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Article

Preparation of dahi from cow and buffalo skim milk with addition of mango (*Mangifera indica*) juice

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Abstract: The aim of this research was evaluation of dahi prepared from cow and buffalo skim milk addition of mango juice. Four types of dahi were prepared from cow's and buffalo's skim milk which designated by A (cows skim milk), B (cows skim milk with 10% mango juice), C (buffalo's skim milk) and D (buffalo's skim milk with 10% mango juice). The quality of prepared dahi was measured by organoleptic, chemical and microbiological test. Smell and taste, body and consistency, colour and texture score of dahi improved due to adding mango juice to compare with their control group. The overall acceptability score of B and D sample were 85.67±1.53 and 81.67±4.04 which higher than both control group. From chemical analysis, it was found higher total solids in 10% mango juice containing B (202.0±0.20 g/kg) and D (196.0±0.49 g/kg) dahi samples than both control groups. Again, lower fat and protein contents found in 10% mango juice containing B and D dahi samples. Total viable count was found significantly higher in both 10% mango juice containing B and D dahi samples than both control groups. In conclusion, that addition of mango juice with cow's skim milk dahi or buffalo skim milk dahi were both better in terms of organoleptic and chemical qualities more acceptable than plain skim milk dahi.

Keywords: yoghurt; mango juice; skim milk; buffalo milk; cow milk

1. Introduction

Dahi or yoghurt is a food obtained by controlled fermentation of milk by a mixed culture of lactic acid bacteria selected to produce a flavour and typical aroma (Schmidt, 1992). The milk sugar (lactose) is fermented to lactic acid and it causes the characteristic curd to form dahi. According to Bystron and Molenda (2004) fermentation ensures not only increased shelf life and microbial safety but also makes food more digestible. Skim milk fruit dahi can be prepared by adding different type of fruits to skim milk. Fruits add colour to the skim milk dahi and make it attractive and improve the nutritive value of dahi. Thus, the objectives of the study were to prepare acceptable quality dahi from cow and buffalo skim milk using mango juice and monitoring the physical, chemical and microbiological quality of dahi prepared from skim milk adding mango juice.

2. Materials and Method

2.1. Study area and duration

The study was carried out at the Dairy Technology and Microbiology Laboratory of the Department of Dairy Science, Bangladesh Agricultural University during the period from 1st August to 3th September, 2015.

2.2. Sample collection and skimming of milk

The milk samples were collected from Bangladesh Agricultural University Dairy farm. Whole milk was skimmed by an electric cream separator machine. Every trial about 2.0 litre of cow milk and 2.0 litre of buffalo milk were skimmed.

2.3. Chemical analysis of cow and buffalo milk

Skim milks were analyzed at the Dairy Technology and Microbiology laboratory to monitor their composition. Chemical analysis of cow and buffalo skim milk collected from BAU Dairy Farm is shown in Table 1.

2.4. Preparation and chemical analysis of mango juice

The seeds were removed from the mango pulp. Then the fruit pulp was blended by adding of distilled water. After blending the juice was filtered by clean cloth (hot water washed). It was preserved in the refrigerator at 4°C up to start of the experiment. Total solids content of the mango juice were determined by oven drying method according to Association of Official Agricultural Chemists (AOAC, 1982). Fat percent was estimated by Babcock method as described by Agarwala and Sharma (1961). Crude protein was determined by Kjeldahl method and moisture was determined by oven drying method as described by AOAC (1982).

2.5. Preparation of different types of dahi

The skim milk was boiled for sometimes to reduce about 20% percent of original volume. After boiling the volume of the cow milk and buffalo milk were 1000 ml. sugar was added to the milk at the rate of 12 percent during boiling. So, 120g sugar was added in 1000 ml 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 reduce temperature. When the temperature decreased to 40°C then the cow milk and buffalo milk were divided into four equal portions (two from each type) and different types of dahi were prepared from each portion by using different levels of mango juice.

2.6. Evaluation of prepared dahi samples

2.6.1. Physical test

The organoleptic parameters were smell and taste, body and consistency, color and texture.

2.6.2. Chemical tests

After the organoleptic evaluations, all dahi samples were chemically analyzed in the laboratory for composition. The following parameters were determined for acidity percentage, pH value, fat (g/kg), protein (g/kg), total solids content (g/kg), ash content (g/kg).

2.6.3. Microbiological test

Total viable count (cfu/g) and coliform count (cfu/g) were done for microbiological test.

2.7. Statistical analysis

Analysis of variance test (ANOVA) was done to find out the statistical difference between the means. In this experiment, all experimental materials were completely homogenous and for this reason data were analyzed by using one-way analysis of variance test in Completely Randomized Design (CRD) using the SPSS statistical program.

3. Result and Discussion

3.1. Organoleptic qualities of cows skim milk dahi prepared by mango juice

Smell and taste score of A & B type dahi samples were 42.00 ±2.00 and 44.00± 1.73, respectively (Table 2) which are higher than control group dahi. The findings of this experiment agree with the work of Mustafa (1997).

Body and consistency score of A and B type dahi samples samples were 24.00±2.00 and 25.33±0.58, respectively. Statistical analysis showed that there was non-significant difference existed within the body and consistency score of dahi but higher score found in 10% mango juice dahi (Table 2). The result of this experiment agrees with the findings of Desai et al. (1994) who found that body and consistency of dahi improved due to addition of fruit juice.

The colour and texture of A and B type dahi were 14.67±0.58 and 16.33±0.58, respectively (Table 2). Results revealed that there was significant ($p<0.05$) difference among the A and B type dahi. Regarding dahi texture

Shukla et al. (1987) advocated the use of stabilizers and additives to improve the textual characteristics of yoghurt.

Overall physical score of A and B type dahi were 80.67±2.08 and 85.67±1.53, respectively (Table 2). Statistical analysis showed that overall acceptability score of dahi was significantly ($p<0.05$) higher in B type dahi than A type.

3.2. Organoleptic qualities of buffaloes skim milk dahi prepared by mango juice

Smell and taste score of C and D type dahi sample containing mango juice were 41.00±1.00 and 42.67±3.21, respectively (Table 3). Statistical analysis showed that there was no significant difference within the smell and taste score of dahi which agree with the work of Mustafa (1997).

Body and consistency score of C and D type dahi samples were 24.00±1.73 and 24.33±0.58, respectively (Table 3). From the study of body and consistency score of all samples, it was found that there was no significant difference ($p>0.05$) between the samples.

The color & texture score of C and D type samples were 13.67±1.53 and 14.67±1.53, respectively (Table 3). The result showed that significant difference ($p<0.01$) existed between the color & texture score of samples. Shukla *et al.* (1987) advocated the use of stabilizers and additives to improve the textual characteristics of yoghurt.

Overall score of C and D type dahi samples were 78.67±2.52 and 81.67±4.04, respectively. Results indicated that significant difference ($p<0.05$) existed between the overall score of samples. Higher overall score was recorded in dahi with 10% mango juice sample than dahi with 0% mango juice sample.

3.3. Chemical parameters of cow skim milk dahi prepared by mango juice

3.3.1. Acidity percentage

Average acidity percentage for A and B type dahi samples were 0.80±0.21 and 0.85±0.00, respectively (Table 4). Research result showed that acidity percentage was significantly ($p<0.05$) lower in control group sample than mango juice dahi sample (Table 3). Acidity percentage increased due to the addition of mango juice. The results of acidity of dahi samples agreed with the findings of Desai *et al*. (1994) who found that the titratable acidity of fruit dahi was significantly increased due to the addition of fruit juice.

3.3.2. pH

The average pH values of A and B type sample were 4.5±0.10 and 4.03±0.06, respectively which were statistically significant ($p<0.01$) (Table 4). It indicates that addition of fruit juice slightly decreased the pH value of dahi. The result of present findings agrees with the work of Mustafa *et al.* (1997) who found that pH of plain dahi was 4.25.

3.3.3. Fat content

The average fat content of A and B type dahi samples were 2.8±0.02 and 3.5±0.00 g/kg, respectively (Table 4). Result revealed that significant difference ($p<0.01$) between the fat content of dahi samples. The higher value was recorded in cow's skim milk with 10% mango juice dahi sample than 0% mango juice dahi sample.

3.3.4. Carbohydrate content

The average values of carbohydrate content of A and B type dahi were 141.8±0.15 and 161.4±1.14 g/kg, respectively which differs significantly ($p<0.05$). Table 4 describe that mango juice contain dahi had higher amount of carbohydrate than control group dahi. This result agrees with Islam (2004) who found that carbohydrate content of dahi was remarkably increased with addition of banana.

3.3.5. Protein content

Protein content of A and B type dahi were 30.6±0.07 & 30.3±0.06 g/kg, respectively (Table 4) and there is no significance difference between A & B type dahi. The protein content also decreased slightly in 10% mango juice dahi which due to adding fruit juice because fruit juice contains lower protein than milk. This finding was supported by Mustafa (1997) who found that plain dahi contained higher amount of protein than fruit dahi.

3.3.6. Total solids content

The average total solids content of A and B type dahi were 181.0±0.1, 202.0±0.20 g/kg, respectively (Table 4). Total solids content was found higher in B than A type dahi and significant ($p<0.01$) difference between the A

and B type dahi. This result agreed with Mustafa (1997) who conducted an experiment with different types of fruit juice and found that addition of fruit juice significantly increased the total solids content of dahi.

3.3.7. Ash content

Ash content of A and B type dahi were 6.2±0.01 & 6.5±0.04 g/kg, respectively (Table 4). Non-significantly ($p>0.05$) higher ash content was found in B type dahi than A type dahi.

3.4. Chemical analysis of buffaloes skim milk dahi prepared by mango juice

3.4.1. Acidity

Average acidity percentage for C and D were 0.8±0.0 and 0.83±0.17 %, respectively (Table 5). Research result showed that acidity percentage was slightly lower in control group sample than mango juice sample and there was significant difference ($p<0.05$) existed between the samples (Table 5). This slight variation in acidity level in between samples was due to addition of mango juice.

3.4.2. pH

The average pH values of C and D sample were 4.5±0.0 & 4.17±0.06, respectively (Table 5). The differences of pH values between the samples were statistically significant ($p<0.01$). It may be due to addition of fruit juice and hence, slightly decreased the pH value of dahi. Here, acidity of mango juice slightly increased which lowered the pH value of dahi and this finding is agreed with the work of Kosikowaski (1996) who stated that the pH of normal dahi samples should be approximately 4.4.

3.4.3. Fat content

Fat content for C and D type's dahi were 2.3±0.02 & 2.6±0.01 g/kg, respectively (Table 5). Statistical analysis showed that there was significant difference ($p<0.01$) within the fat contents of C and D type dahi. Generally, fruit contains low level of fat. That's why addition of fruit juice might have little change in the fat content of fruit dahi.

3.4.4. Carbohydrate content

The average values of carbohydrate content for C and D type dahi were 151.6±0.34, 156.5±0.29 g/kg, respectively (Table 5). Non-significant ($p>0.05$) difference was found in respect of carbohydrate content of both dahi samples. The highest carbohydrate content was observed in 10% mango juice dahi sample than control which agrees with Saldamli and Babacan (1997) who reported that carbohydrate content of dahi sample increased due to addition of mango juice.

3.4.5. Protein content

Protein content of C and D type dahi were 33.1±0.08 & 30.6±0.02 g/kg, respectively (Table 5). Statistical analysis showed that there was significant difference ($p<0.01$) present within the protein content of dahi samples. The protein content was decreased due to adding fruit juice because fruit juice contains lower protein than milk. This result agreed with the work of Mustafa (1997) who found that plain dahi contained higher amount of protein than fruit dahi. Similar type of result was also obtained by Desai et al. (1994).

3.4.6. Total solids content

The average total solids content of C and D type dahi were 193.7±0.20 &196.0±0.49 g/kg, respectively (Table 5). Higher total solids were found in fruits added dahi than control group but there was non-significant difference existed between the C and D type dahi samples. The result of this experiment agrees with the work of Desai et al. (1994) who found that total solids content increased significantly due to addition of fruits in yogurt.

3.4.7. Ash content

Ash content of C and D type dahi were 6.6±0.02 & 6.4±0.03 g/kg, respectively (Table 5). Statistical analysis showed that there was no significant difference of C and D dahi samples. The findings of this study agreed with the work of Mustafa (1997) and Desai *et al.* (1994) who found that addition of fruit juice decrease the ash content in dahi.

Table 1. Chemical analysis of cow and buffalo skim milk collected from BAU Dairy Farm.

Parameters	Cow skim milk	Buffalo skim milk
Specific gravity	1.035 ± 0.001	1.032±0.001
Acidity %	0.14 ± 0.01	0.16±0.003
pH	6.76±0.02	6.95±0.02
Total Solids (g/kg)	80.7±1.1	117.4 ± 3.87
Fat (g/kg)	2.67 ± 0.88	2.3±0.02
Protein (g/kg)	31.74 ± 0.84	38.3 ± 1.09
Lactose (g/kg)	41.42±2.74	48.9±1.29
Ash (g/kg)	6.23±0.09	8.4±0.25

Table 2. Physical parameters of cow skim milk dahi prepared by mango juice.

Physical Parameters	A	B	Level of Significance
Smell and Taste (50)	42.00 ± 2.00	44.00 ± 1.73	NS
Body and Consistency (30)	24.00 ± 2.00	25.33 ± 0.58	NS
Colour and Texture (20)	14.67 ± 0.58	16.33 ± 0.58	*
Overall Score (100)	80.67 ± 2.08	85.67 ± 1.53	*

A, Cow's skim milk dahi and B, Cow's skim milk with 10% mango juice dahi. *indicates significant at 5% level of probability and NS indicates non-significant (p>0.05).

Table 3. Physical parameters of buffaloes skim milk dahi prepared by mango juice.

Physical Parameters	C	D	Level of Significance
Smell and Taste (50)	41.00 ± 1.00	42.67±3.21	NS
Body and Consistency (30)	24.00±1.73	24.33±0.58	NS
Colour and Texture (20)	13.67±1.53	14.67±1.53	*
Overall Score (100)	78.67±2.52	81.67 ± 4.04	*

C, Buffalo's skim milk dahi and D, Buffalo's skim milk with 10% mango juice dahi. *indicates significant at 5% level of probability and NS indicates non-significant (p>0.05).

Table 4. Chemical analysis of cows skim milk dahi prepared by mango juice.

Parameters	A	B	Level of Significant
pH	4.5±0.10	4.03 ± 0.06	**
Acidity (%)	0.8 ± 0.21	0.85±0.0	*
Water (g/kg)	819.0± 0.39	798.0± 3.12	NS
Total Solids (g/kg)	181.0 ± 0.10	202.0 ± 0.20	**
Fat (g/kg)	2.8 ± 0.02	3.5 ± 0.0	**
Protein (g/kg)	30.6 ± 0.07	30.3 ± 0.06	NS
Carbohydrate (g/kg)	141.8 ± 0.15	161.4± 1.14	*
Ash (g/kg)	6.2 ± 0.01	6.5 ± 0.04	NS

A, Cow's skim milk dahi and B, Cow's skim milk with 10% mango juice dahi. *indicates significant at 5% level of probability, **indicates significant at 1% level of probability and NS indicates non-significant (p>0.05).

Table 5. Chemical analysis of buffalo skim milk dahi prepared by mango juice.

Parameters	C	D	Level of Significant
Total Solids (g/kg)	193.7±0.20	196.0 ±0.49	NS
Water (g/kg)	806.3±0.50	803.8±0.46	NS
Fat (g/kg)	2.3±0.02	2.6±0.01	*
Protein (g/kg)	33.1±0.08	30.6±0.02	**
Carbohydrate (g/kg)	151.6±0.34	156.5±0.29	NS
Ash (g/kg)	6.6±0.02	6.4±0.03	NS
pH	4.5 ±0.0	4.17±0.06	**
Acidity (%)	0.8±0.0	0.83±0.17	*

C, Buffalo's skim milk dahi and D, Buffalo's skim milk with 10% mango juice dahi . *indicates significant at 5% level of probability, **indicates significant at 1% level of probability and NS indicates non-significant (p>0.05).

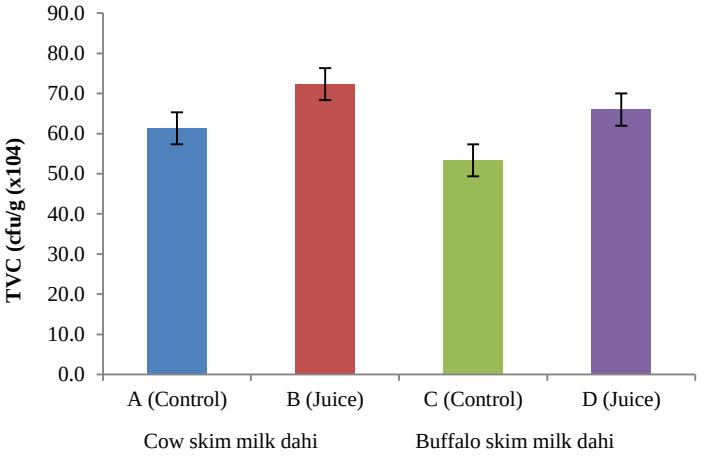

Figure 1. Total viable count of dahi samples.

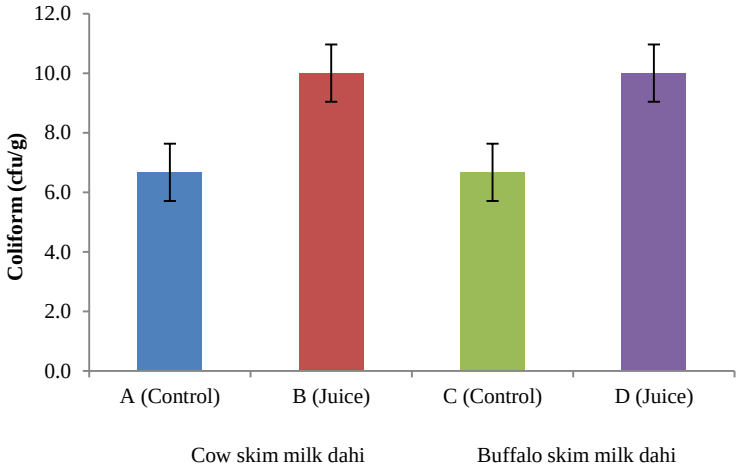

Figure 2. Coliform count of dahi samples.

3.5. Microbiological evaluation of cow skim milk dahi prepared by mango juice

3.5.1. Total viable bacteria count

The total viable count of A and B type dahi were $61.33\times10^{4}\pm2.31$ and $72.33\times10^{4}\pm2.52$ cfu/g, respectively (Figure 1). Statistical analysis showed that there was significant difference among the samples. This finding indicated that total viable count increased with addition of mango juice. The findings of the present study are in agreement with the results of Rahman (2004) who found that average total viable count of flavored yogurt drinks was $120.22\times10^{4}\pm2.51$ cfu/g. Again, Alam (1999) found that the average total viable count yoghurt sample was 75×10^{4} cfu/g.

3.5.2. Coliform count

The coliform bacterial count of A and B type dahi are depicted in Figure 2 and which indicated that coliform bacterial count was low in both types of dahi samples. Result showed that there was non-significant difference ($p>0.05$) between the dahi samples. Lower coliform count indicates that the quality of dahi was maintained hygienically and sanitation condition was good. This finding was similar with Ahmed (2004) who found that there were no coliform bacteria in yoghurt drink samples.

3.6. Microbiological evaluation of buffalo skim milk dahi prepared by mango juice

3.6.1. Total viable bacteria count

The total viable count of C and D type dahi were 53.33 x10^4 ±0.58 and 66.00 x10^4 ±1.73 cfu/g (Figure 1). Research findings showed that there was significant difference ($p<0.01$) between the dahi samples. Alam (1999) found that the average total viable count of yoghurt sample was 75×10^4 cfu/g.

3.6.2. Coliform count

The total coliform count of C and D type dahi were 6.67±5.77 and 10.0±0.00 cfu/g, respectively (Figure 2). Results revealed that there was non-significant difference ($p>0.05$) between the dahi samples. Again, Ahmed (2004) who reported that there were no coliform bacteria in yoghurt drinks samples.

4. Conclusions

From the findings of this study, it might be concluded that dahi could be prepared successfully from cow skim milk and buffalo skim milk with addition of 10% mango juice. Addition of mango juice developed attractive colour and pleasant mango flavor in dahi. It also increased nutritive value of dahi. So, the manufacturers and the consumers might welcome to incorporation of mango juice in the manufacture of dahi from skim milk.

Conflict of interest

None to declare.

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