



International Journal of
Dairy Science

ISSN 1811-9743



Academic
Journals Inc.

www.academicjournals.com

A Comparative Study on the Quality of Dahi (Yoghurt) Prepared from Cow, Goat and Buffalo Milk

¹A. Nahar, ¹M. Al-Amin, ²S.M.K. Alam, ²A. Wadud and ²M.N. Islam

¹Department of Livestock Services (DLS),

Breed Up Gradation Through Progeny Test Project, Bangladesh

²Department of Dairy Science, Bangladesh Agricultural University,
Mymensingh, Bangladesh

Abstract: The experiment was carried out with an aim to assess the quality of Dahi prepared from cow, goat and buffalo milk. With that understanding, milk samples were collected from Bangladesh Agricultural University Dairy farm; Senbari, Mymensingh; Gobiddoher, Mymensingh and Dahi samples were analyzed in the Dairy Technology and Animal Nutrition Laboratory of the Bangladesh Agricultural University, Mymensingh. The parameters used to monitor the quality of Dahi samples were physical (smell and taste, body and consistency, color and texture), chemical (protein, fat, total solids, ash, acidity and pH) and microbiological (gram positive rods and cocci, total viable count, coliform and mould count). From the result of all parameters it can be concluded that Dahi prepared from cows milk in the Dairy Technology Laboratory, Department of Dairy Science was superior to Dahi samples in same place from buffalo and goat milk. Most of the nutritional parameters it can be found that Dahi sample prepared from buffalo milk scored the highest. From the nutritional point of view it can be showed that Dahi prepared from buffalo and goat milk was not so bad. So, the people of our country are suggested to prepare Dahi from cow, buffalo and goat milk and also follow to strict hygienic conditions in order to get good quality Dahi.

Key words: Milk, dahi quality, physical and chemical microbiological test

INTRODUCTION

Milk is very nutritious and perhaps an indispensable food for human being. But in this area of industrialization, food habit of common people is changing. They are preferring more healthy, delicious foods to fresh raw foods. Hence, milk is converted to various products. Yoghurt is one of them locally called *Dahi*. About 4% of the total milk produced in Bangladesh is used for the preparation of Dahi (Mustafa, 1997). Dahi is prepared by using mixed culture of *Streptococcus lactis*, *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Streptococcus citrophilus*, *Lactobacillus plantarum* etc. Like milk, Dahi is also very nutritious. It has been demonstrated that acid milk is somewhat digestible than normal milk. For some individuals, Dahi has a definite therapeutic value, especially who usually suffer from stomach and intestinal disorders. The use based on the assumption that the acid fermenting bacteria and lactose of milk are able to create conditions in the intestinal tract which are unfavourable for the growth of putrefactive bacteria and thereby prevents the formation of gas and a condition known as 'auto-intoxication'. Yoghurt is also effective in lowering the blood cholesterol level. Following

Corresponding Author: M. Al-Amin, Department of Livestock Services (DLS),
Breed Up Gradation Through Progeny Test Project, Bangladesh, Tel: 8801718327773

this discovery, considerable amount of *L. acidophilus* were distributed in the form of a milk culture of the organism. If acidophilus therapy is to be of any value, large number of viable cells of a readily implantable strain of the organism must be consumed daily, along with a suitable carbohydrate such as lactose or dextrin. Presumably these carbohydrates are effective because they are absorbed from the tract fairly slowly, thus remaining available longer as food for the lactobacilli (Foster *et al.*, 1958).

The nutritive value of milk and milk products depends upon their cleanliness, purity and wholesomeness. Milk products having those characteristics are great consumer's demand. But they lack uniformity from place to place. To solve this problem, we have a unique fermented milk product Dahi. For this, a desirable standard for the manufacture of Dahi should be established according to the average consumer's of Bangladesh.

Some research works have been done in different countries on the quality of Dahi prepared from cow and buffalo milk. But very limited works have been done on the quality of Dahi made from goat milk. Hence, an attempt was made to judge the quality of Dahi prepared from cow, buffalo and goat milk. This experiment is carrying significance in this country condition because the people of our country have no idea about the new food product. This new food product can bring significant change in our national health. Moreover, the availability of data on cow, buffalo and goat milk and its Dahi is scanty, so this experiment is very important for practical point of view.

MATERIALS AND METHODS

This research was conducted at the Dairy Technology and Animal Nutrition Laboratory, Bangladesh Agricultural University, Mymensingh during the period of July 04 to August 19, 2005. Cow milk was collected from Bangladesh Agricultural University (BAU) Dairy Farm. Buffalo milk was collected from Senbari; Mymensingh and goat milk was collected from Gobiddochar Mymensingh. Every three liters of fresh whole cow milk and buffalo milk and two liters of fresh whole Goat milk was collected.

Preparation of Dahi in the Laboratory

After collecting each whole milk, an attempt was made to prepare Dahi in the laboratory. At first, milk was boiled to prepare Dahi. At the time of boiling sugar at the rate of 8% was added to the whole milk. Milk was heated to boiling temperature until reduced up to 20-25% of the volume of milk. Boiled milk was then cool down to near 42°C and inoculated with 2 to 3% starter culture collected from Dairy Science Laboratory. After inoculation, warm milk of 42°C was then poured into plastic cups and kept at an incubation temperature of 37°C until complete coagulation. After complete coagulation (8-10 h) titrable acidity percentage of the curd was measured. The samples were then stored in a refrigerator at about 4°C for further analysis.

Judging of Dahi

Organoleptic test (smell and taste; Body and consistency; Color and texture) were done immediately after preparation of each batches of Dahi. Organoleptic test was performed by a panel of expert judges (Nelson, 1948).

Chemical Analysis

Before preparation of Dahi, initial quality of collected milk samples was measured by conducting several tests in the laboratory. The tests were as follows; Acidity (%), Specific Gravity, Fat (%), Total Solids (TS%) and Protein (%).

Milk and Dahi

Before preparation of Dahi, initial quality of collected milk samples was measured by conducting several tests in the laboratory. The tests were acidity (%), specific gravity, fat (%), total solids (TS%) and protein (%). Total solids content of the milk samples were determined by oven dry method according to AOAC (1990). Specific gravity was performed by using Quevenne lactometer, according to the method described by Aggarwala and Sharma (1961). Fat per cent was determined by Babcock method and acidity was determined by titrating with N/10 sodium hydroxide (NaOH) solution using the procedure described by Aggarwala and Sharma (1961). Protein was determined by Kjeldahl procedure (AOAC, 1990). PH was measured with the help of a pH meter-215 (Ciba Corning Diagnostics Ltd. Sudhury, Suffolk, England Co 106xD). Ash per cent of Dahi samples were determined by oven dry method according to (AOAC, 1990).

Microbiological Test

- Determination of gram positive rod and cocci: According to gram staining method (APHA, 1967) gram positive and cocci per cent were determined.
- Determination of Total Viable Count: For Total Viable Count of Dahi samples, Standard Plate Count (SPC) was done according to the method described in Standard Methods for the Examination of Dairy Products (American Public Health Association, 1967).
- Determination of Coliform Count: Coliform count of Dahi was done according to the method as described in the Standard Methods for Examination of Dairy Products (APHA, 1967).
- Determination of Yeast and Mould Count: According to the method of Standard Methods for Examination of Dairy Products (APHA, 1982), Yeast and Mould count of Dahi was done.

Statistical Analyses

Statistical analyses of the collected information were carried out by using Completely Randomized Design (CRD) with one factor in MSTAT program. The differences among sample means were compared by calculating LSD value with the help of Least Significant Difference (Gomez, 1984).

RESULTS AND DISCUSSION

Initial Quality of Milk

The milk samples were collected from Dairy farm of Bangladesh Agricultural University (Cow); Senbari, Mymensingh (Buffalo); Gobiddochar, Mymensingh (Goat) and analyses were carried out according to procedure suggested by Aggarwala and Ahmed (1940) in order to determine the quality of milk (Table 1).

This result indicates that the milk used in the current experiment is good quality and the findings are almost similar to that of Biswas (1997) and Ghatak *et al.* (1998).

Quality of different types of Dahi

In this experiment, three different types of Dahi (Cow, Buffalo and Goat) were prepared and their physical (Organoleptic), chemical and microbiological qualities were measured by various tests.

Physical (Organoleptic) Parameters

Smell and Taste

Smell and taste score of different types of Dahi prepared from Cow, Buffalo and Goat milk were 45.50 ± 1.29 , 40.50 ± 2.52 and 38.75 ± 2.22 , respectively (Table 2). Statistical analysis showed that there

Table 1: The initial quality of Cow, Buffalo and Goat milk

Parameters	Species ($\bar{X} \pm SD$)		
	Cow	Buffalo	Goat
Acidity (%)	0.140±0.005	0.188±0.013	0.15±0.008
Specific gravity	1.030±0.001	1.029±0.0018	1.029±0.002
Fat (%)	3.99±0.06	7.83±0.67	3.68±0.46
Protein (%)	3.77±0.26	4.25±0.37	3.33±0.31
Total solids (%)	11.890±0.18	16.86±0.99	11.83±0.34

\bar{X} = Mean, SD = Standard Deviation

Table 2: Comparison of average score of various Organoleptic characteristics of Dahi prepared from Cow, Buffalo and Goat milk

Parameters	Species ($\bar{X} \pm SD$)			LSD value	Level of significance
	Cow	Buffalo	Goat		
Smell and taste	45.50±1.29	40.50±2.52	38.75±2.22	4.769	**
Body and consistency	25.00±3.56	28.00±2.16	23.75±2.63	-	NS
Color and Texture	17.00±1.83	15.50±1.29	14.05±1.29	-	NS

\bar{X} = Mean, SD = Standard Deviation, **Significant at 1% level, NS = Non Significant

was significant difference ($p < 0.01$) with in the smell and taste scores of different types of Dahi. Dahi prepared from cow milk obtained the highest score followed by Dahi prepared from Buffalo and Goat milk. So, sensory properties of samples of goat milk Dahi were rated as being inferior to those of samples prepared from cow and buffalo milk. Duitschaever (1978) reported that in his study a 32% consumers gave preference for goat milk Dahi and 68% preferred cow milk Dahi.

Body and Consistency

The mean value of body and consistency scores of Dahi prepared from cow, buffalo and goat milk were 25.00±3.56, 28.00±2.16 and 23.75±2.63. Statistical analysis showed that there was no significant difference with in the body and consistency score of different Dahi samples. Among the samples, mean value for body and consistency score was highest in case of Dahi prepared from buffalo milk and lowest for Dahi prepared from goat milk. Venkateshaiah *et al.* (1996) reported that higher levels of fat and SNF improved the body of Dahi. Bozanic *et al.* (1998) prepared yoghurt from goat milk and cow milk. They reported that yoghurt samples prepared from goat milk had a softer consistency and lower viscosity than those prepared from cow milk.

Color and Texture

The color and texture score of Dahi prepared from cow, buffalo and goat milk were 17.00±1.83, 15.5±1.29 and 14.5±1.29, respectively. Statistical analysis showed that there was no significant difference with in the color and texture score of different Dahi samples. The color and texture score was highest for cow milk Dahi and lowest for goat milk Dahi. That might be due to the fact that cow milk contains more carotene that might help to develop golden, yellowish in cow milk Dahi. Goat milk had lower content of fat and total solids, hence the color and texture score was lowest in goat milk Dahi.

Chemical Parameters

Acidity (%)

The acidity per cent of Dahi samples made from cow, buffalo and goat milk were 0.82±0.04, 0.74±0.06 and 0.93±0.03, respectively (Table 3). Highly significant difference ($p < 0.001$) were found among those mean values. Mean percentage of acidity was highest for Dahi made from goat milk, followed by cow milk where as the value was lowest for Dahi made from buffalo milk. The result

Table 3: Comparison of average chemical composition of Dahi prepared from Cow, Buffalo and Goat milk

Parameters	Species ($\bar{X} \pm SD$)			LSD value	Level of significance
	Cow	Buffalo	Goat		
Acidity (%)	0.153±0.004	0.188±0.013	0.151±0.008	0.02168	***
Specific gravity	1.029±0.0012	1.029±0.0018	1.029±0.002	0.00325	**
Fat (%)	4.180±0.26	7.830±0.63	3.68±0.46	1.130	***
Protein (%)	3.710±0.26	4.250±0.37	3.33±0.31	0.7230	**
Total solids (%)	12.160±0.18	16.860±0.99	11.83±0.34	1.415	***

\bar{X} = Mean, SD = Standard Deviation, ***Significant at 0.1% level, **Significant at 1% level

agree with the reports of Cardoso *et al.* (1991), these were found that buffalo milk Dahi acidity was 1%. Wide variation in the titrable acidity could be attributed due to different types of buffering action of protein, citrates, lactose, phosphates etc. (Jenness and Patton, 1959).

Fat (%)

The fat percent of different types of Dahi prepared from cow, buffalo and goat milk were 5.82±0.35, 10.85±0.85 and 5.16±0.65, respectively (Table 3). Statistical analysis showed that fat content of different Dahi samples differ highly significantly ($p < 0.01$). Maximum fat per cent was seen in buffalo milk Dahi, followed by cow milk Dahi and lowest in goat milk Dahi. Akin *et al.* (1995) reported that cow milk and buffalo milk Dahi contained 4.9 and 9.08% fat, respectively. El-Samragy and Samragy (1988) reported that goat milk Dahi contained 4.08% fat. The findings of these research accorded to it,

Total Solids TS (%)

The total solids per cent of cow, buffalo and goat milk Dahi were 29.99±1.64, 40.73±2.77 and 27.89±1.27, respectively (Table 3). Highly significant difference ($p < 0.001$) were found among those mean values. Average total solids content was highest for buffalo milk Dahi, followed by cow milk Dahi and that was lowest for goat milk Dahi. Ali (1998) found that fresh cow milk Dahi contained 29.06% total solids which is similar to our experimental result. Chakraborty (1998) observed that total solids content of buffalo milk Dahi was 30-67% which supports our experimental result. El-Samragy and Samragy (1998) and Park (1994) reported that goat milk Dahi contained 14.16% TS which is very low than our experimental value. Generally variation in TS content of Dahi could be attributed due to different types of milk, addition of sugar in different concentration or extent of concentration of milk during heat treatment (Ray *et al.*, 1972). In our experiment the variations in TS content was mainly due to different species of milk used in the study.

Protein (%)

The protein percent of Dahi prepared from cow, buffalo and goat milk were 4.58±0.34, 5.13±0.17 and 4.00±0.36, respectively (Table 3). Statistical analysis showed that there was significant difference ($p < 0.01$) with in the protein content of different types of Dahi. Maximum protein percent was seen in Dahi of buffalo milk, followed by cow milk and lowest protein content was noted in Dahi of goat milk. The results of this experiment agreed with the findings of Chakraborty (1998) and Ali (1998) whom found that cow milk and buffalo milk Dahi contained 4.22-4.44 and 5.1% protein, respectively. In case of goat milk Dahi the result agreed with the findings of El-Samragy and Samragy (1988) and Park (1994) whom found that average percentage of protein content of goat milk Dahi 3.80 and 3.99, respectively. Concentration of milk to about 60-70% of the original volume due to prolonged heating (Ray and Srinivasan, 1972) has positive effect on protein content of Dahi.

Ash (%)

The ash per cent of cow, buffalo and goat milk Dahi samples were 0.809 ± 0.04 , 0.98 ± 0.06 and 0.784 ± 0.06 , respectively (Table 3). Significant differences ($p<0.01$) were found among those mean values. Maximum ash percent was seen in buffalo milk Dahi, followed by cow milk Dahi and lowest in goat milk Dahi. In case of cow milk Dahi the result agreed with the findings of Rahman (1998) who reported that cow milk Dahi contained 0.825 ± 0.06 per cent ashes. The result of goat milk Dahi agreed with the work of El-Samrangy and samrangy (1988) and those found that ash content of goat milk Dahi were 0.78 and $0.818\pm 0.019\%$, respectively. Buffalo milk contained higher amount of total solids than cow and goat milk. For this reason buffalo Dahi showed higher percent of ash.

pH Value

The average pH value of different Dahi prepared from cow, buffalo and goat milk were 4.88 ± 0.20 , 5.01 ± 0.48 and 4.25 ± 0.06 , respectively. Statistical analysis showed that there was significant difference ($p<0.05$) with in the pH value of different Dahi samples.

Microbiological Parameters

Total Viable Count

The total viable bacterial count per mL. of different types of Dahi prepared from cow, buffalo and goat milk were 5.878 ± 0.03 , 5.996 ± 0.05 and 5.859 ± 0.05 (Log value), respectively (Table 4). Statistical analysis showed that significant differences ($p<0.05$) were existed among the different Dahi samples. Average highest total viable count was recorded for Dahi samples of buffalo milk, which that was lowest for goat milk Dahi. The present investigation partially supported by the result of Adeyl (1998), who found that the total viable bacteria contained per mL. of Laboratory made sweet Dahi samples were with in the range of 6.2 to 6.3 (Log value).

Coliform Count

The average coliform count per mL. of cow, buffalo and goat milk Dahi were 1.75 ± 1.20 , 2.70 ± 0.21 and 1.00 ± 1.15 (Log value), respectively (Table 4). Result demonstrated that there were wide variation in average coliform count per mL. of different Dahi samples. Average highest coliform count per mL. was found in buffalo milk Dahi, followed by cow milk Dahi and it was lowest for cow milk Dahi. Statistical significant differences were found in respect of coliform count per mL. of different Dahi samples. Overall result of this parameter agreed with that of the result of Islam (1999) who found that coliform count per mL. of Laboratory made Dahi was 2.64 ± 2.05 (Log value). The presence of coliform organisms in Dahi samples indicate that contamination during its production and handling may cause public health problems. The possible sources of contamination of product are un cleaned hands of the manufactures, poor quality water used to cleaned earthen pots and exposure of the product to open air during setting of curd.

Yeast and Mould Count

Microscopic examination showed that average mould count per mL. of cow, buffalo and goat milk Dahi were 1.44 ± 1.07 , 1.889 ± 0.59 and 2.064 ± 0.44 (Log value), respectively (Table 4). Average highest mould count per mL. was found in goat milk and lowest in cow milk Dahi. No significant differences were found among the different Dahi samples. No yeast count was observed, may be due to strict sanitary management.

From the result of overall analysis, it could be advocated that Dahi made from cow milk was the best among the Dahi made from cow, buffalo and goat milk. However, Dahi made from buffalo and goat milk, respectively adorned the 2nd and 3rd position. Although buffalo and goat milk Dahi ranked

Table 4: Comparison of average microbiological status of Dahi prepared from Cow, Buffalo and Goat milk

Parameters	Species ($\bar{X} \pm SD$)			LSD value	Level of significance
	Cow	Buffalo	Goat		
Gram positive Cocci (%)	64.140±4.33	67.850±3.65	62.170±5.78	-	NS
Gram positive Rod (%)	35.860±4.33	32.150±3.65	37.830±5.78	-	NS
Total viable count (Log value) mL ⁻¹ of Dahi	5.878±0.03	5.996±0.05	5.859±0.05	0.1028	**
Coliform count (Log value) mL ⁻¹ of Dahi	1.75±1.20	2.70±0.21	1.00±1.15	-	NS
Mould count (Log value) mL ⁻¹ of Dahi	1.445±1.07	1.889±0.59	2.06±0.44	-	NS

\bar{X} = Mean, SD = Standard Deviation, **Significant at 1% level, NS = Non Significant

second and third position, respectively but their nutrient content were also excellent. This sort of innovation may carry benefit for utilization of buffalo and goat milk. In our village condition only a little amount of goat milk and their Dahi is used as medicinal product, like for healing wounds. Attempts should be made to popularize buffalo and goat milk Dahi through the country. So, introduction of buffalo and goat milk for Dahi preparation will not only support better utilization of it but also reduces extra load on cow milk.

REFERENCES

- Adeyl, F.M.M., 1998. Studies on the physical, chemical and microbiological quality of misti dahi of different districts of Bangladesh. MS Thesis, Bangladesh Agricultural University, Mymensingh, Bangladesh.
- Aggarwala, A.C. and S.D. Ahmed, 1940. A Laboratory Manual of Milk Inspection. 2nd Edn., Messrs Gulab Chand Kapur and Sons. Lahor, Pakistan.
- Aggarwala, A.C. and Sharma, 1961. A Laboratory Manual of Milk Inspection. Bombay, Calcutta, New Delhi, India.
- Akin, N., P. Rice and R. Holdich, 1995. The vacuum filtration of yoghurt. Cult. Dai. Prod. J., 30: 2-4.
- Ali, M.D.Y., 1998. A Comparative Study on the Quality of Dahi (Yoghurt) available in Mymensingh Town. MS Thesis, Bangladesh Agricultural University, Mymensingh, Bangladesh.
- AOAC., 1990. Official Methods of Analysis. 15th Edn., Association of Official Analytical Chemists, Arlington, Virginia.
- APHA., 1982. American Public Health Association. USA.
- Biswas, A.A., 1997. Effect of Banana (*Musa sapientum*) leaf on keeping quality of raw milk. MS Thesis. Bangladesh Agricultural University, Mymensingh, Bangladesh.
- Bozanic, R., L. Tratnik and O. Maric, 1998. The influences of goat milk on the viscosity and microbiological quality of yoghurt during storage. Mljekarstvo, 48: 63-74.
- Cardoso, F., C. Iniguez and R. Morgado, 1991. Effect of heat treatment on firmness of yoghurt made from buffalo milk. Revista Cubana-de-Alimentacion-Y-Nutrition, 5: 114-117.
- Chakraborty, M., 1998. A study on the preparation of dahi from whole milk of cow, buffalo and their different proportionate mixture. MS Thesis. Bang. Agricultural University, Mymensingh, Bangladesh.
- Duitschaever, C.L., 1978. Yoghurt from goat milk. Cultured Dairy Products J., 13: 20-23.
- El-Samragy, Y.A. and El Y.A. Samragy, 1988. The manufacture of zabady from goat milk. Milchwissenschaft, 43: 92-94.
- Foster, E.M., F.E. Nelson, M.L. Speck, R.N. Doetch and J.C. Olson, 1958. Dairy Microbiology. Macmillan Co. Ltd. London, pp: 19-20, 325-377.

- Ghatak, P.K., A.K. Bandyopadhyay and M.P. Gupta, 1989. The relation between the heat stability of milk and its chemical composition. *Asian J. Dairy Res.*, 8: 165-168.
- Gomez, A.K. and A.A. Gomez, 1984. *Statistical Procedures for Agricultural Research*. 2nd Edn., Jhon Wiley and Sons, pp: 95-109.
- Islam, M.D.S., 1999. A comparative study on the quality of Laboratory prepared and local village market Dahi. MS Thesis. Bangladesh Agricultural University, Mymensingh, Bangladesh.
- Jennes, R. and S. Patton, 1959. *Principles of Dairy Chemistry*. John Wiley and Sons, Inc. New York.
- Mustafa, M., 1997. A study on the preparation of fruit Dahi (Yoghurt). MS Thesis. Bangladesh Agricultural University, Mymensingh, Bangladesh..
- Nelson, J.A. and G.M. Trout, 1948. *Judging Dairy Products*. The Olsen Publishing Co. Wisconsin.
- Park, Y.W., 1994. Nutrient and Mineral composition on commercial US goat milk Yoghurt. *Small Ruminant Res.*, 13: 63-70.
- Rahman, S.M.R., 1998. A study on the manufacture and shelf-life of jack fruit Dahi (Yoghurt). MS Thesis. Bangladesh Agricultural University, Mymensingh, Bangladesh.
- Ray, H.P. and R.A. Srinivasan, 1972. Use of micro organism for production of indigenous fermented milk products (Sweetened Dahi). *J. Food. Sci. Tec.*, 9: 62.
- Venkateshaiah, B.V., C. Kempanna and H.M. Jayaprakash, 1996. Effect of different levels of fat, S.N.F and acidity on the sensory qualities of frozen yoghurt. *Ind. J. Dairy Bio. Sci.*, 7: 38-40.