Quality of Raw Milk Available at Different Markets of Bangladesh

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Abstract:

The present study was conducted to evaluate the quality of raw milk collected from different markets of Bangladesh. Test for quality was carried out at the Dairy Technology and Microbiology Laboratory, Bangladesh Agricultural University, Mymensingh. For this purpose the samples were collected from Newmarket (T1), Kewatkhali bazar (T2) and Charpara (T3) located in the Mymensingh town, Bangladesh. Parameters used to monitor the quality of milk samples were physical (organoleptic and specific gravity), chemical (% acidity), fat (g/kg), ash(g/kg), protein (g/kg), lactose (g/kg), TS (g/kg), SNF (g/kg)-and microbiological (TVC and coliform count). From the physical parameter, it appeared that the quality of milk of the three markets was similar in respect of color, taste, and flavor. The chemical composition of Newmarket (T1) was better than the other two sources of milk samples. All the raw milk samples did not fulfill the legal standard of milk composition. Microbiological parameters also showed a higher count in all raw milk samples than the standard. Morning milk was slightly lower than the evening milk in term of chemical composition. However, the specific gravity of morning samples was higher than the evening milk samples.

Keywords:

Raw Milk, Quality, Microbiological Parameter, Chemical Composition, Bangladesh

1. Introduction

Milk is a compulsory part of the daily diet for the expectant mothers as well as growing children [1]. Undoubtedly it is established that the milk and milk products form an important well-balanced food and almost complete food for human diet and there is no single food that can substitute the milk. Milk is hereby legally defined to be the lacteal secretion, practically free from colostrum, obtained by the complete milking of one or more healthy cows, 5 days after and 15 days before parturition, which contains not less than 8.5 percent milk solids -not fat and not less than 3.5 percent milk fat [2, 3]. The composition of normal cow's milk varies to a

great extent. The main constituents of milk are- (i) water, (ii) protein, (iii) fat, (iv) carbohydrate (milk sugar of lactose) (v) and ash. According to Byron et al. [4] the average composition of milk are as follows:

Table1. *Composition of different components in Milk.*

Composition	Percentage
Water	87.20
Dry matter	12.80
Fat	3.70
Protein	3.50
Lactose	4.90
Ash	0.70

Source: Byron et al. [4]

Besides, the above constituents' milk also contains a considerable amount of fat-soluble vitamins (A, D, E & K) and water-soluble vitamins (B complex and C). The constituents may vary with the breed, type of feed, stage of lactation, season, the age of the cow etc. and also between individuals of the same breed. Milk fat often called "Butterfat" is commonly the most valuable constituent of milk. Milk fat has a special significance in nutrition due to the presence of wide range of fatty acids and high content of short-chain volatile fatty acids. Milk fat is easily digestible and serves as the concentrated source of energy and each gram of fat furnishes 9 calories energy which is 2.25 times more than protein and carbohydrate. It is a carrier of fat-soluble vitamins and helps in lactose assimilation. However, it is common belief that animal fat including milk fat is responsible for heart diseases as it contains cholesterol. Sayem [5] reported that approximate cholesterol content per 100g of milk, meat, calf liver, whole egg and egg yolk is 12 mg, 101 mg, 260 mg, 500 mg and 1500 mg respectively. It appears from the above figures that milk contains the minimum amount of cholesterol than other consumed daily feed items. Therefore, it is not fair to blame milk for heart disease. In addition, milk also contains vitamin-F, which cures heart disease. The protein of milk is not a single compound but includes two major proteins namely: caffeine (80 percent of the total protein) and lactalbumin (18 percent) and lactoglobulin (2 percent). The essential amino acids like tryptophan and lysine are present in large quality in milk which is deficient in vegetable protein. Besides, glutamic acid presents in cow's milk are 3 times higher than in human milk, which results in a reduction of cholesterol level in blood. Oratic acid of milk protein improves liver detoxification. Another content taurine is responsible for the development of the immature brain. Lactose, the only naturally available milk sugar is an excellent food for babies. One molecule of galactose and 1 molecule of glucose form lactose. Galactose is essential for the synthesis of galactosides, a constituent of central nervous system and therefore, lactose provides an important role for growth and development of the central nervous system as well as brain tissue of mammalian young. Calcium and phosphorus, which are important in the formation of bone and teeth and all most of the essential minerals needed by the body are present in milk. Calcium aiding in the contraction and relaxation of heart muscles including clotting of the blood to prevent fetal bleeding and maintains buffer capacity of blood. Milk is also a rich source of all known vitamins, which are essential for human health and nutrition. Moreover, some are present in large quantity than a human requirement. This is a generalization that consumers want clean, wholesome and nutritious food that is produced and processed in a sound, sanitary manner and is free from pathogens. For

fulfilling consumer's demand we must have to produce quality milk. Quality milk means the milk which contains no pathogenic bacteria and harmful toxic substances, free from sediment and extraneous substances, good flavor, with normal composition, adequate in keeping quality, low in bacteria counts [6]. So, the quality of milk depends on its freshness, cleanliness, purity, and wholesomeness. Quality milk production requires clean, healthy and well-fed cows; clean, dry and well-ventilated barns and clean sanitized utensils.

In Bangladesh, milk is produced mostly in a non-organized way and usually it is being supplied to the consumers from the urban and rural areas by middleman [7]. Most of the dairy farmer's livelihood depends on rearing cow and selling milk [8]. It is very common in rural areas by which dairy farmer of rural area earn money by selling milk and it helps to reduce their poverty and food insecurity [9, 10, 11]. Women farmer also can rear milking cows in the riverine island char areas of Bangladesh which empowers themselves [12]. Although there are little milk pockets especially Milk Vita and some established dairy farm where surplus milk is readily available, this perishable product has neither received particular attention by hygienic distribution to the consumers [13]. Milk being nutritious food for human beings, also serves as a good medium for the growth of many microorganisms, especially Lactobacillus, Streptococcus, Staphylococcus and Micrococcus sp. Bacterial contamination of raw milk can originate from different sources such as air, milking equipment, feed, soil, feces and grass [14, 15]. The number and types of microorganisms in milk immediately after milking are affected by factors such as animal and equipment cleanliness, season, feed and animal health [16]. It is hypothesized that differences in feeding and housing strategies of cows may influence the microbial quality of milk [17, 18]. Rinsing of milking machine and milking equipment with unclear water may also be one of the reasons for the presence of a higher number of microorganisms including pathogens in raw milk [19, 20]. The presence of these pathogenic bacteria in milk often emerge as a major public health concern, especially for those individuals who still drink raw milk. Keeping fresh milk at an elevated temperature together with unhygienic practices in the milking process may also result in microbiologically inferior quality. Cousin [21] reported that there are so many sources viz. udder, the body of the cows, litter, floor, flies, insects and rodents, water supply, milker, milk utensils and atmosphere for bacterial contamination of milk. Brooks et al. [16] reported that milk and milk products derived from the milk of dairy cows can harbor a variety of microorganisms and can be important sources of food borne pathogens. The examination of market milk in different parts of the country would be a valuable addition to our knowledge of dairy technology. The present study was undertaken with the aim of investigating the hygienic quality (physical, chemical and microbiological) of raw milk from different markets of Mymensingh town. The specific objectives of the study were (a) to study the physical qualities e.g. organoleptic and specific gravity of raw milk produced in different markets of Bangladesh and (b) to study some chemical qualities e.g. acidity percentage, fat percentage, SNF percentage, total solids percentage, protein, lactose and ash percentage of raw milk produced in different markets, (c) to determine the microbiological qualities of raw milk of different markets with the help of total viable and coliform count test.

2. Materials and Methods

2.1. Site and Period of Experiment

The present experiment was conducted at Dairy Technology Laboratory of the Department of Dairy Science, Bangladesh Agricultural University, Mymensingh during the period from 9th April to 3rd June 2012.

2.2. Collection of Samples

Raw milk samples were collected from 3 different markets of Mymensingh town. For one trial a total of 8 milk samples were collected from each market, out of which 4 samples were from morning milk and another 4 from evening milk. Thus a total of 24 raw milk samples were received from 3 different markets of Mymensingh town and were transferred to the Dairy Technology Laboratory by keeping them in the bottles. These samples were preserved in the refrigerator prior to the experiment.

Table2. *Sample collection from different markets of Mymensingh town, Bangladesh.*

Sl. no.	**Name of markets**	**Location**
1	Newmarket (T_1)	Mymensingh, Bangladesh
2	Kewatkhali bazar(T_2)	Mymensingh, Bangladesh
3	Charpara (T_3)	Mymensingh, Bangladesh

2.3. Analysis of the Samples

The following physical, chemical and microbiology tests were carried out with each raw milk samples.

2.4. Physical Tests

A) Organoleptic (Colour, Flavor, Texture) and Specific gravity (Sp. Gr.)

B) Chemical tests

a) Determination of Acidity content
b) Determination of Fat content
c) Determination of Solids-not-fat (SNF) content
d) Determination of Total Solids (TS) content
e) Determination of Ash content
f) Determination of Protein content
g) Determination of Lactose content

C) Microbiological examinations

D) Determination of Total Viable Count

E) Determination of coliforms Count

2.5 Analytical Procedure

2.5.1 Physical Test

The physical parameters of the organoleptic test were performed visually and nasally to observe the color, flavor, and textures according to Nelson and Traught [22] by a panel of judges who evaluated the samples. The specific gravity test was performed using Quevenne lactometer, Lactometer cylinder and floating dairy Thermometer according to the method described by Aggarwala and Sharma [23].

2.5.2. Chemical Analysis

The fat test was performed by Babcock fat test methods as described by Aggarwala and Sharma [23]. Acidity test was done by titrating milk with N/10 NaOH solution as per method described by AOAC (1971). Protein test was done by formal titration method. SNF and TS were calculated by the mathematical formula. Details of all procedures are given in appendix section.

2.5.3. Microbiological Examination

The experimental procedures followed for the determination of the number of total viable bacteria in a sample and the detection and enumeration of coliforms bacteria were as per recommendation American Public Health Association (APHA) [24, 25].

2.6. Statistical Analysis

The experiment was conducted in Completely Randomized Design (CRD) with two factors; Factor I was market and Factor 2 was time. The data were statistically analyzed with the help of MSTAT statistical program to find out the statistical differences among the different parameters studied from three different sources of milk.

3. Physical Parameters

3.1. Physical Parameters

The physical parameters were studied after collection and sampling of milk from different markets of Mymensingh town. These parameters were mainly organoleptic test (colour, flavour, texture) and specific gravity of the raw milk samples.

4. Organoleptic Test

4.1. Colour

Out of 24 samples collected from different markets of Mymensingh town, 12 samples (50%) were yellowish white and 12 samples (50%) were, deep yellowish in color (Table 3). The observation for most of the samples agrees with Judkins and Mack [26] who reported that normal milk has a yellowish white color due to the presence of fat and casein and to the presence of small amount of natural coloring materials. The differences in color may be due to the differences in nature of feed the cows consumed, the breed, the fat, and solids content of the milk. These results agree with Eckles et al. [27] who reported that color of milk depends upon the breed, the amount of fat and solids present and most of all cases it depends upon the nature of feed the cow consumed.

4.1.2. Flavour

Out of 24 samples collected from different markets of Mymensingh town, 12 samples (50%) had flat flavor and 12 samples (50%) had sweet aroma flavor (Table 3). No off flavor was detected. Islam et al. [28] indicated that flavor of milk produced hygienically was normal. Murphy et al. [29] also stated that improvement of management during milking improve the flavor of milk. Foley et al. [30] reported that cowy flavor is found in milk from cows suffering ketosis. A barny flavor occurs in the

milk of cows housed in poorly ventilated sheds. Olson [31] stated that feed and weedy flavors develop in milk if the cow consumes onion, French weeds, bitter weeds, green rye, etc. just before milking.

4.1.3. Texture

The texture of raw milk sample was examined before starting the experiment. Milk samples (50%) collected from T_1 had thin texture. Similar results for texture was observed in milk collected from other markets (T_2 and T_3). Milk samples (50%) collected from T_1had normal texture (free-flowing liquid) (Table 3). The thin texture in some of the samples might be due to milk being collected from high producing cows or added water to milk as adulteration.

Table 3. *Physical parameters of milk samples collected during experimental period.*

Physical parameter	T_1	T_2	T_3
Colour	Yellowish white, 50%	Yellowish white, 50%	Yellowish white, 50%
	Deep yellowish, 50%	Deep yellowish, 50%	Deep yellowish, 50%
Flavour	Flat, 50%	Flat, 50%	Flat, 50%
	Sweet aroma, 50%	Sweet aroma, 50%	Sweet aroma, 50%
Texture	Thin, 50%	Thin, 50%	Thin, 50%
	Normal, 50%	Normal, 50%	Normal, 50%
Specific gravity, (mean ±SD)	1.0225 ±0.0029	1.0240 ±0.0020	1.0223 ±0.0019

4.1.4. Specific Gravity

Specific gravity of milk obtained from different dairy farms throughout the experiment period is shown in (Table 3). The mean and standard deviation of the specific gravity of raw milk samples collected from T1, T2 and T3 were 1.0225 ± 0.0029, 1.0240 ± 0.0020 and 1.0223 ± 0.0192 respectively. There were no significant differences ($P<0.01$) within the specific gravity of milk collected from different markets. Generally normal cow's milk may range in specific gravity from 1.027 to 1.035 with an average of 1.032 [27]. Murphy et al. [29] collected 335 samples from individual of Holstein cows and found that it varies from 1.023 to 1.035. The results of the specific gravity were in agreement with Islam et al. [28] who found that specific gravity of cow's milk from BAU Dairy Farm was higher than that collected from the local markers. Similarly Yadav et al. [32] reported lower specific gravity of market milk in Vasranasi town, India. In another experiment, Ito [33] found that specific gravity of cow's milk was 1.030 ± 0.006. Islam et al. [28] obtained almost the same specific gravity value of 1.032 for cows in Yugoslavia. Salam [34] reported that the average specific gravity of milk of Bhaghabarighat Dairy Plant was 1.0275 ± 0.001. Rahman [35] studied the physical and chemical quality of milk collected from different plants of Milk Vita and reported the average specific gravity of the milk of Bhaghabari Dairy Plant was 1.02375 ± 0.0066. Azad [36] reported that the average specific gravity of milk of selected milk producing a society of Baghabarighat Dairy Plant was 1.029 ± 0.001. Alam [37] carried out an experiment on the quality of raw milk collected from different milk collection center and individual farmers of Kishargonj district under ABF Ltd. He reported that the mean specific gravity was 1.0304. Milk fat has some influence on the specific gravity of milk. As the higher the fat content of milk, the lower will be the specific gravity. However, specific gravity mostly depends on the TS content and increases when the TS rises. From the above

findings, it may be pointed out that the physical quality of raw milk collected from all three markets were almost similar with slight variation in terms of physical properties.

4.2. Chemical Parameters

4.2.1. Acidity Percentage

The acidity percentage of milk collected during experimental period were 0.153 ± 0.0074 for T_1, 0.154 ± 0.0077 for T_2 and 0.156 ± 0.0069 for T_3 (Table 4). Statistical analysis showed that there were no significant differences (P<0.01) within the acidity percentage of milk collected from different markets. The normal range of acidity of cow's milk is 0.13 to 0.18% lactic acid [38], and all the sample within this range. A Higher percentage of acidity in milk is an indicator of microbial activities or enzymatic reaction. The acidity of milk collected from the markets depends on the time elapsed from milking up to receiving milk in the market. The higher content of SNF in milk may show the slightly higher percentage of acidity and vice versa. The acidity percentages of the milk collected from three markets agree with Islam et al. [28]. They reported that acidity percentage of market milk was 0.14 ± 0.010% and also the average percentage of cow's milk in BAU Dairy farm was 0.15%, which is similar to the acidity of the milk collected by farms. Rahman [35] reported that the average acidity percentage of Manikgonj Chilling Centre (MCC), Tangail Chilling Centre (TCC), Takerhat Pasteurization plant (TPP) and Bagliabanighat Dairy Plant were 0.15, 0.135, 0.145 and 0.159, respectively. Alam [37] reported that average acidity percentage of raw milk of ABF Ltd. was 0.155. In another experiment, Ito [33] reported that the acidity percentage of cow's milk was 0.142 ± 0.0074, which was similar to this experimental result of acidity percentage. From the acidity values of milk obtained from three markets, it could be concluded that all the milk samples were fresh during laboratory analysis.

Table 4. *Summary of the results of raw milk.*

Farm / Parameter	T_1	T_2	T_3	Level of significance
SNF(g/kg)	79.301 ±4.544	77.672 ±4.687	75.375 ±6.462	NS
TS(g/kg)	109.563 ±2.336	109.172 ±2.692	108.375 ±4.716	NS
Fat(g/kg)	30.25^{c} ±2.492	31.50^{b} ±2.138	33.00^{a} ±2.00	**
Protein(g/kg)	33.762^{a} ±1.481	31.812^{b} ±1.753	30.25^{c} ±2.659	**
Lactose(g/kg)	39.125 ±3.200	39.050 ±3.222	38.612 ±3.613	NS
Ash(g/kg)	6.427 ±0.57	6.797 ±0.276	6.512 ±0.313	NS
Acidity (%)	0.153 ±0.0074	0.154 ±0.0077	0.156 ±0.0069	NS

*** = Significant at 1% level of probability*

NS = Not significant; in a row figures with or without letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

4.2.2. Fat Content

The fat content of milk collected from T1, T2 and T3 were 30.25a ± 2.492, 31.50b ± 2.138 and 33.00a ± 2.00 g/kg respectively (Table 4). Statistical analysis showed that the differences between the fat percentages were significant (P< 0.01). Generally fat content of milk varies from 2.5 to 9% [39]. From this experiment, it was found that fat content of milk collected from all three markets were within normal range. Talukder

[40] studied the fat content of milk collected from different local markets and from different vendors. He reported that the fat content was 2.96 and 4.72% respectively. In another experiment, Islam et al. [28] reported that fat content of milk collected from local markets of Mymensingh town was significantly lower than that of the milk collected from Bangladesh Agricultural University Dairy Farm. Islam et al. [28] studied the fat percentage of milk collected from local markets and co-operative society in M.C.C. He reported the fat percentages of these two sources were 3 and 4.75% respectively. It appears that the fat content of indigenous cows is higher than the crossbred cows. The present experiment agreed with the above finding. In another experiment, Yadav and Saraswat [32] showed that fat content of milk obtained from local markets of Varanasi town, India was lower than the fat contents of control samples. Yoshida [41] found 2.85 to 3.6% fat for market milk in Japan. In another experiment, Mishra and Nayak [42] found the fat percentage in the milk of indigenous cows in Orissa to be 4.69. Rahman [35] observed that the average fat percentage of milk samples collected from Baghabari Dairy Plant was 4.28 ± 0.03. The average fat content found in the present study was lower than that reported by Rahman [35]. All three different markets sold milk with a fat content ranging from 3.025 to 3.30%. The lower fat content of milk may be due to milk being collected from crossbred cows or adulteration of milk by water or partly skimming the milk. Yoshida [41] found 2.85 to 3.63% fat for raw collection center milk in Japan. This result also agrees with Islam et al. [28] who reported 2.3 to 3.6% fat for market milk supplied in Mymensingh Town, Bangladesh.

4.2.3. SNF Content

The SNF content of milk collected from T1, T2 and T3 were 79.30 ±4.54, 77.67 ±4.68, and 75.37 ± 6.46 g/kg respectively (Table 4). Statistical analysis showed that there was no significant difference within the SNF contents of milk collected from different markets. Yadav and Saraswat [32] in an experiment found that SNF content varies from 6.39% to 8.86%, which agrees with this finding. Yoshida [41] found lower SNF contents in the market milk in Fukuyama, Japan. Islam et al. [28] also reported lower SNF percentage in local market milk than that of the milk from BAU Dairy Farm, Mymensingh, Bangladesh. Rahman [35] observed that the average SNF content of mixed milk collected from different primary co-operative society under Milk Vita Baghabari Dairy Plant was 7.69%. Alam [37] conducted an experiment and found that the average SNF percentage of raw milk of ABF Ltd. was 8.43, which was higher than the observations of the current research.

4.2.4. Total Solids (TS) Content

The Total Solids (TS) contents of milk collected from T1, T2 and T3 were 109.56 ±2.33, 109.17 ± 2.69 and 108.37 ±4.71 g/kg respectively (Table 4). Statistical analysis showed that there was no significant difference within the TS contents of milk collected from different markets. The results were in agreement with a number of works [32, 28] who found similar TS contents in market milk in India and Bangladesh Islam et al. [28] found lower total solid percentage in milk from local markets (8.55-12%). Yadav and Saraswat [32] reported lower total solids content in market milk (9.78-15.06%) in India. The lower TS content of collected milk samples may be due to lower fat content and this might also be due to adulteration by adding water. Rahman [35] observed that total solids content of milk collected from Milk Vita Manikgonj Chilling Centre, Tangail Chilling Centre, Takerhat Pasteurization Plant

and Bagliabari Ghat Dairy Plant were 11.49%, 10.78%, 10.72% and 12.91 % respectively [43].

4.2.5. Ash Content

Ash of raw milk obtained from T1, T2 and T3 were 6.42 ±0.57, 6.79 ± 0.27 and 6.51 ± 0.313 respectively (Table 4). Statistically, it was found that there was no significant difference within the ash of different types of raw milk samples collected from different markets. Zheng et al. [43] who reported that the percentage of ash in cow's milk collected from mid-lactation was 0.75%. From the present study, it was observed that ash content of raw milk of three markets was below the normal range. In another experiment, Ali [44] found that the average ash of milk samples from BAU Dairy Farm, for students' Halls suppliers and Vendor's were 0.71 ± 0.02%, 0.68 ± 0.03% and 0.673 ± 0.01 % respectively.

4.2.6. Protein Content

The average protein (g/kg) of different types of milk samples are presented in (Table 4). Statistical analysis showed that there was significant difference ($P<0.01$) within the protein content of different samples. This might be due to different nutritional levels of cows, and also genotypic variations.

4.2.7. Lactose

The Lactose (g/kg) content of different types of milk samples were 39.125 ±3.2, 39.05 ±3.22 and 38.61 ±3.61 for T1, T2 and T3 samples respectively (Table 4). Statistical analysis showed that there was no significant difference within the Lactose contents of different milk samples [45].

4.3. Microbiological Tests

4.3.1. Total Viable Bacterial Count

Total viable count/ml of raw milk samples obtained from three different markets during the experimental period is shown in (Table 5). The average values of total viable count/ml were 1806250 CFU/ml (log 6.256), 1320000 CFU/ml (log 6.120), 821250 CFU/ml. (log 5.914) for T1, T2, and T3 respectively. It was found that total viable bacteria count per ml of raw milk collected from T1 were significantly higher ($P<0.01$) than the other two markets' milk samples. Average Stander plate counts/nil for "Grade A" raw milk should not exceed 200000 for milk to be pasteurized. From this study, it was found that the raw milk collected from different markets were not "Grade A" categories in term of the total viable bacterial count. In this experiment, comparatively higher viable bacterial count in T1 may be due to unhygienic milking. On the other hand total, viable count collected form T2 and T3 were lower, though unsatisfactory. The high bacterial density of above mentioned three different markets might also be due adulteration by poor quality milk [46].

4.3.2. Coliform Count

The average values of coliform count/ml of milk samples collected from T1, T2, and T3 were 625 CFU/ml (log 2.795), 487.5CFU/ml (log 2.687) and 661.25 (log 2.82) respectively (Table 5). Statistical analysis showed that there was no significant difference in the coliform count/ml of different milk samples and it was observed that

the coliform count/ml of milk samples were very high. This may be due to very poor hygienic milking condition and also post-milking contamination.

Table 5. *Total viable count and coliform count of bacteria in raw milk.*

Farm / Parameter	T_1	T_2	T_3	Level of significance
Log value of TotalViable Count (CFU/ml)	6.256a	6.120b	5.9145c	**
Log value of Coliform Count (CFU/ml)	2.795	2.687	2.82	NS

*** = Significant at 1% level of probability*

NS = Not significant; in a row figures without letter do not differ significantly whereas figures with dissimilar letters differ significantly.

4.4. Effect of Milking Time (Morning And Evening) on the Quality of Milk

4.4.1. Composition and Acidity

Data collected from morning and evening milk were separately analyzed to see the effect of time of milking on its quality. It was found that acidity % and contents (g/kg) of fat, SNF, TS, protein, lactose and ash of morning and evening milk did not vary significantly (Table 6). The results of this experiment were slightly different than the findings of Aggarwala and Sharma [23] who reported that the fat content of morning milk was lower than the fat content of evening milk. Islam et al. [28] found that acidity % of morning and evening milk were 0.16 and 0.161 respectively.

Table 6. *Summary of the results of milk collected during morning and evening.*

Parameters	Morning (mean ±SD)	Evening (mean ±SD)	Level of significance
Specific Gravity	1.023±0.002	1.022±0.002	NS
SNF	76.58±5.43	78.31±5.31	NS
TS	109.00±3.77	109.07±2.93	NS
Fat	30.75±2.63	32.41±1.93	NS
Protein	31.85±2.30	32.03±2.66	NS
Lactose	38.25±3.60	39.60±2.75	NS
Ash	6.48±0.48	6.67±0.35	NS
Acidity	0.15±0.01	0.15±0.01	NS
T.V.C/ml	151.25±59.93	111.92±47.99	NS
Coli/ml	647±193.95	535±179.31	NS

NS = Not Significant

4.4.2. Specific Gravity of Milk

In this experiment, it was found that the specific gravity of morning and evening milk samples were 1.0235 and 1.0223 respectively (Table 6). Statistical analysis showed that there was no significant difference between the specific gravity of morning and evening milk. The slightly lower specific gravity of evening milk might be due to a higher amount of milk fat during that time, as the specific gravity of milk fat is lower than moisture in milk. Islam et al. [28] reported that the mean specific gravity of morning and evening milk were 1.030 and 1.029 respectively. Islam et al. [28] also found that mean value of acidity and fat, SNF, TS and ash of morning &

evening milk were 0.153 & 0.156 % and 30.75 & 32.41, 76.58 & 78.31, 109.00 & 109.07 and 6.48 & 6.67g/kg respectively. Analysis showed that morning milk was slightly lower than the evening milk in terms of chemical parameters [47]. Therefore evening milk was richer in nutrients than the morning milk.

5. Conclusions

The experiment was designed to evaluate the quality (physical, chemical and microbiological) of milk collected from three selected markets of Mymensingh town A total of 24 raw milk samples (12 samples from the morning and 12 samples from the evening) were collected. Morning and evening milk were analyzed separately. The experiment was conducted for a period of 9th April to 3rd June 2012. The parameters used to monitor the quality of milk samples were organoleptic test, specific gravity, acidity test, fat test, solids-not-fat (SNF) test, total solids (TS) test, ash test, protein test, lactose test, total viable count and coliform count test of the above three selected markets of Mymensingh town. From the organoleptic test, it was observed that out of 24 samples 12 samples (50%) were yellowish white and 12 samples (50%) were, deep yellowish in color. In respect of flavor out of 24 samples collected from different markets of Mymensingh town, 12 samples (50%) had flat flavor and 12 samples (50%) had sweet aroma flavor. Milk samples (50%) collected from T1 had thin texture. Similar types of results for texture was seen in milk collected from different markets (T2 and T3). Milk samples (50%) collected from T1 had normal texture (free-flowing liquid). There were significant differences in chemical parameters between the farms. Chemical analysis showed that the overall percentage of acidity and fat, SNF, TS, protein, lactose and ash contents were 0.154% and 31.58, 77.44, 109.07, 31.94, 38.92 and 6.57 g/kg respectively. On the other hand, total viable count/ml and coliform count/ml were 131.58x 104and 591.25 respectively. Mean value of acidity and fat, SNF, TS, protein, lactose and ash of morning & evening milk were 0.153 & 0.156 % and 30.75 & 32.41, 76.58 & 78.31, 109.00 & 109.07, 31.85 &32.03, 38.25 &39.60 and 6.48 & 6.67 g/kg respectively. Analysis showed that morning milk was slightly lower than the evening milk in terms of chemical parameters. But the specific gravity of morning samples (1.023) was higher than the evening milk samples (1.022). Evening milk is richer in nutrients than the morning milk. From the results obtained it appears that the quality of milk of 3 selected markets was almost similar. For the production of “better quality milk,” it is necessary to train farmers about the hygienic aspects of milk production. That might help to reduce the higher incidence of microorganisms in milk; hence result the quality of milk will also improve.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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