ORIGINAL RESEARCH PAPER

Dairy Technology

CHEMICAL AND MICROBIOLOGICAL ASSESSMENT OF RAW, PASTEURIZED AND UHT MILK OF DIFFERENT AREAS IN PANSKURA, EAST MIDNAPORE, WEST BENGAL, INDIA

KEY WORDS: Adulterance, Pasteurized milk, Sanitary quality, UHT-milk, Titrable acidity.

Debasree Ghosh*

Assistant Professor, Department of Food and Nutrition, Barrackpore Rastraguru Surendranath College, 85 Middle Road and 6 Riverside Road, Barrackpore, Kolkata-700120. *Corresponding Author

ABSTRACT

Milk is very popular drink in India and is used for various purposes like for making tea coffee, making sweets, dairy products etc. The aim of this study was to diagnose chemical, microbial content of milk during preservation. Major tests considered in the research work were titrable acidity, COB test; total viable bacteria count (TVC) and Coliform count. Nine different liquid milks were examined to evaluate their chemical and sanitary quality. Three of these were open raw milk bought from local market of Panskura, East Midnapore and the other six were processed packet milk (both pasteurized and UHT -Ultra High Temperature, processed) available in shops of Barrack pore. The Nine samples were examined for the determination of percentage of water, total soluble solids (TSS), fat, solids-non-fat (SNF), lactose, protein, and ash; measurement of titrable acidity; detection of adulterants; enumeration of total bacterial count, staphylococcal, coliform, faecal coliform, Salmonella and Shigella, Aeromonas hydrophila, and psychrophilic count. Results revealed that most of the raw and pasteurized milks were substandard in both chemical and sanitary quality whereas the quality of UHT-treated milk was excellent. Majority of the raw and pasteurized milks contained a considerable amount of lactose, protein and ash, but a number of these had lesser amount of fat. All the raw and pasteurized milks were found to be contaminated with bacterial loads exceeding the acceptable limit. The indicator organisms i.e. coliforms and faecal coliforms were present in most of these samples in large numbers. Pathogenic bacterial genera were also identified in some of these. High counts of psychrophilic bacteria were also found in the raw and pasteurized milk. But none of the UHT-processed milks contained any bacteria. Water had been added to five raw and one pasteurized milk whereas sucrose was found in five of the six heat-treated samples.

I. INTRODUCTION

Milk is known to be the most complete food found in nature (1, 2). Milk is valuable and consumed on daily basis. As milk contains fat, protein, carbohydrates, minerals, vitamins and other various ingredients dispersed in water, it is considered as a complete diet (3). But at the same time, it is highly vulnerable to bacterial contamination and hence is easily perishable (4,5). Milk is synthesized in specialized cells of the mammary gland and is virtually sterile when secreted into the alveoli of the udder (6). Beyond this stage of milk production, microbial contamination can generally occur from the exterior of the udder and from the surface of milk handling and storage equipment. Bacterial contamination of raw milk can originate from different sources: air, milking equipment, feed, soil, faces and grass (1, 7). The number and types of microorganisms in milk instantly after milking are affected by factors such as animal and equipment cleanliness, season, feed and animal health (8). It is hypothesized that the various ways in feeding and housing strategies of cows may influence the microbial quality of milk (7). The water used for rinsing milking machine and equipment may also be responsible for the presence of high load of micro-organisms including pathogens in raw milk (9). Among the microbial populations, Gram-negative bacteria usually account for more than 90% in cold raw milk that has been stored including psychotropic species of Pseudomonas, Achromobacter, Aeromonas, Alcaligenes, Flavobacterium and Enterobacter (10-13). The presence of indicator bacteria and some other bacteria in lesser number determines the safety and quality of milk and milk products (8).

Therefore in order to protect the public health, microbiological assessments have an important role to play in the dairy industry. This will also reduce economic losses by the early detection of insufficient processing, packaging or refrigeration. The milk men in Panskura, mostly produce milk in non-standardized way and usually supply to the consumers from the urban and rural areas (1, 14). As a consequence of adulteration in milk both the dilution in the amount of milk solids as well as the introduction of various pathogens takes place. So it is very much imperative to process the milk in such a way so that it assures the safety as well as the wholesomeness of the milk quality is maintained (1, 2). The preamble of pasteurized and Ultra high temperature (UHT) processed milk in Panskura is not very new and proved to be very much well-liked among consumers. Recently microbiological status of various types of treated milk is gaining a matter of great interest (1). Due to the treatment process, high microbial load in milk is unexpected in the pasteurized or the UHT milk. After the date of manufacture, the recommended date of consumption for the pasteurized and the UHT milk is 7 days and 6 months, respectively. But the poor initial milk quality, defective processing or problem in preservation at the consumer side may deteriorate milk quality before the original date of expiry (15). Some institution of milk industry has set various chemical and sanitary requirements for the pasteurized milk (16). This study reveals the microbiological standards of raw and processed milk samples from different areas in Panskura. The findings of the study will be an indication about the initial bacterial loads in raw milk samples as well as how much safe is the processed milk for consumptions. Besides, different regulatory bodies may also realize the importance of frequent inspection of the market milks to ensure whether they meet the minimum microbiological standards for the mass people.

Milk is considered as nature's single most complete food Moreover; its high nutritive value makes it an ideal medium for the rapid multiplication of bacteria, particularly under unhygienic production and storage at ambient temperatures (17, 18). We know that, In order for any processor to make good dairy products, good quality raw materials are essential. A milk processor or handler will only be assured of the quality of raw milk if certain basic quality tests are carried out at various stages of transportation of milk from the producer to the processor. Milk is complex mixture of fat, protein, carbohydrates, minerals, vitamins and other miscellaneous constituents dispersed in water, make it a complete diet. Except high nutritional value, presence of pathogenic bacteria in the milk can results with high health danger and may cause death of consumers. In Panskura, milk is produced mostly in non-standardized way and is usually supplied to the consumers of the urban and rural areas by milkmen and by some established dairy farms where surplus milk is readily available. Contaminated raw milk can be a source of harmful bacteria. Different heat and other treatments are given to raw

milk in order to remove pathogenic microorganism and to increase the shelf life. Pasteurization process is largely applied to certain food products in order to decrease the microbiological risk and to increase their preserving ability. Pasteurization is not intended to kill all pathogenic microorganisms in food or liquid. UHT (ultra heat treatment) is also used for milk treatment. UHT processing holds the milk at a temperature of 138 C for a fraction of second. The microbial status of these heat treated milk is a concern and garbing attention of the authorities nowadays. Heat treated milk like pasteurized and UHT milk should not contain pathogenic bacteria but if the milk does not processed properly, it may results with high microbial load in milk. The problems of post treatment contamination in containers which are not sterilized properly can cause the contamination in the milk. The contamination can either be through poor seal or through pin hole in the containers. The types of spores which have been investigated as of particular relevance in UHT are those of Bacillus subtilis and Clostridium botulinum has been studied. In India till now no standard is known to be established for raw and UHT treated milk. So far, less work had been conducted on the quality evaluation of raw and processed milk during prolonged preservation in India. The present investigation will throw light on quality of raw, pasteurized & UHT milk in India by chemical and bacteriological tests (18).

II. AIMS AND OBJECTVES

The aim and objectives of the study are:

To isolate and identify microorganisms that contaminate raw milk.

To determine of the milk is tubercle bacilli free.

To assay for the presence of coliforms in the milk samples.

To make the milk safe for human consumption by destroying the pathogenic organism, which may be present.

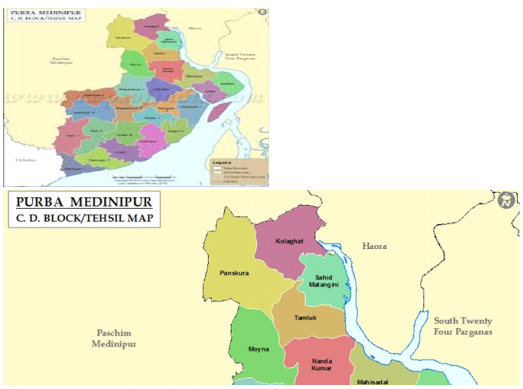
To improve preservation quality by destroying almost all spoilage microorganisms.

To retain good flavour over a longer period of time.

To conduct a systematic review and meta-analyses to assess the potential benefits of drinking raw milk. Claims investigated were changes in vitamin levels associated with pasteurization and the effects of raw milk consumption on allergies, cancer, and lactose intolerance.

III. MATERIALS AND METHODS:

3.1. Study area: The study was conducted during the period from February to May, 2020. The milk samples were collected from different retail markets of Barrackpore and farm house of Panskura , East Midnapore, West Bengal, India.



3.2. Collection of sample: Milk is generally sold in two ways. In most cases, the farmers bring milk in open pots and sell it directly in the market without any processing and packaging. In other cases, milk companies collect milk from the farmers or dairy farms, process it via pasteurization or UHT treatment and package the processed milk which is then sold in shops under specific brand name.

In this study, raw milk samples were purchased from vendors of different localities, while, brand milk samples were bought from different shops. A total of nine samples were examined where three (designated as R-1, R-2, and R-3) were of raw milk samples bought from different vendors. Three (P-1, P- 2, and P-3) were of pasteurized milks samples each of different brand and the other three (U-1, U-2, and U-3) were of UHT-processed also from different brands. During the whole sampling process, its transportation to the laboratory and storage and all precautionary measures were observed.

3.3. Chemical analysis (19):

- Percentage of water, was determined by subtracting the value of total soluble solids (TSS) from 100.
- TSS was determined by using refractometer
- Milk fat, was measured by Rose-Gottlieb's method.
- Amount of solids-non-fat (SNF) was determined by subtracting the amount of fat from TSS.
- Lactose was determined by volumetric method. 20 ml of milk was diluted with water to a volume of 400 ml and 8-16 drops of a 10% solution of acetic acid added. The precipitate was filtered off and washed with cold water (4°C). The filtrate was boiled in a flask and the albumin precipitated. This was filtered off also and the precipitate was washed with cold water (4°C). A portion of this mixture was placed in a burette, and this was run into a boiling mixture of 20 ml Fehling's solution and 80 ml water. After the copper had been completely precipitated, the number of ml used was read. 20 ml Fehling's solution corresponds to 0.135 g milk-sugar.
- Protein was measured by Kjeldahl method.
- Ash content was determined by the method described by Maynard .
- Acidity was measured by titration with 0.1 N sodium hydroxide solution and using 1% ethanol solution of phenolphthalein as indicator.
- Water content of milk is usually 87.25% and it ranges from 84.0 to 89.0%. In this paper, samples with water content of more than 90% were regarded as adulterated with water.

Presence of the other adulterants was tested by specific qualitative tests are as follows:

Neutralizers: 20 ml of milk was taken in a silica crucible, the water was evaporated and the contents were burnt in a muffle furnace. The ash was dispersed in 10 ml distilled water and it was titrated against (N/10) hydrochloric acid using phenolphthalein as an indicator. If the titre value exceeded 1.2 ml, then it was construed that the milk was adulterated with neutralizers.

Formalin: 10 ml of milk was taken in test tube and 5 ml of concentrated sulphuric acid was added on the sides of the test tube without shaking. Appearance of a violet or blue ring at the intersection of the two layers indicated the presence of formalin.

Sucrose: 10 ml of milk was taken in a test tube and 5 ml of hydrochloric acid was added along with 0.1 g of resorcinol. Then the test tube was shaken well and placed in a boiling water bath for 5 min. Appearance of red colour indicated the presence of added sugar in milk.

Starch: 3 ml milk sample was taken in a test tube and boiled thoroughly. Then milk was cooled to room temperature and added with 2 to 3 drops of 1% iodine solution. Change of colour to blue indicated that the milk was adulterated with starch.

Glucose: 3 ml of milk was taken in a test tube and 3 ml Barfoed's reagent was added and mixed thoroughly. Then it was kept in a boiling water bath for 3 min and then cooled for 2 min by immersing in tap water without disturbance. Then 1 ml of phosphomolybdic acid was added and shaken. If blue colour was visible, then glucose was present in the milk sample.

Salt: 5 ml of silver nitrate (0.8%) was taken in a test tube and added with 2 to 3 drops of 1% potassium dichromate and 1 ml of milk and thoroughly mixed. If the contents of the test tube turned yellow in colour, then milk contained salt in it. If it was chocolate coloured, then the milk was free from salt.

3.4. Bacteriological analysis (20):

Standard Plate Count (SPC) method recommended for dairy products was followed for quantitative analysis of bacteria:

Enumeration of total viable bacteria: Nutrient agar medium (Difico) was used for enumeration of total viable bacteria. pH of the medium was adjusted at 6.8 prior to sterilization. Inoculated plates were incubated at 37°C for 24 to 72 h to facilitate viable bacterial growth. After incubation, the inoculated plates having 30 to 300 colonies were considered for counting using colony counter (Gallen Kamp, England) and following back calculation total count was expressed as colony forming units per ml (cfu/ml).

Enumeration of total coliform bacteria: Total coliform was determined by the same method used in the enumeration of total viable bacteria. The medium used for coliform was MacConkey agar. Inoculated plates were incubated at 37°C for 24 h. After incubation, typical pinkish and centrally red colonies were counted by using colony counter and total coliform was calculated.

Enumeration of total fecal coliform bacteria: Fecal coliform (FC) agar medium was used for the enumeration of fecal coliform. The media were inoculated and after incubation at 44°C for 24 h, typical bluish colonies were counted using colony counter, total fecal coliform count determined.

Enumeration of total Staphylococcus organisms: Staphylococcus medium was used for the enumeration of *Staphylococcus* organisms. Media were inoculated and after incubation at 37°C for 24 hours, colonies were counted using colony counter and following back calculation, total Staphylococcus count was obtained in cfu/ml.

Enumeration of total Salmonella and Shigella: *Salmonella* and *Shigella* agar (SSA) medium was used for enumeration of Salmonella and Shigella. Media were inoculated and after incubation at 37°C for 24 h colonies were counted using colony counter and following back calculation, the total Salmonella and *Shigella* count was obtained.

Enumeration of total Aeromonas hydrophila: Starch ampicillin agar medium was used for the enumeration of total viable Aeromonas bacteria. Agar plate media were inoculated and after incubation at 37°C for 24 h, typical pinkish colonies were counted using colony counter and total aeromonas count was determined.

Enumeration of total Psychrophilic bacteria: Nutrient agar medium was also used to enumerate total psychrophilic bacteria. Inoculated plates were incubated at 4°C for 15 days to facilitate the growth of psychrophilic bacteria. After incubation, colonies were counted using colony counter and following back calculation, total psychrophilic bacterial count was determined.

For obtaining single colony isolate, the method described by Mennane Z et al., 2207 (21) was used. Morphologically dissimilar well-spaced colonies were picked up with the help of a sterile loop from the plates, which had from 30 to 300 colonies. Each colony was streaked on to freshly +prepared plates of the same media and incubated at 37°C for 24 h or more. After incubation, typical pure colonies were taken as isolates.

The selected isolates were then purified through repeated streak plating. When plating produced only one type of colony in a particular plate, it was considered to be pure. The purified isolates were then transferred to nutrient agar slant in one drum screw capped culture vial and preserved as stock culture.

Identification was done up to genus by following the 'Bergey's manual of determinative bacteriology (22). For identification, different morphological characteristics including shape, size, form, texture, opacity, edge, elevation of the isolated colonies were studied carefully and after Gram staining, microscopic examination was carried out. The biochemical tests performed were catalase test, oxidase test, methyl-red test (MR Test), Voges-proskauer test (VP Test), production of hydrogen sulphide (KIA Test), hydrolysis of starch and fermentation tests.

IV. RESULT AND DISCUSSION:

Acidity:

Titratable acidity is a measure of freshness and bacterial activity in milk. High quality milk essentially needs to have less than 0.14 percent acidity.

Table 1. Titrable acidity of cow milk samples

Stage	Raw MILK				Pasteurized MILK				UHT MILK			
Time	R-1	R-2	R-3	Average	P-1	P-2	P-3	Average	U-1	U-2	U-3	Average
1	0.203	0.210	0.220	0.221 +0.008	0.160	0.169	0.180	0.179+ 0.010	0.147	0.150	0.152	0.143 +0.010
2	0.215	0.220	0.227	0.226 + 0. 009	0.172	0.175	0.198	0.183 +0. 012	0.154	0.161	0.158	0.158 +0.010
3	0.221	.232	0.236	0.231 +0.009	0.178	0.179	0.207	0.188 +0. 016	0.184	0.172	0.170	0.178 +0.006
4	0.230	0.240	0.250	0.251 +0.010	0.195	0.190	0.216	0.210 +0. 013	0.191	0.200	0.182	0.189 +0.007

The experiment was carried out in triplicate.

The average acidity % for raw milk samples was 0.221±0.008 for the first day of preservation and after six days of preservation the average acidity percentage was0.251±0.010 which indicating high bacterial quality. The average acidity of the pasteurized milk samples ranged from 0.179±0.010 to 0.210±0.013during the six days examination period, where Indian standards allow a maximum acidity of 0.15% for the pasteurized milks.

The most unexpected result was found with UHT milk samples during the preservation period. The average initial acidity percentage for UHT milk samples was 0.143±0.010. After six months of preservation the average acidity percentage in UHT milk samples was 0.189±0.007, suggesting deterioration in milk quality.

Titrable acidity of milk is expressed in terms of percentage lactic acid. Fresh milk does not contain any appreciable

amount of lactic acid and therefore an increase in acidity is a rough measure of its age and bacterial activity. Within a short time after milking, the acidity increases due to Bacterial activity. The amount of acid depends on the cleanliness of Production and the temperature at which milk is kept. Determination of acid in milk is an important factor in judging milk quality. Acidity affects taste when acidity reaches about 0.3%, the sour taste of milk becomes sensible. At 0.4% acidity, milk is clearly sour, and at 0.6% it precipitates at normal temperature. At acidity over 0.9%, it moulds.

Total viable Count:

Table- 2:Total viable count (TVC) in milk sample

Stage	Raw MILK				Pasteurized MILK				UHT MILK			
Time	R-1	R-2	R-3	Average	P-1	P-2	P-3	Average	U-1	U-2	U-3	Average
1	3.75	4.86	4.91	4.19+0.69	3.25	3.24	3.30	3.43+0.17	2.14	2.15	2.26	2.22+0.06
2	4.90	5.01	5.24	5.13+0.09	3.51	3.33	3.52	3.60+0.12	2.14	2.19	2.27	2.23+0.12
3	5.0	5.20	5.10	5.22+.17	3.59	3.45	3.82	3.87+0.06	2.31	2.40	2.53	2.39+0.02
4	5.16	6.17	6.21	6.35+.11	4.67	4.73	4.78	4.82+0.05	3.53	3.55	3.65	3.49+0.04

The experiment was carried out in triplicate.

The results of bacterial distribution in the samples are presented in Table 2. All the raw milks had high bacterial load which average ranged from 4.19+0.69 to 6.35+0.11 log cfu/ml during the preservation period. The most frequent cause of high bacterial load is poor cleaning of the milking system.

Bacterial count was high due to milking dirty udders, maintaining an unclean milking and housing environment and failing to rapidly cool milk to less than 40°F. The TVC (total viable count) of the pasteurized milk samples average ranged from 3.43+ 0.17 to 4.82+0.05 log cfu/ml. cfu/ml). The reason for high microbial count in the pasteurized milks may include defective pasteurization machinery, surviving pasteurization, and post-pasteurized contamination due to poor processing and handling conditions and/or poor hygienic practices by workers. According to the definition of UHT process, UHT milk should contain very little or no active bacteria8.

After four months of preservation, the average bacterial count in UHT milk samples was 3.49±0.04 log cfu/ml. The presence of bacteria in UHT milk might be due to many factors including the milk quality, sanitation of process plant, status of packaging material and also the handling process.

Coliform Count:

Table- 3:Total coliform count in milk samples

Stage	Raw MILK				Pasteurized MILK				UHT MILK			
Time	R-1	R-2	R-3	Average	P-1	P-2	P-3	Average	U-1	U-2	U-3	average
1	2.85	3.02	3.08	2.97+0.13	2.60	2.65	2.42	2.55+0.10	227	2.12	1.55	2.00+0.11
2	2.90	3.18	3.11	3.07+0.12	2.74	2.72	2.51	2.66+0.13	2.40	2.19	2.00	2.11+0.13
3	3.25	3.30	3.27	3.26+0.04	2.82	2.89	2.58	2.72+0.17	2.37	2.35	2.12	2.21+0.07
4	3.37	3.48	3.39	3.04+0.26	2.85	2.97	2.61	2.81+0.09	2.49	2.38	2.50	2.23+0.10

The experiment was carried out in triplicate.

The results of coliform count in the samples are presented in Table 3. Coliform are considered as indicator organisms because their presence in food indicates some form of contamination. Average coliform count in the raw milks average ranged from 2.97±0.13 log cfu/ml. to 3.40±0.26 log cfu/ml. during the six days preservation.

Poor hygiene, contaminated water, unsanitary milking practices, and improperly washed and maintained equipment can lead to higher coliform counts in raw milk .Pasteurized milk shouldn't contain any coliform bacteria as though coliform bacteria can't survive the pasteurization temperature but the presence of TCC (Total coliform count)of the pasteurized milk samples indicates either defect in pasteurization process or post pasteurization contamination which includes contamination in packaging materials(Srairi et al,2006), defects in pipe lines.

The average TCC in pasteurized milk after four days of refrigeration was2.81±0.09 log cfu/ml, which was very high. The experiment also demonstrated that UHT- milks under consideration were not free from coliform. The initial average coliform count for UHT milk samples was 2.00±0.11 log cfu /ml, which became 2.23±0.10 log cfu/ml after four months of preservation at room temperature. These results of coliform bacteria test indicates that processed milk available in India are not properly processed and may cause high health risk to consumers.

CHEMICAL COMPOSITION:

Table- 4: Chemical composition of the milk samples

Milk Sample	% of chemical constituents						
	Water	TSS	Fat	SNF	Lactose	Protein	Ash
R-1	89.0	11.0	3.75	7.25	4.83	3.75	0.80
R-2	91.0	9.0	3.15	5.85	4.30	3.16	0.70
R-3	91.0	9.0	3.81	5.82	4.14	3.07	0.74
P-1	90.83	9.17	3.34	5.83	4.65	3.35	0.64
P-2	89.0	11.0	3.40	7.60	4.82	3.49	0.67
P-3	89.17	10.13	3.72	7.11	4.82	3.51	0.71
U-1	88.0	12.0	3.62	8.38	4.97	3.86	0.75
U-2	88.0	12.0	3.44	8.56	4.80	3.52	0.75
U-3	89.0	11.0	3.09	7.91	4.88	3.43	0.69
N.B.: R= Raw milk, P= Pasteurized milk, U= UHT milk							

TSS= Total Soluble Solids ; SNF=Solids-Non-Fat

The experiment was carried out in triplicate.

From Table 4, it was shown that, chemical constituents were experimentally shown to its higher concentration in pasteurized milk compared to the raw milk samples that also indicates the milk sample to be consumed safely.

Adulteration of milk sample:

Table 5: Adulterants in milk samples

Presence of adulterants							
Sample	Added water	Neutralizer	Formalin	Sucrose	Starch	Glucose	Salt
R-1	-	-	-	-	-	-	-
R-2	+	-	-	-	-	-	+
R-3	+	-	-	-	-	-	+
P-1	+	-	-	-	-	-	-
P-2	+	-	-	+	+	-	-
P-3	-	-	-	+	-	-	-
U-1	-	-	-	+	-	-	-
U-2	-	-	-	+	-	-	-

U-3	-	-	-	+	-	-	-
N.B.: R=Raw milk, P=Pasteurized milk, U=UST milk, '+' = Present, '-' = Absent							

The experiment was carried out in triplicate.
No neutralizer, preservative, added sugar, glucose, starch, in raw milk but salts are found in (R-2 nad R-3). Four (R-2, R-3, P-1,P-2,) of the raw milks, however, had been adulterated with water which is very common in Panskura particularly in case of raw milk found in Table 5.

Addition of water dilutes the amount of total solids in milk and it also involves the danger of introducing germs into milk including the pathogens. Adulteration of milk with water therefore may introduce chemical or microbial hazards to health. It reduces nutritional and processing quality, palatability as well as marketing value of milk Water had also been added in one (P-1 P-2) of the pasteurized milks. The other adulterant detected was added sugar (sucrose) which was found in six (P-2, P-3, U-1, U-2, and U-3) of the processed milk.

IV. CONCLUTION:

It is concluded from the whole study that the initial average TVC (total viable count) in raw milk was 4.19±0.69 log cfu/ml, which increased to 6.35±0.11 log cfu/ml, a clear indication of deterioration in milk quality appears. In case of pasteurized milk samples, initial average total viable count was 3.43±0.17 log cfu /ml that increased to 4.82±0.05 log cfu/ml, after six days of preservation. UHT milk samples which should not contain microbial contamination also provided with initial average total viable count of 2.22±0.06 log cfu/ml and 3.49±0.04 log cfu/ml, during preservation at room temperature.

The UHT-treated milks were much better than the raw and pasteurized milks particularly from sanitary point of view and two of these, U-10 and U-11, were the bests of all samples considering most parameters. The hygienic standard of the raw and pasteurized milks was very poor. All the raw and pasteurized milks had high bacterial loads and some contained pathogenic bacteria.

The UHT milks didn't contain any. Few of the raw and pasteurized milks were also inferior in fat content. Two adulterants, added water and sucrose, were identified in a number of raw and pasteurized milks. The presence of the pathogenic organisms, the high counts of coliforms and the high levels of adulteration are indicative of a potentially hazardous product which is likely to be posing a serious health risk to the consumers. The government therefore should conduct frequent inspection of the marketed milks to check whether they meet the minimum legal standards and should monitor the overall hygienic condition surrounding the production and handling of milk. Realistic standards for the raw milks need to be devised and appropriate training should be given to the raw milk producers in hygienic handling of milk.

The presence of pathogenic organism, the high counts of coliforms and the high levels of adulteration in milk are indicative of a hazardous product. The concerned authorities therefore should monitor the overall hygienic condition surrounding the production and handling of milk.

V. ACKNOWLEDGEMENT

The authors acknowledge the college authority to carry on the research work in the post graduate curriculum smoothly.

VII. REFERENCES:

1. Marjan, S, Das, KK, Munshi, SK Noor, R (2014). Drug-resistant bacterial pathogens in milk and some milk products. *Nutn. Food Sci*. 44 (3): 241-248.
2. Hossain, TJ, Alam, K and Sikdar, D (2010). Chemical and microbiological quality assessment of raw and processed liquid market milks of Bangladesh. *Res. J. Dairy Sci*. 4 (4): 28-34.
3. Haug, A, Hostmark, AT and Harstad, OM (2007). Bovine milk in human nutrition – A review. *Lipids Health. Dis*. 6: 25.
4. Kim, H (1983). Off-tastes in raw and reconstituted milk. *FAO Animal Production and Health Paper.*
5. OECD (2005). Dairy policy reform and trade liberalization. Organization for Economic Co-operation and Development Publishing, Paris, France.
6. Tolle, A (1980). The microflora of the udder: Factors influencing the bacteriological quality of raw milk. *International Dairy Federation Bulletin*.
7. Coorevits, A (2008). Comparative analysis of the diversity of aerobic spore-forming bacteria in raw milk from organic and conventional dairy farms. *Appl. Microbiol*. 31 (2): 126-140.
8. Uddin, MA, Haque, HMMU and Noor, R (2011). Isolation and Identification of pathogenic Escherichia coli, Klebsiella spp. and Staphylococcus spp. in raw milk samples collected from different areas of Dhaka city, Bangladesh. *Stamford J. Microbiol*. 1 (1): 19-23
9. Bramley, A J and McKinnon, CH (1990). The microbiology of raw milk. R. K. Robinson (ed.), *Dairy Microbiology*. 163-208. Elsevier Science Publishers, London.
10. Armesto, MRG and Sutherland, AD (1997). Temperature characterization of psychrotrophic and mesophilic *Bacillus* species from milk. *J. Dairy Res*. 64: 261–270.
11. Sørhaug, T and Stepaniak, L (1997). Psychrotrophs and their enzymes in milk and dairy products: quality aspects. *Trends in Food Sci. Technol*. 8: 35–40.
12. Ryser (1999). Microorganisms of importance in raw milk. *Michigan Dairy Review*. 8: 7–9.
13. Martins, ML (2006). Genetic diversity of Gram-negative proteolytic, psychrotrophic bacteria isolated from refrigerated raw milk. *Int. J. Food Microbiol*. 111: 144–148.
14. Khan, MTG (2008). Physical and microbial qualities of raw milk collected from Bangladesh agricultural university dairy farm and the surrounding villages. *Bangladesh J. Vet. Med*. 6 (2): 217-221.
15. Dey S, Karim, MH (2013). Study on physicochemical and microbial quality of available raw, pasteurized and UHT milk during preservation. *Int. J. Sci. Invent. Today*. 2 (2): 150-157.
16. Bangladesh Standards and Testing Institution. (2002). Bangladesh standard: Specification for pasteurized milk. Bangladesh Standards and Testing Institution, Tejgaon Industrial Area, Dhaka.
17. Kim, H, Hardy, J, Novak, G, Ramet, JP and Weber, F (1983). Off-tastes in raw and reconstituted milk. *FAO Animal Production and Health Paper*. 35: 2.
18. OECD (2005). Dairy policy reform and trade liberalization. Organisation for economic co-operation and development, p. 98, OECD Publishing.
19. FAO/WHO (1997). Risk management and food safety, FAO Food and Nutrition paper number 65. Food and Agriculture Organization, Rome, Italy.
20. Asaminew T, Eyassu S (2011). Microbial quality of raw cow s milk collected from farmers and dairy cooperatives in Bahir Dar Zuria and Mecha district, Ethiopia. *Agric. Biol. J. N. Am*. 2 (1): 29-33.
21. Mennane Z, Ouhssine M, Khedid K, Elyachioui M (2007). Hygienic Quality of Raw Cow's Milk Feeding from Domestic. *Int. J. Agri. Biol*. 9 (1): 1560-8530.
22. Whitman, W, Goodfellow, M, Kämpfer, P, Busse, HJ, Trujillo, M, Ludwig, W, Suzuki, KI and Parte, A (2012). Bergey's Manual of Systematic Bacteriology. Vol 5. Springer publication.