QUALITATIVE CHARACTERISTICS OF MARKET MILK COLLECTED FROM SOME SELECTED AREAS OF PANCHAGARH DISTRICT

A Thesis
By

MD. ASAFUDDAULA
Registration No. 1205020
Session: 2012-2013
Semester: January-June, 2014

MASTER OF SCIENCE (M.S.)
IN
ANIMAL SCIENCE

DEPARTMENT OF ANIMAL SCIENCE AND NUTRITION

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY
DINAJPUR-5200

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Submitted to the Department of Animal Science and Nutrition
Hajee Mohammad Danesh Science and Technology University, Dinajpur
In partial fulfilment of the requirements for the degree of

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DEPARTMENT OF ANIMAL SCIENCE AND NUTRITION

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY
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JUNE, 2014

Dedicated to
My
Beloved Parents

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The Author *June, 2014*

ABSTRACT

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 farmers milk, farm milk and also the market milk.

The experiment was carried out some selected areas of Panchagarh district. This is situated on the northern part of Bangladesh. In this experiment milk samples were collected from different sources like Kazi and Kazi organic dairy farm, Kazi and Kazi cooperative dairy farm, local market and also the farmers house to evaluate the quality of milk. Some physical and chemical test were performed to evaluate the quality of milk. From the result of both experiments it was found that Kazi and Kazi organic dairy farm and Farmers house milk quality are almost same but in the Kazi and Kazi cooperative dairy farm and local market it was found that wide variations were found within different samples.

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 was superior to other milk samples.

On the chemical parameters APT (Alcohol precipitation test), Acidity content Kazi and Kazi organic dairy farm was also superior. The Fat content, solid not Fat (SNF), Total solid content (TS) value was higher than the other milk samples.

CONTENTS

CONTENTS (CONTD.)

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF ABBREVIATIONS

ABBREVIATIONS	ELABORATIONS
FCR	Feed Conversion Ratio
MS	Master of Science
NS	Not significant
BBS	Bangladesh Bureau of Statistics
ULO	Upazila Livestock Office
Kg	kilogram
No.	Number
r	Correlation co-efficient
Sl. N0.	Serial Number
Tk.	Taka
CRD	Chronic Respiratory Disease
DOC	Day Old Chick
%	Percentage

CHAPTER 1

INTRODUCTION

A white fluid secreted by the mammary glands of female mammals for the nourishment of their young, consisting of minute globules of fat suspended in a solution of casein, albumin, milk sugar, and inorganic salts called milk (Source Webster's 1913 Dictionary).

Milk is one of the nature's complete food. It contains all the nutrients in a proper ratio which is necessary for normal functioning of the body system for all ages of people. New born baby can survive only on milk up to six months. Growing children requires it for their normal growth and development. It is also an unique food for adults and elderly people.

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 species of dairy animal, its breed, age and diet, along with the stage of lactation, parity (number of parturitions), farming system, physical environment and season influence the colour, flavour and composition of milk and allow the production of a variety of milk products:

Cow milk: Fat constitutes approximately 3 to 4 percent of the solid content of cow milk, protein about 3.5 percent and lactose 5 percent, but the gross chemical composition of cow milk varies depending on the breed. For example, the fat content is usually higher in Bos indicus than B. taurus cattle. The fat content of milk from B. indicus cattle can be as much as 5.5 percent.

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 animals fats like beef fat, mutton fat etc. consist mainly of saturated fatty acids. For this reason quality of milk fat is considerably than other animals 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).

However no systematic research has been carried out to evaluate the quality of market milk. Scientists other countries have clone 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.

Objectives:

Based on above consideration associated with milk the present experiment was under taken to achieve the following objectives:

a. To study the quality of market milk available in different areas of Panchagarh.
b. To detect specific adulterants (if any) in market milk.
c. To detect Physical and Chemical properties of milk of selected area Panchagarh district.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this section is to review the findings of past research having relevance to the present study. Various kinds of research works have been done in the past by many scientists of the world regarding quality of market milk and their shelf life. Very limited research works were conducted in Bangladesh contest. Some of their important research findings related to milk quality and preservation techniques of milk are reviewed in this section. This section has been divided into several sub sections for easy understanding.

2.1. Physical parameters of milk

Lampert (1970) stated that Guernsey and Jersey breed can transfer more carotene, the pigment that actually imparts yellowish colour to milk from their feed to milk fat as compared to Holstein, Ayrshire and other breeds and hense the colour of milk from Guernsey and Jersey is deeper i.e. more yellowish. He also reported that the colour of milk varies upon fat, solids-not-fat (S.N.F) and the size of the fat globule.

Folley *et al.* (1972) found the cause of abnormal flavour and taste of milk. They reported that salty milk is frequently produced by cows in the final weeks of lactation and by cows with chronic mastitis. A cows flovour is found in milk from cows with ketosis. The barny flavours in the milk is caused by Caused in poorly ventilated shed.

Baevre *et al.* (1976) carried out an experiment to see the effect of addition of various types of fat on flavour of milk. They reported that, flavour of milk is affected by acidity, feeding various types of fat like sunflower, soyabean, rapeseed oil etc. had produced rancid flavour in milk.

Islam *et al.* (1984) studied the physical and chemical qualities of milk of Bangladesh Agricultural University (BAU) dairy farm and market milk of Mymensingh town. They stated that out of 35 samples from BAU dairy farm, all samples were golden yellowish white in colour, slightly sweet in taste and normal in flavour. The average specific gravity, fat and acidity were 1.031, 4.80% and 0.15% respectively. But from 35 samples the market milk of Mymensingh town, 25 were white, 7 golden yellowish white and 3

bluish in colour. The average specific gravity, fat and acidity of market milk of Mymensingh town were 1.026, 3.02% and 0.14% respectively.

Ghaloor *et al.* (1985) studied physico-chemical post-milking changes at room temperature (30-35^{0}C) in July with 50 samples of cow's milk and 50 of buffaloes' milk. Milk from both species showed no changes in appearance, taste, or odour during the first 4 h. Initially cow's milk had a titratable acidity of .16% and a p^H of 6.8, changing to 0.75% and p^H 5.3 after 12h. at room temperature. Corresponding figures for buffaloes milk were 0. 15% titratable acidity and 6.9 initially, 0.76% and p^H 5.4 after 12h. It was observed that raw milk can be stored at room temperature for 4 h. in July and Aug. without deterioration in quality.

Duncan *et al.* (1991) measured that rancidity scores and ADV increased with storage time. Major free fatty acid concentrations increased as ADV increased (r= 0.93, p=0.0001) for farm milk samples but correlations was low (r= 0.27, p=0.40) for laboratory-prepared raneid samples.

Senapoty *et al.* (1995) carried out a comparative study on raw buffalo milk samples produced in 'organized (composite livestock farm) and non organized sectors (rural areas of co-operative milk producers union) at the milk distribution point around Jabalpur, India and reported that organoleptic evaluation of milk samples showed a significant ($P<0.05$) variation in milk quality.

Aakuzwa *et al.* (1995) determined milk aroma from Holstein cows heated to 63^{0}C for 30 min, 75^{0}C for 15s (pasteurized milk) or 120^{0}C for 3s (UHT milk) and the aroma was compared with that of unheated control milk. The strength of the milk-like aroma decreased as the heating temperature increased; however, milk heated to 63^{0}C for 30 min had a similar strength aroma to that of control milk. Pre incubation of milk at 63^{0}C for 30 min before heating to higher temperatures made the milk-like aroma resistant to heat treatment. The strength of the aroma as evaluated when opening milk containers decreased as the heating temperature increased. When control and heated milk were fractionated, tire milk-like aroma appeared to be located in the milk fat globule membrane.

Senapoty *et al.* (1995) carried out a comparative study on raw buffalo milk samples produced in organized (Composite Livestock Farm) and non organized sectors (Rural

areas of Co-operative milk producers union at the milk distribution point around Jabalpur, India and reported that organoleptic evaluation of milk samples showed a significant ($P<0.05$) variation milk quality.

Manzoor Quadir (1995) carried out an experiment on the assessment of chemical qualities of milk produced by primary cooperative societies (Milk Vita). He found that the specific gravity of Rawtara, Resombari and Briangaru societies were 1.027, 1.027 and 1.026 of Baghabarighat milk shed area.

2.2 Chemical parameters

Lavania (1969) curried out art experiment to evaluate the physical and chemical quality of market milk at Baraut town of India by collecting 234 samples from village milk vendors, individual milk producers, small private dairies, milk collection centres and small shopkeepers. He found that the specific gravity, fat, total solids, contents were 1.0304%, 4.3% and 12.923 for milk collected from village milk vendors, 1.0342, 7.01% and 11.71% for milk collected from individual milk producers, 1.0291, 3.68% and 11.85% for milk collected from small private dairies, 1.0343, 596% and 15.3lYo for milk collected from milk collection centres and 1.0312, 4.77% and 13.67% for milk collected from small shopkeepers.

Arai *et al.* (1976) observed the average composition of raw milk from April 1975 to March 1976 in Miyagi and the compositional values were obtained for fat 3.48%, T.S 11.65%, S.N.F 9.11% and specific gravity 1.0309. They also observed that the overall mean values for S.N.F was 7 .98% for other months.

Dehury *et al.* (1977) conducted an experiment to evaluate the physical and chemical quality of market milk at Bhubaneswar of India by collecting milk samples from established dairy farm, local gowalas, local shops, milk collection centres and pasteurized milk booths. They found that the specific gravity, fat 0/o and tritable acidity % for samples from local gowalas were 1.03, 4.89 and 0.15; for samples from local shops were 1.004, 3.84, and 0.11; for samples from milk collection centres were 1.03, 4.12 and 0.15 and for samples from pasteurized milk booths were 1.027, 3.11, and 0.14 respectively.

Simpfenderfer (1988) investigated 335 Holstein milk samples from individual cows. He found that the specific gravity, fat, SNF and TS content of milk were 1.023 to 1.035, 2.00% to 6.00%, 5.41% to 10.74% and 8.21% to 16.74% respectively.

Suchanek *et al.* (1989) observed the composition of milk from cow herds with high milk efficiency. For 19 herds averaging 4450 kg milk for cows in their 1st lactation and 5830 kg milk for later lactations, milk fat percentage averaged 4.17,4.01 and 4.21 in Jan.-Mar., June and Sep. resp., protein percentage 3.30, 3.24 and 3.39, non-protein nitrogen 28.0, 29.9 and 28.3 mg/l00 g milk, urea 23.8, 22.1 and 28.4 mg/100 g, lactose 4.69,4.60 and 4.70%, total solids 12.69, 12.47 and 12.770 , SNF 8.69, 8.64 and 8.74%, and ash 0.72, 0.71 and 0.74%. For Czech Pied, Slovakian Pied and Black Pied cows in the above herds, milk fat percentage averaged 4.20, 3.98 and 4.0, protein percentage 3.38, 3.34 and 3.22, non-protein nitrogen 27.4, 13.4 and 39.7 mg/100 ml, urea 26.4, 13.4 and 29.3 mg/l00 ml, lactose 4.75.4.63 and 4.58%, total solids 12.81, 12.58 and 12.42%, SNF 8.71, 8.70 and 8.50%, and ash 0.74,0.73 and 0.75%. The effect of season on milk composition traits was significant.

Islam (1990) studied the quality of local market milk and market milk collected from co-operative farmers and found that the milk collected from co-operative farmers were of better quality than the local market milk.

Simundic (1991) analysed raw milk samples from the mountainous region of Gorski Kotar, Croatia, Yugoslavia, during the period 1989-90. Yearly average results of 293 milk samples taken in 1989 and 299 samples taken in 1990 are tabulated. Average values for milk fats, TS and SNF were 3.63 and 3.61%, 12.42 and 12.340/0, 8.78 and 8.13% for 1989 and 1990 respectively.

Agabriel *et al.* (1993) studied the factors involved in the chemical composition of milk on farms with a high level of milk production. In this study 76 dairy farms with high-yielding (6200 to 8800 kg/yr) Montbeliarde cows that were given hay-based rations were included in a detailed survey involving the herd and farm structure, the quality of forage, winter and summer feeding practices, and genetic characteristics (breeding value and herd effect for milk production, fat content and protein content). The mean annual fat and protein content varied greatly between farms despite the homogeneity of the farm sample with regard to milk produced, breed and type of winter roughage. Such variability resulted essentially from environmental factors. When farms were classified

according to the level of herd effect (fat or protein content), protein content variations were greater in winter and linked to different feed characteristics (hay quality, type of concentrate) and variations in fat content between farm groups were as marked, if not more so, in summer than in winter. These variations were only partly linked to feeding practices that were beneficial or detrimental to fat concentration (Presence of sugar beet in the ration, concentrate distribution method). No correlation occurred between fat and protein herd effects. It is concluded that these variables may be controlled independently by manipulating environmental factors (especially feeding factors).

Salam (1993) conducted an experiment on the physical, chemical and microbiological qualities of milk produced in Baghabarighat Milk Shed Area and he reported that the means and standard deviations of specific gravity, fat and acidity were 1.02757±0.001, 5.096 ± 0.389% and 0.1671 ± 0.009%, respectively.

Mizanur (1995) found that the fat% were 4.28, 4.10, 3.68, 4.95; S.N.F % 7.20, 6.67, 1.04, 7.96; T.S. % 11.48, 10.78, 10.72, 12.91 and the acidity % were 0.150, 0.135, 0.145, 0.159 of Manikganj Chilling Centre, Tangail Chilling Centre, Takerhat pasteurization Plant and Bagbabarighat Dairy Plant.

Rashid *et al.* (1996) stated that mean fat and TS of Bangladesh Agricultural University (BAU) dairy farm milk, its surrounding-villages and mini dairy farm in Kawatkhali were 3,721± 0.587, 4.621±0.9;44, and 3.986±0.428 respectively and 12.62±0.54, 14.32±1.865 and 12.44±0.58 respectively.

Ito (1996) observed the variation in the quality of raw cows milk. He analyzed 57000 samples of milk from April 1964 to March 1965 and the means with standard deviations obtained for specific gravity was 1.0304± 0.006, acidity 0.148 ± 0.008%, fat 3.312 ± 0.1180%, protein 2.971 ±.0.1040%, lactose 4.388±0.062%, ash 0.687±0.026% and SNF 7.929 ± 0.137%.

Manzoor (1996) studied that the fat % SNF % and TS % of Rawtara, Resombari and Briangaru societies at Baghabarighat Milk shed area of Sirajganj were 4.720, 4.547, 4.340, 7.719, 7.788, 7.606 and 12.433, 12.340 and 11.911 respectively.

Feldhofer *et al.* (1998) observed the dry matter and milk protein with regard to breeds and feeding of cows. Average milk yield of Friesian cows was higher than that of Brown and Simmental cows. Highest SNF and protein were obtained from Brown cows, while highest milk fat content was obtained from Friesian and Brown cows. Cows fed high-hay diets had the lowest milk yields. Enriched forages increased milk yield and quality. Higher milk yields resulted in lower milk fat, protein and TS, but this was increased by enriched feeding. Average SNF, protein and fat was 8.72-8.93%, 3.38-3.61% and 4.02-4.53%, respectively. Average milk yield was 13.2-21.4 litres/day. SNF and protein were generally similar in milk obtained from morning and evening milking, but higher in evening milk from Brown cows fed 6.5 kg hay, 15 kg silage and 7 kg balanced forages.

Piccioli *et al.* (2003) carried out an experiment on the milk yield and changes in its composition, as well as those of some blood metabolites and hormones in dairy cows (n=6) of low-average genetic merit, when intrajugularly infused with a short load of glucose or amino acids or a mixture of these was investigated. Infusion of glucose, regardless of stage of lactation, resulted in increased milk yield significantly. Although fat content of milk remained almost constant in all stages of lactation, it was always reduced when glucose was infused, either alone or with amino acids, The reduction, however, was more pronounced in animals at the third stage of lactation. Infusion of amino acids always resulted in slightly reduced fat contents. The results indicate that the quick raise of blood substrates can modify milk yield and its composition. Glucose substantially increases lactose and milk yield, with a subsequent reduction in protein and fat contents (dilution effect).

Bortolozzo *et al.* (20A3) observed the effect of pasture and soybean supplementation on fatty acid profile and CLA content in dairy cow milk. Eighteen Friesian cows (primiparous and multiparous) in mid-lactation (147$\tilde{n}$49 days) with a milk yield of 33$\tilde{n}$6 kg/day were fed ad libitum, aller an adaptation period of 14 days, with one of three dietary treatments over 3 periods lasting 4 weeks each. The treatments were: TS (mixed diet + 2.6 kg/day toasted soyabean), RS (mixed diet + 2.6 kg/day raw soyabean), and PRS (pasture+concentrate+2.6 kg/day raw soyabean). The mixed diet contained chopped corn (24.2%), barley meal (20.5%), lucerne hay (20.5%), meadow hay (17.9%), and dehydrated lucerne hay (16.8%). The PRS group received a fixed amount of chopped maize (3.5 kg/day), dehydrated lucerne hay (2.4 kg/day), and raw soyabean in addition to

pasture. Dry matter intake was similar for TS and RS, and higher than PRS. Milk yield decreased significantly $P < 0.05$) in grazing cows compared with the other groups, but fat and protein content were unaffected by dietary treatment. The highest milk urea was recorded for PRS. A significantly lower value of short-medium chain fatty acids was recorded for grazing cows. The results indicate that the fatty acid profile and CLA content in milk is mainly affected by pasture than by the sources of soyabean supplementation, and there are no differences between toasted and raw soyabeans supplemented in mixed diets.

Gonzalez et al. (2004) studied the evaluation of milk qualify in different months of the year at the Pelotas dairy basin, The effect of months of the year on milk production and quality was estimated in l0 dairy production units classified as specialized (S), partially specialized (PS) and not specialized (NS), which were visited for I I months within the year [date not given]. Bulk tank milk was sampled to determine the physical and chemical characteristics and somatic cell count (SCC), mastitis percentage and milk production (litres/cow/day). Samples of feeds and water used for drinking and cleaning were also collected. There were no significant differences between months for milk production. crioseopy, percentages of fat, total solids, non protein nitrogen and SCC, but true protein percentages were higher in October and November, and casein showed higher values in October, November, March and April. Total solids were higher in December. Acidity varied in the same way as mastitis percentage, being higher in November and May, Negative relationship between milk production and percentage of fat, mastitis and somatic cell count were detected, while a positive relationship was observed between milk production and lactose percentage. Milk obtained during the year showed differences between months for protein fraction, acidity, solids non fat and percentage of mastitis. Water quality did not change among collection months and was acceptable for drinking and cleaning.

CHAPTER 3

MATERIALS AND METHODS

The experiment was conducted at BRAC Milk collection centre Atowari Panchagarh and Milk Collection centre of Milk Vita (BMPCUL) in Sadar Panchagarh during the period of August, 2013 to March, 2014.

3.1 Selection of area

Panchagarh is the last northern district of Bangladesh. The only organic tea of Bangladesh Kazi and Kazi Tea estate is situated in this district. For the organic tea production Kazi and Kazi established his Large Organic farm and Cooperative Dairy farming in the area for milk and cow dung Production. The byproduct Cow dung is used in the tea garden for organic farming. Because of this influence many farmers in the surrounding villages are increasingly becoming interested in establishing their own small scale dairy farm. Milk production has also increased considerably in this area. Some milk processing industries has setup milk collection centres to collect milk for their processing plant. These are the main reasons for selection of this area. Four different points in Panchagarh district were selected for this purpose and these were

i) Kazi and Kazi Organic Dairy Farm
ii) Kazi and Kazi Tea cooperative dairy farm
iii) Local village market and
iv) Farmer's house.

3.2 Collection of milk samples

During experimental period, samples were collected from the four different points in clean sanitized container and were transferred immediately to the laboratory for analysis.

A total of 80 milk samples were collected talking 20 samples from each of the different sources. Approximately 250ml 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 the following points:

a) Kazi and Kazi Organic Dairy Farm

b) Kazi and Kazi Cooperative Dairy Farm

c) Local village markets.

d) Farmers house/homestead

Photograph 1.1: Collection of Milk samples

3.2.1 Parameters studied

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

3.2.1.1 Physical tests

a) Organoleptic tests

i) Colour

ii) Flavour

iii) Taste

b) Specific gravity (Sp. gr.)

c) CLR (corrected lactometer reading)

3.2.1.2 Chemical tests

a) APT (Alcohol precipitation test)
b) Acidity content (%)
c) Fat content (g/kg)
d) Solids-not-fat content (g/kg).
e) Total solids content (g/kg)
f) Water content (g/kg).

3.3 Analytical Procedure

Organoleptic test was performed visually, lingually and nasally to observe the colour, flavour and taste according to Nelson and Traughat (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 s*et al.* (1951).

Detail experimental procedures of above tests are given in the Appendix section.

3.4 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.

CHAPTER 4

RESULTS AND DICUSSION

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:

4.1 Physical Parameters

4.1.1 Organoleptic test

Table 1.1 Physical parameters of milk samples collected during experimental period.

Physical parameters	Kazi and Kazi organic dairy farm	Kazi and Kazi cooperative dairy 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

4.1.2 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.

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) stared 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). No major abnormalities were detected in the colour of local markets and village farmers milk although a few samples showed slightly golden yellowish color.

4.1.3 Taste

The taste of milk samples from different sources are shown in Table 1.1. 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 1.1 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

4.1.4 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 cows house in poorly ventilated sheds.

4.1.5 Specific Gravity

Specific gravity of milk obtained from different selected places throughout the experimental period are shown in Table 1.1 and Fig. 1.1. 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±0.00a, 1.026±0.00b, 1.026±0.00b and 1.031±0.00a respectively. Statistically it was found that there were significant differences ($P<0.01$) within the specific gravity of milk collected from different sources.

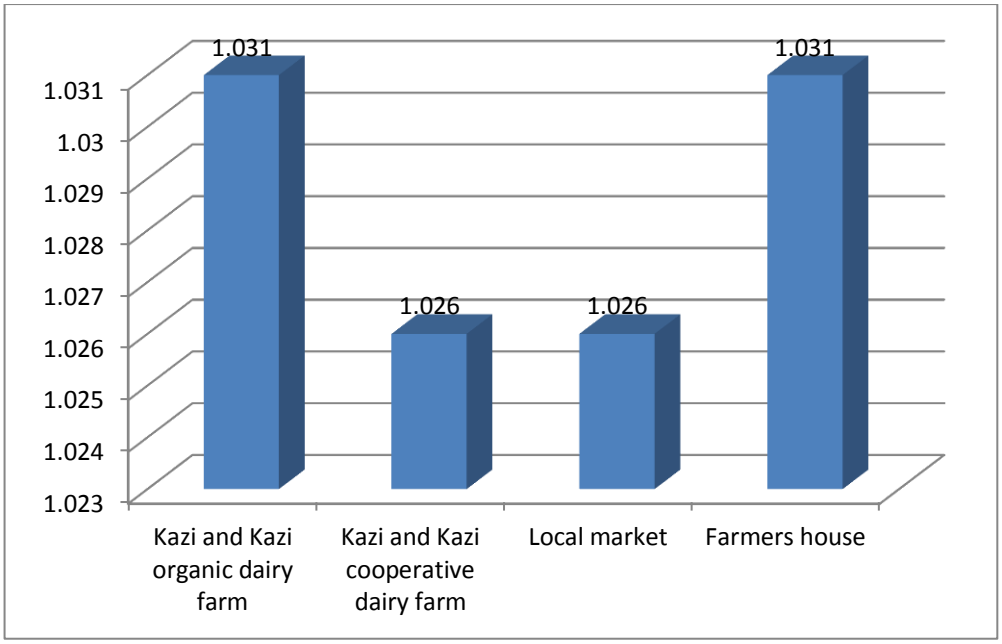


Fig. 1.1: Graph showing the average value of specific gravity of milk

It was observed that the average specific gravity of milk obtained from Kazi and Kazi organic dairy farm (1.031±0.00a) and village farmers (1.031±0.00a) 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.* l951).

From the present studied it was observed that specific gravity of all milk samples collected from different selected places was within the normal range. Lower specific gravity of milk indicates that milk was adulterated with water. However milk fat has some influence on the specific gravity of milk. The higher the fat content of milk, the lower is the specific gravity. Thus one should not prejudge the quality of milk based only one specific gravity but should take in consideration the content of milk fat as well.

Table 1.2 Summary of the results of chemical parameters of milk collected during experimental period.

Parameters studied	Different places of Panchagarh district				LSD	Level of sig.
	Kazi and Kazi Farm	Kazi and Kazi Farm	Local Market	Farmer house		
	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 Positivity 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)

4.2. Chemical Parameters

4.2.1 Acidity

Results of acidity of raw milk samples collected from Kazi and Kazi organicdairy farm and other three places were 0.14±0.01b, 0.17±0.03a, 0.17±0.02a and 0.16±0.04ab percent respectively Table 1.2 and Fig. 1.2 Statistically it was found that there significant differences ($P<0.01$) within the mean activity of different milk samples.

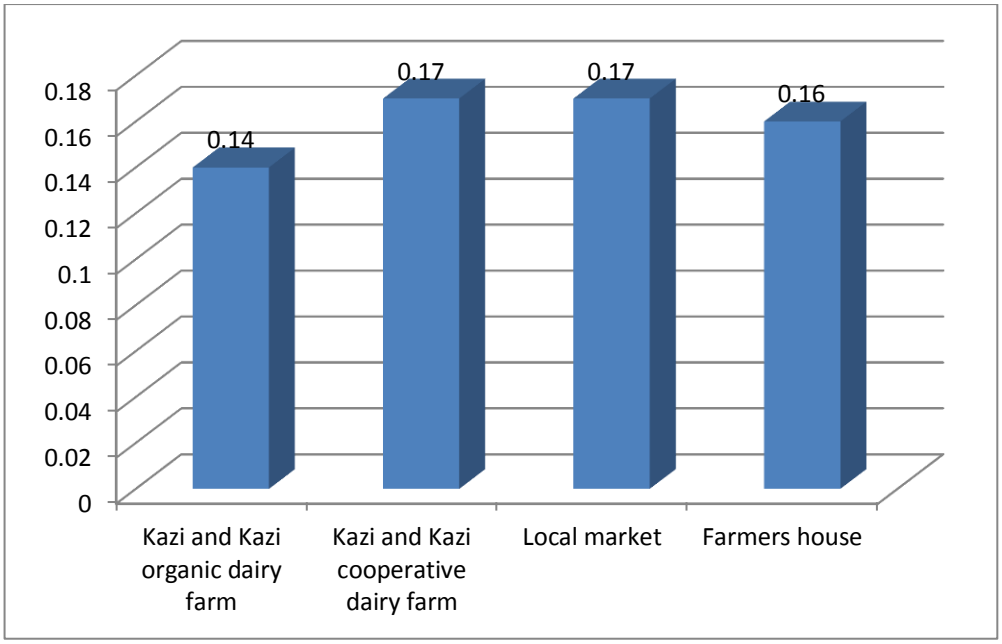
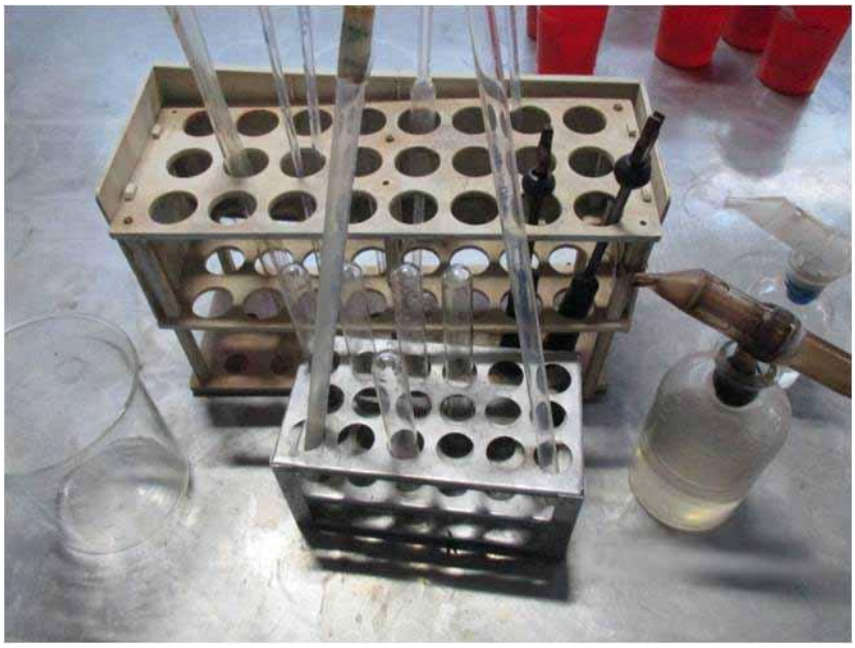


Fig. 1.2: Graph showing average value of Acidity of milk

The difference between the highest value (0.21) and the lowest value (0.1) which is nearly half (47.61) of the highest value Table 1.3. Generally the activity of normal milk sample varies within the range of 0.10 to 0.18% within an average of 0.16% (Eckles *et al.* 1951). Judkins and Keenar (1960) reported that the normal activity of market milk ranged from 0.08 to 0.23 percent. Islam *el al.* (1984) found that the average acidity of cow's milk was 0.15%. The lower acidity of milk may be due to the adulteration of milk with water which reduces the acidity. The result indicated that the value of activity for all samples were within normal range. But slightly higher level of acidity of milk of Kazi and Kazi cooperative dairy farm, local market and farmers house samples might be due to use of unhygienic pots and milking and carrying materials adulteration with water.



Photograph 1.2: Acidity test

4.2.2 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 1.2 and Fig. 1.3 Statistically it was found that there significant differences (P<0.01) within the mean activity of different milk samples. Higher the acidity content of milk higher the chances of alcohol precipitation.

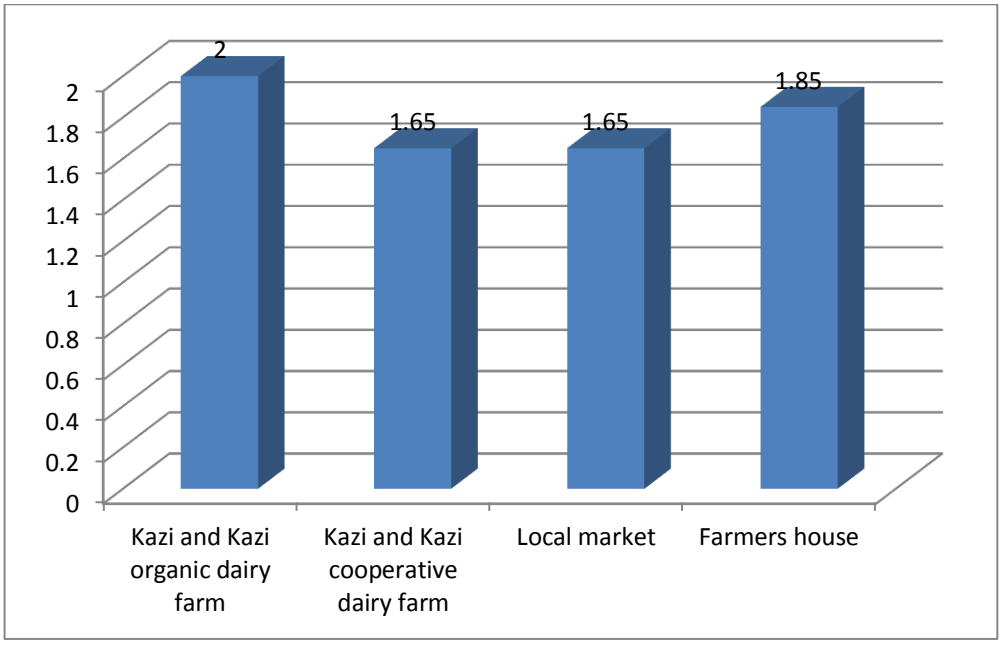


Fig. 1.3: Graph showing the average value of alcohol precipitation test of milk

4.2.3 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±0.22a, 3.41±0.26b, 3.14±0.24c and 4.10±0.25a (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 persecuted in Table 1.2 and Fig 1.4. It was observed that the average value of fat obtain from Kazi and Kazi organic dairy farm 4.10±0.22a% and farmers house 4.10±0.25a% was higher than the fat content of milk of other places.

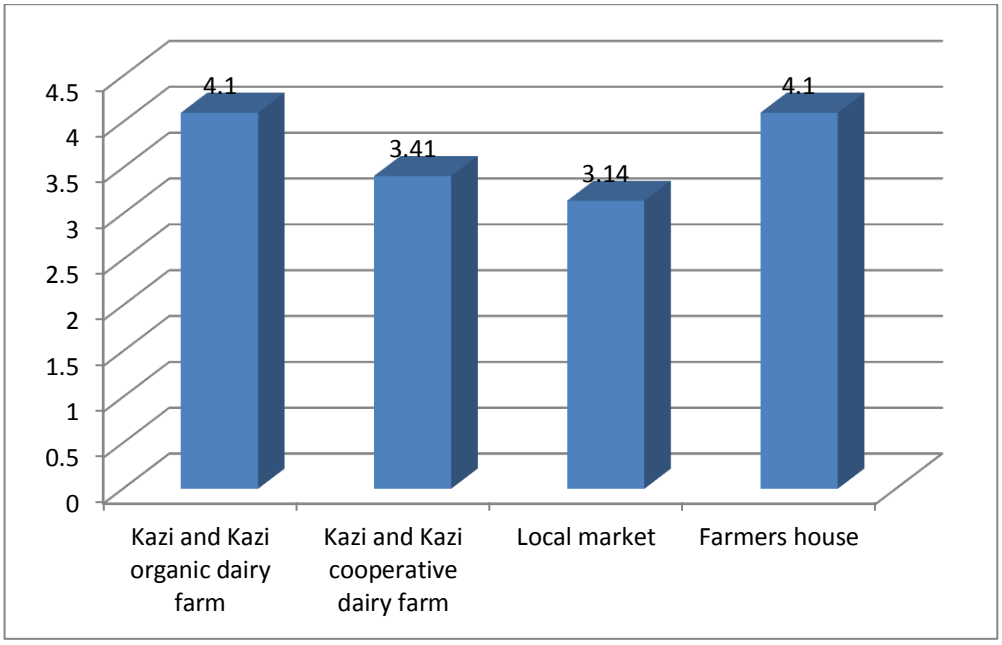


Fig. 1.4: Graph the average value of Fat content of milk

According to United states Public Health Service (1965) the minimum standards of milk lat 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.

The higher fat content of Kazi and Kazi organic dairy farm milk indicated that the farm maintains the standards of milk but in case of other samples there might have some sort of adulteration and for that reasons their fat content was lower than Kazi and Kazi

organic dairy farm milk. The result of this experiment agrees with the finding of Islam (1984) and Alam (1998) who found similar type of results during working with market milk.

Photograph 1.3: Fat test

4.2.4 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±0.31a, 7.55±0.47b, 7.33±0.39b and 8.66±0.32a respectively Table 1.2 and Fig 1.5. 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).

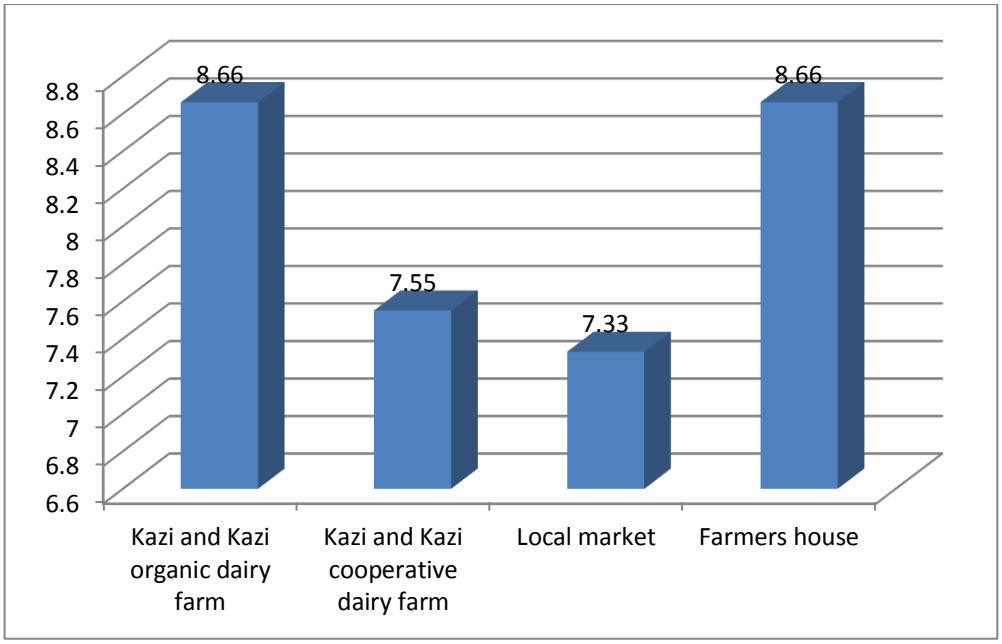


Fig. 1.5: Graph the average value of SNF of milk

But, the SNF content of samples of Kazi and Kazi cooperative dairy farm and local markets were slightly below normal indicating that the 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. This result is in agreement with the present is result is in agreement with the present milk collected from Kazi and Kazi organic dairy farm and village farmers was superior to milk samples collected from Kazi and Kazi cooperative dairy farm and local markets.

4.2.5 Total solids (TS) content

The average values of total solids content of milk collected from four different selected places are shown in Table 1.2 and Fig. 1.6. It was observed that the average values of total solids content of milk samples were 12.76±0.45a, 10.95±0.64b; 10.47±0.38c and 12.76±0.48a 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 ($P<0.01$).

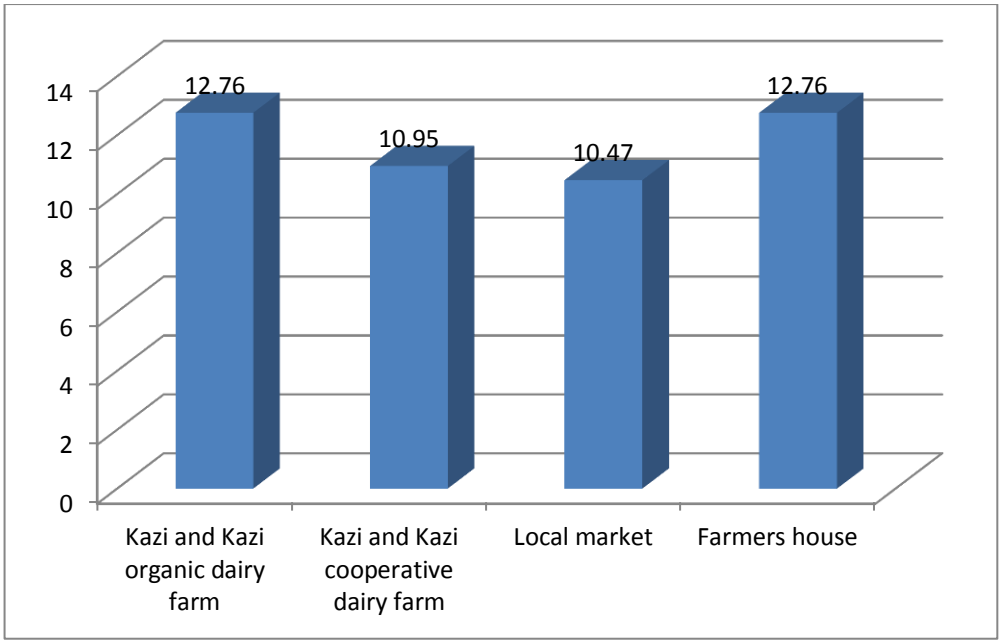


Fig. 1.6: Graph showing the average value of TS of milk

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). Milk collected from Kazi and Kazi cooperative dairy farm and local markets could have been adultered with water resulting in lower fat and SNF percentage, which ultimately affected TS content of milk. The result of this study agrees with the funding of Islam (1984).

4.2.6 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±0.45c, 89.05±0.64b, 89.53±0.38a and 87.24±0.48c g/kg respectively Table1.2 and Fig. 1.6.

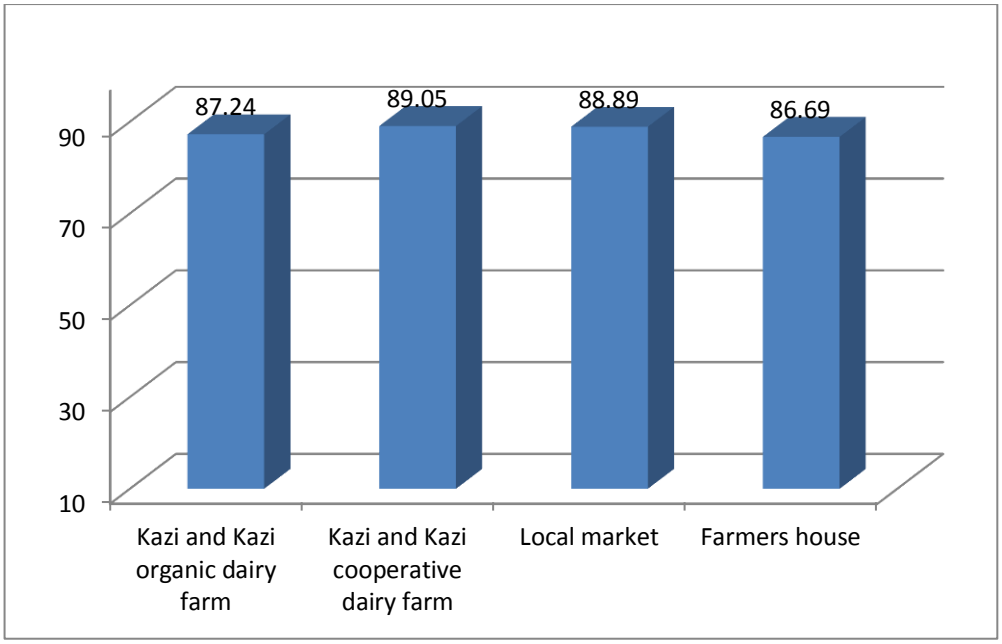


Fig. 1.7: Graph showing the average value of water content of milk

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).

CHAPTER 5

SUMMARY AND CONCLUSION

The experiment was conducted at BRAC Milk collection centre Atowari Panchagarh and Milk Collection centre of Milk Vita (BMPCUL) in Sadar Panchagarh. The experiment was conducted at after collection of milk, samples from that place, they were taken immediately to the laboratory for analysis. The experiment was conducted for a period August 2013 to March, 2014

The parameters used to monitor the physical, and chemical qualities of milk samples were as follows:

l. Physical tests

Colour, taste, flavour and specific gravity of milk samples. The specific gravity of Kazi and Kazi orgranic dairy farm, Kazi and Kazi cooperative dairy farm, Local market, Farmers house 1.031±0.00a, 1.026±0.00b, 1.026±0.00b and 1.031±0.00a and the range is 1.029-1.033, 1.024-1.030, 1.023-1.029 and 1.029-1.033 respectively.

2. Chemical tests

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±0.01b, 0.17±0.03a, 0.17±0.02a, 0.16±0.04ab, 2.00±0.00a, 1.65±0.49b, 1.65±0.49b, 1.85±0.37ab, 4.10±0.22a, 3.41±0.26b, 3.14±0.24c, 4.10±0.25a, 8.66±0.31a, 7.55±0.47b, 7.33±0.39b, 8.66±0.32a, 12.76±0.45a, 10.95±0.64b, 10.47±0.38c, 12.76±0.48a, 87.24±0.45c, 89.05±0.64b, 89.53±0.38a, 87.24±0.48c. 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. In Kazi and Kazi organic dairy farms the physical parameters like Organoleptic tests, Colour, Flavour, Taste, Specific gravity (Sp. gr.), CLR (corrected lactometer reading) was higher than the other milk samples. The milk produced at Kazi and Kazi organic

dairy farm was superior to other milk samples it is due to their hygienic milking, scientific feeding and housing management.

The chemical parameters APT (Alcohol precipitation test), Acidity content at Kazi and Kazi organic dairy farm was also superior. The Fat content, solid not Fat (SNF), Total solid content (TS) value was higher than the other milk samples.

The farmers house milk also the same result of Kazi and Kazi organic dairy farms due to absence of adulterants.

In Kazi and Kazi cooperative dairy farms in the physical and chemical parameters are little bit lower due to mixing of adulterants by the cooperative farmers.

The local market milk samples the physical and chemical parameters are little bit lower due to mixing of adulterants by the middle man sellers.

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