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Microbiological quality analysis of yoghurt in some selected areas of Bangladesh

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ABSTRACT

This study was conducted to investigate the microbiological quality of yoghurt (Dahi) samples collected from different locations in Bangladesh. A total of 50 yoghurt samples were studied from 10 selected areas of Bangladesh. The samples were tested for the Total Viable Bacterial Count (TVBC), Total Coliform Count (TCC) and Total yeast and mold count. TVBC and TCC ranged in yoghurt samples were from $1.72\times10^{7}\pm1.6\times10^{5}$ to $5.04\times10^{8}\pm1.5\times10^{6}$ cfu/ml and $1.02\times10^{2}\pm1.58$ to $4.51\times10^{2}\pm1.58$ cfu/ml; respectively. Total yeast and mold count were ranged from $2.0\times10^{2}\pm1.58$ to $9.4\times10^{3}\pm158.11$ cfu/ml in yoghurt samples. This study indicates a need for emphasis on quality control within processing plants. The level of bacteria, coliform, yeast and mold counts indicated that excessive contamination occurs during manufacture and packaging of the product. Every small and large-scale yoghurt producer is suggested to maintain adequate hygienic condition to make the good quality and healthy yoghurt which will reduce the microorganisms load. Overall the hygienicc quality of those yoghurt samples was lower and must be improved considerably.

INTRODUCTION

Yogurt is most common among the dairy products consumed around the world, and its sensory attributes, have a large effect on consumer acceptability (Saint-Eve et al., 2006). Yogurt is perhaps the oldest fermented milk product known and consumed by large segments of our population either as a part of diet or as a refreshing beverage (Younus et al., 2002). It is nutritiously balanced food containing almost all the nutrients present in milk but in a more assailable form (Olugbuyiro, 2011). It is believed that yogurt has valuable therapeutic properties and helps curing gastrointestinal disorders (Bhattarai and Das, 2016). Whole or skim milk is used for making Yoghurt or dahi which is very popular and nutritious dish in Bangladesh (Ali et al., 2002).Yogurt, is produced when milk or milk products coagulates, causing the lactic acid contained in it to coagulate, via the action of bacterial enzymes lactase provided by the bacteria Streptococcus thermophilus, Lactobacillus bulgaricus breaks down the sugar compound glucose and galactose that the lactose is composed of, under anaerobic conditions (Farnworth et al., 2007). But at the same time yoghurt is highly vulnerable to bacterial contamination and hence it is easily perishable (Girma et al., 2014). Therefore, to create public health concern, microbiological assessments are necessary for yoghurt. Microbiological methods can reduce economic losses by the early detection of inadequate processing, packaging or refrigeration (Huis in't Veld, 1996). This can achieve by monitoring the microbiological quality of raw milk supplies, bulk milk and finish milk products immediately after production and during storage. Microbiological parameters are generally used to verify these conditions, especially by yeasts & mold, coliforms and total viable bacteria enumeration. Coliforms are responsible for the development of objectionable taints in milk and milk products rendering them of inferior quality or even

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unmarketable (Yabaya and Idris, 2012). Yeasts & molds are a major cause of spoilage of yoghurts in which the low pH provides a selective environment for their growth (Fleet and Mian, 1987). 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. Therefore, the objective of this study was aimed to evaluate the microbiological quality of yoghurts from different selected areas of Bangladesh, considering the levels of contamination by coliforms, yeast, molds and total viable bacterial counts.

MATERIALS & METHODS

The study was conducted at the Food Microbiology unit of Food Science and Technology of Bangladesh Council of Scientific and Industrial Research, June 2017 to December 2017.

Collection of samples

Ten samples of yogurt were collected from each different areas of Bangladesh (Dhaka, Bogra, Comilla, Noagoan, Rajshahi, Chittagong, Khulna, Barisal, Pabna, Tangail) under sterilized conditions. Yoghurt samples were prepared according to the method recommended by ICMSF 1996 (Salwa et al., 2004).

Estimation of organism

Materials used in the study works were- reagent, sample, Petri dish, distilled water, glassware, burner, spreader, conical flask etc.

Serial dilutions of samples were made up to 10^7 in Rangers Solutions. The bacterial counts were then performed by standard method recommended by APHA 2001 (Naeem and Rizvi, 1986).

Plate count agar media was prepared by standard method recommended by HiMedia Laboratories Pvt. Ltd. (Banerjee and Sarkar, 2003).

MacConkey agar media was prepared by standard method recommended by HiMedia Laboratories Pvt. Ltd (Lim et al., 1995).

Sabouraud dextrose agar media was prepared by standard method recommended by HiMedia Laboratories Pvt. Ltd (Samaranayake et al., 1987).

Microbiological analysis:

Total Viable Bacterial Count (TVBC)

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 (Fung, 2002). Total Viable Bacterial Count was measured by plate count agar medium by a standard procedure (Atallah, 2015). At first a series of test tubes (10), each containing of 9 ml diluents was taken. Then 0.5 ml yoghurt sample was homogenized in 450 ml diluents and making suspension in a beaker. From the original sample, 1 ml is transferred in to the test tube no.1 and mixed thoroughly. Then transfer 1 ml from the 1st test tube to 2nd test tube and continued up to last one and 1 ml is discarded from the last test tube. In pour plate technique, the homogenizer mixture of sample was placed in the empty petri dish the sufficient amount (10 ml) melting agar (melted at 45^0C) was placed on the sample in Petri dish. At the same time the Petri dish was rotated for 5-10 seconds, so those samples were being mixed thoroughly with the media. Then the media can solidify and after solidification of the media containing samples the Petri dish was kept in the incubator at 37^0C for 2-3 days. Total viable bacterial count was measured in colony forming unit per gram (cfu/ml) (Lin W-H et al., 2006).

Coliform Counts Total (TCC)

Coliform count was measured by using MacConkey agar medium (Micanel et al., 1997). 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. Typical pink colonies were counted for the determination of Total Coliform Count after incubation of plates at 37^0C for 24 hours.

Total Yeast & Mold Count

Sabauroud dextrose agar media was used for enumeration according to the method of monitoring mycological media (Seiler, 1985). 0.5 ml sample was taken and diluted up to 10 ml by using peptone water. Then 1 ml of that preparation

was inoculated on Sabouraud dextrose Agar plate. Finally, it was incubated at 37^0C for 2-5 days. Then yeast and mold colonies were counted separately from here.

Statistical analysis

Laboratory data were stored in the MS excel-2007 programme before exporting to STATA/IC-13 for analysis. Descriptive analysis was performed to determine Total Viable Bacterial Count (TVBC), Total Coliform Count (TCC), Total yeast and mold count.

RESULTS & DISCUSSION

Total Viable Bacterial Count (TVBC)

The yoghurt samples were collected from different districts of Bangladesh and they showed higher Bacterial Counts within them (Table 1). Among the 10 samples TVBC were ranged from $1.72\times10^7\pm1.6\times10^5$ to $5.04\times10^8\pm1.5\times10^6$ cfu/ml. The highest quantity of TVBC was found in yoghurt collected from Tangail and lowest quantity was found in yoghurt of Chittagong. This was agreed the ranged of other previous study (Oyeleke, 2009). The higher initial TVBC values for this study might be due to the serious deficiencies in production of hygiene.

Table 1
Total Viable Bacterial Count in different district.

Sample No.	Mean± Standard Deviation(SD) cfu/ml
Dhaka	$2.31\times10^7\pm$ 158113.88
Bogra	$3.45\times10^7\pm$ 158113.88
Comilla	$3.64\times10^8\pm1581138.8$
Noagoan	$7.31\times10^7\pm206155.28$
Rajshahi	$4.32\times10^7\pm158113.88$
Chittagong	$1.72\times10^7\pm167332.01$
Khulna	$6.17\times10^7\pm$ 158113.88
Barisal	$5.31\times10^7\pm$ 158113.88
Pabna	$3.01\times10^8\pm1581138.8$
Tangail	$5.04\times10^8\pm1581138.8$

Total Coliform Counts (TCC)

Total coliform counts found in yoghurt samples were ranged from $1.02\times10^2\pm1.58$ to $4.51\times10^2\pm1.58$ cfu/ml. The highest quantity was found in yoghurt of Bogra and lowest quantity was found in yoghurt samples of Pabna (Table 2). This was agreed with the range of other previous study (Younus et al., 2002). The studied result reflected highly poor hygienic conditions and improper sanitation during manufacturing of yoghurt.

Table 2
Total Coliform Counts in different districts.

Sample No.	Mean± Standard Deviation(SD) cfu/ml
Dhaka	$1.61\times10^2\pm1.58$
Bogra	$4.51\times10^2\pm1.58$
Comilla	$1.12\times10^2\pm1.58$
Noagoan	$1.31\times10^2\pm1.58$
Rajshahi	$2.75\times10^2\pm1.58$
Chittagong	$1.14\times10^2\pm1.58$
Khulna	$1.54\times10^2\pm1.58$
Barisal	$3.67\times10^2\pm1.58$
Pabna	$1.02\times10^2\pm1.58$
Tangail	$1.24\times10^2\pm1.58$

Table 3
Total Yeast & Mold Count in different districts.

Sample No.	Mean± Standard Deviation(SD) cfu/ml
Dhaka	$5.0\times10^2\pm1.58$
Bogra	$2.0\times10^2\pm1.58$
Comilla	$7.6\times10^2\pm1.58$
Noagoan	$4.4\times10^2\pm1.58$
Rajshahi	$5.7\times10^2\pm1.58$
Chittagong	$6.7\times10^3\pm158.11$
Khulna	$2.9\times10^3\pm158.11$
Barisal	$9.4\times10^3\pm158.11$
Pabna	$4.3\times10^3\pm158.11$
Tangail	$1.8\times10^3\pm158.11$

Total Yeast & Mold Counts

Total yeast and mold counts in yoghurt samples were ranged from $2.0\times10^2\pm1.58$ to $9.4\times10^3\pm158.11$ cfu/ml. The lowest amount was found in Bogra and the highest amount was found in Barisal yoghurt sample (Table 3). Presence of yeasts or molds in yogurt is also indicative for poor sanitary practices in manufacturing or

packaging. Yogurts with added sugar is especially susceptible to yeast growth which can be a cause of higher results (Lourens-Hattingh and Viljoen., 2001).

CONCLUSION

The overall picture of yogurt quality in selected areas of Bangladesh as measured by microbiological evaluation appears to indicate a need for emphasis on quality control within processing plants. The level of bacteria, coliform, yeast and mold counts indicated that excessive contamination occurs during manufacture and packaging of the product. Every small and large-scale yoghurt producer is suggested to maintain adequate hygienic condition to make the good quality and healthy yoghurt which will reduce the microorganisms load.

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