EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 5
Issue: 6
556-565
Year: 2018

QUALITY ASSESSMENT OF MILK ADULTERANTS

Neha Tabassum[1]* Ruksana Husssain[2], Mohd Nisaruddin[3], Mohd Sirajuddin[4], Abdul Saleem Mohammad[5], Dr. B. Jayanthi[6]

*[1,2,3,4]Student, Nizam Institute of Pharmacy, Deshmukhi (V), Pochampally (M), Behind Mount Opera, Yadadri Bhuvanagiri (Dist)-508284, Telangana, India.
[5]Assistant Professor, Department of Pharmaceutical Analysis and Quality Assurance, Nizam Institute of Pharmacy, Deshmukhi (V), Pochampally (M), Behind Mount Opera, Yadadri Bhuvanagiri (Dist)-508284, Telangana, India.
[6]Assistant Professor, Department of Pharmaceutics (Drug Delivery System), Annamalai University, Annamalainagar – 608002, Tamil Nadu, India.

***Corresponding Author: Neha Tabassum**
Student, Nizam Institute of Pharmacy, Deshmukhi (V), Pochampally (M), Behind Mount Opera, Yadadri Bhuvanagiri (Dist)-508284, Telangana, India.

Article Received on 30/03/2018 **Article Revised on 21/04/2018** **Article Accepted on 11/05/2018**

ABSTRACT
Introduction: the aim of the current research was to assess the quality of milk for the various adulterants that are commonly and deliberately added to increase the bulk in quantity or to gain profit by the vendors or to ruin the health of the people. the objective of the study was to test the adulterants in the different samples of milk and approve the quality. a standard milk adulteration kit manufactured by nice chemicals pvt. ltd, cochin, india was used to carry out the quality assessment on various samples obtained. **Methods:** a standard milk adulteration kit was obtained from nice chemicals pvt. ltd, cochin, and india... 8 buffalo milk samples, 2 cow milk samples were collected in sterilized glass containers. the milk samples are subjected 12 tests for various adulterants and are subjected to 20x25 tests. **Results and discussion:** all the samples were found to be negative for the starch, hydrogen peroxide, sodium chloride, formaldehyde etc. few of the samples were found to be positive for the urea test. most of the samples were found to be infected with mastitis. **Conclusion:** to conclude with, it's better to use loose milk from known vendor which is less adulterated or may not be adulterated totally or else hardly adulterated or diluted with drinking or tap water when compared to branded milk which is adulterated by adulterants such as urea, starch, detergent, sugar etc.

KEYWORDS: Adulteration, Quality of milk, Quality of food products, FDA, FD&C, Adulteration kits.

INTRODUCTION
A national survey in India has revealed that almost 70% of the milk sold and consumed in India is adulterated by contaminants such as detergent and skim milk powder, but impure water is the highest contaminant. According to National Survey on Milk Adulteration conducted by FSSAI (India) in 2011, water is the most common adulterant followed by detergent in milk. A survey by FSSAI in 2012, 68% milk samples was found to be adulterated in which 31 % were from rural areas. Of these 16.7 % were packet or branded milk and rest were loose milk samples from dairies. In the urban areas, 68.9 % milk was found to be adulterated with water, detergent, urea and skim milk powder. In Uttarakhand, 88% milk was found to be adulterated. Despite the laws governing the quality and sale of milk existing in India for decades, the adulteration of milk has not been checked completely.[1-5]

In order to keep milk temporarily fresh, some unethical activities are usually adapted to prevent the financial losses due to the spoilage of milk during its transportation and sale. For instance, the addition of water to increase volume of milk, thickening agents like starch, flour, skimmed milk powder, whey powder or other ingredients to counter the dilution and extend the solids content of the milk, vegetable oil, sugarcane or urea to compensate the fat, carbohydrate or protein content of diluted milk. Some chemicals such as hydrogen peroxide, carbonates, bicarbonates, antibiotics, caustic soda and even the most lethal chemical formalin to increase the storage period of milk, ice to enhance the shelf life of milk; detergents to enhance the cosmetic nature of milk which diminishes foamy appearance and whitening of milk or calcium thioglycolate/ potassium thioglycolate/ calcium salts of thioglycolic acid and urea for whitening of milk and giving it a genuine look.[6-7]

Milk in its natural form has high food value. It supplies nutrients like proteins, fat, carbohydrates, vitamins and minerals in moderate amounts in an easily digestible form. Due to its nutritive value, milk is significant to young and old people. Milk contains more than 100 substances that are either in solution, suspension or emulsion in water, the important being casein - the major protein of milk, lactose - milk sugar, whey and mineral salts.[8-11]

From the view point of protecting the health of the consumer, the Government of India promulgated the 'Prevention of Food Adulteration Act' (PFA Act) in 1954. The Act came into force from 1st June, 1955. It prohibits the manufacture, sale and distribution of not only adulterated foods but also foods contaminated with toxicants.[12]

Despite food legislation, adulteration remains uncontrolled, furthermore legal steps laid down in the PFA Act are extremely difficult to maintain due to inadequate and untrained man power and laboratory facilities. Such is the state in the country where we are one of the largest nations of milk producers. In the year 2010-2011, India was ranked among the top 5 countries in the world producing 121.8 million tonnes of milk.[13]

Here are a few examples of what adulterants can be added to milk in order to maintain its freshness and market value which in turn is harmful to the consumer leaving them clueless of what direct effect these adulterants have on them. Water is an adulterant in milk which is often always added to increase the volume of milk which in turn decreases the nutritive value of milk which if contaminated poses a health risk especially to infants and children. Detergents are added to emulsify and dissolve the oil in water giving a frothy solution, the characteristic white colour of milk. Detergents cause gastro – intestinal complications. Urea is added to milk to provide whiteness, increase the consistency of milk and for leveling the contents of solid-not-fat (SNF) as are present in natural milk. The presence of urea in milk overburdens the kidneys as they have to filter out more urea content from the body. Hydrogen Peroxide is also added to milk to prolong its freshness, but peroxides damages the gastro intestinal cells which can lead to gastritis and inflammation of the intestine. Starch is also used as an adulterant and if high amounts of starch are added to milk this can cause diarrhea due to the effects of undigested starch in colon. Its accumulation in the body may prove very fatal for diabetic patients. Carbonates and bicarbonates are added to milk too, this can cause disruption in hormone signaling that regulate development and reproduction. Keeping in view the above facts, the present study was conducted to detect various common adulterants in milk samples obtained from public and educational institutions.[1,14]

AIMS AND OBJECTIVES

The aim of the research was to detect the presence of adulterants in Milk and Milk products. The objective of the project is to study some of the milk adulterants.

CHEMICALS AND REAGENTS

Chemicals and requirements for milk adulteration:

1. Urea reagent - I (UR-I)
2. Starch reagent I (ST- I)
3. Neutralizer reagent I (NT I)
4. Detergent reagent - (DT- I)
5. Sugar reagent - I (S I)
6. Sugar reagent-2 (S-2)
7. Glucose reagent-I (G-I)
8. Glucose reagent-2 (G-2)
9. Sodium chloride reagent - I (SC- I)
10. Sodium chloride reagent - 2 (SC-2)
11. Hydrogen peroxide reagent-I (HP-I)
12. Acidity reagent - I (A- I)
13. Mastitis reagent-I (M-I)
14. Formaldehyde reagent - I (FR- I)
15. Formaldehyde reagent - 2 (FR.2)
16. Maltodextrin reagent - I (MD-I)
17. Maltodextrin reagent - 2 (MD-2)
18. Nitrate nitrogen reagent - I (NN- I)
19. Plastic cylinder - (I 0 ml)
20. Plastic filler - (1 ml)
21. Test tube (25 ml, Glass)
22. Hand book of testing methods with Colour Chart

METHODS

A standard milk adulteration kit and a standard food adulteration kit were obtained from Nice Chemicals Pvt. Ltd, Cochin, and India... 8 buffalo milk samples, 2 cow milk samples from various vendors in Hyderabad were collected in sterilized glass containers. And also the single samples of different food stuffs and are subjected to quality tests. The milk samples are subjected 12 tests for various adulterants and the food products are subjected to 20x25 tests. Test methods, reagents and indications are described in Table I. Observations between pure and contaminated milk are picturized in the figures 1,2 and 3.

METHODOLOGY TO TEST FOR THE MILK ADULTERANTS

Table I: Methodology to Test for the Milk Adulterants.

S.No.	TEST	Reagent used	Test Method	Indication
1	Detection of Urea	Urea reagent – I (UR-I)	2ml of milk sample in test tube + 2ml of UR –I. Mix well	Very distinct yellow colour indicates presence of urea. Normal milk gives slight yellow colour due to presence of natural urea
2.	Detection of Starch	Starch reagent – I (ST – I)	Take 3ml of milk sample and add little water in test tube and boil for few minutes. Cool and add 3 drops of ST – I reagent and mix well.	Blue colour indicates the presence of starch in milk.
3.	Detection of Neutralizers	Neutralizer reagent – I (NT – I)	5ml of milk sample in a test tube + 4 drops of NT- I reagent. Mix well.	Red colour or deep rose red colour indicates presence of neutralizers in milk.
4.	Detection of Detergents	Detergent reagent – I (DT – I)	5ml of milk sample in a test tube + 5 drops of DT –I reagent. Mix well.	Dark purple colour indicates presence of detergents (abnormal milk with increased alkalinity) in milk
5.	Detection of Sugar	Sugar reagent –I (S-I) Sugar reagent – 2 (S-2)	5ml of milk sample in test tube + 2ml of S-I reagent and 4 drops of S- 2 reagent. Mix the contents and place in boiling water bath for 2 minutes.	Red colour indicates presence of sugar in milk.
6.	Detection of Glucose – Dextrose	Glucose reagent -1 (G-1) Glucose reagent -2 (G-2)	1ml of milk sample in a test tube + 1ml of G -1 reagent. Mix and place the test tube in boiling water bath for 3 minutes. Cool and add 1ml of G-2 reagent and mix well.	Dark blue colour indicates presence of glucose in milk. Normal milk gives light blue colour.
7.	Detection of Sodium Chloride (salt)	Sodium Chloride reagent – 1 (SC-1) Sodium Chloride reagent -2 (SC-2)	2ml of milk sample in test tube + 2 drop of SC -1 reagent + 1ml of SC -2 reagents. Mix well.	Yellow precipitate indicates the presence of sodium chloride in milk.
8.	Detection of Hydrogen Peroxide	Hydrogen peroxide reagent – I (HP-I)	5ml of milk sample in a test tube + 1ml of HP- I reagent. Mix well and wait for 5 minutes.	Distinct yellow colour indicates presence of hydrogen peroxide in milk.
9.	Detection of Mastitis	Mastitis reagent – I (M-I)	5ml of milk sample in a test tube + 1ml of M – I reagent. Mix well	Normal milk gives a yellow colour. Milk from infected udders gives a green to slightly bluish-green colour.
10.	Detection of Formaldehyde	Formaldehyde reagent – I (FR-I) Formaldehyde reagent – 2 (FR-2)	5 ml of milk sample in a test tube + 2 drops of FR- I and mix well + add 1ml of FR-2 very slowly and carefully along the sides of the test tube.	Violet colored ring at the junction of the milk and reagent indicates presence of formaldehyde. Normal milk gives a light brown coloured ring at the junction.
11.	Detection of Maltodextrin	Maltodextrin reagent -1 (MD-1) Maltodextrin reagent -2 (MD-2)	10ml of milk in a test tube + 1ml of MD-1 reagent and boil for few minutes. Cool and filter. To 5ml of filtrate, add 2-3 drops of MD-2 reagent and mix well.	Brown colour indicates presence of Maltodextrin in milk. Normal milk gives a golden yellow colour.
12.	Detection of Nitrate nitrogen	Nitrate nitrogen reagent -I (NN-I)	2ml of milk in a test tube + 0.5ml of NN-I reagent along the side of test tube.	Blue colour indicates presence of Nitrate nitrogen in milk.

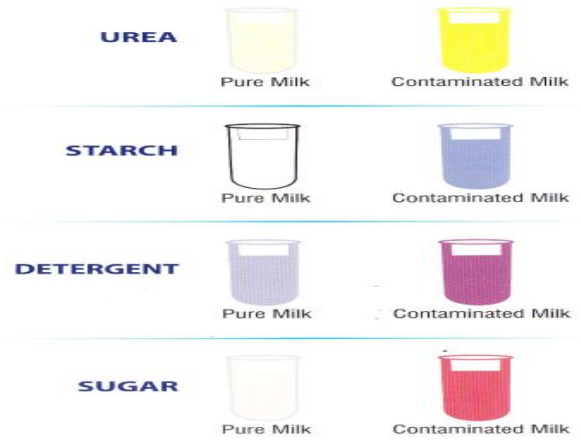

Fig 1: Observation for Urea, Starch, Detergent, Sugar adulteration tests.

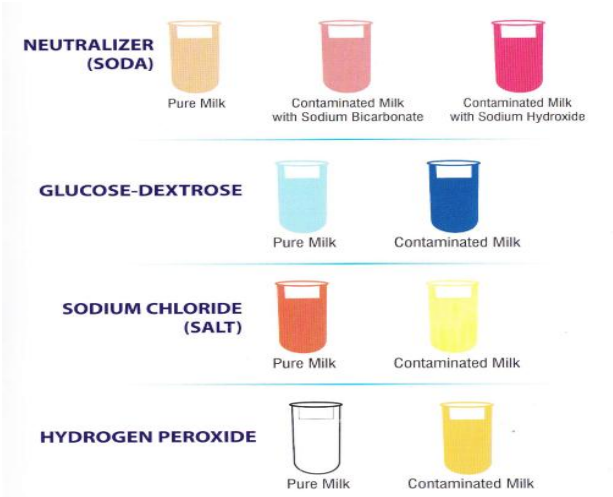

Fig 2: Observations for Neutralizers, Glucose-Dextrose, NaCL, H_2PO_4 Test.

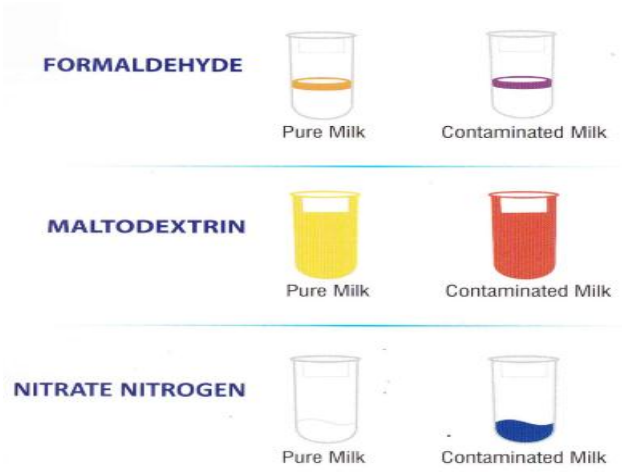

Fig 3: Observations for Formaldehyde, Maltodextrin, Nitrate Nitrogen test.

Table 1: Results for buffalo milk samples (B1, B2, B3, B4).

S.No.	TEST	SAMPLE B1	SAMPLE B2	SAMPLE B3	SAMPLE B4
1	Detection of Urea	Presence of Urea.	Presence of Urea.	Presence of Urea.	Presence of Urea.
2	Detection of Starch	Absence of Starch.	Absence of Starch.	Absence of Starch.	Absence of Starch.
3	Detection of Neutralizers	Absence of Neutralizers.	Absence of Neutralizers.	Absence of Neutralizers.	Absence of Neutralizers.
4	Detection of Detergents	Presence of Detergent.	Absence of Detergent.	Absence of Detergent.	Absence of Detergent.
5	Detection of Sugar	Absence of Sugar.	Absence of Sugar	Absence of Sugar.	Absence of Sugar.
6	Detection of Glucose – Dextrose	Absence of Glucose –Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.
7	Detection of Sodium Chloride (salt)	Presence of sodium chloride.	Presence of sodium chloride.	Absence of sodium chloride.	Absence of sodium chloride.
8	Acidity and Heat stability.	Presence of Acidity.	Presence of Acidity.	Absence of Acidity.	Absence of Acidity.
9	Detection of Hydrogen Peroxide	Absence of hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.
10	Detection of Mastitis	Absence of Mastitis.	Absence of Mastitis.	Presence of Mastitis.	Presence of Mastitis.
11	Detection of	Absence of	Absence of	Absence of	Absence of

	Formaldehyde	Formaldehyde.	Formaldehyde.	Formaldehyde.	Formaldehyde.
12	Detection of Maltodextrin	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.
13	Detection of Nitrate nitrogen	Absence of Nitrate.	Absence of Nitrate.	Absence of Nitrates.	Absence of Nitrates.

RESULTS

Table 1 includes various results for buffalo milk samples (B1, B2, B3, B4), Table 2 emphasizes results for buffalo milk samples (B5, B6, B7, B8) whereas table 3 illustrates results for buffalo milk samples (B9, B10, B11) and cow milk samples (C1 & C2). Fig 4-15 highlights the observations during the tests conducted for Buffalo milk samples whereas Fig 16-17 are for Cow and loose milk samples available in the market. Methodology of each testing process is inculcated in Table 1 and various observations with reference to the color are described in Fig 1-3 for comparing pure and adulterated or contaminated milk samples. All the results are tabulated with reference to the presence or absence of a particular adulterant.

RESULTS FOR BUFFALO MILK SAMPLES

Table 2: Results for buffalo milk samples (B5, B6, B7, B8).

S.No	TEST	SAMPLE B5	SAMPLE B6	SAMPLE B7	SAMPLE B8
1	Detection of Urea	Absence of Urea.	Presence of Urea.	Presence of Urea.	Absence of Urea.
2	Detection of Starch	Absence of Starch.	Absence of Starch.	Absence of Starch.	Absence of Starch.
3	Detection of Neutralizers	Absence of Neutralizers.	Absence of Neutralizers.	Absence of Neutralizers.	Absence of Neutralizers.
4	Detection of Detergents	Absence of Detergent.	Absence of Detergent.	Absence of Detergent.	Absence of Detergent.
5	Detection of Sugar	Absence of Sugar.	Absence of Sugar.	Absence of Sugar.	Absence of Sugar.
6	Detection of Glucose – Dextrose	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.
7	Detection of Sodium Chloride (salt)	Absence of sodium chloride.	Presence of sodium chloride.	Absence of sodium chloride.	Absence of sodium chloride.
8	Acidity and Heat stability.	Absence of Acidity.	Absence of Acidity.	Absence of Acidity.	Absence of Acidity.
9	Detection of Hydrogen Peroxide	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.
10	Detection of Mastitis	Presence of Mastitis.	Presence of Mastitis.	Presence of Mastitis.	Absence of Mastitis.
11	Detection of Formaldehyde	Absence of Formaldehyde.	Absence of Formaldehyde.	Absence of Formaldehyde.	Absence of Formaldehyde.
12	Detection of Maltodextrin	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.
13	Detection of Nitrate nitrogen	Absence of Nitrates.	Absence of Nitrates.	Absence of Nitrates.	Absence of Nitrates.

Table 3: Results for buffalo milk samples (B9, B10, B11) and cow milk samples (C1 & C2).

S.No	TEST	SAMPLE B9	SAMPLE B10	SAMPLE B11	Sample C1	Samples C2
1	Detection of Urea	Presence of Urea.	Presence of Urea.	Presence of Urea.	Presence of Urea.	Absence of Urea.
2	Detection of Starch	Absence of Starch.	Absence of Starch.	Absence of Starch.	Absence of Starch.	Absence of Starch.
3	Detection of Neutralizers	Absence of Neutralizers.	Absence of Neutralizers.	Absence of Neutralizers	Presence of Neutralizers	Absence of Neutralizers
4	Detection of Detergents	Absence of Detergent.	Absence of Detergent.	Absence of Detergent.	Absence of Detergent.	Absence of Detergent.
5	Detection of Sugar	Absence of Sugar.	Absence of Sugar.	Absence of Sugar.	Presence of Sugar.	Absence of Sugar.
6	Detection of Glucose – Dextrose	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.	Absence of Glucose – Dextrose.

7	Detection of Sodium Chloride (salt)	Absence of sodium chloride.	Absence of sodium chloride.	Absence of sodium chloride.	Presence of sodium chloride.	Absence of sodium chloride.
8	Acidity and Heat stability.	Absence of Acidity.	Absence of Acidity.	Absence of Acidity.	Presence of Acidity.	Absence of Acidity.
9	Detection of Hydrogen Peroxide	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.	Absence of Hydrogen peroxide.
10	Detection of Mastitis	Presence of Mastitis.	Presence of Mastitis.	Presence of Mastitis.	Presence of Mastitis.	Absence of Mastitis.
11	Detection of Formaldehyde	Absence of Formaldehyde.	Absence of Formaldehyde	Absence of Formaldehyde.	Absence of Formaldehyde.	Absence of Formaldehyde.
12	Detection of Maltodextrin	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.	Absence of Maltodextrin.
13	Detection of Nitrate nitrogen	Absence of Nitrates.	Absence of Nitrates.	Absence of Nitrates.	Absence of Nitrates.	Absence of Nitrates.

RESULTS FIGURES FOR THE TEST OF ADULTERANTS IN BUFFALO MILK

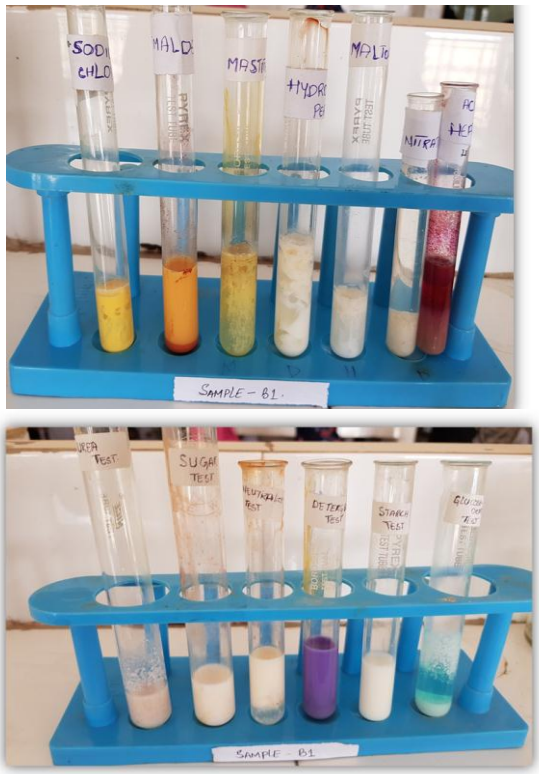

Fig 4: Results for the sample B1 (DODDLA MILK).

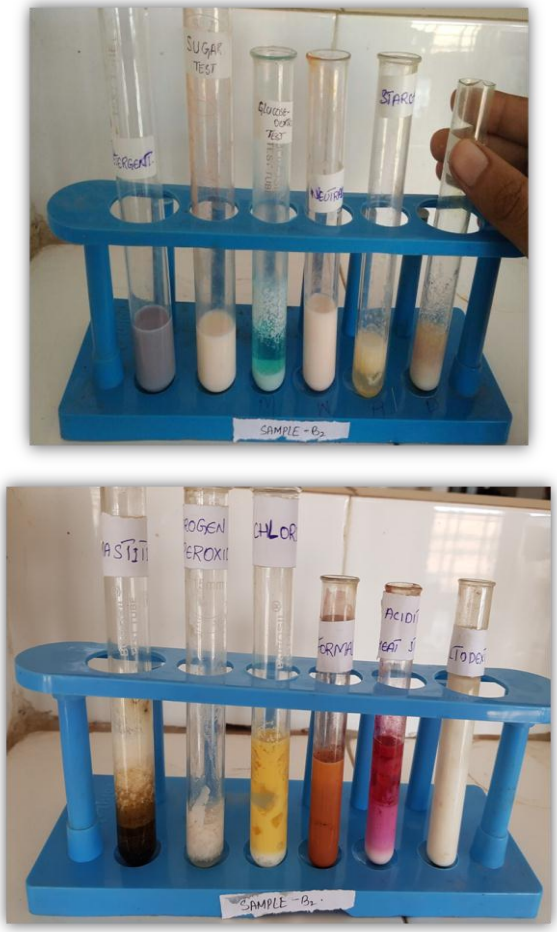

Fig 5: Results for the sample B2 (MASQATI DAIRY MILK).

Fig 6: Results for the sample B3 (SRI-VISHISHTA MILK).

Fig 7: Results for the Sample B4 (JERSEY MILK).

Fig 8: Results for the sample B5 (NARMUL MILK).

Fig 9: Results for the sample B6 (THIRUMALA).

Fig 10: Results for the sample B7 (VT- DAIRY).

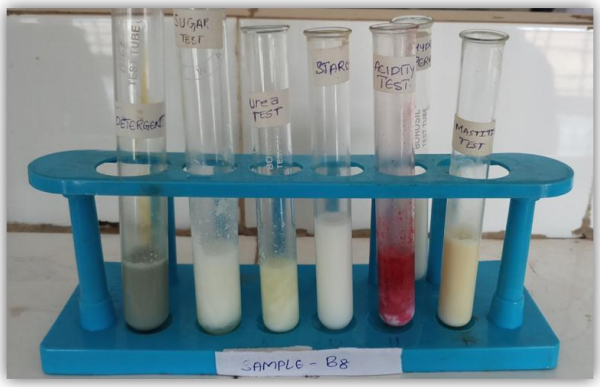

Fig 11: Results for the samples B8 (LOOSE MILK).

Fig 12: Results for the sample B8 (LOOSE MILK).

Fig 13: Results for the sample B9 (LOOSE MILK).

Fig 14: Results for the sample B10 (AMUL).

Fig 15: Result for the sample B11 (HERITAGE).

C. RESULTS FIGURES FOR TEST OF ADULTERANTS IN COW MILK

Fig 16: Result for the sample C1 (GOOD LIFE).

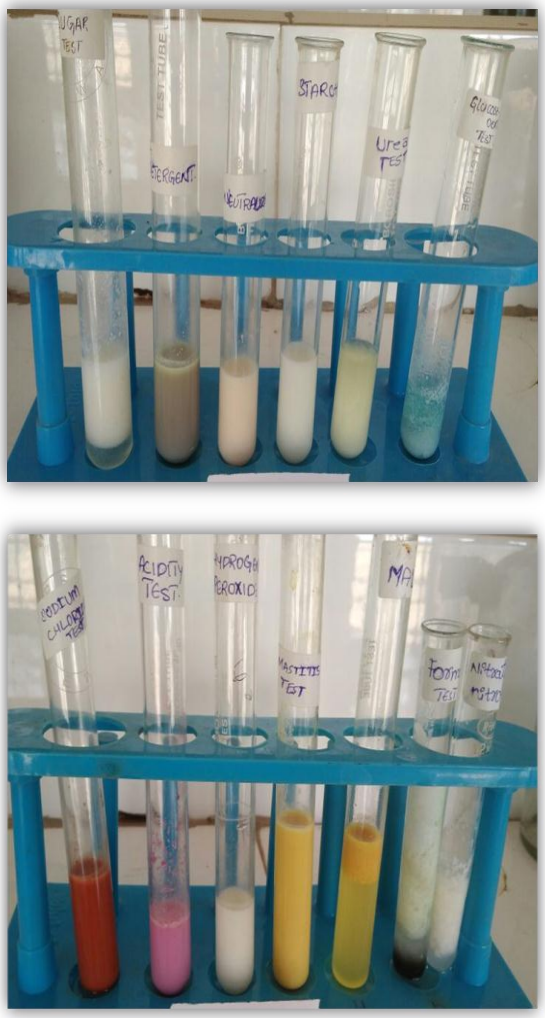

Fig 17: Result for the sample C2 (LOOSE MILK).

F. DISCUSSION OF RESULTS FOR MILK

1. **Detection of Urea:** All samples of buffalo and cow milk are tested positive for presence of urea except sample B5 & B8 (Loose Buffalo milk) and sample C2 (Loose Cow milk)
2. **Detection of Starch, Neutralizers, Hydrogen Peroxide, Formaldehyde and Nitrate Nitrogen:** All the samples tested negative for presence of starch, neutralizers, hydrogen peroxide, and formaldehyde and nitrate nitrogen.
3. **Detection of Detergents:** All Samples tested negative for the presence of detergents while sample B1 tested positive.
4. **Detection of Sugar:** All samples C1 tested positive. All Samples tested negative for sugar content.
5. **Detection of Glucose-Dextrose:** All samples tested negative for the presence of Glucose-Dextrose.
6. **Detection of Sodium Chloride:** Sample B1, B2, B6 & C1 are tested positive while left over samples tested negative.
7. **Detection of Mastitis:** All samples except sample B1, B2, & C2 tested negative for the presence of Mastitis.
8. **Detection of Maltodextrin:** All samples are tested negative for the presence of Maltodextrin.

CONCLUSION

To conclude with, it's better to use loose milk from known vendor which is less adulterated or may not be adulterated totally or else hardly adulterated or diluted with drinking or tap water when compared to branded milk which is adulterated by adulterants such as urea, starch, detergent, sugar etc. Furthermore, many adulterants can be found by carrying out qualitative and quantitative research by advanced instrumental techniques which includes analytical hybrid instrumental methods viz., Gas chromatography-mass spectrometry (GC-MS), liquid chromatography-mass spectrometry (LC-MS), gas chromatography-infrared spectroscopy (GC-IR), and liquid chromatography-nuclear magnetic resonance spectroscopy (LC-NMR) because the current research was confined towards qualitative test. Hybrid techniques are a combination of 2 or more analytical techniques that help detect and quantify components in a mixture. These are few of the most popular hybrid analytical techniques. These are widely used in analytical chemistry and biochemistry.

If we are funded by the government authorities for such kind of research we are ready to advance the project furthermore for the qualitative and quantitative assessment of food and milk products. We request the government quality control or quality assurance departments to throw some light on this project for the betterment of the society.

REFERENCES

1. Nuha Rasheed, Abdul Saleem Mohammed, Hajera Hafeez; A Comparative Assessment of the Quality of Milk-Validation of Standard Brands versus Local Milk Sold in Market. Glob J Pharmaceu Sci. DOI: 10.19080/GJPPS.2018.05.555654 2018; 5(1): 555654.
2. Weise, Elizabeth (April 24, 2007). Food tests promise tough task for FDA. USA Today. Retrieved 2007-04-29.
3. Requirements for Temporary Food Service Establishments. Farmers Branch. Retrieved 27 November2015.
4. https://www.law.cornell.edu/uscode/text/21/342.
5. http://www.cola.org/quality-assessment/.
6. Pehrsson, P.R.; Haytowitz, D.B.; Holden, J.M.; Perry, C.R.; Beckler, D.G. USDA's National Food and Nutrient Analysis Program: Food Sampling (PDF). Journal of Food Composition and Analysis, 2000; 13(4): 379–389. Doi: 10.1006/jfca.1999.0867. Archived from the original
7. Milk - Search Online Etymology Dictionarywww.etymonline.com. Retrieved January 30, 2018.
8. Gerosa and Skoet Milk availability – Trends in production and demand and medium-term

outlook (PDF) Food and Agriculture Organization, United Nations., 2012.
9. O'Connor, George (March–April 1981). The Basics of Beefalo Rising Mother Earth News. Ogden Publications (68) Archived from the original on May 4, 2007. Retrieved February 8, 2011.
10. Milk contains traces of ash. The Hindu. Chennai, India. July 10, 2008. Retrieved August 28, 2010.
11. Phipps, Nikki. Milk Fertilizer Benefits: Using Milk Fertilizer on Plants. Gardeningknowhow.com. Retrieved June 2015; 3.
12. Drop of white the right stuff for vines. Science Daily. September 12, 2002. Retrieved April 1, 2009.
13. https://food.ndtv.com/reviews/amul-nestle-mother-dairy-tru-danone-which-milk-tastes-the-best-767639.
14. Fischer W, Schilter B, Tritscher A, Stadler R. Contaminants of milk and dairy products: contamination resulting from farm and dairy practices. Encyclopaedia of Dairy Sciences. 2011; 2: 887–97.