

IDENTIFYING COMMON FOOD ADULTERANTS

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Food adulteration is a growing menace that unscrupulous traders and manufacture all over the world indulge in to exploit gullible consumers to make quick and easy money. In all free market societies where legal control is poor or non-existent with respect to monitoring of food quality by authorities, usage of adulterants is common and rampant.

Every nation on earth has suffered cases of adulteration at one time or other. Government authorities with great efforts have succeeded in reducing the recurrent occurrences; but have not been able to eliminate it.

Only an aware and an informed consumer will be able to eliminate it conclusively by continuous routine monitoring. The dictionary defines food adulteration as an act of intentionally debasing the quality of food offered for sale by either the admixture or substitution of inferior substances or by the removal of some valuable ingredient.

WHAT IS ADULTERATED FOOD?

- a. If the product sold by a vendor is not of the nature, substance or quality demanded by the purchaser or which it purports to be.
- b. If the product offered contains any substance or if it is so processed as to injuriously affect its nature, substance, or quality.
- c. If any inferior or cheaper substance has been substituted wholly or partly in the product, or any natural constituent has been wholly or partly abstracted from it, to affect its quality.
- d. If the product had been prepared, packed, or kept under unsanitary conditions, has become contaminated, injurious to health or is unfit for human consumption.
- e. If the container of the product is composed of any poisonous or deleterious substance which renders its contents injurious to health.
- f. If the product contains any prohibited coloring matter, preservatives, or contains any permitted coloring matter or preservative more than the prescribed limits.
- g. If the quality or purity of the product falls below the prescribed standard, or its constituents are present in proportions other than those prescribed, whether rendering it injurious to health.

To put it in perspective we can say that adulteration is “The act of intentionally debasing the quality of food offered for sale either by the admixture or substitution by inferior substances or by the removal of some valuable ingredient”.

HOW TO TEST FOR FOOD ADULTERANT

The following lists the common items adulterated and simple test methods to identify the adulterants and ascertain the purity of the food product consumed.

We will keep updating this list as and when we come across an easy and effective method to test adulteration.

FOOD ITEM	ADULTERANT	SIMPLE METHOD TO DETECT ADULTERANTS
Sugar Powder	Chalk	<ul style="list-style-type: none"> • Dissolve sugar in a glass of water, chalk, white sand, stone powder will settle down. • Smell of ammonia indicates Urea contamination.
Bura Sugar	Washing Soda	<ul style="list-style-type: none"> • Put some lemon juice, you will observe bubbles are if washing soda is present. • Add 1 ml of Hydrochloric acid (HCl) to a little of Sugar. If you observe effervescence, then washing soda is present. • Dissolve 2 gram of Sugar in water. Dip a red litmus paper in the solution. If washing soda is present, it will turn to blue color.
Gur (Jaggery)	Metanil Yellow color Washing Soda	<ul style="list-style-type: none"> • Add a few drops of HCl to a sample of Gur Appearance of Magenta Red color indicate the presence of Metanil yellow. • While doing the above test for Metanil yellow if you observe effervescence (bubbles), it indicates the presence of washing soda.
Honey	Water Sugar / Jaggery	<ul style="list-style-type: none"> • A cotton wick dipped in pure honey burns when ignited with a matchstick. Presence of water will not allow the honey to burn, and if it does, it will produce a cracking sound. • Take a dry matchstick and dip it in honey. Now try to light the matchstick by striking against the match box. If the matchstick lights up then the honey is pure. If it does not then honey contains sugar water. • Take 5 ml of honey in a porcelain dish. Add aniline chloride solution (3 ml of aniline dissolved in 7 ml of 1:3 HCL) and stir well. Orange red color indicates presence of sugar. • Take 5 ml of honey in a small beaker. Add 5 ml of solvent ether and mix well. Decant the ether layer in a Petri dish and allow the ether to evaporate. Add 2-3 ml of resorcinol (1-gram resorcinol resublimed in 5 ml of concentrated HCl). A cherry red color indicates presence of sugar or jaggery adulteration. • Take blotting paper or a white fabric and pour a spoon of honey. Pure honey will not leave a stain and fabric and paper will not absorb it. • Mix 10 ml of honey with some water and add 2-3 drops of vinegar. Foaming indicated adulteration. • Pure honey on heating caramelizes quickly. If honey foams on heating before caramelizing it indicates adulteration.
Common Salt Iodized or non-iodized test	Chalk	<ul style="list-style-type: none"> • Dissolve in a glass of water, chalk, white sand, soapstone powder will settle down. • Cut a piece of potato and sprinkle salt on the cut portion. After a couple of minutes add a few drops of lemon juice (citric acid). In case of iodized salt, a blue color will appear on the potato surface.

Paneer, Condensed Milk, Khoya	Starch, mashed potatoes	<ul style="list-style-type: none"> Take a small portion of the product in a test tube add water and boil. Cool to room temperature. Add 1-2 drops Iodine solution. Blue color indicates the presence of starch.
Ice Cream	Washing Powder	<ul style="list-style-type: none"> Put some lemon juice, if we observe bubbles then washing powder is present Add 1 ml of Hydrochloric acid (HCl) to a little of Sugar. If we observe effervescence, then washing powder is present.
Pure Ghee or Butter	<p>Vanaspati</p> <p>Mashed Potato or Sweet Potato</p> <p>Rancid or old Ghee</p> <p>Synthetic coloring matter</p> <p>Coal tar dyes</p>	<ul style="list-style-type: none"> Take one teaspoonful of melted ghee or butter with equal quantity of Conc. Hydrochloric acid in a test tube. Add to it a pinch of cane sugar. Shake well for one minute and let it stand for five minutes. Crimson red color in lower layer shows the presence of Vanaspati. Boil 5 ml sample in a test tube. Cool and add a drop of iodine solution. Blue color indicates the presence of starch. Take 5 ml of molten ghee sample in a stoppered measuring tube. Add 5 ml of HCl. Shake vigorously for 30 seconds. Add 5 ml of 0.1% ether solution of Phloroglucinol. Re-stopper the tube and shake for another 30 seconds. Allow it to stand for 10 minutes. A pink or red color in the lower acid layer indicates rancidity and presence of old ghee. Dissolve 2 grams of Ghee in ether. Divide the portion into two test tubes. Add 1 ml of HCl in one test tube add 1 ml of 10% NaOH solution in the other portion. Shake well and allow standing. Presence of pink color in the acidic solution and /or yellow color in the alkaline solution indicates added coloring materials. Add 5 ml of dilute Hydrochloric Acid or concentrated Sulphuric Acid to 5 ml of molten ghee sample in a test tube. Shake well. Pink color in the case of Sulphuric Acid addition and crimson red color in case of dilute Hydrochloric Acid indicates the presence of coal tar dyes. If addition of HCl does not give crimson red color, add some water. Development of color indicates presence of coal tar color dyes.
Green Vegetables like Peas, Spinach, Capsicum, Chilies, etc.,	Malachite green	<ul style="list-style-type: none"> Take a small part of the sample and place it over a moistened white blotting paper. Color impressions on paper indicates the presence of Malachite green
Sweet Potato	Color	<ul style="list-style-type: none"> Take cotton ball soaked in water and rub the ragi grains with it. The cotton ball will become pink if it contains water soluble color. Do the same test with cotton ball dipped in vegetable oil. Color change will indicate adulteration with oil soluble colorants.

Coffee	Chicory Roasted powdered dates, Tamarind seed powder etc.	<ul style="list-style-type: none"> Gently sprinkle the coffee powder on surface of water in a glass. The coffee floats over the water but chicory begins to sink down within few seconds. Moreover, the falling chicory powder particles leave behind them a trail of color, due to large amount of caramel they contain. Place a small sample on a white filter paper. Spray a 1% sodium carbonate solution. A red color stain on the filter paper will indicate the presence of roasted dates, or tamarind seed powder, etc.
Tea	Tea Colored leaves	<ul style="list-style-type: none"> Rub leaves on white paper, artificial color comes out on paper.
	Used tea	<ul style="list-style-type: none"> Tea leaves sprinkled on wet filter paper. Pink or red spots on paper show color. Spread slaked lime on a white glass plate and then sprinkle some tea leaves on the plate. Shades of red, orange, pink, colors on the slaked lime layer indicates adulteration with coal tar dyes.
	Iron fillings	<ul style="list-style-type: none"> Move a magnet through the sample. Iron will stick to the magnet.
Bajra	Ergot infested	<ul style="list-style-type: none"> Infested Bajra will swell black and float in water.
Ragi	Color	<ul style="list-style-type: none"> Take cotton ball soaked in water and rub the ragi grains with it. The cotton ball will become pink if it contains water soluble color. Do the same test with cotton ball dipped in vegetable oil. Color change will indicate adulteration with oil soluble colorants.
Wheat Flour	Sand / Dirt	<ul style="list-style-type: none"> Shake a small sample with 10 ml CCl₄ and allow standing. Sand will collect at the bottom.
	Barn	<ul style="list-style-type: none"> It will float on water surface.
	Chalk powder	<ul style="list-style-type: none"> Shake the sample with dilute HCl. Effervesce indicates presence of chalk powder.
Sago (Sabudana)	Sand Talcum Powder	<ul style="list-style-type: none"> Burn Sago. If pure, it will swell and burn without leaving any ash. Adulterated Sago will leave behind considerable amount of ash.
Silver Foil	Aluminum Foil	<ul style="list-style-type: none"> On ignition Silver foil burns away completely leaving glistening white spherical ball of the same mass while Aluminum foil will produce a blackish-grey color ash. Take silver leaves in a small beaker and add dilute HCl solution. Appearance of a white turbidity or precipitate indicates silver. If aluminum is present, you will get blackish-grey turbidity, precipitate or fumes.

Saffron	Colored dried tendrils of maize cob	<ul style="list-style-type: none"> • Pure saffron will not break easily like artificial. • Color dissolves in water and artificial tendrils of saffron will separate. • Pure saffron when allowed to dissolve in water will continue to give its color so long as it lasts.
Common Spices & Spices Powder	Color Powdered Barn, Saw dust	<ul style="list-style-type: none"> • Extract the Spice sample with Petroleum Ether. Add 13N Sulphuric Acid Solution (88 ml of Concentrated Sulphuric acid diluted with 250 ml of distilled water). Appearance of red color that persists even upon adding distilled water indicates the presence of artificial color. If the red color completely disappears on adding distilled water, the sample is free of color adulteration. • Sprinkle some powder on the surface of water in a glass beaker. Barn & sawdust will float.
Red Chilli Powder	Brick Powder	<ul style="list-style-type: none"> • Brick powder settles fast chilli powder settles slowly when put in water.
	Red Color dye	<ul style="list-style-type: none"> • Sprinkle some Chilli powder on the surface of water in a glass beaker. Artificial colorants will descend as colored streaks.
	Sudan red III color	<ul style="list-style-type: none"> • Take 1 g of suspected chilli powder in a test-tube, add 2 ml of hexane to it, and shake well. Allow it to settle. Decant the clear solution into another test tube. Add 2 ml of acetonitrile reagent in water (7:3) and shake well. The appearance of a red color in the lower aceto-nitrile layer indicates the presence of Sudan red III.
Turmeric Powder	Metanil Yellow	<ul style="list-style-type: none"> • Add a few drops of HCl to turmeric in water. Instantly the solution will turn to violet color. When the color persists when diluted with water indicates the presence of Metanil yellow.
	Other aniline dyes	<ul style="list-style-type: none"> • Take some turmeric powder in a test-tube and add water to make a solution. Add 1-2 ml of rectified spirit. Immediate separation of yellow color in the rectified spirit will indicate presence of dyes.
Asafetida Hing	Soap Stone or earthy matter	<ul style="list-style-type: none"> • Shake a little portion of sample with water and allow settling. Soap stone or earthy matter will settle down at the bottom.
	Other resin	<ul style="list-style-type: none"> • Powder a gram of asafetida and take it in a test-tube. Add one teaspoon of water. Mix thoroughly by shaking. Milky white solution with no sediments represents pure asafetida.
	Colophon residue obtained after the distillation of turpentine oil.	<ul style="list-style-type: none"> • Further, a small amount of powdered asafetida, taken in a spoon and burnt on a gas flame, burns with a bright flame like camphor, which is an indication of pure asafetida.

		<ul style="list-style-type: none"> Take 1 g of asafetida, powder it thoroughly, and take it in a test-tube. Add some rectified spirit and filter/ decant the solution. Take 5 ml of filtrate and add few drops of ferric chloride (6%) solution. Olive green color shows the presence of adulteration with other resins.
Cinnamon Bark	Cassia Bark	<ul style="list-style-type: none"> Cinnamon bark is very thin and we can roll it around a pencil or pen. It also has a distinct smell. Cassia bark is very thick and stiff and we cannot roll it. Cassia bark comprises of several layers in between the rough outer and inner most, smooth layers. On examination of the bark closely, can also make a clear distinction.
Cloves	Exhausted or De-oiled Cloves	<ul style="list-style-type: none"> Using the magnifying glass, observe the individually spread cloves closely. We can identify exhausted cloves by its small size and shrunken appearance. The characteristic pungent taste of genuine cloves is less pronounced in exhausted de-oiled cloves.
Cumin / Jeera	Grass seeds colored with charcoal	<ul style="list-style-type: none"> Rub the cumin seeds on your palm. If palm turns black, it indicates adulteration with charcoal.
Black Pepper	Papaya Seeds, Immature pepper	<ul style="list-style-type: none"> Float the sample in alcohol. The mature black pepper berries will sink, while papaya seeds and light black pepper float.
Mustard	Argemone Seeds	<ul style="list-style-type: none"> Argemone seeds have rough surface & on pressing is white inside. Mustard is yellow inside
Vegetable Oil	Castor Oil	<ul style="list-style-type: none"> Take 1 ml Oil in a dry test tube. Add 10 ml of acidified petroleum ether. Shake vigorously for 2 minutes. Add 1-2 drops of ammonium molybdate reagent (Dissolve 1 gm ammonium molybdate in 100 ml of Conc. Sulphuric Acid). Turbidity indicates adulteration with castor oil.
	Karanja Oil	<ul style="list-style-type: none"> Take a 1 ml of Oil in a test tube. Add few drops of antimony trichloride solution in chloroform, mix well. Appearance of a canary yellow or orange color indicates presence of Karanja oil
	Mineral Oil	<ul style="list-style-type: none"> Take 2 ml sample in a test-tube and add 2 ml of alcoholic potash to it. Warm the sample on a low flame burner for about 10 min and add water to it. Appearance of turbidity shows presence of Mineral Oil.
	Argemone Oil (In Mustard Oil)	<ul style="list-style-type: none"> Take oil in a transparent glass test tube. Add a few drops of nitric acid. Shake vigorously and heat for 2-3 minutes. Appearance of red color indicated adulteration

	Colors	<ul style="list-style-type: none"> Take 5 ml of oil in a test tube. Add equal quantity of concentrated hydrochloric acid. Shake gently and allow it to stand for 5 minutes. Color if present will separate out in the acidic upper layer in the test tube.
Pulses viz., Yellow Dals, Besan powder, etc.	Metanil Yellow or Lead Chromate or Kesari Dal (Lathyrus Sativus)	<ul style="list-style-type: none"> Extract the color with luke warm water from the sample of pulses. Add drops of HCl. A pink color indicates presence of Metanil yellow / Lead Chromate and other dyes. Add 50 ml of dilute HCl and cook the dal for about 15 minutes. If pink color develops it indicates the presence of Kesari Dal.
Vinegar	Mineral Acid	<ul style="list-style-type: none"> Dip a Metanil yellow indicator paper in vinegar. If the paper turns pink it indicates adulteration of vinegar with mineral acid.
Supari Powder	Saw dust Artificial Colors	<ul style="list-style-type: none"> Sprinkle some powder on the surface of water in a glass beaker. Sawdust will float. Artificial colorants will show up as colored streaks.
Apple	Wax	<ul style="list-style-type: none"> Scratch the surface with a knife. Wax will peel off.

Among all foods, milk adulteration is the most common one, being very easy and lucrative. Simple addition of water to milk adulterates it. Addition of water to pure milk, changes its physical and nutritional constituents. Using inferior quality impure water in adulteration of milk, increases the chances of infection and disease due to microbial contamination on its consumption.

Impure water reduces the keeping quality of milk and so adulterators add artificial harmful preservatives to improve the shelf life of the adulterated product. Pure milk spoils on keeping at room temperature within a day and an adulterated one stays fresh for a much longer time.

Consumers can easily recognize simple water addition the milk becomes thin and watery. To prevent easy identification adulterators, add various chemical agents to thicken the product so that adulterated milk resembles the consistency of pure milk.

To know more about milk adulteration and means to identify, please refer “Test Yourself – Detect Adulteration in Milk” by Dr. Sitaram Dixit, Chairman – Consumer Guidance Society of India (CGSI).