

Testing of Adulterants in Milk and Milk Products by Using Household Chemicals

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Abstract:

Milk is essential sustenance for human life. Health of human being depends on quality of milk that they consume every day. The quality of milk can be lowered by addition of some substances. Milk is declared to be adulterated when some unwanted cheaper substance is added or removal of valuable constituents partly or wholly. Sometimes the various chemicals are added in milk and milk products to improve its appearance and taste. In many countries, the main cause of adulteration is financial gain to increase the quantity of milk and milk products and to make it more attractive. Milk prepared, processed, packaged or stored in unhygienic condition is also one of the major cause of adulteration. Milk adulteration is punishable act and many rules have been imposed by government agency, but still adulteration is reported on daily basis. Awareness and knowledge of detecting common adulterant by some simple methods can prove to be a one of the most weapon to fight against adulteration. Day by day milk can be adulterated, to know the little knowledge about identification of some adulterants, which is discussed here.

Keywords- Adulterants, Household, Organoleptic, Preservatives, MST, LDL

I.INTRODUCTION

The health of mankind depends on the quality of food they consume. Milk is adulterated if its quality is lowered or affected by the addition of substances which are injurious to health or by the removal substances which are nutritious. According to Food Safety and Standard Authority of India (FSSAI), the technical definition of adulteration is addition or removal of substances to or from food substance so that natural composition and quality of food substance get affected. Purpose of adulteration is not only to increase the weight but also to improve taste, lifetime, appearance and productivity of milk and milk products. All these above mentioned practices are responsible for milk adulteration. The addition or removal of some substances, physical contamination of some metals and chemicals are added during the processing of milk and milk products beyond permissible level, affects the quality and can prove to be toxic. The microbial contamination of milk is also one of the biggest cause of health problems. Sometimes metals may also enter into milk by contamination and also proves to fatal if cross certain limits. So the milk that gets contaminated or adulterated becomes unfit for consumption. The adulteration of milk can occurs at various stages.

Producer- 1) Poor agriculture practices.

2) Addition of some cheaper material like cereal flours, detergents, edible oils and irrigation water without knowing its purpose.

3) Improper processing, cleaning, handling, packaging and storage.

Distributor- 1) Improper storage and poor transportation conditions.

2) Addition of some cheaper substances like sugar, gelatin powder, sodium chloride, salts etc.

Retailer- 1) Poor hygiene, sanitization and storage.

2) Addition of some cheaper material for better appearance, preservation and quality.

Efforts by government to control Adulteration --

To control adulteration the FSSAI has also been established under Food Safety and Standards Act, 2006 which consolidates various acts and orders that have hitherto handled food related issues in various Ministers and Departments. FSSAI has been created for laying down science based standards for food articles and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome milk for consumption. Along with the regulations in farming, production, packaging, transportation, etc. they are doing following programmes.

- Creating an information network across the country so that the public, consumers, Panchayats, etc. receive rapid, reliable and objective information about food safety and their concern issues.
- Provide training programmes for persons who are involved to get involved in food business.
- Contribute to the development of international technical standards for food and sanitary standards.
- Promote general awareness among the people about food safety and food standards.

Despite of so many efforts of government agencies consumer are still facing adulterations. Increased demand during festival season leads to increase adulteration. Paneer, khoya, milk, ghee etc. are most targeted items. Milk and milk products are generally adulterated with starch which is used to give a thick, rich texture to those products. Urea, washing soda, alkali etc. are the ingredients which are used to prepare synthetic milk? Boiled potato kiss also added to ghee to increase appearance and quantity. These adulterants can lead to nausea, vomiting, diarrhea, skin ailments and cause paralysis and cancer in some extreme cases. The adulterated ghee if consumed for longer period, may cause allergy, tingling, of the sensory nerves and allergic arthritis.

Many survey reports are available which says it is not necessary that if you purchase milk and milk products from branded shop, will be safe and free from adulteration; it might be more adulterated to improve its appearance and taste. Consumer wants to be sure that what they are eating is safe. So it is very much necessary that we must try to taste or to get them tasted for adulteration time to time. Hence some efforts have been done to develop few tests to check the adulteration in milk at home. These tests are less expensive and rapid, used for detection of adulterant using household chemicals. Without knowledge of science some tests can be easily performed at home.

II. MATERIALS AND METHODS

Now a days there are two types of milk are available in market i.e. A₁ milk and A₂ milk. A₁ milk includes milk obtained from cross breeding mammals like Jersey, Holstein, Guernsey etc. and synthetic milk. Similarly A₂ milk includes milk obtained from pure deshi cows or buffalos called organic milk. Organic milk is the milk which is obtained from cows or buffalos, who fed organic feed which is not grown by using any synthetic fertilizers. It contains large amount of milk constituents in pure form. Therefore it is called "Amrut" and is good for human health. But now this milk is unfit for consumption due to adulteration by various substances and becomes "poison". Adulterate milk is dangerous and causes many fatal diseases to human beings. So to avoid such diseases, we have to detect the adulterants in milk at home by using household chemicals.

2.1 Household Chemicals --

The tests have been reported in this paper which can be performed at home by using the chemicals that are available at home. Generally the chemicals that are available at home are

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| a) Toilet cleaner- Dil. / Conc. HCL | b) Turmeric- Indicator | c) Tincture iodine- Iodine |
| d) Iodized Salt- NaCl | e) Soybean powder | f) Arhar dal powder |
| g) Diabetic test strip (available in all medicals). | | |

2.2 Milk Adulterant Tests-

The milk can be tested for various adulterants at home with little efforts by using household chemicals.

2.2.1 Organoleptic Test –

- a) Color - The judging of color was done by eye which one of the important organoleptic test. Color of milk is a blend of individual effects produced by Carotene (to some extent of xanthophyll), which imparts a yellowish color.
- b) Flavor - Flavor may be detected by sniffing the products before placing in the mouth and also while in the mouth.
- c) Taste - The sample was placed in the mouth, rolled around in the mouth to come in contact with the taste buds located on the various portion of the tongue.
- d) Texture - The judging of texture of milk sample was also done by eye.

2.2.2 Detection of added water –

Addition of water, dilutes the buffalo milk and as a result both the fat and solid-not-fat content are reduced in it. It can also be added to milk to increase the quantity. It can be detected by Milk slip test (MST).

Presence of added water in milk samples was determined by putting a drop of milk on a polished slanting (sloping direction) surface. The drop of pure milk flows slowly leaving a white trail behind it, whereas milk adulterated with water will flow immediately without leaving any mark.

2.2.3 Detection of Urea –

It can be added to increase the density of normal milk and to make profit/ money. It can be performed by following test.

Take a small amount of milk. Add ½ teaspoon of soybean or arhar dal powder. Mix up the contents thoroughly. After five minutes, add ¼ teaspoon of turmeric powder in it. A change in color from yellow to red indicates the presence of urea/ washing powder in the milk.

2.2.4 Detection of Starch/ Cereal flours –

These substances are added to milk to increase the density of milk, as thickening agents. It can be performed by following test.

Take a small quantity of milk, add small amount of water mix thoroughly and boil. Then cool at room temperature and add 1-2 drops of tincture iodine or add 1 gram iodized salt and shake well. If the color of milk turns blue then it indicates the presence of starch / cereal flours in milk.

2.2.5 Detection of Synthetic milk –

It is a mixture of water, urea, soap/ detergent, stabilizer, sodium hydroxide, vegetable oil and salts. It can be detected by using reduction test. Synthetic milk tastes bitter, has a soapy texture when you rub it between your fingers and it turns yellowish on heating

Boil some milk on a slow heat while moving it with a spoon till it becomes solid (khoya). Take it off the heat and wait for 2-3 hours. If the produced solid is oily, the milk is of good quality; if it's not, it means the milk is synthetic.

2.2.6 Detergent or soap / sodium hydroxide –

It is added in milk generally in rural areas to prolong its keeping quality.

Take 5 to 10 ml of milk sample with an equal amount of water. Shake the contents thoroughly. If the milk is adulterated with detergent, it forms dense lather. Pure milk will form very thin foam layer due to agitation.

2.2.7 Formalin in milk-

Formalin is used for preservation purpose usually added in milk bag. Since it's transparent in color and can preserve milk for long time, packaged, manufacturers use it for adulteration purposes. The following test is used for existence of formalin in milk.

Take 10 ml of milk in test tube and put 2-3 drops of Hydrogen peroxide (30% H_2SO_4) carefully into it. If a blue shade of milk appears, indicates the presence of formalin in milk.

2.2.8 Glucose/ Invert sugar –

It is obtained from granulated sugar and water. This kind of sugar syrup is added to milk to increase the consistency and enhance the sweetening taste of milk.

Take a diabetic test strip and dip it in the milk for 30 seconds to 1 minute. If the test strip changes color, then it shows that the sample of milk contains glucose. If there is no change in the color of the strip it proves there is no glucose in the milk.

2.3 Milk Products Adulterant Tests -

The milk products can be tested for various added adulterants at home by using household chemicals.

2.3.1 Detection of Starch -

Sometimes it can be added to milk products like Khoya, Paneer and other milk products. It can be added to give thick and rich texture to milk products. It can be detected by performing the following test.

Take a small sample of milk product, add 20 ml of water and bring it to boil. Cool it to room temperature and add 1-2 drops of tincture iodine solution. If the solution turns blue then it indicates the presence of starch in milk products.

2.3.2 Mashed potato/sweet potato-

It can be added to ghee to increase the thickness, texture and quantity of milk products. It also gives yellow color to ghee. It can be tested by performing following test.

Boil 5 ml of ghee sample, cool it and add a drop of tincture iodine solution. If color of ghee sample turns blue then it indicates the presence of mashed potato in ghee.

2.3.3 Vanaspati oil /Margarine-

Modern margarine are made from vegetable oils, which contain polyunsaturated fats that can lower the “bad” LDL cholesterol when used instead of saturated fat. Sometimes it may be added to ghee to increase quantity and to make profit. It can be detected by performing following test.

Melt a small quantity of ghee sample and then add equal quantity of toilet cleaner, shake it well for one minute. Now let it stand for five minutes. Crimson red color is formed, indicates the presence of vanaspati oil / margarine in ghee.

III. RESULT AND DISCUSSION

Milk is considered to be the ideal food and used for manufacture of dairy products because it contains all the food constituents required in the human diet. Milk supplies bodybuilding proteins, bone forming minerals, health giving vitamins, energy giving lactose and milk fat. More importantly these constituents are present in proper proportions and in an easily digestible and absorbable form. All these essential properties make milk an important food for pregnant mother, growing children's young peoples, adults, disables, patients and also for person recovering from illness.. Unfortunately milk is being very easily adulterated throughout the world. Possible reasons behind it may include demand and supply gap. The adulteration in milk and its product cannot be seen by necked eye, but it can be tested easily in home by doing following simple tests as given above.

Adulterants and preservatives in milk shows harmful effects on human health are as follows. i) Starch can cause diarrhea. Too much accumulation of starch can be problematic for diabetics. ii) Urea can take a toll on a person's kidney. iii) Detergents can cause harmful effects on intestine and kidney. iv) Melamine introduced from contaminated metals can cause kidney related problems. v) Hormones, Sometimes injection of hormones (e.g. oxytocin) are given to cows and buffalos to produce more milk. Hormones in milk can cause problems related to eyes, kidney and heart. vi) Formalin is a disinfectant used to preserve biological samples used to increase milks shelf-life, can cause skin problems and Cancer. vii) Hydrogen peroxide used as a preservatives can cause problems related to digestive system.

IV. CONCLUSION

The adulteration in milk and milk products is worse in developing and underdeveloped countries due to the absence of adequate monitoring and lack of proper law enforcement. According to WHO there are nearly about 87% cancer patients are found in India up to the year 2025, due to cause of milk adulteration. Therefore, consumers have to be alert and check the adulterants in milk and milk products by their own time to time at home by using the simple and easy tests discussed above to keep themselves healthy.

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