

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 nonexistent 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 colouring matter, preservatives, or contains any permitted colouring matter or preservative in excess of 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 or not 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.

FOOD ITEM	ADULTERANT	SIMPLE METHOD FOR DETECTING THE ADULTERANT
Sugar Powder	Chalk	Dissolve sugar in a glass of water, chalk, white Sand, Stone powder will settle down.
Common Salt	White Sand, Stone powder, Chalk	
Bura Sugar	Washing Soda	<ol style="list-style-type: none"> 1. Put some lemon juice, bubbles are observed if washing soda is present 2. Add 1 ml of Hydrochloric acid (HCl) to a little of Sugar. If you observe effervescence, then washing soda is present. 3. 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 colour.
Silver Foil	Aluminium Foil	<ol style="list-style-type: none"> 1. On ignition Silver foil burns away completely leaving glistening white spherical ball of the same mass while Aluminium foil will produce a blackish-grey colour ash. 2. Take silver leaves in a small beaker and add dilute HCl solution. Appearance of a white turbidity or precipitate indicates silver. If aluminium is present, you will get blackish-grey turbidity, precipitate or fumes.
Gur (Jaggery)	Metanil Yellow colour	Add a few drops of HCl to a sample of Gur Appearance of Magenta Red colour indicate the presence of Metanil yellow.
Coffee	Chicory Roasted powdered dates, Tamarind seed powder etc.	<ol style="list-style-type: none"> 1. 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 colour, due to large amount of caramel they contain. 2. Place a small sample on a white filter paper. Spray a 1% sodium carbonate solution. A red colour stain on the filter paper will indicate the presence of roasted dates, or tamarind seed powder, etc.

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Honey	Water	1. 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.
	Sugar / Jaggery	2. 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 colour indicates presence of sugar. 3. 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 5ml of concentrated HCl). A cherry red colour indicates presence of sugar or jaggery adulteration.
Common Spices	Colour	1. 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 colour that persists even upon adding distilled water indicates the presence of artificial colour. If the red colour completely disappears on adding distilled water, the sample is free of colour adulteration.
Spices Powder	Powdered Barn, Saw dust	2. Sprinkle some powder on the surface of water in a glass beaker. Barn & sawdust will float.
Red Chilli Powder	Brick Powder	Brick powder settles fast chilli powder settles slowly when put in water.
	Red Colour dye	Sprinkle some Chilli powder on the surface of water in a glass beaker. Artificial colorants will descend as coloured streaks.
	Sudan red III colour	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 aceto-nitrile reagent in water (7:3) and shake well. The appearance of a red colour in the lower aceto-nitrile layer indicates the presence of Sudan red III.
Green Vegetables like chilli, Peas, etc.,	Malachite green	Take a small part of the sample and place it over a moistened white blotting paper. Colour impressions on paper indicates the presence of Malachite green

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Turmeric Powder	Metanil Yellow	Add a few drops of HCl to turmeric in water. Instantly the solution will turn to violet colour. When the colour persists when diluted with water indicates the presence of Metanil yellow.
	Other aniline dyes	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 colour in the rectified spirit will indicate presence of dyes.
Pure Ghee or Butter	Vanaspathi	1. 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 colour in lower layer shows the presence of Vanaspathi.
	Mashed Potato or Sweet Potato	2. Boil 5 ml sample in a test tube. Cool and add a drop of iodine solution. Blue colour indicates the presence of starch.
	Rancid or old Ghee	3. 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 colour in the lower acid layer indicates rancidity and presence of old ghee.
	Synthetic colouring matter	4. Dissolve 2 grams of Ghee in ether. Divide the potion into two test tubes. Add 1 ml of HCl in one test tube add 1 ml of 10% NaOH solution in the other potion. Shake well and allow standing. Presence of pink colour in the acidic solution and /or yellow colour in the alkaline solution indicates added colouring materials.
	Coal tar dyes	5. 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 colour in the case of Sulphuric Acid addition and crimson red colour in case of dilute Hydrochloric Acid indicates the presence of coal tar dyes. If addition of HCl does not give crimson red colour, add some water. Development of colour indicates presence of coal tar colour dyes.

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Bajara	Ergot infested	Infested Bajara will swell black and float in water.
Black Pepper	Papaya Seeds, Immature pepper	Float the sample in alcohol. The mature black pepper berries will sink, while papaya seeds and light black pepper float.
Pulses viz., Dals, like Moong, Channa	Metanil Yellow or Lead Chromate	Extract the colour with luke warm water from the sample of pulses. Add drops of HCl. A pink colour indicates presence of Metanil yellow / Lead Chromate.
Tea	Tea Coloured leaves	Rub leaves on white paper, artificial colour comes out on paper.
	Used tea	Tealeaves sprinkled on wet filter paper. Pink or red spots on paper show colour
	Iron fillings	Move a magnet through the sample. Iron will stick to the magnet.
Supari Powder	Saw dust Artificial Colours	Sprinkle some powder on the surface of water in a glass beaker. Sawdust will float. Artificial colorants will show up as coloured streaks.
Sago (Sabudana)	Sand Talcum Powder	Burn Sago. If pure, it will swell and burn without leaving any ash. Adulterated Sago will leave behind considerable amount of ash.
Vegetable Oil	Castor Oil	Take 1ml 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	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	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.
Paneer, Condensed Milk, Koya	Starch	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 colour indicates the presence of starch.
Besan / Yellow Dal	Kesari Dal (Lathyrus Sativus)	Add 50 ml of dilute HCl and cook the dal for about 15 minutes. If pink colour develops it indicates the presence of Kesari Dal

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Wheat flour	Sand / Dirt	Shake a small sample with 10ml CCl ₄ and allow standing. Sand will collect at the bottom.
	Barn	It will float on water surface
	Chalk powder	Shake the sample with dilute HCl. Effervescence indicates presence of chalk powder.
Cumin Seed / Jeera	Grass seeds coloured with charcoal	Rub the cumin seeds on your palm. If palm turns black, adulteration with charcoal is indicated.
Mustard	Argemone Seeds	Argemone seeds have rough surface & on pressing is white inside. Mustard is yellow inside
Asafoetida Hing	Soap Stone or earthy matter	Shake a little portion of sample with water and allow settling. Soap stone or earthy matter will settle down at the bottom.
	Other resin	Powder a gram of asafoetida and take it in a test-tube. Add one teaspoon of water. Mix thoroughly by shaking. Milky white solution with no sediments represents pure asafoetida.
		Further, a small amount of powdered asafoetida, taken in a spoon and burnt on a gas flame, burns with a bright flame like camphor, which is an indication of pure asafoetida.
	Colophon residue obtained after the distillation of turpentine oil.	Take 1 g of asafoetida, 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 colour shows the presence of adulteration with other resins.
Saffron	Coloured dried tendrils of maize cob	Pure saffron will not break easily like artificial. Pure saffron when allowed to dissolve in water will continue to give its colour so long as it lasts.
Cinnamon Bark	Cassia Bark	<i>Cinnamon</i> bark is very thin and can be rolled around a pencil or pen. It also has a distinct smell. <i>Cassia</i> bark is very thick and stiff and cannot be rolled. <i>Cassia</i> bark comprises of several layers in between the rough outer and inner most, smooth layers. On examination of the bark closely, a clear distinction can be made.
Cloves	Exhausted or De-oiled Cloves	Using the magnifying glass, observe the individually spread cloves closely. Exhausted cloves can be identified by its small size and shrunken appearance. The characteristic pungent taste of genuine cloves is less pronounced in

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		exhausted de-oiled cloves.
Ice Cream	Washing Powder	1. Put some lemon juice, bubbles are observed if washing powder is present 2. Add 1 ml of Hydrochloric acid (HCl) to a little of Sugar. If you observe effervescence, then washing powder is present.

Among all foods, milk adulteration is the most common one, being very easy and lucrative. Simple addition of water to milk adulterates it. When water is added to pure milk, it undergoes a change in its physical and nutritional constituents. When inferior quality impure water is used to adulterate milk, chances of infection and disease due to microbial contamination is very high on its consumption.

Impure water reduces the keeping quality of milk and so artificial harmful preservatives are added to improve the shelf life of the adulterated product. Pure milk is spoiled on keeping at room temperature within a day and an adulterated one stays fresh for a much longer time. Simple addition of water is also easily recognisable by users as the product becomes thin and watery. To prevent easy identification adulterators add various chemical agents to thicken the product so that adulterated milk closely resembles the consistency of pure milk.

To know more about milk adulteration and means to identify, please refer the following published papers in KEEMAT by Sitaram Dixit.

1. Food Adulteration – The menace that need to be curbed.
2. Test yourself – Detect adulteration in milk.
3. Detect adulteration in milk (using CGSI milk kit).

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