

Qualitative characteristics of market milk collected from some selected areas of Panchagarh district

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Abstract

Context: Milk is a complete diet and its adulteration could be harmful for our health. So, qualitative assay of milk can prove its safety.

Objectives: To detect physical and chemical properties of milk of selected areas of Panchagarh district.

Material and methods: The experiment was conducted at BRAC Milk collection centre Atowari Panchagarh & Milk Collection Centre of Milk Vita (BMPCUL) in Sadar Panchagarh. The experiment was conducted during the period of August, 2013 to March, 2014. To evaluate the quality of Kazi and Kazi Organic Dairy Farm, Kazi and Kazi Cooperative Dairy Farm, Local market and Farmers house.

Results: The specific gravity of Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, Local market, Farmers house 1.031±0.00, 1.026±0.00, 1.026±0.00 and 1.031±0.00 and the range is 1.029-1.033, 1.024-1.030, 1.023-1.029 and 1.029-1.033 respectively. Acidity, APT, Fat%, Solids-Not-Fat% (SNF), Total Solids% (TS), water content% in Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, Local market, Farmers house are 0.14±0.01, 0.17±0.03, 0.17±0.02, 0.16±0.04, 2.00±0.00, 1.65±0.49, 1.65±0.49, 1.85±0.37, 4.10±0.22, 3.41±0.26, 3.14±0.24, 4.10±0.25, 8.66±0.31, 7.55±0.47, 7.33±0.39, 8.66±0.32, 12.76±0.45, 10.95±0.64, 10.47±0.38, 12.76±0.48, 87.24±0.45, 89.05±0.64, 89.53±0.38, 87.24±0.48. Statistical analysis showed that the different parameters of milk samples among the four different places were significant ($P < 0.01$). From the result obtained it may be concluded that to get pure and wholesome milk the producers and distributors must be honest.

Conclusion: On the basis of physical parameters like Organoleptic tests, Colour, Flavour, Taste, Specific gravity (Sp. gr.), CLR (corrected lactometer reading) it was found that milk produced at Kazi and Kazi organic dairy farm and farmer house was superior to other milk samples. The milk produced at Kazi and Kazi organic dairy farm was superior to other.

Keywords: Milk, Physical & Chemical properties and Panchagarh district.

Introduction

Milk from various mammals are used for producing different dairy products including milk cream, butter, yogurt, ghee, sour milk, etc (AOAC, 2000, Shojaei and Yadollahi, 2008). Consumers always demand nutritionally enriched milk and dairy products (BSD, 1985, Boume, 1982). Fresh milk considered as a complete diet because it contains the essential nutrients as lactose, fat, protein, mineral and vitamins in balanced ratio rather than the other foods (Khalid, 2006). According to World Health Organization (WHO) standards and other Scientific works, the quality milk should contain 2.6% fat, 3.5% protein, 0.17% TA, 7.71% SNF and SG 1.030, total bacterial count 1.3×10^6 cfu per ml. The pH 6.6 ensures the milk freshness at boiling point 100°C -117°C (Khan and Zeb, 2007; Imran et al, 2008; Rehman and Salaria, 2005; Anand, 2004).

Milk provides essential nutrients and is an important source of dietary energy, high-quality proteins and fats. Milk can make a significant contribution to the required nutrient intakes for calcium, magnesium, selenium, riboflavin, vitamin B12 and pantothenic acid. Milk and milk products are nutrient-dense foods and their consumption can add diversity to plant-based diets. Animal milk can play an important role in the diets of children in populations with very low fat intakes and limited access to other animal source foods.

The main components of milk are water, fat, protein, lactose, minerals and vitamins. The composition of milk may vary with the breed, type of feed, stage of lactation, season, age of the cow etc and also among individuals of the same breed.

Milk fat contains 40% saturated and 40% unsaturated fatty acids, but most of the animal fats like beef fat, mutton fat etc. consist mainly of saturated fatty acids. For this reason quality of milk fat is considerably better than other animal fats. Major milk protein is casein (about 80% of total protein) which is not found in any other foods.

The remaining 20% are albumin and globulin fractions. Milk protein contains all the essential amino acids in right proportion and for this reason quality of milk protein is better than other animal proteins. Another unique component of milk is lactose, which is a disaccharide and responsible for proper nourishment of brain tissues and nerves. Lactose is not in any other foods. This is the specialty of milk. Milk also contains good amount of minerals. It is an abundant source of calcium and phosphorus but only limited in iron. All fat and water soluble vitamins are also present in milk and performing various functions for the body system.

Although milk is a highly nutritious food for all ages of people, unfortunately its availability is very low in our country. Hardly, we can get about 40 ml of milk/head/day. But according to GOB (1999) recommendation an adult person should consume about 300 ml of milk/day. At the same time the quality of milk we buy from local market is unknown. There are good reasons to support that the milk sold in the market is of low quality. Besides villagers have very limited knowledge about hygienic milking. Vendors who supply milk to the city centres also adulterate milk with water. Sometimes they mix chemical preservatives with milk to increase the shelf life. Some research works have been done in our country to monitor the quality of market milk by Islam (1984), Alam (1989), Rahman (1995), Ali (1998) and Azad (1998).

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However no systematic research has been carried out to evaluate the quality of market milk. Scientists other countries have done a lot of works on their market milk Ghos and Ananta 1965, Borges 1978, Hur 1984, Bjorck 1987, Kukde 1991 and Barnerd *et al.*, 1995 but their result will not be application in our country condition. So, in order to get idea about the quality of milk that we purchase from local markets it is imperative that systematic study he conducted. Hence, the present research was undertaken to judge the quality of market milk available at different local markets of Panchagarh District.

Materials and Methods

Collection of milk samples

During experimental period, samples were collected from the four different points of Panchagarh districts of Bangladesh in clean sanitized container and were transferred immediately to the laboratory for analysis. A total of 80 milk samples were collected taking 20 samples from each of the different sources. Approximately 250 ml of milk were taken for each representative samples. Cleaned disinfectant pots were used in order to avoid any kind of external contamination. Samples were collected from Kazi and Kazi Organic Dairy Farm, Kazi and Kazi Cooperative Dairy Farm, Local village markets, Farmers house / homestead

Parameters studied

The following physical, chemical tests were performed with each raw milk samples

Physical tests

Organoleptic tests, Colour, Flavour, Taste, Specific gravity (Sp. gr.), CLR (corrected lactometer reading)

Chemical tests

APT (Alcohol precipitation test), Acidity content (%), Fat content (g/kg), Solids-not-fat content (g/kg), Total solids content (g/kg), Water content (g/kg).

Analytical Procedure

Organoleptic test was performed visually, ling ally and nasally to observe the colour, flavour and taste according to Nelson and Traughtat (1964). Specific gravity test and CLR was performed by using Quevenne lactometer, lactometer cylinder and floating dairy thermometer according to the method described by Aggarwala and Sharma (1961). APT (Alcohol precipitation test) was performed by using 68% ethyl alcohol. Fat test was performed by Babcock fat test method described by Eckles *et al.* (1951). Acidity test was done by titrating milk with N/10 NaOH solution by using A.O.A.C (1971) method. Solids-not-fat (SNF) and Total Solids (TS) content of collected milk samples were performed according to Eckle *set al.* (1951). Detail experimental procedures of above tests are given in the Appendix section.

Statistical Analysis

Data collected from this experiment were analyzed by using Completely Randomized Design (CRD) as per Steel and Torrie (1980). Analysis of variance test was performed to find out the statistical difference treatments. In case of significant difference

Least Significant Difference (LSD) Test-was done to find out the significant difference between treatment means.

Results and Discussion

A total of eighty milk samples collected from four different points were examined to evaluate their quality. Results obtained from this experiment are presented below:

Organoleptic test

Colour: Out of 80 samples collected from different points in Panchagarh district, 38 samples were (47.5%) golden yellowish white, 42 samples (52.5%) were light yellowish while.

Table 1. Physical parameters of milk samples collected during experimental period

Physical parameters	Kazi and Kazi organic dairy farm	Kazi and Kazi cooperative dair farm	Local market	Village farmers
Colour	Golden yellowish white (13 samples) = 65%, Light yellowish white (7 samples) = 35%	Golden yellowish white (9 samples) = 45%, Light yellowish white (11 samples) = 55%	Golden yellowish white (1 samples) = 5%, Light yellowish white (19 samples) = 95%	Golden yellowish white (15 samples) = 75%, Light yellowish white (5 samples) = 25%
Taste	Slightly sweet (20 samples) = 100%	Slightly sweet (20 samples) = 100%	Slightly sweet (18 samples) = 90%, Odd (2 samples) = 10%	Slightly sweet (19 samples) = 95%, Odd (1 samples) = 5%
Flavour	Milky flavour (20 samples) = 100%	Milky flavour (20 samples) = 100%	Milky flavour (13 samples) = 65%, Barny flavour (7 samples) = 35%,	Milky flavour (16 samples) = 80%, Barny flavour (4 samples) = 20%,
AV. Sp. Gravity	1.029-1.033 1.031±0.00a	1.024-1.030 1.026±0.00b	1.023-1.029 1.026±0.00b	1.029-1.033 1.031±0.00a
Level of significance of sp.gr.			**	
LSD value			0.001	

** means significant at 1% level (p<0.01).

Different superscripts with in entire same row different significantly

The colour of all milk samples obtained from Kazi and Kazi organic dairy farm and Kazi and Kazi Cooperative dairy farm were golden yellowish white (65%), light yellowish white (35%) and golden yellowish white (45%), light yellowish white (55%) but for local markets and village farmers, 5% and 75% were golden yellowish white, light yellowish white 95% and 25% respectively. Usually the color of normal cow's milk is golden yellowish white due to the presence of fat, casein and carotene. Eckles *et al.* (1951) stated that milk color depends upon the breed of animal, the kind of feed consumed and the amount of fat and solids present in milk. Lampart (1970) stated the colour of milk depends upon fat, solids-not-fat (SNF) and the size of the fat globules. Samples collected from Kazi and Kazi organic dairy farm and Kazi and Kazi cooperative dairy farm indicated in the colour were (golden yellowish white and light yellowish white).

Taste: The taste of milk samples from different sources are shown in Table 1. It was found that out of 80 samples 77 samples (96.25%) has normal slight sweet taste and remaining 3 samples (3.75%) had abnormal (flat) in taste.

It is evident from Table 1 that the taste of milk samples of Kazi and Kazi organic dairy farm and Kazi and Kazi cooperative dairy farm were all are normal (slightly sweet). But Local markets and Village farmers 18, 19 and 90%, 95% samples respectively showed normal taste. On the other hand, 2, 1 and 10%, 5% samples showed flat taste. Slightly sweet taste of milk is due to the presence of lactose (Eckles *et al.* 1951; Judkins and Keener 1960). Flat flavour of milk might be due to low, lactose content.

Presumably odd taste of the milk samples arises due to unhygienic conditions where milking was done or because milk was stored for a long time prior to sale which might provide conditions for growth of such microorganisms that cause the so-called odd taste. In this connection, Judkins and Keener (1960) reported that milk produced under proper condition had slightly sweet taste. This supports the former presumption as a reason of odd taste in some milk samples

Flavour: Our of 80 samples 69 samples (86.25%) has normal flavour and 11 samples (13.75%) had abnormal flavor. Flavour of all milk samples collected from Kazi and Kazi organic dairy farm and Kazi and Kazi cooperative dairy farm was of normal cows milk is pleasant and aromatic. On the other hand, among the samples of another 2 places namely, local market and village farmers, 65%, 80% normal. Flavour and 35%, 20% are burny flavour respectively.

The differences in flavour of milk may be due to the unhygienic condition during milking or probably due to consumption of odoriferous feed (like bitter weeds, bitter grass, green rye, garlic, onion, silage etc.) consumed by cows during or prior to milking (Olson, 1956), Ward *et al.* (1956). Judkins and Keener (1960) found that flavour of milk produced under sanitary condition was normal. Foley *et al.* (1972) reported that cowy flavour found in milk from cows suffering from ketosis. A barny flavour occurs in the milk of cow's house in poorly ventilated sheds.

Specific Gravity: Specific gravity of milk obtained from different selected places throughout the experimental period are shown in Table 1 and Fig. 1 The mean and standard deviation of the specific gravity of milk collected from Kazi and Kazi organic dairy farm Kazi and Kazi cooperative dairy farm, local market end village farmers were (1.031±0.00), (1.026±0.00), (1.026±0.00) and (1.031±0.00) respectively. Statistically it was found that there were significant differences ($P<0.01$) within the specific gravity of milk collected from different sources.

It was observed that the average specific gravity of milk obtained from Kazi and Kazi organic dairy farm (1.031±0.00) and village farmers (1.031±0.00) was significantly higher ($P<0.01$) than that of the specific gravity of milk collected from other two places. We know that the normal range of specific gravity of whole milk is 1.027 to 1.035 with an average of 1.032 (Eckles *et al.* 1951).

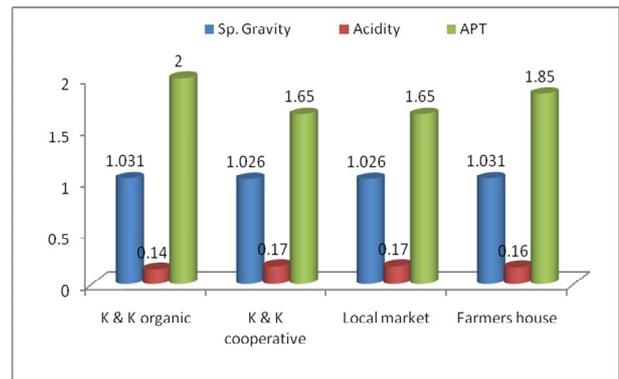


Figure 1. Graph showing the average value of specific gravity, acidity and Alcohol Precipitation test (APT) of milk

Table 2. Summary of the results of chemical parameters of milk collected during experimental period

Parameters	Kazi and Kazi Organic Farm		Kazi and Kazi Cooperative arm		Local Market		Farmer house		P
	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	
Acidity content%	0.10-0.16	0.14±0.01b	0.12-0.22	0.17±0.03a	0.11-0.21	0.17±0.02a	0.11-0.24	0.16±0.04ab	0.004**
Alcohol Precipitation test	2.00-2.00	2.00±0.00a	1.00-2.00	1.65±0.49b	1.00-2.00	1.65±0.49b	1.00-2.00	1.85±0.37ab	0.055**
Fat(%)	3.60-4.50	4.10±0.22a	3.00-3.90	3.41±0.26b	2.80-3.90	3.14±0.24c	3.50-4.50	4.10±0.25a	0.034**
SNF(%)	8.17-9.21	8.66±0.31a	6.74-8.34	7.55±0.47b	6.49-8.01	7.33±0.39b	8.09-9.21	8.66±0.32a	0.054**
TS(%)	11.96-13.31	12.76±0.45a	9.74-12.07	10.95±0.64b	9.49-11.11	10.47±0.38c	11.59-13.31	12.76±0.48a	0.070**
Water (%)	86.69-88.04	87.24±0.45c	87.93-90.26	89.05±0.64b	88.89-90.51	89.53±0.38a	86.69-88.41	87.24±0.48c	0.070**

** means significant at 1% level ($p<0.01$). In a raw figures with same letter do not differ significantly whereas figures with dissimilar letter differ significantly (as per DMRT)

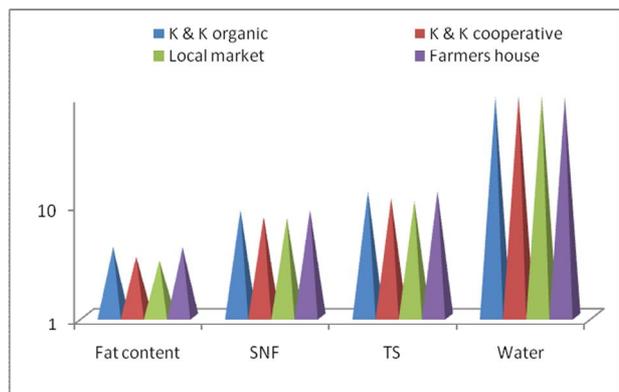


Figure 2. Graph showing the average mean value of fat, solid not fat (SNF), total solid (TS) and water content of milk

Alcohol precipitation test (APT)

Results of APT of raw milk samples collected from Kazi and Kazi organic dairy farm and other three places were 2.00±0.00a, 1.65±0.49b, 1.65±0.49b and 1.85±0.37ab respectively Table 2 and Fig.1. Statistically it was found that there significant differences ($P<0.01$) within the mean activity of different milk samples. Higher the acidity contents of milk higher the chances of alcohol precipitation.

Fat content

The mean and standard deviation of fat content of milk collected from Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, Local market and Village Farmers were (4.10±0.22), (3.41±0.26), (3.14±0.24) and (4.10±0.25) (g/100ml) respectively. Statistical analysis showed that the difference between Fat content of milk samples collected from the above places were found significant ($P<0.01$). The results are presented in Table 2 and Fig 2. It was observed that the average value of fat obtained from Kazi and Kazi organic dairy farm (4.10±0.22) % and farmers house (4.10±0.25)% was higher than the fat content of milk of other places.

According to United States Public Health Service (1965) the minimum standards of milk fat is within the range of 30.0-38.0 g/kg. The present result showed that the average fat content of the milk samples collected from the above sources just met the minimum of US standards except Kazi and Kazi organic Dairy Farm samples, which had fat content quite higher than the upper level of the US standard.

Solids-Not Fat (SNF) content

Mean and standard deviation of solids not fat (SNF) content of milk collected from Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, local markets and village farmers were (8.66±0.31), (7.55±0.47), (7.33±0.39) and (8.66±0.32) respectively Table 2 and Fig 2. The statistical analysis showed that the differences in the solids-not fat (SNF) content of milk samples collected from the above four points were found significant ($P<0.01$). From the present study, it was observed that solids-not-fat (SNF) content of milk samples of Kazi and Kazi organic dairy farm and village Farmers milk were within the normal value (8.0-8.5%) recommended by US Public Health Services (1955).

Mean and standard deviation of solids not fat (SNF) content of milk collected from Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, local markets and village farmers were (8.66±0.31), (7.55±0.47), (7.33±0.39) and (8.66±0.32) respectively Table 2 and Fig 2. The statistical analysis showed that the differences in the solids-not fat (SNF) content of milk samples collected from the above four points were found significant ($P<0.01$). From the present study, it was observed that solids-not-fat (SNF) content of milk samples of Kazi and Kazi organic dairy farm and village Farmers milk were within the normal value (8.0-8.5%) recommended by US Public Health Services (1955). But, the SNF content of samples of Kazi and Kazi cooperative dairy farm and local markets were slightly below normal indicating that was not up to the mark. Islam et al. (1984) showed that the SNF content of milk collected from local markets was lower than that collected from Kazi and Kazi organic dairy farm.

Total solids (TS) content

The average values of total solids content of milk collected from four different selected places are shown in Table 2 and Fig. 2. It was observed that the average values of total solids content of milk samples were (12.76±0.45), (10.95±0.64); (10.47±0.38) and (12.76±0.48) for Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, local Market and Village farmers respectively. Statistical analysis showed that the

difference between the total solids (TS) content of milk samples collected from different places were significant ($P<0.01$). The comparatively lower total solids content of milk collected from Kazi and Kazi cooperative dairy farm and Local markets than that of Kazi and Kazi organic dairy farm and Village farmers might be due to the relatively lower fat content of milk as well as solids-not-fat (SNF). The result of this study agrees with the finding of Islam (1984).

Water content

Mean and standard deviation of water content of milk samples collected from Kazi and Kazi organic dairy farm Kazi and Kazi cooperative dairy farm, local markets and village farmers were (87.24±0.45), (89.05±0.64), (89.53±0.38) and (87.24±0.48) g/kg respectively Table 2 and Fig.2.

There were significant differences ($P<0.01$) in the water content of milk samples collected from the above four different places. The higher water percentage of milk samples of Kazi and Kazi cooperative dairy farm and local markets indicated that some portion of water might have been added in their samples. The result agrees with the findings of Alam (1998).

Conclusions

The Fat content, solid not Fat (SNF), Total solid content (TS) value of milk was higher in organized private farm than that of others farms. The physical and chemical parameters at was better in individual private than cooperative dairy farms

Author's contribution

Authors have no conflict of interest to report.

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