Quality of Yogurt (Dahi) Made in Laboratory and Available in the Market of Mymensingh Town in Bangladesh

1M. Y. Ali, 2M. A. Islam, 3M. J. Alam and M. N. Islam
Department of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh
1Livestock Development Programme, Proshika Dhaka, Bangladesh
2Poultry Research Division, BLRI, Savar, Dhak, Bangladesh
3Department of Animal Science, BAU Mymensingh, Bangladesh

Abstract: Yogurt samples from ten different shops of Mymensingh Town and Laboratory made in 3 batches were analyzed in the Dairy Technology Laboratory, Department of Dairy Science, Bangladesh Agricultural University to monitor the quality. Significant differences in overall score of physical test (smell and taste, body and consistence, colour and texture), chemical (protein, fat, total solids, ash, acidity and pH) and microbiological status was found among different yogurt samples. Laboratory made yogurt was the best in quality. Dayamoy and Anil Gosh were in 2nd and 3rd position in quality of yogurt. This investigation suggested that adulterated milk must be avoided in yogurt preparation and also to follow strict hygienic condition in order to have good quality yogurt.

Key words: Yogurt/ dahi, local markets, laboratory, physical, chemical, microbiological test, adulteration

Introduction
Yogurt or dahi is a fermented milk product, which may be made from whole or skim milk. It is very popular and nutritious dish in Bangladesh. Consumer can take it without having any harmful effect. It is easily digested and vital for health because of its high protein and fat content, lactose, minerals specially Ca and P content, important vitamins and lactic acid (Robson, 1981; Loxmanayaraya, 1952). Yogurt or dahi may be plane or flavored with sugar cane (Sweet) fruit juices or jam with pure culture of Streptococcus thermophilus and Lactobacillus bulgaricus in a ratio of 1:1 for quality yogurt / dahi. Adding sugar and mango juice enrich the quality of yogurt (Shakoor et al., 1994).

Though yogurt or dahi are similar dairy products but there are some discrepancy between them. Dahi is prepared using mixed culture of Streptococcus lactis, Lactobacillus bulgaricus, Streptococcus thermophilus, Streptococcus citrinus and Lactobacillus planetarius etc.

An evidence indicated that live and active bacteria in yogurt enhanced specific or non-specific immune mechanisms which protected against pathogens microbes and viruses. That is why it may protect against heart disease and cancer (Dairy Industries International, September, 1991). A number of sweet yogurt or dahi are being prepared in different areas of Mymensingh town. But there is no standard to make quality yogurt. That is why, they make yogurt in their own way. So, the present study was undertaken to monitor the quality of yogurt available in different shops of Mymensingh as representative town and standard yogurt prepared in the Dairy Technology Laboratory of Bangladesh Agricultural University.

Materials and Methods
The experiment was carried out in the Dairy Technology Laboratory, Dept. of Dairy Science, Bangladesh Agricultural University, Mymensingh, Bangladesh for the period of June to August 1997.

Preparation of yogurt in the laboratory: Yogurt sample was prepared in the Laboratory under strict hygienic conditions as per the procedure of Ramgappa and Achaya (1974). Whole milk was collected from the BAU Dairy Farm and standardized adjusting 3.5% fat and 8.5% SNF. Milk was boiled and stirred for 30 minutes from the boiling point. Boiled milk was cooled down to near 42°C and inoculated with 2% cultures collected from local market. Incubated warm milk (42°C) was poured into several pre-boiled water washed plastic cups and kept at an incubation temperature of 37°C until complete coagulation. After 8-12 hours of complete coagulation yogurt samples were stored in the refrigerator at 5°C until used.

Collection of market yogurt: Yogurt samples from ten different sweet-meat shops Mymensingh Town and BAU Kamal-Ranjit Market namely Mononi (M1), Krishna Cabin (M2), Joygyro (M3), Kamal-Ranjit Market (M4), Bhai Bhai Restaurant (M5), Jabbar (M6), Dayamoy (M7), Anil Gosh (M8), Ma Monorona (M9) and Sudir Gosh (M10) in 3 batches of market and Laboratory made (C-control) having 150-200g in each sample were collected. All the samples were packed separately in small size plastic pots and stored in the refrigerator at 5°C until judging. The following tests were made on 33 samples (11x3).

Physical tests (sensory and organoleptic evaluation): All yogurt samples were judged to evaluate the smell and taste, body and consistence, colour and texture and then by the overall of physical score of the samples by a panel of some aged expert judges.

Chemical analysis: Acidity, protein and fat % were determined as per procedure of Aggarwala and Sharma, (1961), and total solid and Ash as per methods of AOAC (1990). pH value was measured with the help of pH-meter-215 (Ciba Corning Diagnostics Ltd. Sudbury, Suffolk, England Co. 106 XD).

Microbiological tests: Yogurt samples were tested by gram staining method for counting the gram positive rod, cocci and yeast’s.

Statistical analysis: Data were analyzed using computer MSTATS package programme. The differences among shops means were compared by Duncan’s Multiple Range Test (DMRT) (Gomez and Gomez, 1984)

Results and Discussion
Physical tests (organoleptic evaluation): The significant differences were not found for smell and taste, colour and texture score of different sweetmeat shops and laboratory made yogurt or dahi (P > 0.05) (Table 1).

But the score of body and consistence and over all score of different yogurt samples differed significantly. The highest score body and consistence was found in Laboratory made Yogurt (26.66) and the lowest in Kamal-Ranjit Market yogurt (18.33). As per overall score of the organoleptic panel taste, different
### Table 1: Average score of various sensory or organoleptic properties of yogurt collected from different sweetmart shops and prepared in the laboratory

| Physical Parameters | Monroni | Krishna | Joyguru | Kannal Ranjit | Bhil Bhil | Jajbar | Dayamoy | Anil Ghosh | Mt Monroni | Sudir Ghosh | Laboratory | SED Value | Level of significance |
|---------------------|---------|---------|---------|---------------|-----------|--------|---------|------------|------------|------------|------------|-----------|-----------|----------------------|
| Small and Taste (50) | 32.33±6.81 | 36.66±5.77 | 32.33±6.86 | 28.9±6.64 | 36.9±5.0 | 36.3±1.53 | 40.0±2.0 | 37.0±2.68 | 29.33±1.56 | 34.33±3.61 | 38.0±6.56 | 4.25 | NS |
| Body and Consistency (30) | 22.33±4.04 | 23.66±3.21 | 20.66±1.16 | 18.33±1.53 | 25.33±0.58 | 24.0±2.0 | 24.0±1.73 | 23.66±3.21 | 21.6±2.08 | 25.6±1.09 | 26.6±3.06 | 2.90 | * |
| Colour and Texture (20) | 13.66±3.21 | 15.00±2.00 | 13.0±2.65 | 13.66±0.85 | 15.33±1.53 | 14.33±1.53 | 13.33±1.46 | 16.33±1.53 | 13.0±1.0 | 12.33±2.92 | 16.0±4.58 | 2.12 | NS |
| Overall Score | 60.33±1.75 | 75.33±1.01 | 65.99±2.25 | 60.39±1.50 | 75.09±1.0 | 74.86±1.0 | 77.33±0.5 | 76.99±2.1 | 63.99±3.25 | 71.66±2.3 | 81.66±2.48 | 1.60 | ** |

* = Mean
SD = Standard deviation
** = P< 0.01
* = P< 0.05

### Table 2: Comparison of average chemical composition of dairy collected from different sweetmart shops and prepared in the laboratory (Chemical Test)  

| Physical Parameters | Monroni | Krishna | Joyguru | Kannal Ranjit | Bhil Bhil | Jajbar | Dayamoy | Anil Ghosh | Mt Monroni | Sudir Ghosh | Laboratory | SED Value | Level of significance |
|---------------------|---------|---------|---------|---------------|-----------|--------|---------|------------|------------|------------|------------|-----------|-----------|----------------------|
| Fat % | 0.97±0.15 | 1.16±0.15 | 1.03±0.10 | 1.9±0.10 | 2.0±0.10 | 1.9±0.10 | 2.3±0.15 | 2.2±0.20 | 1.73±0.21 | 2.03±0.06 | 4.3±0.10 | 0.18 | ** |
| Protein % | 4.6±0.10 | 3.88±0.24 | 4.48±0.19 | 4.36±0.21 | 4.16±0.18 | 4.51±0.28 | 4.60±0.10 | 4.16±0.15 | 4.43±0.06 | 4.33±0.21 | 4.44±0.06 | 0.24 | ** |
| Total solids % | 26.0±1.6 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 26.0±1.2 | 1.64 | ** |
| Ash % | 1.21±0.10 | 1.5±0.10 | 1.45±0.08 | 1.35±0.05 | 1.17±0.05 | 0.93±0.15 | 1.03±0.21 | 1.2±0.10 | 1.32±0.08 | 1.15±0.13 | 1.17±0.16 | 0.093 | ** |
| pH | 4.7±0.01 | 4.8±0.01 | 4.6±0.01 | 4.6±0.01 | 5.0±0.07 | 4.8±0.01 | 4.9±0.01 | 4.9±0.01 | 4.7±0.01 | 4.7±0.01 | 4.7±0.01 | 0.025 | ** |
| Acidity % | 0.67±0.01 | 0.637±0.03 | 0.727±0.03 | 0.86±0.07 | 0.60±0.08 | 0.757±0.02 | 0.757±0.02 | 0.643±0.03 | 0.847±0.13 | 0.827±0.03 | 0.78±0.07 | 0.03 | ** |

* = Mean
SD = Standard deviation
** = P< 0.01

### Table 3: Comparison of average microbiological status of dairy collected from different sweetmart shops and prepared in the laboratory (Microbiological Test)  

| Microbiological Parameters | Monroni | Krishna | Joyguru | Kannal Ranjit | Bhil Bhil | Jajbar | Dayamoy | Anil Ghosh | Mt Monroni | Sudir Ghosh | Laboratory | SED Value | Level of significance |
|-----------------------------|---------|---------|---------|---------------|-----------|--------|---------|------------|------------|------------|------------|-----------|-----------|----------------------|
| Gram positive cocci % | 52.0±2 | 65.6±5.13 | 80.6±4.94 | 26.3±4.72 | 57.6±2.51 | 83.3±3.06 | 48.6±3.51 | 50.3±3.51 | 41.3±3.86 | 37.3±2.08 | 47.6±2.51 | 2.73 | ** |
| Gram positive rod % | 44.6±3.06 | 22.0±2.00 | 16.0±3.00 | 42.3±3.51 | 42.6±2.08 | 17.3±3.06 | 46.6±2.00 | 47.6±2.51 | 56.3±2.51 | 56.3±1.15 | 48.6±3.51 | 2.18 | ** |
| Yeast % | 7.33±1.62 | 10.0±2.00 | 4.0±1.00 | 2.0±1.00 | 8.0±1.00 | 6.0±1.00 | 3.0±1.00 | 6.0±1.00 | 10.0±1.00 | 6.0±1.00 | 2.0±1.02 | 1.39 | ** |

* = Mean
SD = Standard deviation
** = P< 0.01

344
sweetmeat shops for quality yogurt were in position sequentially Laboratory, Dayamoy, Anil Gosh, Bhui Bhai Restaurant, Krishna Cabin, Jabbar Sudder Gosh, Manmoni, Joyguro, Me Moncoroma and Kanal-Ranjit market respectively.

Despite, there was no significant difference for smell and taste scores of different yogurt samples, Laboratory yogurt was the best (40-0) for smell and taste, and the lowest was Kanal-Ranjit market yogurt (29.0). The variations among different yogurt samples could be attributed to different types of milk, starter cultures and manufacturing process, reported by some authors. Patra and Lolkema (1950) found that yogurt aroma and most of the flavour, body of yogurt were developed by Lactobacillus bulgaricus. Another experiment reported that milk stored too long before seeding often give rise to broken curd of poor taste (Rangappa and Acharya, 1974). It is found that use of gelatin at 0.2-0.3% level not only improve the quality of yogurt but also control the problem of whey off. The curd tension of skim milk was higher than that of corresponding whole milk, observed by Hill (1931). Highly significant difference among different yogurt samples was also found by Ghosh and Rajorisha (1967) and Sarkar et al. (1996).

Chemical composition: Statistically significant differences (P< 0.01) were found for fat, protein, total solids, ash, acidity % and pH value among the yogurt from different sources (Table 2). The highest fat % was found in Laboratory made yogurt (4.3%) and the lowest in Mamoni Yogurt (0.97). Me Moncoroma yogurt contained the highest percentage of total solids (39.43%), 2nd in the Dayamoy (38.03) and the lowest in Kanal-Ranjit Market Yogurt (25.16%). pH and acidity were oppositely correlated. The highest % was found in Kanal-Ranjit Market and the lowest in Krishna Cabin and Anil Gosh.

Variation in chemical composition of different yogurt samples may be attributed to different types of milk, cultures, addition of different concentration of sugar (Ghosh and Rajorisha, 1967) or extent of concentration of milk during heat treatment (Ray and Srinivasan, 1972). Fat content of yogurt ranged between 0.8 to 4.4% with an average of 1.95% whereas Sarkar et al. (1996) found 1.1 to 11.5% with a average protein content of 4.33% which was consistent with Rehman (1998) and Desai et al. (1994). The present investigation showed the total solid range of 25.16 to 39.43% which was in agreement with the findings of Ghosh and Rajorisha (1967) and Adelay (1996), but different from Sarkar et al. (1996). They found the range of 29.5 to 52.30%. Acidity varied from 0.63 to 0.88% due to the production of lactic acid by microorganisms, supported by Ghosh and Rajorisha (1987) who found the acidity range of 0.73 to 0.90%.

Microbiological status: Significant difference (P< 0.01) was found for gram positive cocci, red and yeasts among the yogurt samples from different sources (Table 3). The highest and lowest cocci were found in Jabbar and Kanal-Ranjit Market, whereas the highest and lowest gram positive rod were in Sudhir Gosh and Joyguro Yogurt respectively. The highest and lowest Yeast were counted in Krishna Cabin and Laboratory made yogurt respectively. The ratio of Cocci and rod in most of the samples was 1:1 to 1:2 which was supported by Persio (1991) and Mostafa (1997), who found the ratio of 1:1:1:27. Yeast may get enter in yogurt from utensils, human hands, atmosphere and starter culture during handling, and repeated transfer, as reported by Mohanan et al. (1995). The present investigation do not exceed the range of yeast counts those reported for misty-yogurt of Calcutta by Ghosh and Rajorisha (1987).

The finding of this study revealed that the Laboratory made yogurt might be superior to different Market made yoghurt. However, Dayamoy and Anil Gosh were in 2nd and 3rd position for quality yogurt preparation. The wide variation was found among the market yogurt, due to disorganized, lack of awareness to maintain hygienic and nutrition condition of yogurt. Therefore, to make the quality yogurt, every shop is suggested to adopt proper hygienic condition as well as must be avoided in adulteration of milk. So, more studies are needed to establish a standard for yogurt making in Bangladesh.

References