

Article

Evaluation of borhani prepared from whole milk, skim milk and full cream powdered milk curd

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Received: 26 October 2020/Accepted: 22 November 2020/ Published: 30 November 2020

Abstract: The present research work was carried out to evaluate the qualities of borhani prepared by curd using whole milk, skim milk and full cream powder milk. In this purposes, three types of borhani were prepared, these were grouped as; A: Borhani prepared from whole milk curd, B: Borhani prepared from skim milk curd and C: Borhani prepared from full cream powder milk curd. The prepared borhani samples were subjected to organoleptic, chemical and microbiological qualities. After performed physical examination, for sample A it was found that there was no significant difference in color and appearance (17.67 ± 0.33) but there was significant difference ($p<0.05$) in smell and taste (47.33 ± 0.33), body and consistency (26.33 ± 0.33) and total physical scores (91.33 ± 0.88) of the three borhani samples. Chemical analysis showed that for group A; there were significant differences with others ($p<0.01$) in contents (%) of fat (2.95 ± 0.33), total solids (TS) (18.15 ± 0.16), acidity (0.80 ± 0.01), pH (4.25 ± 0.02), moisture (81.85 ± 0.16), CHO (10.50 ± 0.93) and ($p<0.05$) in contents (%) of ash (1.82 ± 0.02), protein (2.88 ± 0.02). The result of chemical parameter showed that borhani prepared from whole milk (sample A) was best among the samples. However, there were no significant differences in coliform count and yeast and mold count but there were significant differences ($p<0.01$) in total viable count (60.67 ± 2.33). Cost analysis showed that samples B and C was cheap than sample A. It can be concluded that even costly; the nutritive value and the consumer preference of borhani from whole milk was better than the others.

Keywords: borhani; whole milk; skim milk; powdered milk; milk curd

1. Introduction

Borhani is a traditional spicy yogurt drink. It is made from sour dahi with addition of different spicy materials, sugar and ice. Sour dahi or yoghurt is required for preparing borhani. Sour dahi is generally prepared by seedling milk with a combination of *S. thermophilus* and *L. bulgaricus* and no sugar is added (Sharma, 1997; Kiani *et al.*, 2010; Agarwal *et al.*, 2001). Borhani is mainly prepared by sour yoghurt. It is packed with source of protein, carbohydrates, fats, minerals and vitamins (Talukder *et al.*, 2017). Healthy bacteria are used for the fermentation of milk for preparation of yoghurt which maintains the balance between bacteria and also helpful

for the lactose intolerant patients. It also maintains the overall health of the people (Karazul *et al.*, 2001; Isolauri *et al.*, 2001).

According to Bhavna (2016) borhani helps to assist digestion, treats colorectal cancer, treats osteoporosis, enhance immunity, lowers high blood pressure, lowers cholesterol, brain ailments, moisturizes skin, reduces wrinkles and fine lines, fights acne, fades blemishes and pigmentation, reduces dark circles, treats skin infections, soothes sunburns, conditions hair, reduces hair fall, treats dandruff (Shang *et al.*, 2000; Akruiti, 2017).

Moserrof (2015) and Ghosh (2013) worked with borhani to evaluate the market borhani with laboratory prepared borhani and to determine the quality of borhani prepared from different concentrations of sour yoghurt. About 7% of the total milk production in India and 4% of the total production of Pakistan and Bangladesh is converted to dahi for consumption (Mustafa, 1997; Sarkar *et al.*, 2015).

Nowadays people prefer milk and dairy products to other sources of animal protein because their food habit is changing rapidly. In a modern civilized nation, fermented dairy products and drinks are occupying increasingly greater portion of the diet, certainly due to their great values and palatability (Vesely *et al.*, 1995; Tamime *et al.*, 2002). Per capita fresh milk and dairy product (such as cultured milk products) is one of the most important measures of living standard of a nation. As spicy yoghurt drinks borhani is popular in Bangladesh (Sayed, 2008). It is usually served at weddings, restaurants and special feasts (Ahmed, 2004).

However, in our country very few research works have been done on the preparation of borhani and no research work has been done on the preparation of borhani prepared from skim milk and full cream powder milk. For this instance, the present experiment was performed based country condition because the people of our country have very little idea about manufacturing technology and nutritive value of this nutritious food product. For these reasons this research was undertaken to manufacture the acceptable quality, analyze physical, chemical and microbiological qualities of borhani using fermented milk.

2. Materials and Methods

2.1. Place and period of experiment

This study was executed at the laboratory of dairy chemistry and technology, Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, during the period of January 16 to March 5, 2017.

2.2. Collection of raw milk

Whole milk and skim milk was collected from the BAU Dairy Farm and whole cream powder milk (Diploma, New Zealand dairy products Bangladesh Ltd., Vulta, Rupgonj, Narayangonj) purchased from K.R. Market, BAU, Mymensingh After collection of raw milk and powder milk chemical analysis was performed at laboratory of dairy chemistry and technology of Department of Dairy Science, BAU, Mymensingh (Table 1).

Table 1. Nutritional composition of whole milk, skim milk and full cream powdered milk.

| Components | Whole milk | Skim milk | Full cream powdered milk | Reconstituted full cream powder milk |
|--------------|------------|-----------|--------------------------|--------------------------------------|
| Total solids | 15.00 % | 9.1 % | 9.21 % | 7.08 % |
| Fat | 4.70 % | 0.7 % | 2.60 % | 2.00 % |
| Protein | 3.90 % | 3.50 % | 2.41 % | 1.85 % |
| Ash | 1.80 % | 0.80 % | 1.20 % | 0.68 % |
| Lactose | 4.60 % | 4.10 % | 3.77 % | 2.90 % |
| pH | 6.60 | 6.60 | | |

2.3. Experimental layout

| Ingredients | Experimental group | | |
|-----------------------------|------------------------|-----------------------|------------------------------------|
| | A (Whole milk curd) | B (Skim milk curd) | C (Full cream powder milk curd) |
| Milk curd (Kg) | 1.0 | 1.0 | 1.0 |
| Water (mL) | 300 | 300 | 300 |
| Mint (paste) (gm) | 20 | 20 | 20 |
| Coriander (Ground) (gm) | 5 | 5 | 5 |
| Cumin (Ground) (gm) | 5 | 5 | 5 |
| White Mustard (Ground) (gm) | 5 | 5 | 5 |
| White Pepper (Ground) (gm) | 3.5 | 3.5 | 3.5 |
| Green chili (paste) (gm) | 5 | 5 | 5 |
| Tamarind extract(gm) | 5 | 5 | 5 |
| Rock Salt(gm) | 7 | 7 | 7 |
| Sugar (gm) | 160 | 160 | 160 |
| Salt (gm) | 5 | 5 | 5 |

A= Borhani prepared by whole Milk curd; B= Borhani prepared by skim Milk curd; C= Borhani prepared by full cream powder Milk curd

2.4. Preparation of milk curd

Milk curd was prepared from full cream powder milk according to Ghosh, 2013. Briefly; 130gm powder milk was mixed in 1000mL of water and boiled. When the milk was cooled down to 40 - 45⁰C, then 1.5% mixed non-descriptive starter culture was added and kept undisturbed condition in incubator (JP Selecta, Nil km: 585.1, Spain) at 42⁰C temperature for 5 hours.

2.5. Preparation of borhani

Borhani prepared from whole milk curd, skim milk curd and full cream powder milk curd same amount of prepared Milk curd, mint (paste), coriander, cumin, white mustard, white pepper, green chilli, tamarind extract, sugar, salt and water were mixed. After mixing filtration was done by muslin cloth and stirring the filtrate, 100ml ice was added.

2.6. Analysis of borhani

Organoleptic and chemical tests were performed immediately after preparation at laboratory of dairy chemistry and technology of Department of Dairy Science, BAU, Mymensingh.

2.6.1. Organoleptic tests

A panel of seven experienced judges examined the samples smell and taste (50), body and consistency (30), color and appearance (20). Score card for judging Borhani were as Excellent: 91-100%, Good: 81-90%, Fair: 71-80% and poor: below 70%.

2.6.2. Chemical tests

Chemical analysis was performed at laboratory of dairy chemistry and technology of Department of Dairy Science, BAU, Mymensingh (Table 2).

Table 2. Chemical tests and methods.

| Tests | Method used | References |
|------------------|--------------------------|-----------------------------|
| i. Acidity | Titration with N/10 NaOH | Aggarwala and Sharma (1961) |
| ii. Total solids | Oven drying method | A.O.A.C (2003) |
| iii. Fat | Babcock method | Aggarwala and Sharma (1961) |
| iv. Protein | Kjeldahl method | A.O.A.C (2003) |
| v. Ash | Incineration | A.O.A.C (2003) |
| vi. Carbohydrate | Indirect method | By Calculation |

2.6.2.1. Estimation of carbohydrate of borhani sample

Carbohydrate of borhani samples was not determined directly. It was calculated by the following formula:

$$\text{Carbohydrate (\%)} = \text{TS\%} - (\text{Fat \%} + \text{Protein \%} + \text{Ash \%})$$

2.6.3. Microbiological tests:

All the samples were tested for their microbiological qualities using the following parameters:

- i. Total viable count (cfu/mL)
- ii. Coliform count (cfu/mL).
- iii. Yeast and Mould count (cfu/mL)

i. Estimation of total viable count

For total viable count of borhani samples, standard plate count was done according to the method described by "Standard Methods for the Examination of Dairy Products" (American Public Health Association). Briefly; media was prepared using Tryptone Glucose Yeast Extract (TGYE). Dilution was placed in the Petridis and then agar media was poured in and gently tilted, then kept undisturbed to solidify the agar media. After solidification, inverted incubation was performed at 32⁰C for 48 hours and counted colonies with the aid of a colony counter.

ii. Estimation of coliform count

Coliform count of borhani samples was done according to "Standard Methods for the Examination of Dairy Products" by American Public Health Association. Briefly; media was prepared using Violate Red Bile (VRB) agar. After dilution surface layering after solidification of first layer of VRB agar into Petridis, a second layer was made over the first by pouring few mL of the same agar. After solidification of agar, the plates were inverted and incubated at 32⁰C for 48 hours. After incubation, the plates were taken out from the incubator and dark red colonies were counted.

iii. Estimation of Yeast and mold count (cfu/mL)

Yeast and mold count was done according to "Standard Methods for the Examination of Dairy Products" by American Public Health Association. Placed yeast and mold count plate on flat surface and properly inoculated 1mL test suspension. After that left the plate undisturbed 1 min to let gel solidify. Placed plate in incubator in horizontal position, clear side up, in stacks not exceeding 20 units. Incubated plates 5 days at 20-25⁰C. Counted plates promptly after incubation period. Yeast appeared as blue-green or off-white in color and form small defined colonies. Mold colonies are usually blue but may also assume their natural pigmentation (e.g. black, yellow, green). To calculate yeast and mold count, multiply total number of yeast and mold colonies/plate (or average number of colonies/plate, if counting duplicate plates of same dilution) by appropriate dilution factor. When counting colonies on duplicate plates of consecutive dilutions, calculate mean number of colonies for each dilution before determining average yeast and mold count.

2.7. Statistical analysis

Data were analyzed with the help of SPSS (Statistical Package for Social Science, IBM-17 Corporation, 2014) software and MS excel 2007 were also used for data analysis. Completely randomized design (CRD) was performed to investigate the effect of different treatments on the parameters of borhani. Also, means were compared by using Duncan's Multiple Range Test (DMRT) in Web Agri. Stat Package (WASP) as described by Gomez and Gomez (1984).

3. Results and discussion

3.1. Organoleptic parameters

The results of organoleptic characteristics such as smell and taste, body and consistency, and color and appearance (Table 3).

3.1.1. Color and appearance

Among the borhani, color and appearance of sample C obtained highest scores (18.00±0.01) and sample B borhani obtained lowest scores (17.33±0.33) because sample C borhani prepared from full cream powder milk curd and sample B borhani prepared from skim milk curd. Similar result also found by Ghosh (2013). Statistical analysis showed that there was no significant difference of the color and appearance scores of among different borhani samples.

Table 3. Comparison of average score of various organoleptic characteristics of borhani prepared by different milk curd.

| Parameters | Types of sample | | | Level of Sig. |
|---------------------------|----------------------------|----------------------------|----------------------------|---------------|
| | A (Mean ± SE) | B (Mean ± SE) | C (Mean ± SE) | |
| Color and appearance (20) | 17.67 ± 0.33 | 17.33 ± 0.33 | 18.00 ± 0.01 | NS |
| Smell and taste (50) | 47.33 ^a ± 0.33 | 45.00 ^{bc} ± 0.57 | 46.00 ^{ab} ± 0.57 | * |
| Body and consistency (30) | 26.33 ^{ab} ± 0.33 | 25.33 ^{bc} ± 0.33 | 26.67 ^a ± 0.33 | * |
| Total score (100) | 91.33 ^a ± 0.88 | 87.67 ^c ± 0.33 | 90.67 ^{ab} ± 0.67 | * |

^{a,b,c} Mean values within a row having different superscripts differ significantly. *Significant at $p < 0.05$.

A= Borhani prepared by whole milk curd; B= Borhani prepared by skim milk curd; C= Borhani prepared by full cream powder milk curd

3.1.2. Smell and taste

The borhani sample A was superior in smell and taste (47.33 ± 0.33) than the others sample. Among the different types of borhani samples, sample B was lowest (45.00 ± 0.57) smell and taste scores. But others two samples of borhani, the smell and taste scores were nearly similar. Statistical analysis showed that there was significant difference in smell and taste among different borhani samples. Similar type of result of smell and taste scores (46.33 ± 3.21) was also in borhani found by Ghosh (2013).

3.1.3. Body and consistency

The mean of body and consistency scores were significantly ($P < 0.05$) differ among the different types of borhani samples. Higher value of body and consistency scores (26.67 ± 0.33) was found in sample C. The present study found coherence with Moserrof (2015) worked on borhani prepared from whole milk dahi.

3.1.4. Total organoleptic score

Compositional factors of the sample A borhani was contained higher (91.33 ± 0.88) than others because it was prepared from whole milk curd. The statistical analysis showed that there was significant difference ($P < 0.05$) among different types of borhani samples.

3.2. Chemical parameters

Chemical parameters are also important indicators of quality measures of prepared borhani. Results obtained from different parameters are presented in bellow as Table 4.

Table 4. Comparison of average score of various chemical compositions of borhani prepared by different milk curd.

| Parameters | Types of sample | | | Level of Sig. |
|------------------|----------------------------|---------------------------|----------------------------|---------------|
| | A (Mean ± SE) | B (Mean ± SE) | C (Mean ± SE) | |
| Acidity (%) | 0.80 ^c ± 0.01 | 0.86 ^a ± 0.01 | 0.83 ^b ± 0.00 | ** |
| pH | 4.25 ^a ± 0.02 | 3.95 ^c ± 0.02 | 4.11 ^b ± 0.01 | ** |
| Moisture (%) | 81.85 ^{bc} ± 0.16 | 84.86 ^a ± 0.18 | 82.27 ^b ± 0.08 | ** |
| Total solids (%) | 18.15 ^a ± 0.16 | 15.14 ^c ± 0.18 | 17.73 ^{ab} ± 0.08 | ** |
| Fat (%) | 2.95 ^a ± 0.03 | 0.22 ^c ± 0.01 | 2.38 ^b ± 0.01 | ** |
| Protein (%) | 2.88 ^a ± 0.02 | 2.82 ^{ab} ± 0.02 | 2.60 ^c ± 0.01 | * |
| Lactose (%) | 11.12 ^a ± 0.06 | 10.50 ^b ± 0.09 | 10.38 ^{bc} ± 0.13 | ** |
| Ash (%) | 1.82 ^a ± 0.02 | 1.72 ^{ab} ± 0.05 | 1.64 ^{bc} ± 0.02 | * |

^{a,b,c} Mean values within a row having different superscripts differ significantly. **Significant at $p < 0.01$, *Significant at $p < 0.05$.

A= Borhani prepared by whole milk curd; B= Borhani prepared by skim milk curd; C= Borhani prepared by full cream powder milk curd

3.2.1. Acidity

The acidity of sample A was lowest (0.80 ± 0.01) than the others. The statistical analysis showed that there was significant difference ($P < 0.01$) among different types of borhani samples. The results in respect of acidity percentage are in agreement with the findings of Moserrof (2015) and Ghosh (2013).

3.2.2. pH

The pH of sample A borhani was highest (4.25 ± 0.02) and sample B borhani was lowest (3.95 ± 0.02). The statistical analysis showed that there was significant difference ($P < 0.01$) among different types of borhani. The results of the present study in respect of average pH were in agreement with the findings of Moserrof (2015) and Ghosh (2013) who prepared borhani from whole milk dahi (4.20 ± 0.10) and (4.20 ± 0.10) respectively.

3.2.3. Total solids content

If the whole milk contained higher amount of fat, protein, lactose and ash that were affected the total solids in prepared borhani for obtaining the highest scores (18.15 ± 0.16) shown in (Table 4) which is the reason for obtaining the highest scores for sample A borhani. The statistical analysis showed that there was significant difference ($P < 0.01$) among different borhani samples.

3.2.4. Fat content

The sample A borhani was found highest fat% (2.95 ± 0.03) and sample B borhani was found lowest fat% (0.22 ± 0.01) depend on the initial composition of raw materials. Results of the study in respect of fat were in agreement with the findings of Moserrof (2015) who worked on borhani prepared from whole milk dahi (fat content of borhani 2.63 ± 0.30), Aneja *et al.* (2001) worked on lassi (with the range of fat content of lassi is 15 to 38 g/kg).

3.2.5. Protein content

The protein percentage of sample A was higher (2.88 ± 0.02) followed by sample B borhani (2.82 ± 0.02) and samples C borhani (2.60 ± 0.01). The protein content of all samples of borhani that were prepared from whole milk, skim milk and full cream powder milk curd significantly different ($P < 0.05$) among those mean values.

3.2.6. Lactose

Sample A borhani was obtained higher scores (11.12 ± 0.06) and sample C borhani obtained lowest scores (10.38 ± 0.13). Differences were highly significant ($P < 0.01$) among those mean values.

3.2.7. Ash content

Borhani sample A obtained the highest amount ash (1.82 ± 0.02) and sample C borhani obtained lowest amount ash (1.64 ± 0.02) because of the raw materials using whole milk, skim milk and full cream powdered milk curd formation. The statistical analysis showed that there was significant difference ($P < 0.05$) among different of borhani samples.

3.3. Microbiological status

The microbiological status such as total viable count, coliform count and yeast and mold count were presented in Table no. 5.

Table 5. Comparison of average score of various microbiological status of borhani prepared by different levels of milk curd.

| Parameters | Types of sample | | | Level of Sig. |
|----------------------------------|--------------------|--------------------|--------------------|---------------|
| | A (Mean±SE) | B (Mean±SE) | C (Mean±SE) | |
| TVC ($\times 10^4$) (c.f.u/mL) | $60.67^c \pm 2.33$ | $72.00^b \pm 1.73$ | $81.33^a \pm 1.85$ | ** |
| Coliform count (c.f.u/mL) | 0 | 0 | 0 | |
| Yeast and mold count | 3.33 ± 3.33 | 10.00 ± 0.00 | 10.00 ± 0.00 | NS |

^{a,b,c} Mean values within a row having different superscripts differ significantly. **Significant at $p < 0.01$.

NS= Non-Significant.

A= Borhani prepared by whole milk curd; B= Borhani prepared by skim milk curd; C= Borhani prepared by full cream powder milk curd

Total viable count of sample C borhani was higher (81.33 ± 1.85) followed by sample B borhani ($72.00 \pm 1.73 \times 10^4$) and sample A borhani ($60.67 \pm 2.33 \times 10^4$). But coliform count was nil or absent in all samples of borhani. It was found that sample A borhani was contained lowest number of yeast and mold (3.33 ± 3.33 cfu/mL) and sample B and C borhani was contained same number of yeast and mold (10.00 ± 0.00 cfu/mL). Similar observation also perceived by Moserrof (2015), Ghosh (2013) and Adolfsson *et al.* (2004).

3.4. Cost analysis

Table 6. Cost analysis of different borhani.

| Ingredients | Cost (Tk/kg) | | | Level of significance |
|-------------|--------------------------|-------------------------|--------------------------|-----------------------|
| | A (Mean±SE) | B (Mean±SE) | C (Mean±SE) | |
| Yoghurt | 48.89 | 29.63 | 39.93 | |
| Spice | 9.53 | 9.53 | 9.53 | |
| Sugar | 7.11 | 7.11 | 7.11 | |
| Electricity | 5 | 5 | 5 | |
| Total | 70.53 ^a ±0.01 | 51.27 ^c ±0.0 | 61.57 ^b ±0.01 | ** |

^{a,b,c} Means with different superscript in the same raw differ significantly; **= Significant at 1% level of probability

A= Borhani prepared by whole milk curd; B= Borhani prepared by skim milk curd; C= Borhani prepared by full cream powder milk curd

Statistical analysis showed that there was significant difference was found from the cost analysis among the borhani samples (Table 6). The cost of sample A borhani is not too higher than the other samples. The nutritive value and the consumer preference of sample A was better than the others. The results of the present investigation in respect of coliform content are in agreement with the findings of Ghosh (2013) who worked on borhani.

4. Conclusions

The nutritive value and the consumer preference of borhani prepared by whole milk curd was better than the others, but borhani prepared by skim milk curd and full cream powder milk curd was cost effective than borhani prepared by whole milk curd. However due to nutritive value and the consumer preference can be concluded that borhani prepared by whole milk curd was best among the other types of borhani.

Conflict of interest

None to declare.

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