banana Extract

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Abstract: In Bangladesh, dahi is considered as a yummy nourishing and admired milk product. Dahi is available in the market but it exists in diversified quality in respect of locality. The producers every so often add some ingredients that may reduce or raise the excellence of dahi. This study was intended to evaluate the supremacy and to measure the feasibility of incorporation of banana extract in the manufacture of dahi. Dahi was prepared through boiling of milk, homozinization followed by incorporation of banana juice at different levels and subsequent addition of starter culture. Physical analysis was conducted through organoleptic tests and chemical analysis was done through proximate analysis. The experiment was conducted with 4 treatments (0%, 2%, 4% and 6% banana juice) having 3 replications for each treatment. The differences for body and consistency among various treatments were statistically insignificant in Khulna and Bagerhat coastal regions. Dahi with 2% banana extract was superior in respect of smell and taste in Khulna region. No significant different scores were found for colour and texture among various treatments in Bagerhat region but that of Khulna were highly significant ($P < 0.01$). The differences for colour and texture scores among various treatments were statistically significant in Khulna region ($P < 0.05$) while, that of Bagerhat region were insignificant. Incorporation of banana juice, therefore, improves the organoleptic qualities of dahi. Differences in acidity percentage among the treatments were insignificant in Khulna region but that of the Bagerhat region were statistically significant ($p < 0.01$). The differences in average fat percentage of plain, 2%, 4% and 6% banana juice made dahi was statistically highly significant ($p < 0.01$) in Khulna region and significant ($P < 0.05$) in Bagerhat region. The average total solid (TS), moisture, ash content for plain, 2%, 4% and 6% banana juice made dahi in both regions were insignificant. Incorporation of banana juice might increase organoleptic qualities. Manufacture of maximum volume of dahi from minimum volume of milk incorporating banana extract might definitely profitablize and popularize the milk product business.

Key words: Dahi and banana fortified

Introduction

Now a day, the manufacturing and uses of fermented milk product has taken a rapid mode in a huge number of developing as well as developed countries of the world. Fermented milk originated in the Near-East perhaps before the Phoenician era and spread through Central and Eastern Europe since early times it is an important food item in the Middle East especially in those countries bordering the Eastern Mediterranean Coast. In some countries of Central Europe, the Mediterranean Basin area, Asia and Africa fermented milk is considered as an article required in Vedic rites and the ancient medical books spells highly of its therapeutic value (Aggarwala and Sharma, 1961). Dahi, being a fermented milk product, is becoming an indispensable part of daily food menu of people of the subcontinent. Dahi is an elegant fermented milk product that has been taken in most of the regions of Indian subcontinent. Not only that, the use of dahi as one of the major fermented milk product has established itself rapidly all over the world. Bangladesh, being a developing country is occupied by a portion of dairy sector, has already been introduced with fermented milk products like dahi. In Bangladesh, dahi is not only eaten as raw but also used in the preparation of different rich food stuffs in many festivals. Dahi has made a crucial

position in our customary food habit. It has become a tradition in the heart of the people of Bangladesh.

Dahi is smooth thick gel and unusual flavoured dairy product resulting from the acidification of milk by fermentation with a mixed culture of *Streptococcus lactis*, *Streptococcus thermophilus*, *Streptococcus circophilus*, *Lactobacillus bulgaricas*, *Lactobacillus plantarum* etc. (Desai *et al.*, 1994). Traditionally, fruits like strawberry, apricot and black current are used for the manufacture of fruit dahi. Indian scientists prepared fruit dahi by using different types of fruit juice viz, mango, sapota, papaya, pineapple and kokun (Desai, *et al.* 1994). An effort was initiated for making fruit formed dahi by using different types of fruit juice by Mustafa (1997). Recently, dahi was made by adding jack fruit juice in milk (Rahman, 1998) and also by accumulating mango juice in milk (Yasmin, 1999). Research work on dahi incorporated with banana juice has not been conducted in Bangladesh as well as the coastal regions. As Khulna and Bagerhat, coastal part of Bangladesh, represent the important parts of the milk producing pocket, the current experiment will add a new avenue in the manufacture of fermented milk product and may make the dairy business more profitable. Moreover, we know banana is the most admired and attractive fruit. It is full of nutrient and accessible in all seasons in Bangladesh. For these

reasons, this research work is very important in this country context because the people have not enough idea about these new food products. Therefore, the present research work was undertaken with the following objectives:

- i. To prepare quality fruit dahi incorporating different levels of banana extract with milk.
- ii. To study the differences between plain dahi and fruit dahi on the basis of physical and chemical properties.
- iii. To recommend the level of banana juice to be used for the preparation of fruit dahi.

Materials and Methods

The experiment was conducted at the Animal Husbandry Laboratory, Agrotechnology Discipline, Khulna University, Khulna, during the period of 31st December, 2010 - 20th April, 2011. Chemical analysis was also conducted at Animal Husbandry Laboratory, Agrotechnology Discipline and Dairy Science and Animal Nutrition Laboratory, Bangladesh Agricultural University.

Collection of Fresh Milk

Fresh cow's milk was collected everyday from a reliable source near Khulna University, Khulna as well as from Bagerhat district.

Preparation of Banana

The banana (*Musa sapientum*) was collected from Gollamari Kachabazar, near Khulna University. It was washed by distilled water and the outer coat was separated by hand and the seeds were also separated from fruit. Then the banana was blended using a pre-washed blender. After blending the banana was filtered by a clean sieve. The extract was then kept in a plastic pot covered with its cover.

Preparation of whole milk and banana dahi

After collection of cow's whole milk, it was heated to boiling temperature until it losses 20% of whole milk volume. Sugar was added at the rate of 10% of the current volume. The heated milk was then divided into 4 equal portions. The experiment was conducted into four treatments with three replications. The treatment was a control (milk without banana juice) and banana juice added to milk at the rate of 2%, 4% and 6% i.e. Whole milk dahi (T₀); Whole milk + 2% banana dahi (T₁); Whole milk + 4% banana dahi (T₂) and Whole milk + 6% banana dahi (T₃), respectively. The banana juice incorporated milk was then cooled into a temperature of 40-45^oC and added with 2% of starter culture of the milk followed by incubating at 37^oC for 8-12 hrs. in an incubator. The dahi samples were then preserved in a refrigerator at a temperature

of 5^oC until used. The parameters of fruits fortified dahi were investigated into two heads i) physical tests i.e. smell and taste, body and consistency, and colour and texture and ii) chemical tests i.e. determination of percentage of acidity, fat, protein, total solids (TS), ash percentage and moisture. Data were analyzed statistically by using Statistical package program MSTAT. Duncan's Multiple Range Test (DMRT) was done to find out the significant difference among treatment means.

Result and Discussion

Physical Parameters of dahi

Smell and taste

In case of smell and taste, the average score of dahi samples containing plain (0%), 2%, 4% and 6% banana juice were 46.00±0.00, 48.67±0.58, 48.00±0.00 and 46.67±0.58 in Khulna region (Table 1) and 47.33±1.53, 48.67±0.58, 48.33±1.15 and 46.00±4.36 in Bagerhat region (Table 2), respectively. It was evident from the result that differences in smell and taste score among various dahi samples were highly significant (P<0.01) in Khulna region while that of Bagerhat region were statistically insignificant. Although differences in smell and taste score was not significant in Bagerhat region but the score increased a little in case of banana juice dahi. Higher smell and taste score was found in case of 2% level of banana juice dahi in both regions. On the other hand, lowest score was found in case of 6% level of banana juice dahi in Bagerhat region while that of Khulna region was lowest in plain dahi. The results of these experiments indicate that smell and taste of dahi was increased due to the addition of banana juice and the best result was found at 2% level of banana dahi in both regions. The results of this experiment agreed with the findings of Desai *et al.* (1994) who found that smell and taste of mango and pineapple yogurts were higher than that of control dahi. Mustafa (1997) found that addition fruit juice improved the smell and taste score of dahi.

Body consistency

Average values of body consistency for plain, 2%, 4% and 6% banana juice made dahi samples were 27.33 ±1.53, 29.67± 0.58, 28.33± 0.58 and 27.67± 0.58 in Khulna region (Table 1) and 30.00±0.00, 26.67±2.89, 26.67±2.89 and 26.67±2.89 in Bagerhat region (Table 2), respectively. Statistical analysis showed that differences in body consistency among various treatments were insignificant in Khulna and Bagerhat regions. Higher body consistency score was recorded in case of 2% banana dahi and lowest score was recorded incase of plain dahi in Khulna region. The experiment agreed with the findings of Desai *et al.* (1994), Mustafa (1996) and Rahman (1998) who

found that body consistency of dahi improved due to the addition of fruit juice. On the other hand, higher body consistency score was recorded in case of plain dahi and lowest score was recorded in case of 2%, 4% and 6% levels of banana dahi in Bagerhat region, which differed with the same findings of Desai *et al.* (1994), Mustafa (1997) and Rahman (1998). In Bagerhat region the result was found inconsistent.

Colour and texture

Average values of the colour and texture for plain, 2%, 4% and 6% banana juice made dahi were 17.67±1.15, 20.00±0.00, 18.67±0.58 and 18.67±0.58 in Khulna region (Table 1) and 19.33±1.15, 19.33±1.15, 18.67±2.31 and 19.00±1.73 in Bagerhat region (Table 2), respectively. Statistical analysis showed that differences in colour and texture among

various treatments were significant (P<0.05) in Khulna region while that of Bagerhat region were insignificant. Highest score of colour and texture were recorded in case of 2% level of banana juice dahi and lowest score was recorded in case of plain dahi in Khulna region. The results of our experiment matched with the findings of Desai *et al.* (1994) who observed that the addition of fruit juice improved the colour and texture score of dahi. On the other hand, highest score of colour and texture were recorded in case of 2% and plain dahi and lowest score was recorded in case of 4% banana dahi in Bagerhat region which differed with the findings of Desai *et al.* (1994). In Bagerhat region the result was found inconsistent same as in case of body and consistency.

Table 1. Comparison of various average physical parameters of plain and banana juice made dahi in Khulna region

Physical Parameter	Smell and taste	Body consistency	Colour and texture
Plain (0%Level of Banana)	46.00 ^b ± 0.00	27.33 ± 1.53	17.67 ^b ± 1.15
2% Level of Banana	48.67 ^a ± 0.58	29.67 ± 0.58	20.00 ^a ± 0.00
4% Level of Banana	48.00 ^a ± 0.00	28.33 ± 0.58	18.67 ^b ± 0.58
6% Level of Banana	46.67 ^b ± 0.58	27.67 ± 0.58	18.67 ^b ± 0.58
CV %	0.86	3.23	3.82
Level of significance	**	NS	*

NS = Non Significant; ** = Significant at 1% level and * = Significant at 5% level.

Table 2. Comparison of various average physical parameters of plain and banana juice made dahi in Bagerhat region

Physical Parameter	Smell and taste	Body consistency	Colour and texture
Plain (0% Level of Banana)	47.33±1.53	30.00±0.00	19.33±1.15
2% Level of Banana	48.67±0.58	26.67±2.89	19.33±1.15
4% Level of Banana	48.33±1.15	26.67±2.89	18.67±2.31
6% Level of Banana	46.00±4.36	26.67±2.89	19.00±1.73
CV %	5.04	9.09	8.69
Level of significance	NS	NS	NS

NS = Non Significant

Chemical Parameter

Dry Matter/Total Solid (TS)

The average values of Total Solid (TS) in percentage were 22.50±0.00, 23.00±0.87, 22.17±0.29 and 22.17±1.04 in Khulna region (Table 3) and that of Bagerhat region were 20.67±2.52, 22.33±0.29, 22.00±0.00 and 21.50±0.50 (Table 4) for 0%, 2%, 4% and 6% levels of banana made dahi, respectively. The differences in TS percentage between plain dahi and dahi containing banana juice at different levels were insignificant in both regions. Addition of banana increased the TS content compared to that of plain

dahi. The results partially supported to the work of Desai *et al.* (1994). He found that TS content increased significantly due to addition of fruit in dahi. Mustafa (1997) also reported that addition of different types of fruit juice significantly increased the TS content of dahi. The reason behind is that banana itself contain more TS rather than milk or plain dahi (Mondal, 2000).

Moisture

The average values of moisture percent of different dahi samples were 77.50±0.00, 77.00±0.87, 77.83±0.29 and 77.67±0.76 in Khulna region (Table

3) and 79.33 ± 2.25 , 77.67 ± 0.29 , 78.00 ± 0.00 and 78.50 ± 0.50 in Bagerhat region (Table 4) using 0%, 2%, 4% and 6% banana juice, respectively. Statistical analysis showed that no significant differences were found in both regions. Highest moisture percentage was recorded in 4% banana dahi and lowest moisture percentage was recorded in 2% banana dahi in Khulna region. This result agreed with the finding of Islam (1999), who reported that the higher moisture content of dahi is found due to lower fat content, whereas highest moisture percentage was recorded in plain dahi and lowest moisture score was recorded in 2% banana dahi in Bagerhat region which differed the same finding of Islam (1999).

Acidity

The average values of acidity in percentage were found as 0.88 ± 0.03 , 0.85 ± 0.07 , 0.96 ± 0.07 and 0.95 ± 0.02 in Khulna region (Table 3) and 0.88 ± 0.05 , 1.03 ± 0.03 , 1.14 ± 0.02 and 1.22 ± 0.03 in Bagerhat region (Table 4) for 0%, 2%, 4% and 6% levels of banana made dahi, respectively. Statistical analysis showed that differences of acidity percentage among various treatments were highly significant ($P<0.01$) in Bagerhat region while that of Khulna region were insignificant. Acidity increases a little due to the addition of banana juice in both cases. This findings agreed with the findings of Desai *et al.* (1994) who found that the titratable acidity of fruit dahi was significantly ($P<0.01$) increased due to the addition of fruit juice/pulp. Sarkar *et al.* (1996) studied the acidity content of misti dahi from different district of West Bengal and found that acidity percentage was within the range of 0.36 to 1.17% with an average value of 0.92%. Addition of fruit juice might have initiated quick fermentation of milk. This was the main reason of increased acidity in fruit dahi samples.

Ash

The average ash percent on dry matter basis of different dahi samples were 4.44 ± 1.93 , 3.33 ± 0.00 , 4.44 ± 1.93 and 3.33 ± 0.00 in Khulna region (Table 3) and 6.89 ± 0.19 , 6.89 ± 0.19 , 6.89 ± 0.19 and 6.78 ± 0.19 in Bagerhat region (Table 4) for 0%, 2%, 4% and 6% levels of banana made dahi, respectively. The ash percent on dry matter basis of dahi with different levels of banana juice was somewhat lower than that of plain dahi (except in 4% level of banana) but differences in ash content between and among the treatments was not significant. The highest percent of ash were found both in plain dahi and 4% banana dahi and the lowest percent of ash were found in dahi having both 2% and 6% levels of banana dahi in case of Khulna region and in case of Bagerhat region, the highest ash percentage were found in plain and 2% banana dahi and the lowest ash percentage were

found in both 4% and 6% levels of banana dahi. The findings of this study partially supported to the work of Mustafa (1997) and Desai *et al.* (1994). Both researchers reported that addition of fruit juice decreased the ash percent in dahi sample. In both regions the result was found inconsistent.

Fat

The average fat percentage of 0%, 2%, 4% and 6% levels of banana juice made dahi were 4.57 ± 0.06 , 4.70 ± 0.00 , 4.53 ± 0.06 and 4.60 ± 0.00 in Khulna region (Table 3) and 4.47 ± 0.06 , 4.45 ± 0.05 , 4.67 ± 0.12 and 4.60 ± 0.10 in Bagerhat region (Table 4), respectively. Fat percentage of plain dahi was to some extent higher than that of 2%, 4% and 6% level of banana juice made dahi. The differences in fat percent between plain dahi and dahi containing banana juice at different level were highly significant in Khulna region ($P<0.01$) and significant in Bagerhat region ($P<0.05$). Maximum fat percentage was found in 4% banana dahi and lowest fat was found in case of plain dahi in Bagerhat region but in case of Khulna region maximum fat percentage was found in 2% banana made dahi and lowest fat was found in case of dahi containing 4% banana juice. So, the addition of fruit juice might have decrease the fat percentage of dahi. The result agreed with the findings of Desai *et al.* (1994) who reported that fruit yogurt contained lower amount of fat than that of plain yogurt. Similar type of results was also obtained by Mustafa (1997). The reason behind it is that banana contains lower percentage of fat (Mondal, 2000). As milk is partially replaced with banana, the fat percentage of different level is lower than that of plain dahi.

Protein

The average values of protein in percentage for plain, 2%, 4% and 6% level of banana juice made dahi were 2.60 ± 0.00 , 2.81 ± 0.00 , 3.31 ± 0.00 and 2.93 ± 0.00 in Khulna region (Table 3) and 2.60 ± 0.00 , 2.90 ± 0.00 , 2.90 ± 0.00 and 2.93 ± 0.00 in Bagerhat region (Table 4), respectively. The protein content was higher in 4% level of banana dahi and lowest in plain dahi in Khulna and in case of Bagerhat region, protein content was higher in 6% level of banana dahi and lowest in plain dahi. The protein content differed significantly ($P<0.01$) among different treatment in both regions. The results of this experiment differed with the findings of Mustafa (1997) and Desai *et al.* who found that plain dahi include higher amount of protein than that of fruit dahi. The reason behind it is that banana contains lower percentage of protein (Mondal, 2000). As milk is partially replaced with banana, the protein percentage of different level is lower than that of plain dahi.

Table 3. Comparison of various average chemical parameters among the treatments of plain dahi and banana made dahi in Khulna region

Treatment	Dry matter/Total solid (%)	Moisture (%)	Acidity (%)	Ash (%) on DM basis	Fat (%)	Protein (%)
Plain (0% Level of Banana)	22.50 ±0.00	77.50±0.00	0.88±0.03	4.44±1.93	4.57b ± 0.06	2.60d ± 0.00
2% Level of Banana	23.00±0.87	77.00±0.87	0.85±0.07	3.33±0.00	4.70 ^a ± 0.00	2.81 ^c ± 0.00
4% Level of Banana	22.17±0.29	77.83±0.29	0.96±0.07	4.44±1.93	4.53 ^b ± 0.06	3.31 ^a ± 0.00
6% Level of Banana	22.17±1.04	77.67±0.76	0.95±0.02	3.33±0.00	4.60 ^b ± 0.00	2.93 ^b ± 0.00
CV %	3.08	0.77	5.49	35.08	0.89	0.00
Level of significance	NS	NS	NS	NS	**	**

NS = Non Significant; ** = Significant at 1% level

Table 4. Comparison of Various Average Chemical Parameters among the treatments of Plain Dahi and Banana made Dahi in Bagerhat Region

Treatments	Dry matter/Total solid (%)	Moisture (%)	Acidity (%)	Ash (%) on DM basis	Fat (%)	Protein (%)
Plain (0%) Level of Banana	20.67 ± 2.52	79.33 ± 2.25	0.88 ^d ± 0.05	6.89 ± 0.19	4.47 ^b ± 0.06	2.60 ^c ± 0.00
2% Level of Banana	22.33 ± 0.29	77.67 ± 0.29	1.03 ^c ± 0.03	6.89 ± 0.19	4.45 ^b ± 0.05	2.90 ^b ± 0.00
4% Level of Banana	22.00 ± 0.00	78.00 ± 0.00	1.14 ^b ± 0.02	6.78± 0.19	4.67 ^a ± 0.12	2.90 ^b ± 0.00
6% Level of Banana	21.50 ± 0.50	78.50 ± 0.50	1.22 ^a ± 0.03	6.78± 0.19	4.60 ^{ab} ± 0.10	2.93 ^a ± 0.00
CV %	5.97	1.65	2.81	2.79	1.88	0.00
Level of significance	NS	NS	**	NS	*	**

NS = Non Significant; ** = Significant at 1% level and * = Significant at 5% level.

Recommendations

Judging from the maximum results of physical and chemical parameters, it could be recommended that, dahi made by incorporating 2% level of banana juice was best among different dahi samples. If we consider physical qualities of dahi, no doubt, incorporation of banana juice to the milk during manufacturing might increase such qualities. It has been determined through score card used in organoleptic test. According to score card, the score for 2% banana dahi was 96.6% (excellent) which was highest among all the levels. General consumers usually choose such types of dahi having improved physical and chemical qualities. From commercial point of view, production of maximum volume of dahi from minimum volume of milk incorporated

with banana juice might popularize the fermented milk product business and at the same time it will open a new window in dairy sector in Bangladesh.

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