The Pharma Innovation Journal 2018; 7(5): 486-491

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(5): 486-491

www.thepharmajournal.com
Received: 09-03-2018
Accepted: 10-04-2018

Dr. G Sireesha
Assistant Professor,
Department of Home Science,
Sri Padmavati Mahila
Visvavidyalayam, Tirupati,
Andhra Pradesh, India

MSD Mounika
Research Scholar,
Department of Home Science,
Sri Padmavati Mahila
Visvavidyalayam, Tirupati,
Andhra Pradesh, India

Correspondence
Dr. G Sireesha
Assistant Professor,
Department of Home Science,
Sri Padmavati Mahila
Visvavidyalayam, Tirupati,
Andhra Pradesh, India

Physicochemical and microbiological quality assessment of different milk brands available in Tirupati, Andhra Pradesh

Dr. G Sireesha and MSD Mounika

Abstract
Milk quality control tests are designed to ensure that milk products meet accepted standards for chemical composition and purity as well as levels of different micro-organisms. To assess the quality of the different milk brands available in Tirupati, Andhra Pradesh. Using questionnaire, information was elicited among the local people, to know the highly preferred milk sample; 9 more samples of varied brands were selected for the present study. Microbial, organoleptic and physiochemical parameters tests were carried out in all the 10 samples. Majority of the consumers preferred M7 (40%) milk sample. The microbial quality assessment reveals that 50% samples recognized as good and the remaining is fair quality. The organoleptic assessment of samples indicate that the M3, M7 and M10 milk were in the category of good and the remaining samples were satisfactory. The colour and pH observed was in the normal condition. There was a slight variation observed the acidity and SNF levels of the collected milk samples. A majority of the milk samples have the normal COB and CLF reading except some milk samples. This indicates that the adulteration of milk with water is the reasons.

Keywords: Acidity, microbial, organoleptic, solid not fat, adulterants

Introduction
Milk is a complete food that invariably improves the country's food and nutrition security. Milk is a source of essential nutrients such as carbohydrates, proteins, fats, vitamins and minerals. Milk is needed to promote growth and maintenance of health. Of the world's total population, 6 billion consume milk and dairy products. More than 750 million people live in dairy households (Haytowitz, 2006) [1]. There are many dependent factors that include geographical and climatic conditions, availability and cost of milk, food taboos, and religious restrictions (Deborah, 2007) [2].

Increasing emphasis is being placed on the quality and hygiene of milk in the dairy industry. High quality milk production requires effective udder health programs at the herd level (Bhutto *et al*., 2010) [3]. Milk safety is an important attribute for consumers of milk and dairy products. Milk and dairy products from dairy cows can harbor a variety of microorganisms and can be important sources of foodborne pathogens. The presence of food-borne pathogens in milk is due to direct contact with contaminated sources in the dairy farm environment and the excretion of the udder of an infected animal (Oliver *et al*. 2005) [4]. The introduction of food-borne pathogens by contaminated raw milk into dairy processing plants may result in the persistence of these pathogens in biofilms and the subsequent contamination of processed dairy products and consumer exposure to pathogenic bacteria.

Sellers of milk adulterated milk to increase their profit margin and increase the shelf life of milk by adding several chemicals such as urea, starch, ammonium sulphate, salt, formalin, cane sugar detergents, etc. This adulterated milk causes serious health problems. It is therefore necessary to analyze the milk samples. This adulteration diminishes the nutritional value of milk. These adulterants, preservatives and drugs in milk cause very serious health problems (Ali *et al*., 2011) [5]. With the development of international trade, food security has become an important global issue (Sudershan *et al*., 2009) [7]. Adulteration of milk is an act of intentional degradation of the quality of foods offered for sale, either by the addition or substitution of inferior substances, or the elimination of certain valuable ingredients (Kandpal *et al*., 2012) [8, 25]. Adulterated foods are dangerous for health because they can contain a variety of toxic chemicals, they can be deprived of the nutrients necessary for the growth and development of the human body (Awan *et al*., 2013) [9].

Falsification of milk indicates poor hygiene, poor practices, lack of preservation technology, cooling facilities and sanitary conditions are the main causes of losses in quantity and the falsification of milk is the most pressing public health problem. To increase the shelf life of milk, dirty ice and certain chemicals such as hydrogen peroxide, carbonates, bicarbonates, antibiotics, caustic soda and even the most lethal chemical formol is also used. Milk adulterated with urea is very harmful to girls because it speeds up the puberty process (Altaf and Siddique, 2007) [10]. Thus, it is clear that in addition to the less harmful adulterants, toxic and potentially harmful substances are also added to the milk. From the point of view of protecting the health of the consumer, the Government of India promulgated the PFA Act in 1954. The law came into force on June 1, 1955. It prohibits the manufacture, sale and distribution of not only adulterated foods but also contaminated foods, with toxic substances. Despite food legislation, forgery remains uncontrolled and the legal measures in the PTA Act are extremely difficult to maintain due to inadequate and untrained manpower and laboratory facilities.

Objectives: The overall objective of the study was to assess the quality of marketed milk in Tirupati urban area. The specific objectives are as fallows

1. To assess physical and chemical quality of milk marketed in Tirupati.
2. To determine the microbial quality of milk samples.
3. To find out the adulterants present in the milk.

Materials and Methods

Study area

The study was conducted in Tirupati urban. Tirupati is a city in Chittoor district of the Indian state of Andhra Pradesh. It is a municipal corporation and the head quarters of Tirupati (urban) Mandal, and of the Tirupati revenue division.

Study design

The study involved a laboratory tests based investigation aimed to assess the quality of different types of milk brands, marketed in Tirupati town. A total of M1, M2, M3, M4, M5, M6, M7, M8, M9, M10 (10) samples of milk were collected at shops. Questionnaire was issued to the home makers to elicit the information on the preference of milk they use. As per their response the consumer preference of various milk brands was determined. Highly preferred milk samples coded M1, M2, M3, M4, M5, M6, M7, M8, M9, and M10 were selected for the present study on the basis of the result of the questionnaire conducted in the Tirupati.

The four areas selected for the milk analysis of Dairy Technology, Gayathri Nagar, Padmavathi Nagar and Balaji Colony, Korlagunta. The milk samples collected were 1. Tirumala Milk, 2. Doddla Milk, 3. Heritage Milk, 4. Shreeja Milk, 5. Sangam Milk, 6. Mother Milk, 7. Vander's Milk, 8. Kalahasti Milk, 9. Arokya Milk, 10. Dairy Technology Milk. The standard methods were adapted for the analysis of milk quality given by the food science and "FSSAI" and the chemical used were best graded chemicals. The samples collected were analyzed for their physic-chemical, microbial and adulterant test adapted were done to check their quality.

Research Design

The study involved a laboratory based investigation aimed to assess the quality of milk marketed in Tirupati.

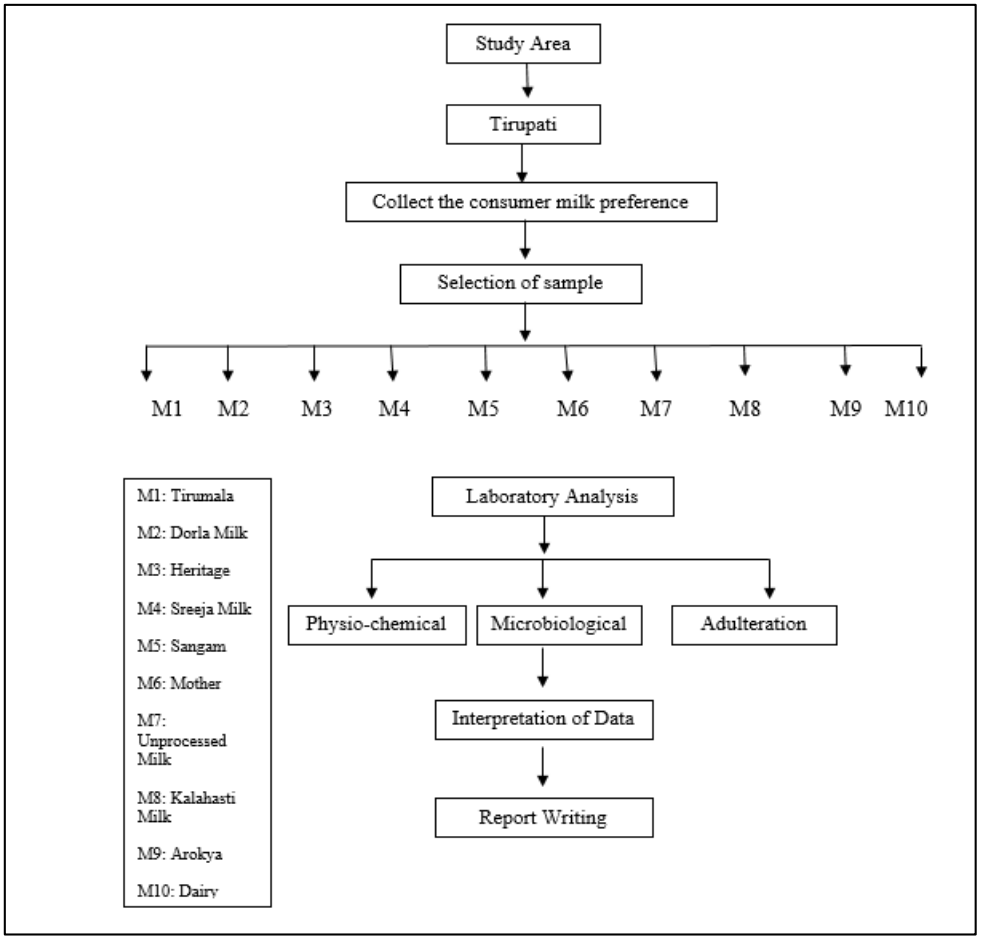

Fig 1: Research Design

Sample collection
The milk samples were collected from the commercially available milk sachets and the fresh natural milk were purchased from local markets in Tirupati.

Laboratory analysis of milk samples
The milk samples were analysed for physical appearance (Harding, 1995) [11], compositional, quality, presence of adulterants and microbial quality. Organoleptic tests (FAO, 1986) [12], pH, cotton boiling test (COB) (Marshal, 1992) [13], lactometer reading, fat, carbohydrates, protein, solid not fat (S.N.F) (AOAC, 1990) [14], acidity tests (AOAC, 1990) [14] and for Microbial test are methylene blue reduction test (MBRT) were conducted to check the milk quality (AOAC, 1990) [14]. The adulteration tests included glucose, urea, starch and cane sugar. All the tests were conducted based on the standard procedures of AOAC, 1990 [14].

Data analysis
Information obtained from the structured questionnaires and laboratory milk analysis was collaborated during data analysis. Data was then captured in Microsoft Excel to generate descriptive statistics.

Results and Discussion
Milk preference
Consumer preference of various milk brands were determined and presented in the Table 1, it is understood that M7 sample have an increasing rate of preference of 40 present and secondly sample M2 have a percent followed by remaining brands so majority of the subjects have preferred unprocessed milk then the processed milk.

Milk is extremely susceptible to spoilage by microorganisms and the microbiologist plays a major role in the dairy industry in quality control of milk. Good product and herd management practices help ensure low bacteria x.

Table 1: Consumer Preference for Different Milk Brands Available in Tirupati

S. No.	Samples	% preference
1	M1	5
2	M2	9
3	M3	8
4	M4	5
5	M5	8
6	M6	8
7	M7	40
8	M8	6
9	M9	7
10	M10	4
Total		100

M1- Tirumala Milk; M2- Doddla Milk;
M3 – Heritage Milk; M4 – Shreeja Milk;
M5- Sangam Milk; M6- Mother Milk;
M7- Unprocessed Milk; M8- Kalahasti Milk
M9 – Arokya Milk M10- Dairy Technology Milk

Microbial quality analysis
The details regarding the microbial quality assessment of selected samples given in the table 2. Out of 10 samples 2 were of poor quality, 3 sample were of fair quality 1 sample was slightly fair, 1 sample was good and 3 samples were of very good quality respectively. This indicates that 50 percent of samples recognised as good and the remaining are fair quality of milk.

Table 2: Analysis of milk quality in Methylein Blue Reduction Test (MBRT)

Quality grade	No. of samples
½ Hour (very poor)	M8, M9
1 Hour (fair)	M1, M2
1 ½ hour (slightly fair)	M6, M4
3 – 4 Hours (good)	M5
6 Hours (very good)	M3, M7, M10

As per the present data, only 3 milk samples were under very good quality standards while remaining samples were of fair quality category. Milk as it is secreted from the udder of a healthy cow is very low in bacterial numbers. Bacteria can increase in raw milk due to poor milking methods, inadequate cleaning of milk equipment, poor cooling and in some cases as a result of mastitis (Khan *et al*, 2008) [15].

Organoleptic test
Organoleptic evaluation should always be the first screening of milk, it is cheap, fast and requires no equipment. These tests are also called organoleptic breast milk, 2010
The organoleptic evaluation of quality parameters and standards for milk is the most important because there are no laboratory methods that can replace the human senses to judge the parameters such as the color, the aromas, the taste quality of the milk. package, etc. usual products normal sense of sight, smell and taste in order to observe and record the overall quality. The result of this test (Table 3) was obtained immediately on the spot where and when it is done. This method has a minimum cost but when properly used, it is very useful, for example. allows rapid detection of substandard milk on receipt. It is applicable on the forms, during the collection of milk upon receipt of milk and at the milk processing plant (Kavitha Vijayan and Archana Prabhat, 2015) [16]

Table 3: Organoleptic assessment of selected samples

S. No.	Samples	Appearance	Taste	Texture	Odour
1	M1	Good	Usual	Good	Good
2	M2	Average	Good	Satisfactory	Satisfactory
3	M3	Good	Good	Good	Good
4	M4	Satisfactory	Usual	Good	Good
5	M5	Good	Satisfactory	Satisfactory	Satisfactory
6	M6	Average	Usual	Satisfactory	Good
7	M7	Good	Good	Good	Good
8	M8	Good	Satisfactory	Good	Satisfactory
9	M9	Satisfactory	Usual	Satisfactory	Satisfactory
10	M10	Good	Good	Good	Good

From the result of organoleptic assessment of samples it is seen that the quality parameters of the samples M3, M7 and M10 are in the category of good and the remaining samples are satisfactory because its appearance was cloggy taste was not appealing, texture was granular and the odour was also not like of fresh milk.

The organoleptic and physical parameters for processed and non-processed milk have been used. No dilutions have been performed. This is also one of the way to establish milk quality. In this way find out if something has been added to the milk in order to make it more commercial but of a lower quality.

Physico-chemical properties

The colour of milk observed was white in appearance (50%) to yellow (50%). The Ph of milk samples ranged from 6.8 to 7.8 (Table-4) respectively.

Table 4: Physical properties of selected milk samples

S. No.	Samples	Colour	pH
1	M1	White	6.8
2	M2	Light yellow	6.4
3	M3	White	7.2
4	M4	White	6.8
5	M5	Yellowish white	7.2
6	M6	Yellowish white	7.0
7	M7	Yellowish white	7.8
8	M8	White	7.0
9	M9	White	6.8
10	M10	Yellowish white	7.8

In the present study, out of 10 samples only a few meet the standards to be recognized as good quality of milk. The milk samples have white or yellow colour, pH ranges from 6.8 – 7.8. These findings agreed with the reports of Judkins and Mack (1955), who reported that normal milk has a yellowish colour due to presence of fat and casein, these differences in colour may be due to differences in nature of feed consumption or presence of fat, casein. These differences in colour may be due to difference in nature of feed consumption bread, season and *etc.* The bread of cow or the fat and solid contents of the milk.

Action of them on lactose is responsible for lactic acid production in milk produced lactic acid contributes a major part of the milk acidity & it can be measured by simple titration method. It is expressed as percent lactic acid https://www.researchgate.net/publication/227017510_Responses_of_Lactic_Acid_Bacteria_to_Starvation.

Assessment of acidity measures the lactic acid in the milk. Bacteria that normally develop in raw milk produced more (or) less lactic acid. In the acidity test the acid is neutralised with 0.1N sodium hydroxide and the amount of alkaline is measured (Kavitha Vijayan and Archana Prabhat, 2015) [16]. Table 5 presents the details regarding acidity level and Solid Not Fat (S.N.F) content.

Table 5: Acidity and Solid Not Fat (S.N.F) content of selected samples

S. No.	Samples	S.N.F %	Acidity (% L.A)
1	M1	8.1	0.18/12
2	M2	8.5	0.17/4
3	M3	8.5	0.17/4A
4	M4	9.0	0.18/4
5	M5	9.0	0.18/1A
6	M6	8.5	0.15/4A
7	M7	8.5	0.18/14
8	M8	9.0	0.18/2A
9	M9	8.5	0.14/A
10	M10	9.0	0.18/ 1A

The normal market milk samples should have acidity (% LA) ranging between o.14 – o.18 respectively. This proves that all the samples are in the normal range of acidity level. If the acidity is higher than 0.19% it needs not to be processed. If the lactic acid content is lower than the normal range (0.10%). Then it may be of two reasons 1. Either the milk is of poor quality and 2. Sodium hydroxide/ bicarbonate might have been added due to lactic acid formed as a result of growth of lactic acid bacteria in milk.

Action of them on lactose is responsible for lactic acid production in milk produced lactic acid contributes a major part of the milk acidity & it can be measured by simple titration method. It is expressed as percent lactic acid.

The results of SNF analysis indicates that all the groups are having standards meting PFA requirements. From the table number-5 it is also depicted that solid non-fat content of sample M1 is comparatively low (8.15%) then the sample M2, M3, M6, M7 and M9 which is 8.5 and samples M4, M5, M8 were with 9.0 of SNF indicates mineral content in them. The difference observed in SNF content of milk could be due to difference in the feeding practices, season, milking method and lactation period exerted (Suman *et al.*, 1998) [19].

Table - 6 indicates the details regarding of the chemical quality assessment of selected sample for corrected lactometer reading. Corrected lactometer reading of the sample M1, M5 were 28, sample M2 was 27.4, sample M3, M6, and M9 were 30, sample M4 and M7 were 24, M8 were 25.4. This results shows that the adulteration of milk with water, among these milk samples M9, M6 and M3 is extremely adulterated with water. The corrected lactometer normal reading is 24 to 25. Clot – on – boiling (COB) is all milk samples were +ve because all milk samples are available in market were processed milk.

Table 6: Corrected lactometer reading of the selected samples

S. No.	Samples	Clot-on-Boiling (COB)	Corrected lactometer reading
1	M1	+V	28.0
2	M2	+V	27.4
3	M3	+V	30.0
4	M4	+V	24.5
5	M5	+V	28.0
6	M6	+V	30.0
7	M7	+V	24.0
8	M8	+V	25.4
9	M9	+V	30.0
10	M10	+V	25.4

Table 7 indicates the details of the compositional analysis of selected milk samples for energy, carbohydrates, protein, fat, cholesterol and calcium.

Energy content

The energy in milk comes from its protein, carbohydrate and fat content, with the exception of milk that has virtually no fat. The energy content of milk samples was presented the Table no. 7. The milk samples have an energy ranging between 59 to 90 k.cal. there was a differences observed in energy content due to its fat content bread and feed of the animal or any adulterant.

Table 7: Compositional analysis for selected milk samples

S. No	Samples	Energy (K.cal)	Carbohydrates (%)	Protein (%)	Fat (%)	Cholesterol (%)	Calcium (mg)
1	M1	60	4.9	3.25	3.0	8.0	131
2	M2	59	5.0	3.01	3.0	10.0	114
3	M3	90	4.6	3.20	3.1	10.0	125
4	M4	60	4.8	3.10	3.1	8.0	109
5	M5	87	5.0	3.70	6.1	20.0	130
6	M6	89	5.1	3.20	4.0	25.0	116
7	M7	90	4.8	3.40	6.0	8.0	120
8	M8	90	4.6	3.60	4.0	30.0	125
9	M9	60	4.8	3.00	3.5	11.4	114
10	M10	90	5.0	3.70	6.0	13.0	130

Carbohydrate content

Milk contains approximately 4.9 % carbohydrates in the form of lactose. The carbohydrate content of the milk ranges between 4.6 to 5.1 % respectively.

Carbohydrates are the primary source of energy for activity. Glucose is the only from of energy that can be used by the brain. Excess glucose is stored in the form of glycogen 5.0 percent of milk is very good quality of milk.

Fat content

The fat content of milk from the different milk brands have difference might be due to variability among the breeds of cows, with in a breed and stage of lactation. How ever there was a differences observed in fat content ranging between 3 to 6 percent respectively.

Lipids provided fifty percent of the calories of total caloric value obtained from milk. The results showed that maximum fat was observed in samples M5, M7 and M10 (6.0%). The fat content of samples M3, M4, M6, M8 and M9 was 3.1, 3.1, 4.0, 4.0 and 3.5%, respectively (Table 7). This difference in current fat content may be due to differences in diet, management practices, season and breed of animals (Cervalhao *et al*., 2000) [20]. The fat content of the milk in the buffalo milk sample is approximately 7.45% (Webb *et al*., 1974). The fatty acids contained in the milk fat are approximately 65% saturated, 29% monounsaturated and 6% polyunsaturated.

Protein content

M5 and M7 milk samples have the highest protein content, 3.7% relative to other milk samples. Samples M9, M4 and M2 obtained a lower protein content, namely 3.0 to 3.1%. Milk contains about 3.3% protein and contains all the essential amino acids. The protein content of certain varieties of milk is indicated in the table of protein content.

Although milk is widely promoted for its exceptional calcium content, it is also an excellent source of high quality protein, providing at least 30% of the nutritional value per cup of milk protein is particularly rich in lysine, an ideal accompaniment for whole grains and their products, many of which are low in essential amino acids.

Calcium content

Estimated calcium in milk is shown in Table 7. Calcium plays an essential role in bone formation and metabolism, muscle contraction, so that milk is a recommended source of calcium. Good quality milk 125 to 130%. In this study, 50% of the samples have normal calcium levels, the remaining samples are below normal.

Cholesterol content

There are two types of high density lipoprotein cholesterol or HDL, and low density lipoprotein or LDL. The latter is considered "bad" cholesterol and is directly from the food you eat. Saturated and trans fats found mainly in meat, milk and dairy products are the two main causes of increased LDL levels. However, unsaturated fats from plants and oily fish help reduce bad cholesterol.

Adulteration tests

Table 8: Adulteration tests for the selected milk samples

S. No.	Samples	Starch	Urea	Glucose	Cane sugar
1	M1	Present	Present	Absence	Absence
2	M2	Absence	Absence	Absence	Absence
3	M3	Absence	Absence	Absence	Absence
4	M4	Present	Present	Present	Present
5	M5	Absence	Absence	Absence	Absence
6	M6	Present	Present	Present	Present
7	M7	Absence	Absence	Absence	Absence
8	M8	Absence	Absence	Absence	Absence
9	M9	Present	Absence	Present	Absence
10	M10	Absence	Absence	Absence	Absence

The results presented in Table 8 show that the extent of adulteration in milk samples taken in Tirupati. Starch is the frequent adulteration that has been reported in milk samples (M1, M4, M9, M6). A high amount of starch can cause diarrhea and its accumulation can be problematic in patients with diabetes. However adulteration with starch was not observed in the samples (M2, M3, M5, M7, M8, M10) also reported the absence of starch.

Milk contains mainly lactose sugar (Pandya *et al*., 2013). Lactose gives the milk its sweet taste. However, in all samples tested, the presence of glucose / can sugar was observed in samples M4 and M6 respectively. The presence of cane sugar in milk has been reported in many parts of India as well as in Pakistan.

Urea content in milk samples was also observed. Urea was detected in sample M1, M4, and M6 milk samples. The results related to urea are in line with the work reported by (Bhatt *et al*. 2008) [23], who determined 16, 24, 35 and 12 % of urea adulteration in milk samples of different urban areas.
Wadekar *et al.* (2011) [24] observed the variation in adulteration in different season at latur. They observed that maximum milk samples adulterated with sugar were 20 percent in summer, 12.00 percent in rainy and 3.00 percent in winter seasons. Recently Kandpal *et al.* (2012) [8, 25] also showed poor milk quality of milk at Jolly grant, Dehradun area and showed the presence of urea and detergents as adulterants in milk samples.

Conclusion

It can be concluded that the quality of the milk is not completely compliant with the standards and that the adulteration of the milk is still practiced and has not been completely verified. The consumption of inferior milk can lead to serious health problems. To eradicate this malpractice by the owners of local dairy products that is deeply rooted in the cities. Consumers need to be more active against milk adulteration across the country. It is important to have a quality control system that checks regularly and ensures that only good quality milk is sold. The combined effort of consumers and sellers of milk will help reduce the practice of adulteration.

References

1. Haytowitz. Physical and Chemical Properties of Lactose. Advanced Dairy. 2006, 3.
2. Debora. Effect of Heating and Cooling on the Milk Salts and their Interaction with Casein, Heat Induced Changes in Milk. International Dairy Federation, Brussels, Belgium. 2nd Ed, 2007
3. Bhutto Abdul L, Richard D Murraya, Zerai Woldehiwet. Udder shape and teat-end lesions as potential risk factors for high somatic cell counts and intra-mammary infections in dairy cows. 2010; 183(1):63-67
4. Oliver, James D. The Microbiological Society of Korea The Viable but Nonculturable State in Bacteria Department of Biology, University of North Carolina at Charl, The Journal of Ali A, Mahmood MS, Hussain L, Akhtar M. Adulteration and microbiological quality of milk: A Review. Pak J Nutr. 12: 1195-1202. Microbiology. 2011, 2005; 43:93-100
5. Ali Afzal MS, Mahmood, Iftikhar Hussain, Masood Akhta. Institute of Microbiology, Faculty of Veterinary Science, University of Agriculture, Faisalabad, 38040, Pakistan 1195 Adulteration and Microbiological Quality of Milk (A Review), Pakistan Journal of Nutrition. 2011; 10(12):1195-1202, ISSN 1680-5194
6. Adulteration and Microbiological Quality of Milk (A Review). Available from: https://www.researchgate.net/publication/267566928_Adulteration_and_Microbiological_Quality_of_Milk_A_Review [accessed Apr 24 2018].
7. Sudershan RV, Rao P, Polasa K. Food safety research in India: a review. Asian J Food Ag-Ind. 2009; 2(3):412-433.
8. Kandpal SD, Srivastava AK, Negi KS. Estimation of quality of raw milk (open and branded) by milk adulteration testing kit. Indian J Community Health. 2012; 3:188-192.
9. Awan A, Misbah N, Iqbal A, Ali M, Miqbal R. A study on chemical composition and detection of chemical adulteration in tetra pack milk samples commercially available in Multan. Pak J Pharm Sci. 2013; 27:183-186.
10. Altaf IM, Siddique S. Handbook on Quality Control Laboratory. Published by (Eds Tipu, M.S.). Lahore University of Veterinary Animal Sciences, 2007, 7.
11. Harding F. Milk Quality 1st Ed, Blackie Academic and Professional, Chapman and Hall, New York, London, Tokyo, Madras, 1995.
12. FAO. Conducted a study on manuals of food quality control, 14/8 food analysis, quality adulteration and test of identify, FAO food and nutrition paper and agricultural organization of the united nations, 1986
13. Marshal RT. conducted a study on standard methods for the determination of dairy products. 16th edition. Publ, American public health association, 1992
14. AOAC. Association of official analysis chemists. Official methods of analysis 15th addition, Association of official analysis chemists, Washington, D.C, 1990
15. Khan MJ, Drochner W, Steingass H, Islam KMS. Nutritive evaluation of some tree leaves from Bangladesh for feeding ruminant animals. Indian J Anim. Sci. 2008; 78(11):1273-1277
16. Kavitha Vijayan, Archana Prabhat. Quality Assessment of Different Milk Brands Available in Kottayam District, Kerala, International Journal of Advanced Nutritional and Health Science. 2015; 3(1):137-142, Article ID Med-246, ISSN 2348-5140
17. Judkins HF, Mack MJ. The principle of dairying. 3rd Rev. Ed., John Wiley and Sons, Inc. New York, 1955, 31.
18. https://www.researchgate.net/publication/227017510_Responses_of_Lactic_Acid_Bacteria_to_Starvation
19. Suman CL, MM, Saxena HS, Pandey Show all 7 authors PL. Yadav, Some factors affecting milk constituents yield of Murrah buffalo, 1998. https://www.researchgate.net/publication/296775999_Some_factors_affecting_milk_constituents_yield_of_Murrah_buffalo
20. Cervalhao MP, carbalho MC duracs. c. e matrins f. deresz J. R. F brito A. F frita JAB., effect of nutrition milk quality and consumption anais do 20 minas leite avance technologics, 2000; 77-82.
21. Webb WL, Newton M, Starr D. Carbon dioxide exchange of Alnus rubra: A mathematical model. Oecologia. 1974; 17:28l-291.
22. Pandya, Ishan Y, Harshad Salvi, Omprakash Chahar, Nilesh Vaghela. Quantitative Analysis on Carbon Storage of 25 Valuable Tree Species of Gujarat, Incredible India, Indian J. Sci. Res. 2013; 4(1):137-141.
23. Bhatt SR, Singh A, Bhatt SM. Assessment of synthetic milk exposure to children of selected population in Uttar Pradesh, India. Ind. J Res. Anvikshiti. 2008; 7:22-34.
24. Wadekar Sanjeevani B, Chavan BR, menkudale GV. Survey on adulteration of the milk received from government milk scheme nanded town. Inter link research analysis. 2011, 32-35.
25. Kandpal SD, Srivastava SK, Negi KS. Estimation of quality of raw milk (open & branded) by milk adulteration testing kit. Indian Journal of Community Health, 2012.