

Adulteration of Milk

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INTRODUCTION

- Milk is the part of diet of every individual, its benefits are being innumerable.
- It is a complete health drink. However increase rate of adulteration of milk has been a matter of concern, posing health hazards thus masking its advantages despite the check on its purity, adulteration continues to be on rise.

.Adulteration of milk:

- The process of intentionally degrading milk quality either by adding some inferior substance or by removing some valuable ingredients.
- Adulteration decreases the specific gravity of the milk.

The raw milk should have less than one lakh SPC(standard plate count) and not more than 0.5 ppb aflatoxin and nil pesticides.

CHIEF ADULTERATIONS OF MILK

- Addition of water.
- Skimming of milk.
- Both skimming and watering.
- Addition of thickening agents (sugar, gelatin, starch)
- Addition of coloring matter (annatto, caramel)
- Addition of preservatives (H_2O_2 , boric acid, Na_2CO_3)
- Addition of urea.
- Accidental adulterations.

DETECTION OF ADDED WATER

- Addition of water raises freezing point, lower the index of refraction and the viscosity of milk.
- Apparatus req; specific gravity and SNF testing apparatus (lactometer, cylinder, petridish thermometer)
- Fat testing apparatus (Gerbers butyrometer, rubber stopper, key, pipettes for measuring milk and acid).

Method:

- Test the sample of fat% as per the procedure given by estimation of fat by **Gerber`s butyrometer**.
- Test the sample for SNF as per the procedure given for estimation of SNF.

Calculations

$$\text{A) \% of water added in milk} = \frac{(8.5 - \%SNF)}{8.5} \times 100$$

$$\text{B) percentage of water added on basis of fat lactometer reading} = 100 \times \frac{\text{lactometer reading} + \text{fat}\%}{36} \times 100$$

Skimming of Milk : It is detected by high specific gravity, low fat percentage and high percentage of SNF. The milk is less viscous.

Both Skimming and watering: It is detected when the percentage of fat is low, specific gravity either normal or not and the SNF is nearly normal.

Detection of Thickening Agent:

When the milk is watered or skimmed, it is **deficient in viscosity** of consistency. The viscosity may be restored by the addition of substances like starch, cane sugar, foreign fat or gelatin.

Detection of Starch in Milk

Reagents : 1% iodine solution

Procedure:

Take 5 ml of milk in test tube



Add few drops of the iodine solution



Appearance of blue colour indicates starch in milk

Detection of Cane Sugar in Milk

- Reagents: Resorcin, HCl

Procedure:

Take 10ml milk in the test tube.



Add 1g of resorcin and few drops of HCl in milk.



Boil the milk for few minutes.



A rose red color develops in presence of cane sugar

Detection of Gelatin in Milk

reagents :- Acid mercuric nitrate (prepared by dissolving a given weight in twice its weight of nitric acid and then diluting the solution with equal volume of water).

- Saturated aqueous solution of picric acid.
- Procedure:

Take 10ml of milk in a test tube.



Add equal volume of acid mercuric nitrate solution and shake it properly



If gelatin is present in large quantities the filtrate will be opalescent and not clear.



If saturated solution of picric acid is added, yellow precipitate or cloudiness indicates the

presence of gelatin



If no gelatin is present the solution will be clear.

Detection of Coloring Matter in Milk

- Sometimes artificial coloring matters are added to milk that is previously watered or skimmed .
- Artificially coloring may also be done in milk that appears abnormal and poorer in color to make it more attractive.
- Colors generally used are annatto, caramel, and coal tar dyes.

Test for Detection of Annatto

- Reagents: Ether
- **Procedure:**

Take 10ml of milk in test tube



Add equal amount of ether and shake the test tube vigorously, then allow it to stand for sometime.



The ether separates out on the top.



In presence of annatto the ethers become yellow.

Test for Detection of Coal Tar and Dyes

- Reagent : Concentrated HCl
- Procedure

Take 10ml of milk in test tube



Add equal amount of conc. HCl acid.



Pink color is produced if coal tar dyes are present

Detection of Preservatives in Milk

- **Preservative** is a product when added to milk or milk product will retard sourness or decomposition.
- A number of chemical substances i.e. boric acid, formaldehyde, salicylic acid, hydrogen peroxide, sodium carbonate and bicarbonate are used by some dairymen to preserve milk for prolonged period of sweetness of milk & to inhibit and destroy bacteria to neutralize acid formed by bacteria and delay curdling.
- It is very much objectionable because:-
 1. May be poisonous.
 2. It tends to promote carelessness and unhygienic conditions.
 3. It makes possible the sale of milk which is unfit for human consumption
 4. It interferes with the normal process of digestion.

Test for Boric Acid in Milk

- **Reagents** : phenolphthalien, dilute caustic soda, 50% of neutral aqueous solution of glycerine
- **Procedure:**

Take 10ml of milk in test tube.

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Add few drops of phenolphthalien and some dilute caustic soda.

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Add equal quantity of 50% neutral aqueous solution of glycerin.

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In presence of boric acid or borax the pink color of solution changes to white but in absence no change in color

Test for Detection of Formaldehyde Present in Milk

- If formaldehyde is present in excessive quantity repeatedly then it makes casein less digestible and irritates the digestive tract.
- It inhibits the action of digestive ferments and enzymes. In children are feeding of formalized milk for weeks may result in an injury of the kidney epithelium.
- Reagents: Commercial sulphuric acid, ferric chloride and water
- Procedure:

Take 5ml of milk in test tube



Add equal amount of water in the test tube.



Add 1 to 2 drops of ferric chloride.



Add a little of commercial sulphuric acid slowly in such a manner that the acid collects in a separate layer at the bottom of tube.



If milk contains formaldehyde a bluish or violet ring is formed at the junction of acid and milk.

Test for detection of hydrogen peroxide in milk

- Objectives : Quality control of milk
- Reagents: 2% aqueous solution of paraphenylenediamine hydrochloride.

Procedure:

Take 10 ml of milk sample in a test tube.



Add a few drops of 2% aqueous solution of paraphenylenediamine hydrochloride.



Shake the contents in test tube vigorously for few minutes and then make to stand.



Development of a deep blue or red colour show the presence of dihydrogen peroxide.

TEST FOR DETECTION OF CARBONATES AND BICARBONATES

- Sodium carbonates and bicarbonates delay the curdling of milk by neutralizing the acid formed by bacteria.

Reagents: 95% alcohol, 1% solution of rosolic acid.

Procedure:

Takes about 10ml of milk in a test tube.

Mix an equal volume of 95% alcohol to the milk in the test tube.

Add few drops of 1% solution of rosolic acid.

Mix the contents carefully.

A rose red colour is produced in presence of alkali otherwise a brownish yellow color will appear.

Detection of Synthetic Milk

- Now a day's urea and detergent based synthetic milk is frequently added into milk to increase its volume by unscrupulous dairymen.
- **Urea** can be **detected by adding sodium hydroxide** followed by sodium hypochloride and phenol solutions to protein free filtrate of milk that gives bluish green colour for urea that persists for 12 hours.
- **Objective:** To detection of synthetic milk because of detergent present in it gives a soapy sensation to fingers.
- Synthetic milk has no suspended protein so it cannot be curdled by lemon juice or citric acid.

Test for detection of pulverized soap

- Take 10 ml of milk in a test tube, dilute it with equal quantity of hot water
- Then add 1 - 2 drops of phenolphthalein indicator.
- Development of pink colour indicates that the milk is adulterated with soap.

Detection of detergents in milk

Take 5 ml of milk in a test tube



Add 0.1 ml of 0.5% bromocresol purple solution



Appearance of violet colour indicates the presence of detergent in milk.



Unadulterated milk samples show a faint violet colour.

Detection of Urea Reagents

Sodium Hypo chloride solution 2% , sodium hydroxide 2% , phenol solution ,TCA (Trichloroacetic acid solution) 24% , Buffer (In sodium acetate, in acetic acid buffer).

Equipment's : Glass funnel, filter paper Whatman No. 42 and test tube, conical flask.

Procedure:

Take 5 ml of milk in a 50 ml conical flask.

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Add TCA (24%) solution.

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Filter the contents through Whatman filter paper No. 42

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Collect 1 ml of filtrate in a test tube.

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Add 1 ml of NaOH solution (2%) and 0.5 ml of sodium hypochloride solution in the filtrate.

↓
Mix the contents thoroughly

↓
Add 0.5 ml of phenol solution (5%)

↓
Presence of bluish green colour, which persists for few hours, indicates the presence of urea in the milk sample.

THANK YOU