

Microbiological Quality Analysis of Raw Milk and Yogurt Available in Some Selected Areas of Bangladesh

G. M. M. Anwarul Hasan¹, Dr. Sahana Parveen², Jesmin Sultana³

Scientific Officer, Institute of Food Science & Technology (IFST), Bangladesh Council of Scientific & Industrial Research (BCSIR), Dr Quadrat-I- Khuda Road, Dhaka-1205, Bangladesh¹

Principle Scientific Officer, Institute of Food Science & Technology (IFST), Bangladesh Council of Scientific & Industrial Research (BCSIR), Dr Quadrat-I- Khuda Road, Dhaka-1205, Bangladesh²

Assistant Professor, Department of Food and Nutrition, Home Economics College, Azimpur, Dhaka-1205, Bangladesh³

ABSTRACT: This study investigate the microbiological quality of raw milk and samples collected from different locations in Bangladesh. A total of 30 samples were studied including 20 raw milk and 10 yogurt samples from some selected areas of Bangladesh. The samples were tested for the Total Viable Bacterial Count (TVBC) and Total Coliform Count (TCC). The range of TVBC and TCC in raw milk samples were 1.24×10^6 to 4.17×10^7 cfu/ml and 2.87×10^4 to 3.94×10^5 cfu/ml, respectively. On the other hand Total Viable Bacterial Count (TVBC) and Total Coliform Count (TCC) ranged in yogurt samples were from 35.31×10^6 to 5.04×10^8 cfu/ml and 1.12×10^4 to 4.51×10^2 cfu/ml respectively.

KEYWORDS: milk, yogurt, total bacterial count, coliform, Bangladesh.

I. INTRODUCTION

Milk is secreted by mammary gland of mammals and has rightly been recognized as nature's single most complete food [1]. As an essential part of our daily diet, liquid milk plays a crucial role to meet up the increasing nutritional demand as well as ensures food safety in developing countries like Bangladesh [2]. It is popular, delicious and valuable diet. Whole or skim milk is used for make Yogurt or dahi is very popular and nutritious dish in Bangladesh [3]. But at the same time, Milk and Yogurt are highly vulnerable to bacterial contamination and hence are easily perishable [4]. Therefore in order to protect the public health, microbiological assessments are necessary for milk and yogurt. Microbiological methods can reduce economic losses by the early detection of inadequate processing, packaging or refrigeration. This can achieve by monitoring the microbiological quality of raw milk supplies, bulk milk and finish milk products immediately after production and during storage [5].

So, the present study was undertaken to monitor the microbiological standards of raw milk and yogurt samples available in some selected areas of Bangladesh. The findings of the study will be an indication about the initial bacterial loads in raw milk and yogurt samples as well as how much safe for human consumption.

II. MATERIALS AND METHODS

Working place and study period: All these experiments of this study were carried out in the Food Microbiology section of Institute of Food Science and Technology of Bangladesh Council of Scientific and Industrial Research., Bangladesh from January 2016 to February 2016.

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Collection of Samples: Raw milk samples were purchased from local daily markets and the yogurt samples were bought from different yogurt shops of different districts of Bangladesh using a sterile aseptic container together with ice. They were transported to laboratory with isolated iceboxes. A total of 30 samples were studied. 20 raw milk designated as M-1 to M-20 and yogurt samples designated as Y-1 to Y-10. We maintain ICMSF [6] rules for sampling milk and yogurt.

Dilutions and estimation of microorganisms: Serial dilutions of samples were made up to 10^{-7} in Ringers Solutions. The bacterial counts were then performed by standard method recommended by (APHA, 2001) [7].

Microbiological Analysis:

Total Viable Bacterial Count:

Total Viable Bacterial Count was measured by plate count agar medium. The sample (0.1ml) of each dilution was taken onto each sterile petridish and poured plate count agar medium. The plates were then incubated at 37°C for 24 hours. Total bacterial count was measured in colony forming unit per gram (cfu/ml).

Total Coliforms Count (TCC):

Coliform count was done using MacConkey agar medium. Typical pink colonies were counted for determination of Total Coliform after incubation of plates at 37°C for 24 hours.

III. RESULTS AND DISCUSSION

Milk samples:

Total Viable Bacterial Count (TVBC): Total Viable Count (TVC) is the most common microbiological test gives a quantitative idea about the presence of microorganisms such as bacteria in a sample [8]. To be specific, the count actually represents the number of colony forming units (cfu) per g (or per ml) of the sample. These numbers directly reflect microbial contamination during production, collection and handling. The results of Total Viable Bacterial Count (TVBC) of the raw milk samples are presented in Table 1:

Table 1: Microbial assessment of Milk samples collect from some selected areas of Bangladesh.

| Sample No | Collection Point | Location | TVBC* (cfu/ml) | TCC** (cfu/ml) |
|-----------|------------------|----------|--------------------|--------------------|
| M-01 | Sherpur | Bogra | 2.51×10^7 | 1.21×10^5 |
| M-02 | Joynagar | | 2.42×10^7 | 2.92×10^5 |
| M-03 | Doshmail | | 1.24×10^6 | 2.34×10^5 |
| M-04 | Shima Bari | | 4.17×10^7 | 2.61×10^5 |
| M-05 | Garidoha | | 1.31×10^6 | 3.52×10^4 |
| M-06 | Shatahar | Naogaon | 1.72×10^6 | 1.68×10^5 |
| M-07 | Noagaon | | 5.22×10^6 | 1.92×10^5 |
| M-08 | Mohadevpur | | 6.16×10^6 | 2.79×10^5 |
| M-09 | Porsha | | 5.21×10^6 | 3.05×10^4 |
| M-10 | Manda | | 3.23×10^6 | 5.12×10^4 |
| M-11 | Lakhmipur | Rajshahi | 4.25×10^6 | 6.31×10^4 |
| M-12 | Dashmari | | 1.71×10^6 | 2.47×10^5 |

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| | | | | |
|------|-------------|---------|--------------------|--------------------|
| M-13 | Binodpur | Comilla | 6.85×10^6 | 1.68×10^5 |
| M-14 | Banesshor | | 8.82×10^6 | 3.54×10^5 |
| M-15 | Meherchondi | | 3.52×10^7 | 8.14×10^4 |
| M-16 | Nimshar | | 5.76×10^6 | 6.22×10^4 |
| M-17 | Companigonj | | 4.94×10^6 | 3.01×10^5 |
| M-18 | Konshonagar | | 8.62×10^6 | 2.87×10^4 |
| M-19 | Shameshpur | | 6.14×10^6 | 3.94×10^5 |
| M-20 | Daudkandi | | 3.47×10^6 | 6.21×10^4 |

*Total Viable Bacterial counts(TVBC), **Total Coliform Counts (TCC)

All the raw milk samples had high bacterial counts ranged from 1.24×10^6 to 4.17×10^7 cfu/ml. This results are similar with the result found in Aaku et al[9], and Khan et al[10], and Banik et al[11]. The study of high initial TVBC values (e.g. $>100,000 \text{ml}^{-1}$) are evidence of serious deficiencies in production hygiene, whereas TBVC values of $<20,000 \text{ml}^{-1}$ reflects good sanitary practices(International Dairy Fedaration,1974)[12]. In many countries, a standard for Grade A (or Grade 1) raw milk is an SPC or TVBC $<1 \times 10^5 \text{ml}^{-1}$ for milk intended for heat treatment before consumption. For milk that is to be consumed raw, a more stringent standard generally is required because consumers of raw milk are at a greater risk for contracting milk borne illness such as salmonellosis. In some countries, standards adopted may depend on whether milk is refrigerated or merely water-cooled. For example, in North America, SPC or TVBC values of $<1 \times 10^6 \text{ml}^{-1}$ or equivalent are acceptable for manufacturing grade milk. In contrast, the United Kingdom makes no distinction between raw milk marketed for manufacture and that marked for fluid consumption [13].. In Bangladesh there is no BDS standard for raw milk.

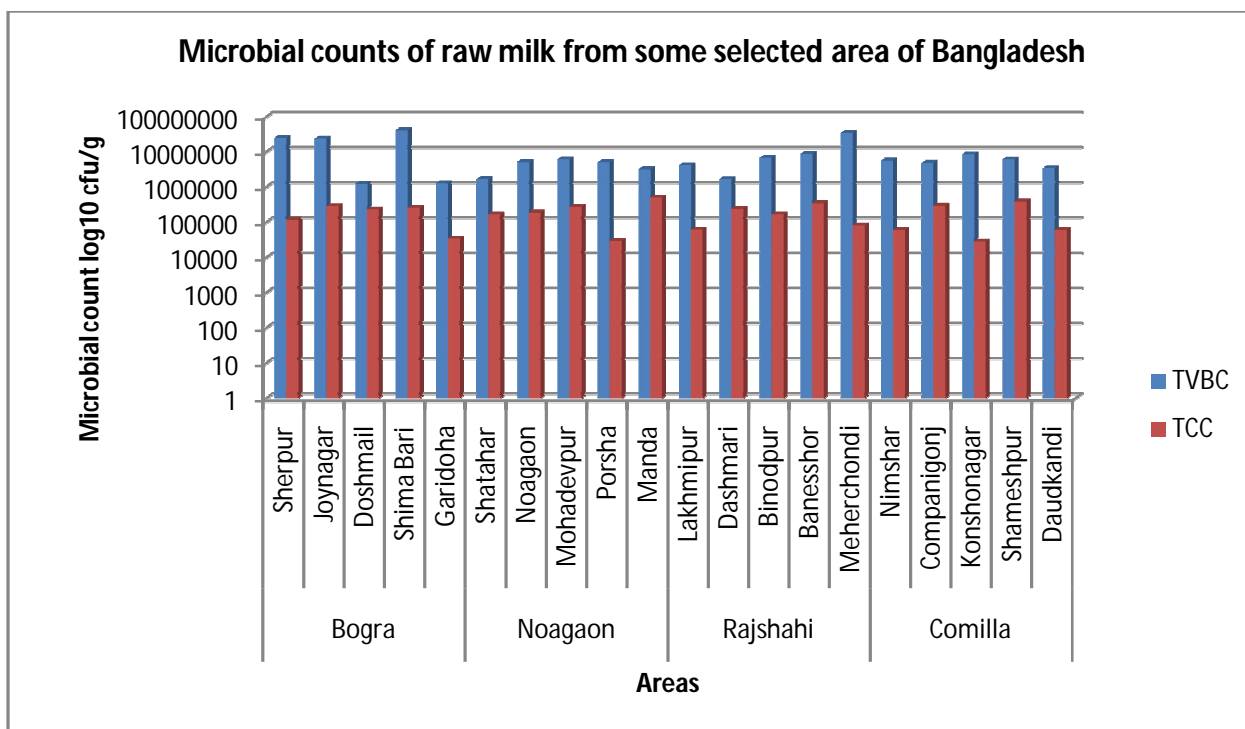


Fig-1: Microbial count of milk samples collected from different are of Bangladesh

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Total Coliform Counts:

Average coliform count in the raw milks ranged from 3.05×10^4 to 3.94×10^5 cfu/ml (Table 1). Incidence of coliforms belonging to the genera Enterobacter and E. coli in raw milk have received considerable attention [14]. The presence of coliforms in raw milk is not evidence of direct faecal contamination and should not be relied upon to detect inadequate udder cleaning prior to milking. Coliforms can rapidly build up in moisture, milky residues on milking equipment and then become a major source for contamination for raw milk.

Yogurt Samples:

The presence of bacterial population is obvious in yogurt as yogurt is cultured milk products. There is no specific acceptable limit of bacterial population for yogurt is available in Bangladesh. However, presence of pathogenic bacteria or coliforms is not acceptable and presence of coliform is often used as a parameter of proper sanitary condition in different countries [15].

Table 2: Microbial assessment of Milk samples collect from some selected areas of Bangladesh.

| Sample No | Collection Point | TVBC* (cfu/ml) | TCC** (cfu/ml) |
|-----------|------------------|--------------------|--------------------|
| Y-01 | Dhaka | 2.31×10^7 | 1.61×10^2 |
| Y-02 | Bogra | 3.45×10^7 | 4.51×10^2 |
| Y-03 | Comilla | 7.64×10^6 | 1.12×10^2 |
| Y-04 | Naogon | 7.31×10^7 | 1.31×10^2 |
| Y-05 | Rajshahi | 4.32×10^7 | 2.75×10^2 |
| Y-06 | Chittagong | 1.72×10^7 | 1.14×10^2 |
| Y-07 | Khulna | 6.17×10^6 | 1.54×10^2 |
| Y-08 | Barishal | 5.31×10^6 | 3.67×10^2 |
| Y-09 | Pabna | 3.01×10^8 | 1.02×10^2 |
| Y-10 | Tangail | 5.04×10^8 | 1.24×10^2 |

*Total Viable Bacterial counts (TVBC), **Total Coliform Counts (TCC)

Total Viable Bacterial Count (TVBC):

The yogurt samples collected from different district of Bangladesh showed a large number of Total bacterial counts. Among the 10 samples TVBC ranged from 1.72×10^7 to 5.04×10^8 cfu/ml (Table 2). The higher amount is found in Tangail Yogurt sample and lower amount is found in Chittagong sample.

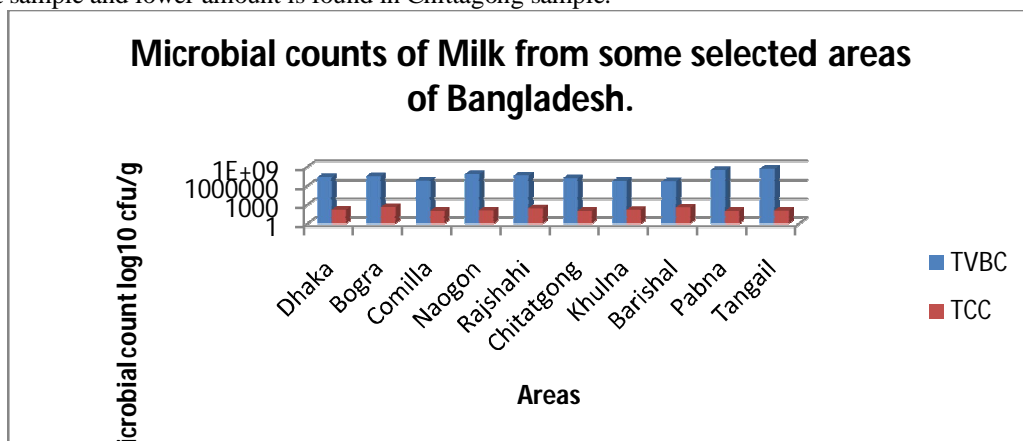


Fig-2: Microbial count of yogurt samples collected from different are of Bangladesh

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Total Coliform Counts (TCC):

Total coliform counts found in yogurt samples ranged from 1.02×10^2 to 4.51×10^2 cfu/ml which reflects highly poor hygienic conditions and improper sanitation during manufacturing of yogurt. The highest amount is found in Bogra sample and lowest amount is found in Pabna Yogurt sample.

IV. CONCLUSION

From this study, it can be concluded that the microbiological quality of most of the raw milk and yogurt samples collected from different areas of Bangladesh were not satisfactory as indicated by their high bacterial loads. So, precaution is needed to handling raw milk and yogurt. Every shop is suggested to adopt proper hygienic condition to make the quality yogurt. More studies are needed to establish standard for raw milk and yogurt in Bangladesh.

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