STM JOURNALS

Research and Reviews: Journal of Dairy Science and Technology
ISSN: 2319-3409 (Online), ISSN: 2349-3704 (Print)
Volume 6, Issue 3
www.stmjournals.com

Detection of Different Adulterant in Different Milk Samples

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Abstract

The study is carried out keeping in view the recently emerging concern of adulteration of natural milk with various illegal substances to increase its marketability. This study explains in detail the hygienic status of milk supplied to various cafes, small hotels and other public and educational institutions. A total of 50 samples were collected from different localities in Delhi/NCR, India and tested for determination and extent of adulteration. Qualitative analyses were carried out on 20 milk samples. Out of 20 samples, only two samples were found to be adulterated with sulphate and starch. Other adulterants were found absent. For analysis seven test comprising of sulphate test, Anionic detergent test, nitrate test, starch test, ammonium compound test, saccharine test, sucrose test were performed to check the presence of different adulterants. The two samples were confirmed to be adulterated by the appearance confirmatory results of the analysis i.e. appearance blue color confirmed the presence of starch in sample no. 6 and sample no. 18, appearance visible precipitate confirmed the presence of sulphate in sample no. 6 and sample no. 18. Only 10% samples were found to be adulterated by starch and sulphate, however other adulterants were found to be absent. Sample no. 6 is collected from Verka dairy in Delhi and Sample no. 18 is collected from Vishnu dairy in Ghaziabad. It is evident from the result that the milk served in Delhi/NCR is approximately hygienic on the parameters analysis for the detection of adulterants as only two samples out of twenty were found to be adulterated. This analysis also shows that packed milk served in Delhi/NCR is hygienic as no adulteration is observed in milk samples of packed milk. This qualitative analysis which has unfolded proved that the milk procured did not conform to the legal standards and was adulterated with toxic chemicals which are injurious to health.

Keywords: *Adulterant, milk, qualitative analysis*

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INTRODUCTION

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 case in the major protein of milk, lactose—milk sugar, whey and mineral salts. The casein micelles and fat globules give milk most of its physical characteristics, and give taste and flavor to dairy products such as butter, paneer, curd, cheese, etc. [1].

Caseins have an appropriate amino acid composition that is important for growth and development of the nursing young. This high quality protein in cow milk is one of the key reasons why milk is such an important human food [2]. Centrifugation of the skim milk in an ultracentrifuge (usually about 50,000 x g or greater) results in pelleting of the casein and in a supernatant called whey (also sometimes called the serum phase of milk) which contains the water, lactose and soluble non-casein proteins. Once casein is removed, then by definition every other protein left in the milk preparation is a whey protein. There are many whey proteins in milk and the specific set of whey proteins found in mammary secretions varies with the species, the stage of lactation, the presence of an intramammary infection, and other factors. The major whey proteins in cow milk are ß-lactoglobulin and α-lactalbumin. α-Lactalbumin is an important protein in the synthesis of lactose and its presence is central to the process of milk synthesis [3]. ß-Lactoglobulin's function is not known. Other whey proteins are the immunoglobulins (antibodies; especially high

in colostrum) and serum albumin (a serum protein). Whey proteins also include a long list of enzymes, hormones, growth factors, nutrient transporters, disease resistance factors, and others.

On the demand side, the situation is buoyant. With the sustained growth of the Indian economy and a consequent rise in the purchasing power during the last two decades, more and more people today are able to afford milk and various other dairy products [4]. This trend is expected to continue with the sector experiencing a robust growth in demand in the short and medium run. If the impediments in the way of growth and development are left unaddressed, India is likely to face a serious supply - demand mismatch and it may gradually turn into a substantial importer of milk and milk products.

Fortunately, the government and other stakeholders seem to be alive to the situation and efforts to increase milk production have been intensified. Transformations in the sector are being induced by factors like newfound interest on the part of the organized sector, new markets, easy credit facilities, dairy friendly policies by the government, etc. Dairy farming is now evolving from just an agrarian way of life to a professionally managed industry—the Indian dairy industry. With these positive signals, there is hope that the sector may eventually march towards another white revolution.

Today, India is 'The Oyster' of the global dairy industry. It offers opportunities galore to entrepreneurs worldwide, who wish to capitalize on one of the world's largest and fastest growing markets for milk and milk products. A bagful of 'pearls' awaits the international dairy processor in India. The Indian dairy industry is rapidly growing, trying to keep pace with the galloping progress around the world. As he expands his overseas operations to India many profitable options await him. He may transfer technology, sign joint ventures or use India as a sourcing center for regional exports. The liberalization of the Indian economy beckons to MNC's and foreign investors alike. Fortification is the process by which manufacturers add micronutrients such as vitamins and minerals to food. The purpose is to reduce the rate of common deficiencies and diseases that would otherwise occur in the absence of these nutrients. This is especially important in regions where the soil and thus the plants that grow in the soil is nutrient poor. Though fortification is sometimes optional, the federal government mandates the inclusion of certain nutrients in cereal, salt and even milk because of concerns over public health [5].

OBJECTIVES

To survey the amount of adulteration in milk from various sources. To identify the types of adulterants in milk.

REVIEW OF LITERATURE

Food Safety and Standards Authority of India (FSSAI) reveal something startling—most Indians are consuming detergents and other contaminants through milk.

The National Survey on Milk Adulteration 2011, a snap shot survey, was conducted to check the contaminants in milk, especially liquid milk, throughout the country. The study found that due to lack of hygiene and sanitation in milk handling and packaging, detergents (used during cleaning operations) are not washed properly and find their way into the milk. Other contaminants like urea, starch, glucose, formalin along with detergent are used as adulterants. These adulterants are used to increase the thickness and viscosity of the milk as well as to preserve it for a longer period. The study notes that the consumption of milk with detergents in hazardous to health. About eight per cent samples were found to have detergents.

Recently, research was done in different regions of Dehradun. The study aimed to analyze the milk quality, adulteration and mastitis infection in milk sold at different regions of Dehradun. Hundred random raw milk samples were collected from dairy owners from 30 different regions of Dehradun. A total number of 100 samples were analyzed for physical appearance, quality, adulterants and mastitis infection. Ninety percent milk samples were white in color and 10% were yellowish white. pH ranged between 6.7–6.9.

Analysis of milk quality showed that 15 milk samples were of very poor quality, 73 samples were of fair quality, 10 were good and only 02 samples were of very good quality. Out of 100 milk samples analyzed for adulteration, adulterants found were glucose (80%), skim milk powder (58%), salt (51%) and urea (35%) while found negative for formalin, salicylic acid, boric acid, starch, soap and ammonium sulphate. All the samples were free from mastitis infection. The adulterants decrease the nutritive value of milk and may also cause serious human health related problems[6].

A study was carried out in Hyderabad keeping in view the recently emerging concern of adulteration of natural milk with various illegal substances to increase its marketability. This study explains in detail the hygienic status of milk supplied to various cafes, small hotels and other public and educational institutions. A total of 50 samples were collected from different localities in Hyderabad, India and tested for determination and extent of adulteration. Qualitative analyses were carried out on 50 milk samples; a standard milk adulteration kit manufactured by Himedia Laboratories, Mumbai, India was used. Following are the significant observations of the study: Sucrose and skim milk powder were present in 22% and 80% of the milk samples respectively. Urea, neutralizers and salt were present in 60%, 26% and 82% of the milk samples respectively. Formalin, detergents and hydrogen peroxide were present in 32%, 44%, and 32% of the milk samples obtained. All percentage values are indicative of presence of these adulterants (trace, moderate and high amounts combined). This qualitative analysis which has unfolded proved that the milk procured did not conform to the legal standards and was adulterated with toxic chemicals which are injurious to health.

Adulteration of milk and dairy products with different types of milk, other than declared, presents a big problem for food monitoring. The evidence of milk adulteration is a difficult task considering similar compositions of various types of milk. The presented review is therefore focused on the study of the composition of milk from different animal species. The aim is to find a useful marker component for the adulterant detection. The analysis of milk proteins is a suitable solution of this problem. The techniques used for research in this area were also studied. As prospective techniques, immunological techniques and techniques based on DNA analysis are especially considered. The first ones are able to determine 0.5% of different milk adulterant and the second ones even as little as 0.1%. Reverse-phase high-performance liquid chromatography is successfully applied in the quantitative analysis of individual milk adulterants in samples [7–8]. The most frequent adulteration of ewe and goat milk is its replacement with less expensive and more plentiful bovine milk. Not so typical adulteration is the presence of goat milk in ewe milk or the detection of bovine milk as adulterant in buffalo mozzarella cheese.

Milk contains considerable amounts of constituents [9–10]. For healthy nation, we need quality of food & milk. But antisocial elements have been adding some adulterants like water, urea, lactose powder etc. in milk sample. The linear and mass attenuation coefficient plays an important role in agricultural dairy, food technology, science & technology, medicines and forensics etc. In the present work, we measured the linear and mass attenuation coefficient of adulterate milk sample with urea by using gamma source Ba-133 at energy 360 keV. The experimental values are in good arrangement and then validate absorption the law [11].

METHODS AND MATERIALS

Twenty samples incorporating different milk samples consumed in various areas of Delhi/NCR which were collected and analyzed for the detection of different adulterants.

The different milk samples were analyzed by performing seven test comprising of sulphate test, anionic detergent test, nitrate test, starch test, ammonium comp. Test, saccharine test, sucrose test were performed to check the presence of different adulterants.

Equipment: Test tubes, test tube holder, filter paper, pipette, water bath, oven, centrifuge, petri dish, stoppered test tube, conical flask, weighing balance, micropipettes tips.

Chemicals: Iodine solution, sodium hydroxide, sodium hypochlorite, phenol solution, barium chloride, acetic acid, hydrochloric acid, diethyl ether, diphenylamine, sulphuric acid, methylene blue dye, chloroform, TCA solution.

Sampling

Collection of Samples

Twenty raw milk samples were collected from dairy owners from different regions of Delhi/NCR. All the possible precautions were taken to avoid contamination (Table 1).

Table 1: *Sample of different dairies located in different area.*

Sr. No.	Sample Source	Area of Collection	Marked as
1.	Paras	Greater Noida	S.01
2.	Mother Dairy	Delhi	S.02
3.	Amul (Tonned)	Greater Noida	S.03
4.	Amul (Full Cream)	Delhi	S.04
5.	Pehlwan Dairy	Ghaziabad	S.05
6.	Verka Dairy	Delhi	S.06
7.	Madhu Milk	Noida	S.07
8.	Mohan Dairy	Delhi	S.08
9.	Monu Dairy	Greater Noida	S.09
10.	Sweety Dairy	Ghaziabad	S.10
11.	Ganga Milk	Greater Noida	S.11
12.	Rita Dairy	Delhi	S.12
13.	Danone Vanilla	Ghaziabad	S.13
14.	Cavin Strawbery	Ghaziabad	S.14
15.	Paras Delight	Greater Noida	S.15
16.	Amul Kool Kesar	Greater Noida	S.16
17.	Gopal Jee	Delhi	S.17
18.	Vishnu Dairy	Ghaziabad	S.18
19.	Parag	Delhi	S.19
20.	Akash Dairy	Ghaziabad	S.20

Preparation of Samples

- Warm the sample 37–40°C.
- Keep in water bath maintained at 40–45°C.
- Stirr slowly for proper homogenization.
- Allow the sample to come to room temperature 26–28°C.

Methodology for Detection of Adulterant in Milk

Detection and Qualification of Cane Sugar in Milk

- Take 1 ml of milk in the test tubes. (Table 3).
- Add 1 ml of Resorcinol Solution and mix (Table 2a, 2b).
- Place the tube in boiling water bath for 5 minutes (Table 2c).
- Withdraw the tube and observe the colour (Table 2).

Detection and Qualification of Starch in Milk

- Take 5 ml of milk in the test tubes (Table 7).
- Bring to boiling condition and allow the test tubes to cool to room temperature (Figure 6a, b, c).
- Add 1–2 drops of iodine solution.
- Observe the color (Figure 7).

Detection of Ammonium Compounds in Milk

- Take 1 ml of milk in the test tubes (Table 4).
- Add 0.5 ml Sodium hydroxide, 0.5 ml Sodium hypochlorite and 0.5 ml Phenol solution (Figure 3a, 3b).
- Heat for 20 seconds in boiling water bath.
- Observe the color (Figure 3).

Test for Presence of Sulphates in Milk

- Take 10 ml of milk in 50 ml stoppered test tubes (Table 6).
- Add 10 ml of TCA Solution (Figure 5a).
- Filter the coagulated milk through Whatman filter paper (Figure 5b).
- Take 5 ml of clear filtrate (Figure 5c).
- Add few drops of Barium chloride solution.
- Observe for any visible precipitates in the tube (Figure 5).

Detection of Nitrates in Milk (Table 2)

- Weigh 2 g of diphenyl amine and dissolve it in sulphuric acid to obtain final volume of 100 ml (reagent) in Fig 1a and 1b.
- Take 2 ml of milk in test tube.
- Rinse the tube with the milk and drain the milk from tube.
- Add 2–3 drops of the reagent along the side of the test tube in Fig 1c.
- Note the develop color.
- Deep blue color will be formed in the presence of nitrates in Fig 1.

Test for Presence of Saccharin in Milk

Curdle an aliquot of the diluted milk sample with dilute acetic acid.

- Shake well and filter (Table 8).

- Acidify the clear filtrate with 2.0 ml on conc. HCl, and extract with two 25 ml portions of diethyl ether (Figure 7a).
- Draw off the aqueous layers and wash the combined ether extracts with three successive portions of 5 ml of water (Figure 7a).
- Evaporate the ether extract on a water bath.
- Add a drop two of water, well with glass rod and taste a little.
- A characteristics sweet taste indicates the presence of saccharine.
- Confirmed by heating NaOH and detecting Salicylic acid thereby.

Conversion to Salicylic Acid

- Acidify about 20–25 ml of filtrate obtained.
- Extract with three portions of ether as above.
- Wash ether extract with two 5 ml portions of water.
- Evaporate greater amount of ether in porcelain dish on steam bath.
- Let remainder evaporate spontaneously and add 1 drop of 0.5% neutral $FeCl_3$ solution.
- Violet color indicates salicylic acid.

Test of Presence of Anionic Detergent in Milk

- Pipette 1 ml of suspected milk sample into a 15 ml tube (Table 5).
- Add 1 ml of dye solution followed by addition of 2 ml chloroform (Figure 4).
- Vortex the contents for about 15 second and centrifuge about 1100 rpm for 3 minute (Figure 4a).
- Note the in density of blue colour in upper layer (Figure 4b).
- Relatively, more intense blue colour in upper layer indicates presence of detergent in milk (Figure 4c).
- Relatively more intense blue colour in upper layer indicates absence of detergent in milk.

RESULT

The results of present work are summarized in Tables 2 and 8 in which the amount of adulteration is checked by qualitative analysis.

A total of 20 milk samples comprising of milk samples collected from different milk sources, i.e. milk from cow, buffalo, and packed flavored samples were collected from Greater. Noida, Noida, Ghaziabad, Delhi and were analyzed.

In the current work, the results were found to be very promising as only 2 samples, sample no. 6 and sample no. 18 were found to be contaminated with starch and sulphate while other adulterants were found completely absent.

Table 2: *Amount of Adulteration is Checked by using Nitrates in Different Milk Samples.*

Sr. No.	Adulterant	Sample no.	Sample Source	Area of source	Result	Figure no.
1.	Nitrates	1	Paras	Greater Noida	Positive	1(a)
2.		2	Mother Dairy	Delhi	Positive	1(a)
3.		3	Amul (tonned)	Greater Noida	Positive	1(a)
4.		4	Amul (Full Cream)	Delhi	Positive	1(a)
5.		5	Pehlwan Dairy	Ghaziabad	Positive	1(a)
6.		6	Verka Dairy	Delhi	Positive	1(a)
7.		7	Madhu Milk	Noida	Positive	1(a)
8.		8	Mohan Dairy	Delhi	Positive	1(a)
9.		9	Monu Dairy	Greater Noida	Positive	1(a)
10.		10	Sweety Dairy	Ghaziabad	Positive	1(a)
11.		11	Ganga Milk	Greater Noida	Positive	1.b
12.		12	Rita Dairy	Delhi	Positive	1.b
13.		13	Danone Vanilla	Ghaziabad	Positive	1.c
14.		14	Cavin Strawbery	Ghaziabad	Positive	1.c
15.		15	Paras Delight	Greater Noida	Positive	1.c
16.		16	Amul Kool Kesar	Greater Noida	Positive	1.c
17.		17	Gopal Jee	Delhi	Positive	1.c
18.		18	Vishnu Dairy	Ghaziabad	Positive	1.b
19.		19	Parag	Delhi	Positive	1.b
20.		20	Akash Dairy	Ghaziabad	Positive	1.b

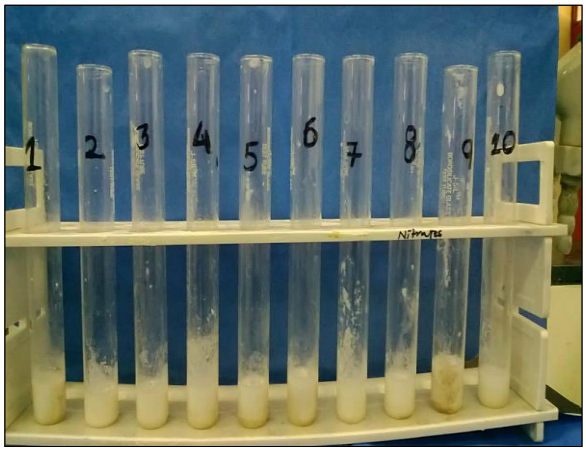

Fig. 1: *(a) Nitrate Test.*

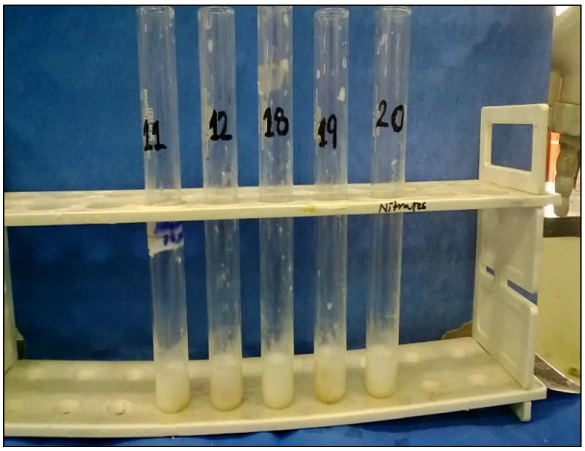

Fig. 1: *(b) Nitrate Test in continuation.*

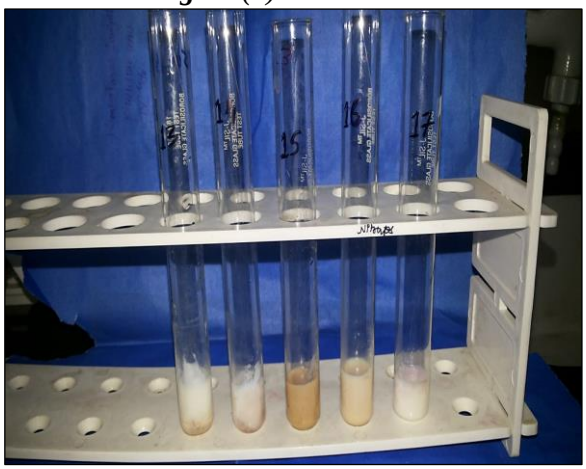

Fig. 1: *(c) Showing the Amount of Adulteration.*

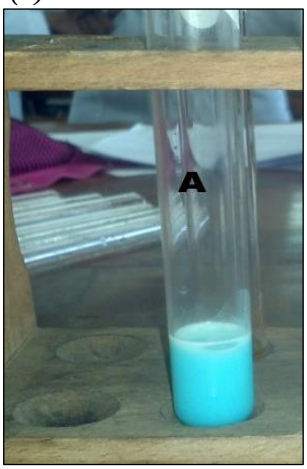

Fig. 1: *Test Tube showing the Control.*

Table 3: *Amount of Adulteration is Checked by Using Sucrose in Different Milk Samples.*

Sr. No.	Adulterant	Sample No.	Sample Source	Area of Source	Result	Figure No.
1.	Sucrose	1	Paras	Greater Noida	Positive	2.a
2.		2	Mother Dairy	Delhi	Positive	2.a
3.		3	Amul (tonned)	Greater Noida	Positive	2.a
4.		4	Amul (Full Cream)	Delhi	Positive	2.a
5.		5	Pehlwan Dairy	Ghaziabad	Positive	2.a
6.		6	Verka Dairy	Delhi	Positive	2.a
7.		7	Madhu Milk	Noida	Positive	2.a
8.		8	Mohan Dairy	Delhi	Positive	2.b
9.		9	Monu Dairy	Greater Noida	Positive	2.b
10.		10	Sweety Dairy	Ghaziabad	Positive	2.b
11.		11	Ganga Milk	Grt. Noida	Positive	2.b
12.		12	Rita Dairy	Delhi	Positive	2.b
13.		13	Danone Vanilla	Ghaziabad	Positive	2.c
14.		14	Cavin Strawbery	Ghaziabad	Positive	2.c
15.		15	Paras Delight	Greater Noida	Positive	2.c
16.		16	Amul Kool Kesar	Greater Noida	Positive	2.c
17.		17	Gopal Jee	Delhi	Positive	2.c
18.		18	Vishnu Dairy	Ghaziabad	Positive	2.b
19.		19	Parag	Delhi	Positive	2.b
20.		20	Akash Dairy	Ghaziabad	Positive	2.b

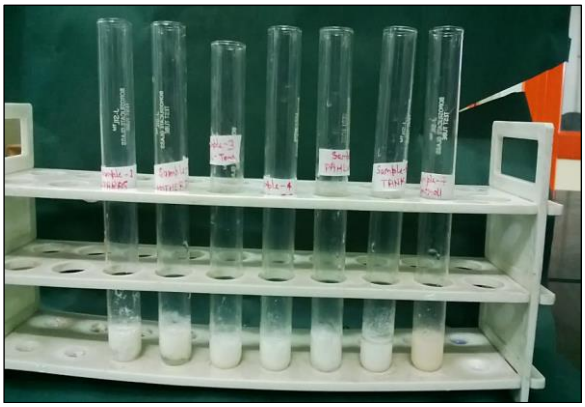

***Fig. 2** (a): Sucrose Test. (a) Sucrose is Added in all the Test Tube to Check the Adulteration.*

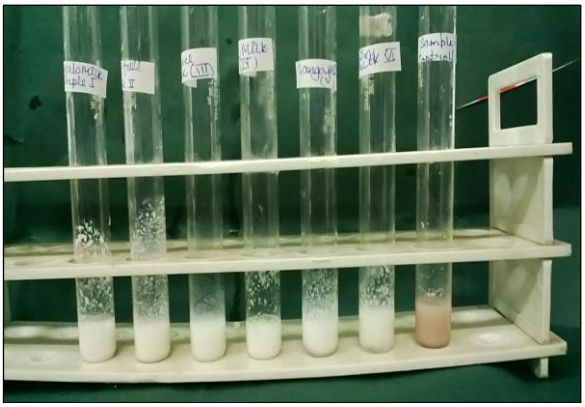

***Fig. 2** (b): Sucrose is Added in all the Test Tube to Check the Adulteration.*

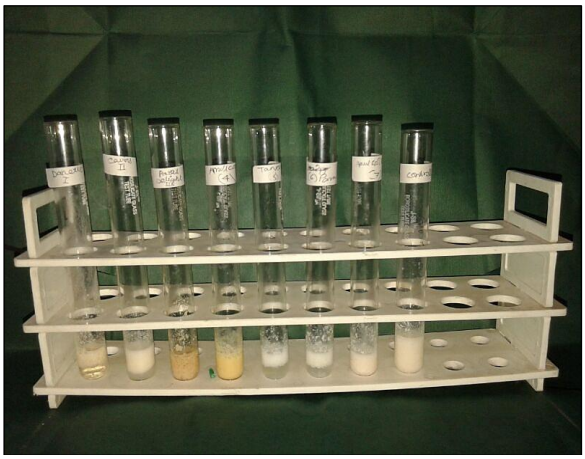

***Fig. 2** (c): Sucrose is Added in all the Test Tube to Check the Adulteration.*

***Fig. 2:** Test Tube showing the Control Sample.*

***Table 4:** Amount of Adulteration is Checked by using Ammonium Compound in Different Milk Samples.*

Sr. No.	Adulterant	Sample No.	Sample Source	Area of Source	Result	Figure No.
1.	Ammonium Compound	1	Paras	Greater Noida	Positive	3.a
2.		2	Mother Dairy	Delhi	Positive	3.a
3.		3	Amul (tonned)	Greater Noida	Positive	3.a
4.		4	Amul (full cream)	Delhi	Positive	3.a
5.		5	Pehlwan Dairy	Ghaziabad	Positive	3.a
6.		6	Verka Dairy	Delhi	Positive	3.a
7.		7	Madhu Milk	Noida	Positive	3.a
8.		8	Mohan Dairy	Delhi	Positive	3.a
9.		9	Monu Dairy	Greater Noida	Positive	3.a
10.		10	Sweety Dairy	Ghaziabad	Positive	3.a
11.		11	Ganga Milk	Greater Noida	Positive	3.b
12.		12	Rita Dairy	Delhi	Positive	3.b
13.		13	Danone vanilla	Ghaziabad	Positive	3.c
14.		14	Cavin Strawbery	Ghaziabad	Positive	3.c
15.		15	Paras delight	Greater Noida	Positive	3.c
16.		16	Amul Kool Kesar	Greater Noida	Positive	3.c
17.		17	Gopal Jee	Delhi	Positive	3.c
18.		18	Vishnu Dairy	Ghaziabad	Positive	3.b
19.		19	Parag	Delhi	Positive	3.b
20.		20	Akash Dairy	Ghaziabad	Positive	3.b

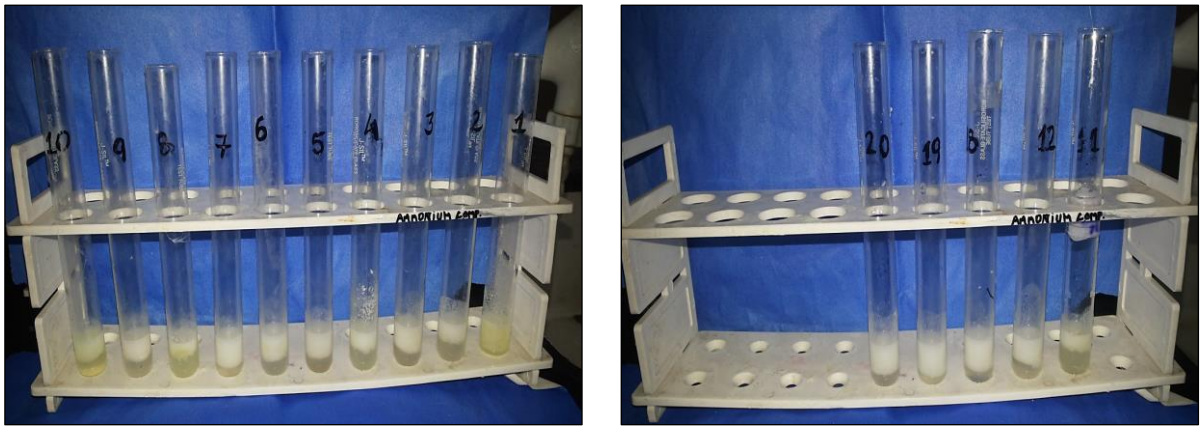

Fig. 3(a): *Ammonium Compound Test. Amount of Adulteration is Checked by using Ammonium Compound in Various Milk Sample.*

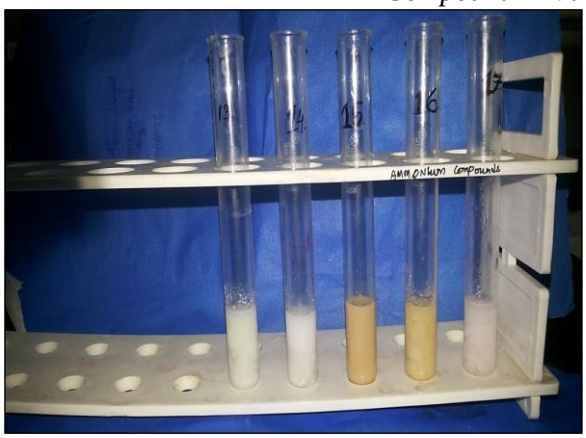

Fig. 3 (b): *Amount of Adulteration is Checked by using Ammonium Compound in Various Milk Sample.*

Fig. 3: *Test Tube showing the Control Sample.*

Table 5: *Amount of Adulteration is Checked by using Anionic Detergent in Different Milk Samples*.

Sr. No.	Adulterant	Sample no.	Sample Source	Area of source	Result	Figure no.
1.	Anionic Detergent	1	Paras	Greater Noida	Positive	4.a
2.		2	Mother Dairy	Delhi	Positive	4.a
3.		3	Amul (Tonned)	Greater Noida	Positive	4.a
4.		4	Amul(full Cream)	Delhi	Positive	4.a
5.		5	Pehlwan Dairy	Ghaziabad	Positive	4.a
6.		6	Verka Dairy	Delhi	Positive	4.a
7.		7	Madhu Milk	Noida	Positive	4.a
8.		8	Mohan Dairy	Delhi	Positive	4.a
9.		9	Monu Dairy	Greater Noida	Positive	4.a
10.		10	Sweety Dairy	Ghaziabad	Positive	4.a
11.		11	Ganga Milk	Greater Noida	Positive	4.b
12.		12	Rita Dairy	Delhi	Positive	4.b
13.		13	Danone Vanilla	Ghaziabad	Positive	4.c
14.		14	Cavin Strawbery	Ghaziabad	Positive	4.c
15.		15	Paras Delight	Greater Noida	Positive	4.c
16.		16	Amul Kool Kesar	Greater Noida	Positive	4.c
17.		17	Gopal Jee	Delhi	Positive	4.c
18.		18	Vishnu Dairy	Ghaziabad	Positive	4.b
19.		19	Parag	Delhi	Positive	4.b
20.		20	Akash Dairy	Ghaziabad	Positive	4.b

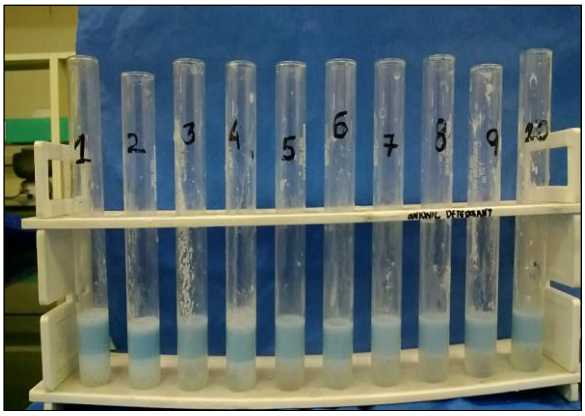

Fig. 4: *(a) Anionic Detergent Test. is checked by using various Milk Samples.*

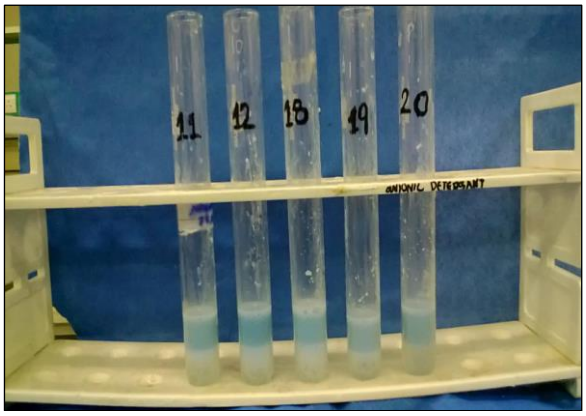

Fig. 4: *(b): Anionic Detergent Test. is checked by using various Milk Samples.*

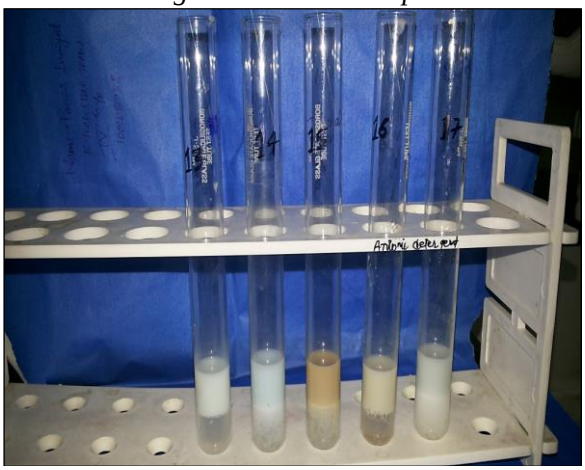

Fig. 4: *(c): Anionic Detergent Test. is checked by using various Milk Samples.*

Fig. 4: *Test Tube showing the Control Sample.*

Table 6: *Amount of Adulteration is Checked by using Sulphate in Different Milk Samples.*

Sr. No.	Adulterant	Sample No.	Sample Source	Area of Source	Result	Figure No.
1.	Sulphate	1	Paras	Greater Noida	Positive	5.a
2.		2	Mother Dairy	Delhi	Positive	5.a
3.		3	Amul (Tonned)	Greater Noida	Positive	5.a
4.		4	Amul (Full Cream)	Delhi	Positive	5.a
5.		5	Pehlwan Dairy	Ghaziabad	Positive	5.a
6.		6	Verka Dairy	Delhi	Negative	5.a
7.		7	Madhu Milk	Noida	Positive	5.a
8.		8	Mohan Dairy	Delhi	Positive	5.a
9.		9	Monu Dairy	Greater Noida	Positive	5.a
10.		10	Sweety Dairy	Ghaziabad	Positive	5.a
11.		11	Ganga Milk	Greater Noida	Positive	5.b
12.		12	Rita Dairy	Delhi	Positive	5.b
13.		13	Danone Vanilla	Ghaziabad	Positive	5.c
14.		14	Cavin Strawbery	Ghaziabad	Positive	5.c
15.		15	Paras Delight	Greater Noida	Positive	5.c
16.		16	Amul Kool Kesar	Greater Noida	Positive	5.c
17.		17	Gopal Jee	Delhi	Positive	5.c
18.		18	Vishnu Dairy	Ghaziabad	Negative	5.b
19.		19	Parag	Delhi	Positive	5.b
20.		20	Akash Dairy	Ghaziabad	Positive	5.b

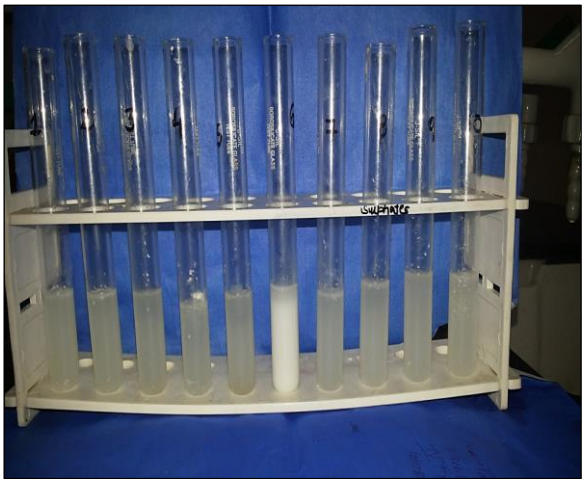

Fig. 5: *(a) Sulphate Test is checked by using various Milk Samples.*

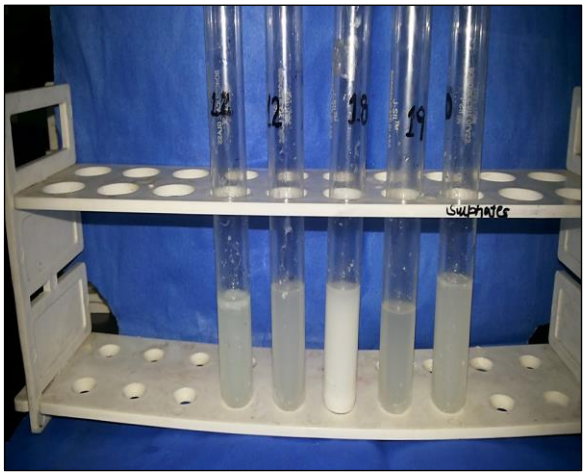

Fig. 5: *(b) Sulphate Test is checked by using various Milk Samples*

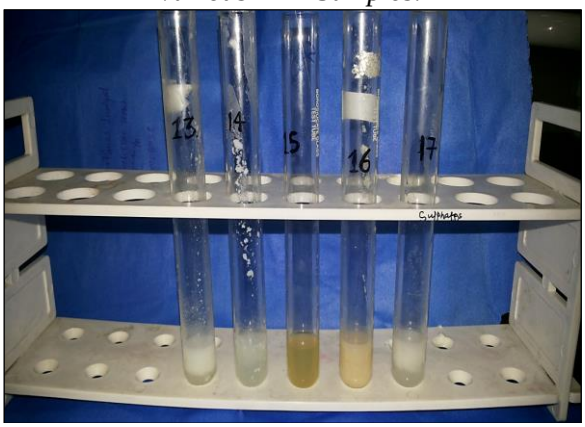

Fig. 5: *(c): Sulphate Test is checked by using various Milk Samples*

Fig. 5: *Test Tube showing the Control Sample.*

Table 7: *Amount of Adulteration is Checked by Using Starch in Different Milk Samples.*

Sr. No.	Adulterant	Sample No.	Sample Source	Area of Source	Result	Figure No.
1.	Starch	1	Paras	Greater Noida	Positive	6.a
2.		2	Mother Dairy	Delhi	Positive	6.a
3.		3	Amul (tonned)	Greater Noida	Positive	6.a
4.		4	Amul (Full Cream)	Delhi	Positive	6.a
5.		5	Pehlwan Dairy	Ghaziabad	Positive	6.a
6.		6	Verka Dairy	Delhi	Negative	6.a
7.		7	Madhu Milk	Noida	Positive	6.a
8.		8	Mohan Dairy	Delhi	Positive	6.a
9.		9	Monu Dairy	Greater Noida	Positive	6.a
10.		10	Sweety Dairy	Ghaziabad	Positive	6.a
11.		11	Ganga Milk	Greater Noida	Positive	6.b
12.		12	Rita Dairy	Delhi	Positive	6.b
13.		13	Danone Vanilla	Ghaziabad	Positive	6.c
14.		14	Cavin Strawbery	Ghaziabad	Positive	6.c
15.		15	Paras Delight	Greater Noida	Positive	6.c
16.		16	Amul Kool Kesar	Greater Noida	Positive	6.c
17.		17	Gopal Jee	Delhi	Positive	6.c
18.		18	Vishnu Dairy	Ghaziabad	Negative	6.
19.		19	Parag	Delhi	Positive	6.b
20.		20	Akash Dairy	Ghaziabad	Positive	6.b

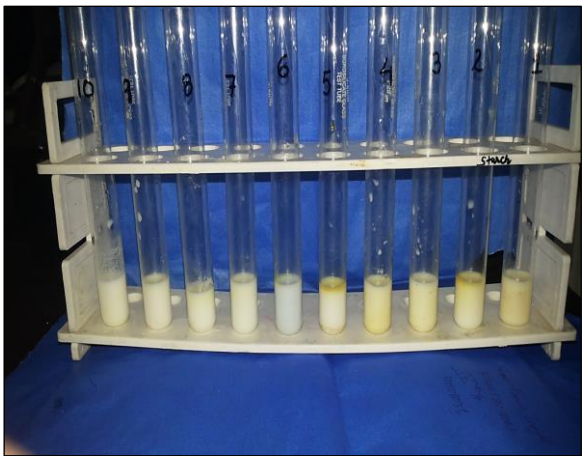

Fig. 6: *(a) Starch Test is showing adulteration by using various Milk Samples.*

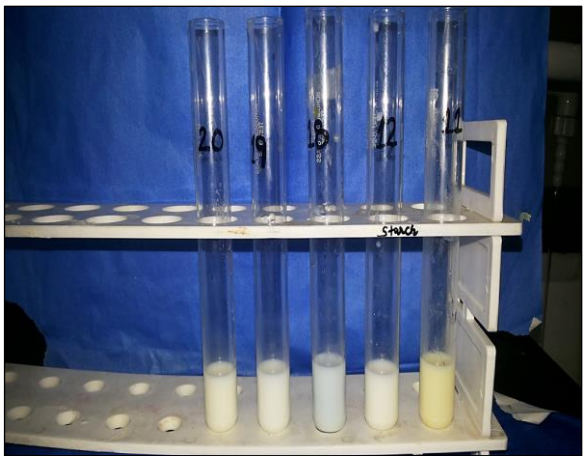

Fig. 6: *(b) Starch Test is showing adulteration by using various Milk Samples.*

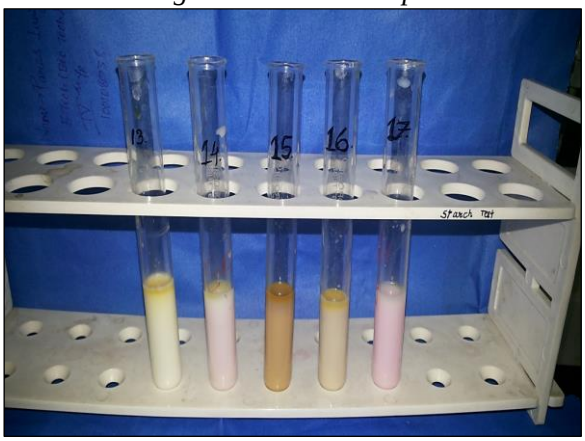

Fig. 6: *(c) Starch Test is showing adulteration by using various Milk Samples.*

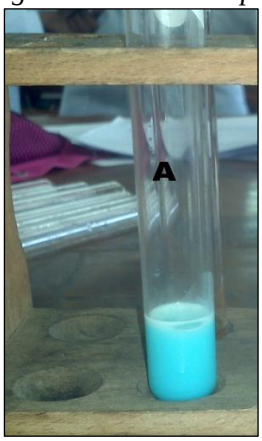

Fig. 7: *Test Tube showing the Control Sample.*

Table 8: *Amount of Adulteration is Checked by Using Saccharine in Different Milk Samples.*

Sr. No.	Adulterant	Sample No.	Sample Source	Area of Source	Result	Figure No.
1.	Saccharine	1	Paras	Greater Noida	Positive	7.a
2.		2	Mother Dairy	Delhi	Positive	7.a
3.		3	Amul (Tonned)	Greater Noida	Positive	7.a
4.		4	Amul (Full Cream)	Delhi	Positive	7.a
5.		5	Pehlwan Dairy	Ghaziabad	Positive	7.a
6.		6	Verka Dairy	Delhi	Positive	7.a
7.		7	Madhu Milk	Noida	Positive	7.a
8.		8	Mohan Dairy	Delhi	Positive	7.a
9.		9	Monu Dairy	Greater Noida	Positive	7.a
10.		10	Sweety Dairy	Ghaziabad	Positive	7.a
11.		11	Ganga Milk	Grt. Noida	Positive	7.a
12.		12	Rita Dairy	Delhi	Positive	7.a
13.		13	Danone Vanilla	Ghaziabad	Positive	7.b
14.		14	Cavin Strawbery	Ghaziabad	Positive	7.b
15.		15	Paras Delight	Greater Noida	Positive	7.b
16.		16	Amul Kool Kesar	Greater Noida	Positive	7.b
17.		17	Gopal Jee	Delhi	Positive	7.b
18.		18	Vishnu Dairy	Ghaziabad	Positive	7.a
19.		19	Parag	Delhi	Positive	7.a
20.		20	Akash Dairy	Ghaziabad	Positive	7.a

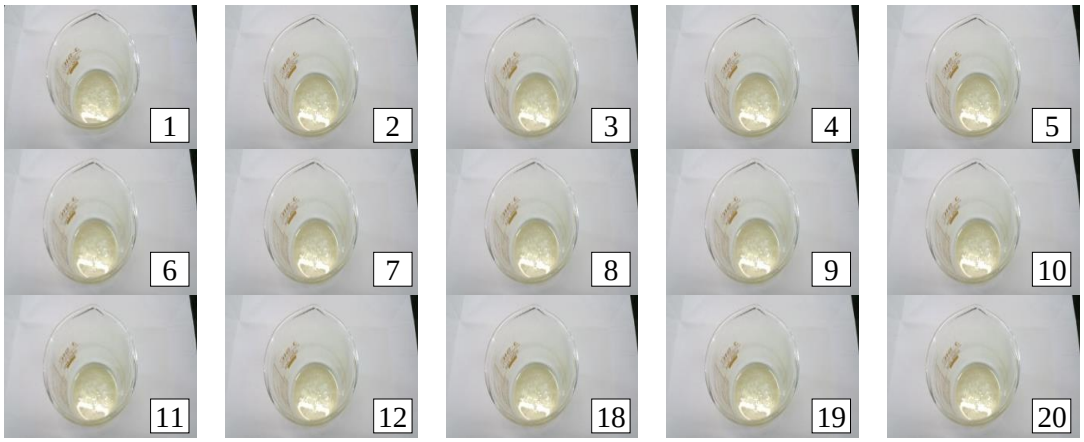

Fig. 7: *(a) Saccharine Test is showing adulteration by using various Milk Samples.*

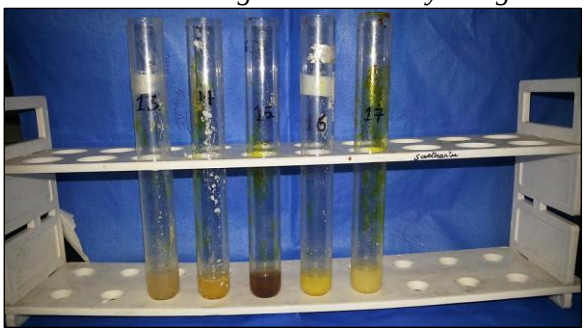

Fig. 7: *(b) Saccharine Test showing adulteration in various Milk Samples*

Fig. 8: *Test Tube showing the Control Sample.*

CONCLUSION

The present work was aimed to explore the qualitative analysis, i.e., detection of amount of adulterants in Milk samples. A total of 20 samples comprising of milk of buffalo, cow, and goat were collected from Ghaziabad, Greater Noida, Delhi, i.e. different areas in Delhi/NCR.

Out of 20 samples, only two samples were found to be adulterated with sulphate and starch. Other adulterants were found absent. For analysis seven test comprising of sulphate test, Anionic detergent test, Nitrate test, Starch test, Ammonium comp. Test, Saccharine test, Sucrose test were performed to check the presence of different adulterants.

The two samples were confirmed to be adulterated by the appearance confirmatory results of the analysis, i.e. appearance blue color confirmed the presence of starch in sample no. 6 and sample no. 18, appearance visible precipitate confirmed the presence of sulphate in sample no. 6 and sample no. 18.

Only 10 % samples were found to be adulterated by starch and sulphate, however other adulterants were found to be Absent.

Sample no. 6 is collected from Verka dairy in Delhi and Sample no. 18 is collected from Vishnu dairy in Ghaziabad. It is evident from the result that the milk served in Delhi/NCR is approximately hygienic on the parameters analysis for the detection of adulterants as only two samples out of twenty were found to be adulterated.

This analysis also shows that packed milk served in Delhi/NCR is hygienic as no adulteration is observed in milk samples of packed milk.

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Cite this Article
Neeti Nayak. Detection of Different Adulterant in Different Milk Samples. *Research and Reviews: Journal of Dairy Science and Technology*. 2017; 6(3): 17–29p.