**A STUDY ON NUTRITIONAL QUALITY OF INCOMING FLUID MILK FROM RURAL TO CHITTAGONG METROPOLITAN AREAS**

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# A PRODUCTION REPORT SUBMITTED

# BY

**Intern ID: C-21**

**Roll No: 2006/24**

**Registration No: 262**

**Session :2005-2006**

Chittagong veterinary And Animal Sciences University, Khulshi, Chittagong

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**LIST OF ABBREVIATIONS**

**ABBREVIATIONS ELABORATION**

**CMA Chittagong Metropolitan Areas**

**SNF Solids-not-fat**

**TS Total solids**

**FPM Farm produce milk**

**VSRM Vendor supplied rural milk**

**VSFM Vendor supplied farm milk**

**MM Market milk**

**CHAPTER 1**

**NUTRITIONAL QUALITY OF INCOMING FLUID MILK FROM RURAL TO CHITTAGONG METROPOLITAN AREAS**

**ABSTRACT**

Over 3.5 million people lives at Chittagong Metropolitan Areas (CMA) in Bangladesh. To meet the demand of fluid milk for such a large human population four sources of fluid milk is available in CMA as farm produced milk, vendor supplied farm milk, vendor supplied rural milk, and market milk of different brands. The present study was carried out during a period from 5th January to 26th February’2012 to detect the nutritional quality of incoming fluid milk from rural to CMA. Milk samples were collected from five different entry points of CMA (Solasahar, Janalirhat, Karnafuli bridge, Potenga and Bohoddarhat). A total of 20 samples, 4 from each entry point were collected to evaluate the physical (specific gravity) and chemical (percentage of butter fat, solids-not-fat, total solids, protein and water) parameters of milk samples and analyzed by I.S.I. (1984) method for detecting the types of adulterant. Study reveals that the nutritional quality was very poor in almost all samples. Water adulteration was detected in 100% samples. To increase the volume of milk more water adulteration is occurred as well as for extra earning. Adulterations with powder milk were also detected in kornafuli bridge point which was used for producing sweetmeat and curd.

**Key words:** Raw fluid milk, CMA, Nutritional quality, Water, Adulteration

CHAPTER 2

INTRODUCTION

As a developing country Bangladesh is a low quantity milk producing nation having production of 2.11 million tons of fluid milk annually as per FAO statistics with per capita production of 13 kg/capita/year. (http://www.fao.org). According to the most recent data of DLS milk production of Bangladesh is 2.27 million tons (DLS, 2004-2005). The total number of cattle population is 22.87 million and the total numbers of the registered dairy farms are 5364 in all over Bangladesh (http://www.dls.gov.bd/about\_us.htm). According to FAO statistics in 2002 Bangladesh produced 0.35 percent of total world milk production. This represents around 6.7 and 2.5 percent of the milk production of Pakistan and India respectively or less than 2 percent of the milk production of South Asia.

It is well-known that milk is ``almost complete’’ as well as wholesome nutritious food for all mammals including human being. As the second largest metropolitan and the trade capital of the nation there is a large number of dairy farm has been established by the entrepreneur of Chittagong. Human population of Chittagong Metropolitan Area (CMA) is over 3.5 million (CCC Website, 2010). To meet the demand of fluid milk for such a huge human population four sources of fluid milk is available in CMA namely as farm produced milk (FPM), vendor supplied farm milk (VSFM), vendor supplied rural milk (VSRM) and market milk (MM) of different brands (Debnath *et al.,* 2008). In Bangladesh usually milk is being supplied to the consumers from urban area and rural areas by the middleman. They collect milk from different houses as well as from the local markets. The supplied milk is generally found adulterated (Islam *et al*. 1984). This adulterated milk may cause various diseases to the consumers.

The quality of milk is deteriorated due to adulteration of milk in different marketing channels dishonest producers, middlemen and vendors increase the volume of milk by various ways like by adding water with other solid materials. It is difficult to determine the type of adulteration through visual observation. Sometimes goat or buffalo milk are mixed with cow milk. Occasionally chemical preservatives and coloring agents are added to milk. Sometimes milk fat is withdrawn from milk. All of these are known as adulteration of milk

Adulteration may be defined as to debase by adding inferior materials or elements; make impure by admixture; use cheaper, inferior of less desirable goods in the production and marketing of an article (Prassad, 1999). The most common adulteration is to addition of water in milk but more sophisticated adulteration are practiced as e.g.-adding starch or flour, cane sugar, low priced powder milk, vegetable oil etc. to increase total solids (FAO, 1984).The detection of the adulterants in milk has been approached by the scientists in number of ways. Firstly by knowing the physical and chemical properties (Specific gravity, water, Fat, SNF and TS) and their percentage in milk and then detect the abnormalities in proportion. In this way market milk can be examined for adulteration of water or skimming of milk (removal of fat). The variation in the standard physical property of milk helps to suspect the adulterants present in the milk. On the other hand, presence of flour, sugar, milk powder and starch can be tested chemically. Thus, the known adulterants of the milk can be detected physically and chemically.

Though Government of Bangladesh possess BSTI under the ministry of Science and Technology to play this role but surveillance is almost unperceivable. Information is not available on the quality of milk from different sources in CMA. However, very limited numbers of research work have been carried out in Bangladesh regarding milk quality.

So, the present study was undertaken with the aim to make a comparative study of nutritional quality of incoming fluid milk from rural to different entry points in Chittagong metropolitan areas with purpose of uses of fluid raw milk.

**CHAPTER 3**

**RIVEW OF LITARATURE**

**3.1 Definition of milk**

Milk may be defined as the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy milch animals, excluding that obtained within 15 days before or 5 days after calving or such periods. It may be necessary to render the milk practically colostrum-free, and containing the minimum prescribed percentages of milk fat and milk-solids-not-fat (De, 2000).

**3.2 Constituents of Milk**

Chandan (1997) and Singh *et al.* (1997) showed that milk is a complex colloidal dispersion of fat globules and protein (casein, whey) in an aqueous solution of lactose, minerals, and other minor constituents. Milk is made up of 12.6% milk solids (3.7% fat, 8.9% milk solids-not-fat

According to Eckles *et al*. (1951) milk should contain on an average 87.25 % water, 3.80 % protein, 4.80 % lactose and 0.65 % minerals, Besides, milk contains considerable amounts of fat soluble vitamins (Vit-B complex and Vit-C).

**3.3 Nutritive Value of Milk**

According to Ziegler (1983) the principal carbohydrate in milk is lactose, a natural disaccharide consisting of one galactose and one glucose unit. Lactose accounts for about 54% of the total solids-not-fat content of whole milk

Fox (1992) described that cow's milk is a heterogeneous mixture of proteins. About 80% of the total protein in milk is casein and 20% is whey protein. Milk also contains small amounts of various enzymes (e.g., lipoprotein lipase, alkaline phosphates, lactoperoxidase) and traces of non protein nitrogenous compounds (e.g., ammonia, urea, creatinine, creatine, and uric acid).Casein constitutes about 80% of the total nitrogen present in the milk. Alpha lactalbumin, constitutes about 3.5 % of the total nitrogen content.

milk is fairly a good source of vitamins such as thiamine and riboflavin. Except vitamin C it provides particularly all the ingredients necessary to promote and maintain life. Enzymes found in the milk include lipase, alkaline phosphatase, acid phosphatase, xanthinie oxidase, peroxidase, protease, amylase, catalase and lactase (Fox , 1997).

Millar (1999) found that minor quantities of glucose, galactose, and oligosaccharides present in milk. Glucose and galactose are the products of lactose hydrolysis by the enzyme lactase. He assumed that galactose may have a unique role in the rapidly developing infant brain.

**3.4 Physical Parameters of Milk**

Eckles *et al.* (1951) demonstrated the normal range of specific gravity of whole milk is 1.027 to 1.035 with an average of 1.

Islam (1993) found the average specific gravity of milk was 1.0276±0.001

Rahman (1995) reported in his study that the specific gravity of milk were 1.025±.001, 1.023±.001, 1.023±.001 from Manikjonj Chilling plant, Takerhat Pasteurization plant and Baghabarighat Dairy Plant respectively.

Azad *et al*. (2007) demonstrated in a comparative study that the specific gravity of milk do not significantly differs in different month of the year. The maximum, minimum and average specific gravity of milk obtained from Bhaghabarighat area was 1.0288(February), 1.0262 (October) and 1.0260 respectively.

Debnath *et al.* (2009) found in their study that the specific gravity of milk from different sources from Chittagong metropolitan area varied from 1.025 to 1.028 and vendor supplied rural milk had the lowest value of it

**3.5 Chemical parameters**

Islam *et al.* (1984) also reported that lower SNF% in local market milk than that of the milk from BAU Dairy Farm, Mymensingh.

Rahman (1995) observed that the average SNF content of milk collected from Pasteurization Plant and Baghabarighat Dairy Plant were 6.67%, 7.2%, 7.04% and 7.96% respectively.

Debnath *et al.* (2009) studied SNF% 8.33, 7.98, 7.85, 8.2 from farm produced milk, vendor supplied farm milk, and vendor supplied rural milk and brand market milk respectively in Chittagong metropolitan area. He also demonstrated that the butter fat of milk from different sources from Chittagong metropolitan area varied from 3.52 to 4.01 and vendor supplied rural milk had the highest value of it.

**3.6 Adulteration of Milk**

Hussain (1987) found moida (Flour) was one of the common adulterants used by the Goala. Admixture of milk with Moida (flour) reacted with iodine solution and formed blue color.

Ding and Chang (1987) raw milk is often adulterated with dried milk and one of the commonest forms of adulteration of fresh milk sold in summer time in Taiwan.

Pal *et al.* (1989) demonstrated that added sugar in milk is a very common adulteration problem in dairy industry.

Debnath *et al.* (2009) found that 45.83% of vendor supplied farm milk and 31.56% of vendor supplied rural milk was adulterate with water.10.52 % of the vendor supplied rural milk was tainted with formalin in different sources of milk in Chittagong metropolitan area.

CHAPTER 4

MATERIALS & METHODS

The study was conducted at the Dairy science Laboratory under the Department of Dairy and poultry Science, Chittagong Veterinary and Animal Sciences University, during a period from 5th January to 26th February’2012. Before collecting the milk samples, the entry points of fluid raw milk from rural areas to CMA were identified. The relevant information regarding the mode of transportation of milk, distance of production areas from CMA, time required for reaching milk from production areas to consumers or product manufacturers hand were collected through interview of the suppliers during the collection of milk sample.

**4.1 Selection of sample collection points:**

Five different entry points of raw fluid milk from rural areas to CMA were identified and selected for sample collection. The entry points were: 1)Sholoshahor rail station, 2) janalirhat rail station, 3) kornafuli bridge, 4) potenga, 5)Bohoddarhat bus terminal.

**4.2 Collection of milk sample:**

The fluid raw milk samples were collected directly from the selected entry points. The volume of each sample was 500ml. A total of 20 samples, 4 from each entry point were collected during this study.

**4.3 Procedure of Sampling**:

The samples were directly collected from the bulk sources of incoming fluid raw milk through proper mixing with the help of plunger and dipper. Soon after collection the sample were kept into the cool box for ceasing the growth and activity of acid producing organisms.

**4.4 Methods followed for testing of collected fluid raw milk:**

The collected milk samples were kept in the refrezarator at 00 C until the tests were conducted. Before using each and every sample was pre warmed for few minutes.

The nutritional quality test of the milk samples were conducted by the following procedure-

Specific gravity of milk was determined by using quevenne lactometer as described in Manual on milk and milk products testing procedures. (FAO, 1984)

Fat percentage was detected by Gerber method according to the procedure described in milk and milk products testing procedures I.S.I. (1958).

Protein and casein percentage of milk was estimated according to (Pyne, 1932).

Total solids, solids-not-fat percentage were estimated according to simple calculation method described in Indian standard Institute. Hand book of Food analysis I.S.I. (1984).

Chemical Tests: In different regions of Bangladesh the common adulterants used in milk are water, starch, cane sugar, starch, and low quality powder milk. Starch, cane sugar, starch and powder milk detection tests were performed by following Kumar et al. (1998)method

**4.5 Data recording and analysis:**

The obtained data were imported and stored in Excell-2000 and analyzed by using software-STATA/IC-11.0. The mean and SEM with 95% CI were calculated to expressed the different parameters.

**CHAPTER 5**

**RESULTS & DISCUSSION**

**5.1 Physical and Chemical Quality Assessment:**

**5.1.1 Specific gravity**

Among the five sources of milk the average specific gravity was found highest at potenga (1.027 ±.0015) entry point which was within the normal range of specific gravity of milk (De, 2000), and lowest at sholoshahar station (1.022 ± 0.001). In another three entry points shows the lowest specific gravity of milk that is below the normal range (Table: 1, Fig: 1). Lowest specific gravity of milk below the normal range indicates the nutritional quality of the rural milk was deteriorated by middlemen due to water adulteration. This result is agreed with the findings of Islam *et al.* (1984) and Debnath *et al.* (2009)

**Figure1: Graph showing the Comparisons in average Specific gravity of milk sample in five entry points in CMA.**

**5.1.2 Fat content**

The average fat% of collected milk sample was highest in potenga entry point (3.3 ± 0.115) and was lowest in janalirhat rail station (2.9 ± 0.057). (Table: 1, Fig: 2) shows that milk samples in all entry points contains poor fat percentage as mentioned by De (2000). It might be due to the water adulteration.

**Figure 2: Graph showing the Comparison in average Fat% of milk sample in five different entry points in CMA**

**5.1.3 Solids -Not -Fat Content (SNF)**

Average SNF % of the collected milk sample was recorded highest in potenga (7.6±0.433) having a range of 6.8-8.3. And lowest in janalirhat (6.9 ± 0.196). Among 20 milk samples only in two sample contained above 8% SNF. Most of the samples did not satisfy the SNF% according to PFA Rules (1986). Lower SNF% can be a result of higher fat% or adulteration of water with milk. Islam *et al.* (1984) reported that milk containing less than 7.9%-8% SNF is adulterated with water.

**Figure 3: Graph showing the Comparison in average SNF% of milk sample in five different entry points in CMA**

**5.1.4 Total Solids (TS):**

The average TS % was highest in potenga (11.1 ±0.351), and lowest in janalirhat (9.8 ± 0.249). Among all the samples TS% were ranged from 8.82% to 12%, that were recorded in kornafuli bridge point. The TS% of the most of samples was satisfactory which is similar to the results of Yadav and Sarwat (1982) and Islam *et al*. (1984) where they found lower total solids in milk from local markets (8.5%-12%). But, according to De (2000) TS% of cow milk should be 12 to above. Lower fat% in milk sample could be a cause. On the other hand it might be a result of adulteration in milk.

**Fig4: Graph showing the Comparisons in average TS% of milk sample in five different entry points in CMA**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Source of milk sample** | Parameter of physical and chemical quality(Mean ±SEM) , (95% confidence interval) | | | | | |
|  | SPG | FAT% | SNF% | TS% | PROTEIN% | WATER% |
| Sholoshohor  rail station | 1.022 ± 0.001  (1.016 1.028) | 3.2 ± 0.057 (2.951 3.448) | 7.2 ± 0.338 (5.708 8.624) | 10.4 ± 0.316 (9.071 11.794) | 2.55 ± 0 .098 (2.127 2.972) | 89.9 ± 0.647 (87.114 92.685) |
| Janalirhat rail station | 1.023 ±0.0005  (1.020 1.025) | 2.9 ± 0.057 (2.651 3.148) | 6.9 ± 0.196 (6.046 7.739) | 9.8 ± 0.249 (8.721 10.865) | 2.38 ± 0.098 (1.957 2.802) | 90.91 ± 0.530 (88.624 93.189) |
| Kornafuli bridge | 1.024 ± .0020  (1.015 1.032) | 3.07 ±0 .272 (1.892 4.240) | 7.2 ± 0.661 (4.351 10.041) | 10.2 ± 0 .929 (6.263 14.263) | 2.60 ± 0.204  (1.727 3.485) | 89.77 ± 0.929 (85.736 93.736) |
| Potenga | 1.027 ±.0015  (1.020 1.033) | 3.3 ± 0.115 (2.803 3.796) | 7.6 ± 0.433 (5.702 9.431) | 11.1 ± 0 .351 (9.588 12.611) | 2.78 ± 0.149 (2.131 3.421) | 88.9 ± 0.351 (87.385 90.411) |
| Bohoddarhat | 1.026 ± 0.0017  (1.018 1.033) | 3.0 ± 0.057 (2.751 3.248) | 7.02 ± 0.141 (6.409 7.623) | 10.01 ± 0 .112 (9.534 10.499) | 2.38 ± 0.098 (1.957 2.802) | 89.98 ± 0.114 (89.496 90.479) |

**5.1.5 Protein:**

The average protein% was highest in potenga entry point (2.78 ± 0.149) and lowest in janalirhat and bohoddarhat point (2.38 ± 0.098) (Table:1, Fig:5). And it ranges from 2.21 to 3.08% among all the collected milk samples. According to De (2000) protein% of cow's milk should be 3.3 to 3.42. The less protein% might be due to feeding problem in the cows and adulteration of milk with water.

**Fig 5: Graph showing the Comparisons in average protein% of milk sample in five different entry points in CMA**

**5.1.6 Water Content**

According to Eckles *et al*. (1951) milk should contain on average 87.25 % water. Our study reported that highest average water (%) was detected in janalirhat station (90.91 ± 0.530). and lowest in kornafuli bridge point (89.77 ± 0.929). In other entry points also shows (Table:1, Fig: 6)the higher water % in milk, that indicate the water adulteration in milk. This result agrees with the research findings of Das *et al*. *(*2010). Islam *et al.* (1984) also found higher water content(89.9%) in milk collected from local markets of Mymensingh Town.

**Fig 6: Graph showing the Comparison in Average Water % of milk sample in five different entry points in CMA**

**5.2 Adulteration**

Table 2: Status of adulteration of milk in all five entry points in CMA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample Collection points** | **Type of adulterants detected in the collected samples** | | | | | | | | |
| Water | | Starch | | Powder milk | | Cane sugar | | Porpose of using raw milk |
| +ve% | -ve% | +ve% | -ve% | +ve% | -ve% | +ve% | -ve% |
| Sholoshohor rail station | 100 | 00 | 00 | 100 | 00 | 100 | 00 | 100 | Drinking |
| Janalirhat rail station | 100 | 00 | 00 | 100 | 00 | 100 | 00 | 100 | Drinking |
| Kornafuli bridge | 100 | 00 | 00 | 100 | 25 | 75 | 00 | 100 | Sweetmeat,  curd |
| Potenga | 100 | 00 | 00 | 100 | 00 | 100 | 00 | 100 | drinking |
| Bohoddarhat | 100 | 00 | 00 | 100 | 00 | 100 | 00 | 100 | Drinking |

Table 2: shows that all the samples collected from five different entry points were adulterated with water. It is also noticed that fluid raw milk uses for drinking purposes were detected more percentage of water adulteration in compare to sweetmeat manufacturing purposes. To increase the commercial life of milk as well as increase the volume of milk more water adulteration in case of drinking milk might be occurred. This result agrees with the findings of Das *et al.* (2010). Water is a common adulterant of milk and frequently adding in different regions of Bangladesh. Rahman *et al*. (2000*)* also detected added water in milk in Mymensingh town though the high water adulteration was detected in drinking purpose of milk but no other adulterant was detected. On the other hand, milk used for sweet meat purpose was also adulterated with powder milk along with added water in kornafuli bridge point.

**Table 3: Added Water in collected milk sample in five points in CMA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **No of Samples** | **Added Water** | **Percentage** |
| Sholoshohor rail station | 4 | 4 | 100% |
| Janalirhat rail station | 4 | 4 | 100% |
| Kornafuli bridge | 4 | 4 | 100% |
| Potenga | 4 | 4 | 100% |
| Bohoddarhat | 4 | 4 | 100% |

Table-4 shows that all the samples collected from five different entry points were adulterated with water .

**Table 4: Added powder milk in collected milk sample in five points in CMA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **No of Samples** | **Added Powder milk** | **Percentage** |
| Sholoshohor rail station | 4 | 0 | 00% |
| Janalirhat rail station | 4 | 0 | 00% |
| Kornafuli bridge | 4 | 1 | 25% |
| Potenga | 4 | 0 | 00% |
| Bohoddarhat | 4 | 0 | 00% |

**Table 5: Added starch in collected milk sample in five points in CMA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **No of Samples** | **Added Powder milk** | **Percentage** |
| Sholoshohor rail station | 4 | 0 | 00% |
| Janalirhat rail station | 4 | 0 | 00% |
| Kornafuli bridge | 4 | 0 | 00% |
| Potenga | 4 | 0 | 00% |
| Bohoddarhat | 4 | 0 | 00% |

**Table 6: Added canned sugar in collected milk sample in five points in CMA**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **No of Samples** | **Added Powder milk** | **Percentage** |
| Sholoshohor rail station | 4 | 0 | 00% |
| Janalirhat rail station | 4 | 0 | 00% |
| Kornafuli bridge | 4 | 0 | 00% |
| Potenga | 4 | 0 | 00% |
| Bohoddarhat | 4 | 0 | 00% |

Out of 20 samples which were tested within 2 hours after collection, 20(100%) samples were proved in added water, and only one sample showed positive result for added powder milk.

**CHAPTER 6**

**CONCLUSION**

From the above discussion it can concluded that. Nutritive values of all the samples irrespective of purpose of uses were below the standard level. The water adulteration was common in incoming milk from rural areas to CMA in five entry points & no other adulterants were detected in drinking purpose milk but sweetmeat purpose milk was adulterated with powder milk

**CHAPTER 7**

**REFERENCES**

Azad, M. A., Hasanuzzaman, M., Azizunnesa, Shil, G. C. and Barik , M. A. (2007): Milk Production Trend, Milk Quality and Seasonal Effect on it at Baghabarighat Milk Shed Area, Bangladesh. Pakistan J. of Nutrition, 6(4): 363-365.

CCC Website (2010): Chittagong City Corporation Websit, www.

Chandan, R. (1997): Dairy-Based Ingredients*.* St. Paul, Minn.Eagan Press.

De, S. (2000): Outlines of Dairy Technology. Oxford University Press, London. pp: 1-2.

Debnath, G.K., Kober, A.K.M.H. and Chanda, G. C. (2009): Quality of Fluid Milk Available in Chittagong Metropolitan Area, proceedings of the sixth annual scientific conference, 178-182. Chittagong Veterinary and Animal Sciences University.

Das, S., Debnath, G.K., Chanda, T., Alim, M. A. and Sarker, S. ( 2010): A study on quality of milk from farm to shop in Chittagong Metropolitan area. International J. of Animal and Fisheries Sciences, 3: 252- 256.

Eckles, C., Combs, C. and Macy, H. (1951): Milk and milk products 4th edition, Mcgraw-Hill book company, New York, Toronto, London. pp: 22-23.

Fox, P. E. and Grufferty, M. B. (1997): Effect of added NaCl on some physiochemical properties of milk. Dairy Science Abst. 48(7):482.

Fox, P. F. (1992): Proteins. Advanced Dairy Chemistry*,* 1:52-63.

FAO (1984): Food and Agriculture Organization of the United Nations. A Manual on milk and milk products testing procedures. Co-operative Dairy Organization and Extension Programme (Phase II), Bangladesh.

FAO (1999): Food and Agriculture Organization of the United Nations A manual on the use of the LP-system in milk handling and preservation.

Islam, M. S., Zaman, M. M., Quadir, M. M., Hasan, M. N. and Hossain, M. I. (2002): Study on the Assessment of Chemical Qualities of Milk Produced by Primary Cooperative Societies (Milk Vita). Pakistan j.of Biological Sci*.*  5(11):1261-1263.

Islam, M.N., Hossain,S.M.I. and Mannan, A.(1984): Studies on the physical parameters

and chemical quality of milk in Mymensingh town. Bangladesh J. of Animal

Sci. 13: 52-54.

ISI (1984): Indian Standard Institution. Hand book of Food Analysis part XII-XV, ISI,

Delhi.

Miller, G. D., Jarvis, J. K. and McBean, L. D. (1999): Handbook of Dairy Foods and Nutrition. 2nd ed. Boca Raton, Fla.: CRC Press.

Prassad, J. (1999): Principles of Animal Nutrition. Kalyani Publishers, New Delhi-110002.

Payne, G.T.(1932): Biochemistry J.,26 1006,cited in a text of Dairy Chemistry, Vol.2.

PFA, 1976. (The prevention of the Food Adulteration Rules) New Delhi

Pal, P. K., Battacharya, A. M., Das, M. K. and Bandyopadhyay, T. S. (1989): Rapid detection of added sugar in mlk. The Indian J. of Dairy Sci. 32(2): 405.

Rahman, M.S.,Islam, M.N., Hassan,S.M.I. and Sarkar, E. A.(2000): Quality of packaged fluid milk available in retail market of Mymensingh . Bangladesh J. of Animal Sci. 29 (1-2): 163-172.

Singh, H., McCarthy, O. J. and Lucey, J. A. (1997): Physico-chemical properties of milk. In Advanced Dairy Chemistry Vol. 3. 2nd ed. New York,Chapman & Hall. pp: 469.

Yadav, A. N. and Sarawant, B. L. (1982): Note on the physical and chemical qualities of Markets milk in Varanasi Town, India. Asia J. of Dairy Res*.* 1(1): 74-76.

Ziegler, E. E. and Fomon, S. J. (1983): Lactose enhances mineral absorption in infancy. J. Pediatr. Gastroenterl. Nutr. 2: 288.

**CHAPTER 8**

**ANNEX**

Data1:Sholoshahar station

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Area | Sp.gravity | Fat% | SNF% | TS% | Protein% | Water% |
| Sholoshohor1 | 1.020 | 3.3 | 6.51 | 9.81 | 2.38 | 91.19 |
| Sholoshohor2 | 1.023 | 3.1 | 7.35 | 10.65 | 2.55 | 89.35 |
| Sholoshohor3 | 1.025 | 3.2 | 7.64 | 10.84 | 2.72 | 89.16 |
| Sholoshohor4 | 1.023 | 3.2 | 7.34 | 10.5 | 2.55 | 89.88 |

Data2:janalir hat station

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Area | Sp.gravity | Fat% | SNF% | TS% | Protein% | Water% |
| Janalirhat1 | 1.023 | 2.9 | 7.08 | 9.98 | 2.38 | 91.12 |
| Janalirhat2 | 1.024 | 3.0 | 7.1 | 10.1 | 2.55 | 89.90 |
| Janalirhat3 | 1.022 | 2.8 | 6.5 | 9.3 | 2.21 | 91.70 |
| Janalirha4 | 1.023 | 3.1 | 6.9 | 10 | 2.38 | 90.3 |

Data3:new bridge

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Sp.gravity | Fat% | SNF% | TS% | Protein% | Water% |
| New bridge1 | 1.028 | 3.6 | 8.4 | 12 | 2.89 | 88.00 |
| New bridge2 | 1.023 | 2.9 | 7.07 | 9.97 | 2.72 | 90.03 |
| New bridge3 | 1.021 | 2.7 | 6.12 | 8.82 | 2.21 | 91.18 |
| New bridge4 | 1.023 | 3.3 | 7.1 | 10.4 | 2.62 | 89.7 |

Data4: potenga

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Sp.gravity | Fat% | SNF% | TS% | Protein% | Water% |
| Potenga1 | 1.028 | 3.1 | 7.6 | 10.7 | 2.55 | 89.3 |
| Potenga2 | 1.024 | 3.3 | 6.8 | 10.8 | 2.72 | 89.2 |
| Potenga3 | 1.029 | 3.5 | 8.3 | 11.8 | 3.06 | 88.2 |
| Potenga4 | 1.027 | 3.2 | 7.7 | 10.9 | 2,78 | 88.9 |

Data:5bohoddarhat

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Sp.gravity | Fat% | SNF% | TS% | Protein% | Water% |
| Bohoddarhat1 | 1.023 | 2.9 | 7.07 | 9.97 | 2.38 | 90.03 |
| Bohoddarhat2 | 1.025 | 3.1 | 6.75 | 9.85 | 2.21 | 90.16 |
| Bohoddarhat3 | 1.029 | 3.0 | 7.23 | 10.23 | 2.55 | 89.77 |
| Bohoddarhat4 | 1.026 | 3.0 | 7.0 | 10.0 | 2.38 | 90.05 |

Determination of fat: The fat percentages of the milk sample were determined by Gerber fat Test Method

Before taking a reading, the position of the fat columns were adjusted to bring the lower end of the fat column on a main graduation mark, the scale readings were noted correspondingly to the lowest point of the far meniscus and to the surface of separation of the fat and acid; the difference between the two readings gives the percentage by weight of fat in the milk. When the reading was being taken, the butyrometer were held with the graduated protein vertical and kept the point read level with the eye.

Determination of SNF, TS and Water percent of Milk sample:

Solids- not- fat %= 0.25L+0.2F

Total solids %= 0.25L+1.2F

Water %= 100-total solids

Where,

L = Corrected quevenne lactometer reading.

F = Fat percentage of the milk by Gerber method.

Detection of the adulterants in Milk:

1. Cane sugar Detection:

1. 2ml of milk was taken in a test tube.
2. Then 1ml of the HCL and 0.1gm of resorcinol were added to the test tube.
3. Incubate at hot water bath at 600 C for 2 minutes.

Red color indicate positive test.

2. Starch Detection:

1. 2ml of milk sample was taken in test tube.
2. Few drops of 5% iodine solution added.

Formation of blue color indicates the positive test.

3. Milk powder Detection:

1. 10 ml of milk was taken in a test tube.
2. A drop of formalin was added to the test tube.
3. Then the test tube was incubated at 600 C for 10 minutes.

A peculiar odor indicate positive test.

**Procedure of protein estimation**

1. 10 ml of milk was taken in a 250 ml conical flask and add 2.3 drops of phenopthelien indicater & 0.4 ml of neutral saturated. Potassium oxalate solution.

2.After 2 minutes it is titrated against 0.1 N solution till a faint pink color appeared.

3.Ten 2 ml of neutral formaldehyde is added & well mixed.

4.Titration is done against to a faint pink color with 0.1 N NaOH solution

5.Volume of 0.1N, NaOH utilized after the addition of formaldehyde is recorded and used for further calculation.

**Calculation:**

Protein content of milk = titrated value × 1.7