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A Qualitative Study of Microbiological Analysis of Raw Milk Samples and Yogurt from Different Selected Districts of Bangladesh

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Abstract: ***In this study, the microbiological quality of raw milk and yogurt samples was investigated. A total of 50 samples were studied, including 25 raw milk samples and 25 yogurt samples were used. These samples were collected from different parts of some selected district in 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 2.26×10^6 to 7.56×10^6 and 1.43×10^4 to 7.46×10^4 respectively. And the TVBC and TCC ranged in yogurt samples were from 2.17×10^6 to 5.65×10^6 and 1.32×10^4 to 8.73×10^4 respectively.***

Keywords: Raw milk, yogurt, TVBC, TCC, Bangladesh

1. Introduction

Milk is considered an ideal food and is meant to contain proteins, fats, carbohydrates, mineral salts and vitamins [1]. Basically, milk consists of 88 percent water and 12 percent solids. Of these solids, 4% is fat, 3.5% is protein, 4% is lactose (milk sugar) and 0.5% is minerals [2]. Milk is one of the food items that is widely consumed worldwide. "It is called the "Liquid Diamond"[3] because of the consumption levels across the globe. Cultured milk or yogurt is another common and demanding food that is nutritious. Yogurt is a cultured dairy product which is produced by fermenting milk with lactic acid and is also a means of pre-serving milk nutrients [4]. Yoghurt with active cultures protects the gut, can prevent infections of the vagina and can allow one to feel fuller [5]. Because of its high digestibility and bioavailability of nutrients, yogurt is considered a safe food and can also be recommended for people with lactose intolerance, gastrointestinal disorders such as inflammatory bowel disease and irritable bowel disease, and immune function and weight control aids [6]. Due to unhygienic pre-processing, production and post-production processes [7], yogurt was found to be infected with both spoilage and pathogenic organisms. In freshly drawn milk, pathogens may also be present and may spread further during manipulation [8]. Microbiological evaluations of milk and yogurt are also important for the protection of public health. Via early detection of insufficient processing, packaging or refrigeration, microbiological methods may minimize economic losses. Through the use of industrial starters, the consistency and reproducibility of fermented milks and processes are assured, but consumers prefer conventional fermented milks since artisanal starters offer these products more typical flavors [9].

The aim of this research was to evaluate and check the microbial quality of the samples of yogurt and raw milk as well as to know how much safe for human consumption.

2. Materials and Methods

2.1 Place of Work and Study Duration

All the experiments of this study were performed in the Milk, Dairy and Fermented Food Product Research section of Institute of Food Science and Technology of Bangladesh Council of Scientific and Industrial Research., Bangladesh from June 2019 to February 2020.

2.2 Samples Collection

Raw milk and yogurt samples were gained from local daily markets of different areas of some selected districts in Bangladesh. The samples were kept in isolated iceboxes during transportation. A total of 50 samples were studied and the 25 raw milk samples and 25 yogurt samples designated as A-1 to A-5 for Bagerhat district, B-1 to B-5 for Jessore district, C-1 to C-5 for Jhenaidah district, D-1 to D-5 for Khulna district, E-1 to E-5 for Kushtia district. Sampling of milk and yogurt were done by using ICMSF rules [10].

2.3 Serial Dilutions and estimation of microorganisms

By using 10-7 in Rangers Solutions, we were done Serial dilutions of samples. Standard methods were used to perform the bacterial counts (APHA, 2001) [10].

2.4 Microbiological Analysis

2.4.1 Total Viable Bacterial Count

Total viable bacterial count is the most common microbiological test gives a quantitative idea about the presence of microorganisms such as bacteria in a sample. The total viable bacterial count is the number of bacteria in a sample that can grow and form countable colonies on nutrient agar. Total viable counts were enumerated according to the method of International Dairy Federation (IDF, 1991). After dilution, each sample (0.1ml) was taken onto each sterile petridish and poured plate count agar medium. Then incubation period was started for these plates at 37◦C for 24 hours. Total bacterial count was measured in colony forming unit per gram (cfu/ml). The variation in TVBC of the milk may be due to the hygienic maintenance during milking.

2.4.2 Total Coliforms Count (TCC)

Detection of coliform (indicator organisms) indicates the presence of potential disease causing bacteria not only in water, but also in given foods and drinks (milk etc).The presence of coliform bacteria, such as E. coli, in milk is a common indicator of fecal contamination. According to pour plate technique, 1 ml of each sample was transferred into a sterile plate and 15-20 ml of the selected media was added. The medium was mixed immediately and shake for 5-10 seconds. Using MacConkey agar medium, the Coliform count was done. Typical pink colonies were counted for determination of Total Coliform after incubation of plates at 37◦C for 24 hours. Results were expressed as total coliforms per 100ml of water. In Egypt, Aly and Galal, (2002) showed the presence of E. coli in raw milk and the number reduced in the heat treated one

3. Results and discussion

3.1 Milk samples

3.1.1 Total Viable Bacterial Count (TVBC)

The quantitative information about the presence of microorganisms such as bacteria in a sample comes from Total Viable Count (TVC) test [10]. The results of Total Viable Bacterial Count (TVBC) of the raw milk samples are given in Table 1:

Table 1: Microbial assessment of Milk samples collect from some selected districts in Bangladesh

Sample No	Collection Point	Location	TVBC (cfu/ml)	TCC (cfu/ml)
A-01	Bagerhat Sadar	Bagerhat	2.45×10^6	5.32×10^4
A-02	Chitalmari		5.32×10^6	2.13×10^4
A-03	Fakirhat		7.22×10^6	4.24×10^4
A-04	Mollahat		2.42×10^6	2.42×10^4
A-05	Kachua		4.25×10^6	4.35×10^4
B-01	Abhaynagar	Jessore	2.82×10^6	1.43×10^4
B-02	Bagherpara		4.13×10^6	2.35×10^4
B-03	Chaugachha		3.21×10^6	4.57×10^4
B-04	Jhikargachha		5.34×10^6	2.32×10^4
B-05	Keshabpur		4.37×10^6	5.86×10^4
C-01	Harinakunda	Jhenaidah	4.24×10^6	7.46×10^4
C-02	Jhenaidah Sadar		5.22×10^6	7.27×10^4
C-03	Kaliganj		2.43×10^6	3.42×10^4
C-04	Kotchandpur		3.32×10^6	4.56×10^4
C-05	Maheshpur		4.24×10^6	2.45×10^4
D-01	Batiaghata	Khulna	3.12×10^6	3.87×10^4
D-02	Dacope		6.43×10^6	4.45×10^4
D-03	Dumuria		4.32×10^6	3.67×10^4
D-04	Dighalia		7.56×10^6	5.26×10^4
D-05	Koyra		3.74×10^6	2.54×10^4
E-01	Bheramara	Kushtia	2.46×10^6	4.24×10^4
E-02	Daulatpur		4.35×10^6	2.34×10^4
E-03	Khoksa		2.26×10^6	2.43×10^4
E-04	Kushtia		4.25×10^6	5.32×10^4
E-05	Kumarkhal Sadar		3.23×10^6	5.65×10^4

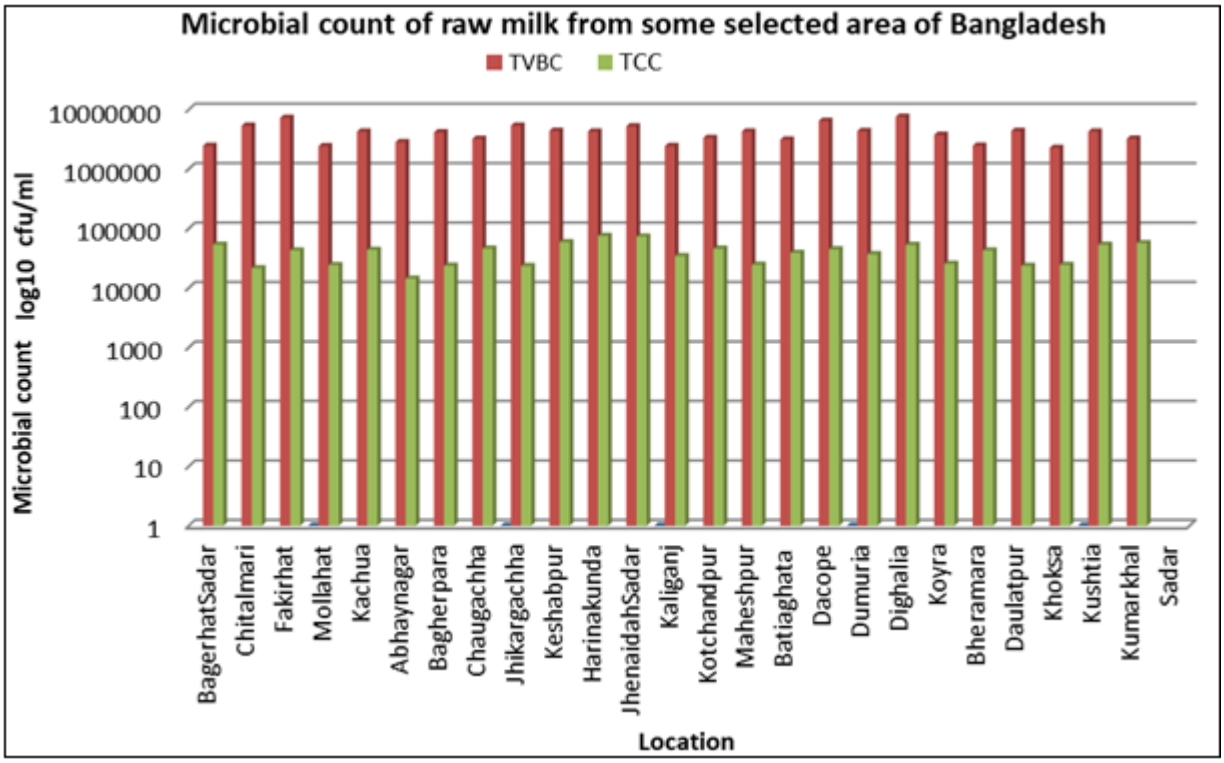
Total Viable Bacterial Counts(TVBC), Total Coliform Counts (TCC)

The high bacterial counts of each and every raw milk samples was found which was ranged from 2.26×10^6 to 7.56×10^6 cfu/ml. The highest total viable bacterial count was found in Dighalia of Khulna district and the lowest total viable bacterial count was found in Khoksa in Kushtia district. These results are similar with the result found in Aaku et al [11], and Khan et al [12], and Banik et al [13]. . This TVBC values (e.g. >100,000ml-1) indicates serious deficiencies in production hygiene, whereas TBVC values of <20,000ml-1 indicates good sanitary practices (International Dairy Fedaration, 1974) [14]. As we consumed milk as raw milk, consumer must be maintained a more rigid standard. Because consumers are at a greater risk for contracting milk borne illness such as salmonellosis. There is no BDS standard for raw milk in Bangladesh.

3.1.2 Total Coliform Counts (TCC)

In this study the average coliform count in the raw milks ranged from 1.43×104 to7.46×104 cfu/ml (Table1). No evidence are available, direct faecal contamination occurs due to presence of coliforms in raw milk and should not be relied upon to detect inadequate udder cleaning prior to

milking. However, presence of pathogenic bacteria or coliforms is not acceptable and the presence of coliform is often used as a parameter of proper sanitary condition in different countries. Among the 25 raw milk samples from different areas of some selected districts the highest coliform bacterial count was found in Harinakunda of Jhenaidah district and the lowest coliform bacterial count was found in Abhaynagar of Jessore district.



3.2 Yogurt Samples

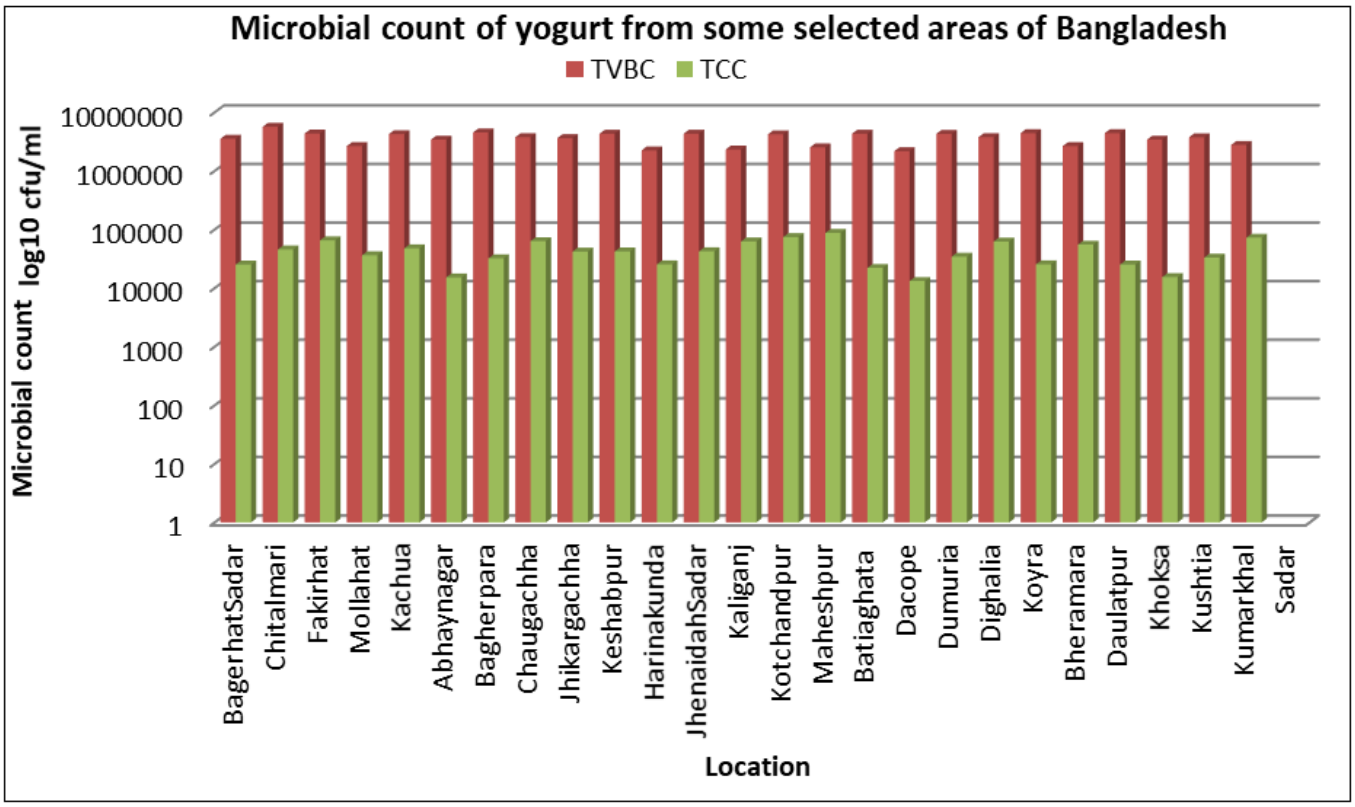
As yogurt is a cultured milk product, the bacteria can grow easily in these. Yoghurt is highly susceptible to bacterial contamination, because it is easily perishable [15]. So, it is necessary to assess microbiological quality of yogurt for public health concern. Research in the field of quality evaluation of yogurt is the basic need to create awareness among common people the existing situation and protect the consumer's health and rights [16]. To determine which yogurt is healthier, we have to consider the storage, transportation and commercialization of the product.

Table 2: Microbial assessment of Yogurt samples collect from some selected districts of Bangladesh

Sample No	Collection Point	Location	TVBC (cfu/ml)	TCC (cfu/ml)
A-01	Bagerhat Sadar	Bagerhat	3.53×10^6	2.52×10^4
A-02	Chitalmari		5.65×106	4.56×10^4
A-03	Fakirhat		4.35×10^6	6.54×10^4
A-04	Mollahat		2.65×10^6	3.64×10^4
A-05	Kachua		4.24×10^6	4.76×10^4
B-01	Abhaynagar	Jessore	3.42×10^6	1.52×10^4
B-02	Bagherpara		4.53×10^6	3.21×10^4
B-03	Chaugachha		3.76×10^6	6.32×10^4
B-04	Jhikargachha		3.64×10^6	4.20×10^4
B-05	Keshabpur		4.32×10^6	4.23×10^4
C-01	Harinakunda	Jhenaidah	2.24×10^6	2.54×10^4
C-02	Jhenaidah Sadar		4.32×10^6	4.24×10^4
C-03	Kaliganj		2.32×10^6	6.27×10^4
C-04	Kotchandpur		4.21×10^6	7.42×10^4
C-05	Maheshpur		2.52×10^6	8.73×10^4
D-01	Batiaghata	Khulna	4.32×10^6	2.21×10^4
D-02	Dacope		2.17×10^6	1.32×10^4
D-03	Dumuria		4.29×10^6	3.44×10^4
D-04	Dighalia		3.76×10^6	6.23×10^4
D-05	Koyra		4.42×10^6	2.54×10^4
E-01	Bheramara	Kushtia	2.65×10^6	5.52×10^4
E-02	Daulatpur		4.42×10^6	2.53×10^4
E-03	Khoksa		3.42×10^6	1.54×10^4
E-04	Kushtia		3.75×10^6	3.32×10^4
E-05	Kumarkhal Sadar Upazila		2.78×10^6	7.24×10^4

3.2.1 Total Viable Bacterial Count (TVBC)

We were collected yogurt samples from different areas of some selected districts in Bangladesh which showed a large number of total bacterial counts. Among the 25 samples TVBC ranged from 2.17×106 to 5.65×106 cfu/ml (Table 2).The higher amount was found in Dacope of Khulna district and lower amount was found in Chitalmari of Bagerhat district samples.



3.2.2 Total Coliform Counts (TCC)

The TCC of the selected districts in this study was ranged from 1.32×104 to 8.73×104 cfu/ml in yogurt samples and the higher amount found in Maheshpur of Jhenaidah district samples and the lower amount was found in Dacope of Khulna district samples.

4. Conclusion

As this districts such as Bagerhat, Jessore, Jhenaidah, Khulna, Kushtia are very much rich in milk production so a proper investigation can be done with the raw milk and milk products such as yogurt samples collected from this districts. This laboratory investigation confirms that the raw milk and yogurt samples which are mainly found in our local market are contaminated with much bacterial load and also not provide proper health benefit for the consumers. So, proper guidance should be maintained by the processers and high precaution is needed in handling and processing of all the procedure in collecting and storage of raw milk and yogurt. They should also be very careful about the nutritional maintenance of the product and should maintain adequate hygienic condition so that the consumers can lead a healthy and happy life.

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