

P R E F A C E

FOOD is essential for nourishment sustenance of life. Adulteration of food cheats the consumer and can pose serious risk to health in some cases. Food adulteration is thus a punishable offence under the provisions of Prevention of Food Adulteration Act, 1954 and the Rules made there under. Consumer awareness of quality of food and alertness in detecting common types of food adulteration can thus help in arresting this menace and enable Government to achieve the objective of 'Health for All by 2000 A.D.*

The purpose of this booklet is to give the consumer an opportunity to detect a few common adulterants in food. These tests will simply help the consumers to screen their day-to-day food articles. But for conformatory test and quantification under P.F.A. Act the in a laboratory is must.

A simple kit for testing of such adulterants can be made by using apparatus and common reagents, list of which is at Appendix-II.

SI No.	Name of Food Article	Adulterant	Simple Method for detection of Common Adulterants	Remarks
A	MILK AND MILK PRODUCTS			
I	Milk	Water	<p>i. The lactometer reading shall not ordinarily be less than 26.</p> <p>ii. The presence of water can be by putting a drop of milk on a polished slanting surface. The drop of pure milk either flows slowly leaving a white trail behind it, whereas milk adulterated with water will flow immediately without leaving a mark,</p>	<p>Lactometer is marked in degrees ranging from 0 — 40.</p> <p>The test is not valid if skimmed milk or other thickening material is added.</p>
		Starch	Add a few drops of tincture of Iodine or Iodine solution. Formation of blue colour indicates the presence of starch.	
		Removal of Fat	The lactometer reading will go above 26 while the milk apparently remains thick	
II	Khoa and its products	Starch	Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch	
III	Chhana or Paneer	Starch	Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.	

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IV	Ghee	Vanaspati or Margarine	Take about one tea spoon full of melted sample of Ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.	<p>The test is specific for sesame oil which is compulsorily added to Vanaspati and Margarine. Some coal tar colours also give a positive test.</p> <p>If the test is positive i.e. red colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present</p>
		Mashed Potatoes, Sweet Potatoes and other starches.	The presence of mashed potatoes and sweet potatoes in a sample of Butter can easily be detected by adding a few drops of Iodine, which is brownish in colour turns to blue if mashed potatoes/sweet potatoes/other starches are present.	
V	Butter	Vanaspati or Margarine	Take about one teaspoon full of melted sample of Ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower (acid) of Vanaspati or Margarine.	The test is specific for sesame oil which is compulsorily added to Vanaspati and Margarine. Some coal tar colours also give a positive test.

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VI	OILS AND FATS	Argemone oil	Take small quantity of oil in a test tube. Add equal quantity of concentrated Nitric acid and shake carefully. Red to reddish brown colour in lower (Acid) layer would indicate the presence of Argemone oil	Colourless (not yellowish) Nitric acid may be used. Artificial colour if present will usually be a bright shade of colour, generally red or pink. The test may sometimes give misleading result. The test may not respond if the Argemone oil is present in small quantity.
		Mineral oil	Take 2 ml of the oil sample and add an equal quantity of <i>N12</i> Alcoholic potash. Heat in boiling water bath (dip in boiling water) for about 15 minutes and add 10 ml of water. Any turbidity shows presence of mineral oil.	If mineral oil is present in small quantity this test may not be positive.

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		Castor oil	Take about one ml of the oil, add 10 ml of acedified petroleum ether and mix well, Add a few drops of ammonium molybdate reagent. Immediate appearance of white turbidity indicates the presence of castor oil.	If castor oil is present in small quantity, this test may be positive
B	SWEETENING AGENTS			
I	Sugar	Chalk powder	Dissolve 10 gm of sample in a glass of water, allow to settle, Chalk will settle down at the bottom.	
II	Pithi Sugar		Add few drops of Hydrochloric acid, effervescence (give off bubbles) will indicate the presence of washing soda.	
		Chalk powder	Dissolve 10 gm of sample in a glass of water, allow to settle, chalk will settle down at the bottom.	
III	Honey	Sugar solution	A cotton wick dipped in pure honey when lighted with a match stick burns and shows the purity of honey. If adulterated, the presence of water will not allow the honey to burn, If it does, it will produce a cracking sound.	This test is only for added water.
IV	Sweetmeats, Ice-cream and beverages	Metanil yellow (a non-permitted coal tar colour)	Extract colour with luke-warm from food articles. Add few drops of concentrated Hydrochloric acid. If magenta red colour develops the presence of metanil yellow is indicated.	
		Saccharin	i. Taste a small quantity. Saccharin leaves a lingering sweetness on tongue for a considerable time and leaves a bitter taste at the end.	

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			ii. Take two spoons of liquid sample or about 5 to 10 gins of solid sample with little quantity of water in a test tube, add few drops of Hydrochloric acid and 10 ml of solvent ether. Shake well. Decant the ether layer into a test tube or a beaker, evaporate the ether spontaneously. Add one drop of water (warm) to the residue and taste. Sweet taste will indicate the presence of saccharin	See Appendix-II.
	Aluminium foil		Aluminium foil is whitish grey in colour and is readily soluble in concentrated Hydrochloric acid while pure silver foil is not,	
C	FOODORAINS AND THEIR PRODUCTS			
I	Wheat, Rice, Maize, Jawar, Bajra, Ghana, Barley etc.	Dust, pebble, stone, straw, weed seeds, damaged grain, weevilled grain, insects, rodent hair and excreta.	These may be examined visually to see foreign matter, damaged grains, discoloured grains, insect, rodent contamination etc.	Damaged / discoloured grains should be as low as possible since they may be affected by fungal toxins, argemone seeds, Dhatura seeds etc. In moderately excessive amount can result in risk to health, Discard the damaged undesirable grains before use
		Ergot (a fungus containing poisonous substance)	(i) Purple black longer sized grains in Bajra show the presence of Ergots. (ii) Put some grains in a glass tumbler containing 20 per cent salt solution Ergot floats over the surface while sound grains settle down	
		Dhatura	Dhatura seeds are flat with edges with blackish brown colour which can be separated out by close examination.	

Sl No.	Name of Food Article	Adulterant	Simple Method for detection of Common Adulterants	Remarks
		Karnel Bunt	The affected wheat kernel have a dull appearance, blackish in colour and rotten fish smell,	
		Argemone seed	Assemble mustard seed but show a protrusion on close examination. The surface of Argemone seed is grainy and rough while that of mustard seed is smooth. When Mustard seed is pressed in side, it is yellow whereas Argemone seed is white.	
II	Sella Rice (Parboiled Rice)	Metanil yellow (a non-permitted coal tar colour)	Rub a few grains in the palms of two hands. Yellow would get reduced or disappear. Add a few drops of dilute Hydrochloric acid to a few rice grains mixed with little water, presence of pink colour indicates presence of Metanil yellow	
		Turmeric (colouring for golden appearance)	Take a small amount of sample in a test tube, add some water and shake. Dip Boric acid paper (filter paper dipped in Boric acid solution) If it turns pink turmeric is present	See Appendix-I
III	Dal whole and spilt Khesari Dal		(i) Khesari dal has edged type appearance showing a slant on one side and square in appearance in contrast to other dals.	
			(ii) Add 50 ml of dilute Hydrochloric acid to the sample and keep on simmering water for about 15 minutes. The pink colour developed indicates the presence of Khesari dal.	The test is only for Khesari dal. (Metanil yellow if present will give a similar colour immediately even without simmering).
		Clay, stone, gravels, webs, insects, rodent hair and excreta	Visual examination will detect these adulterants.	Reject if the number of Insects is large or if the odour is unpleasant and taste bitter or gritty

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		Metanil yellow (a non permitted coaltar colour)	Take 5 gins of the sample with 5 ml. of water in a test tube and add a few drops of concentrated Hydrochloric acid. A pink colour shows presence of Metanil yellow	
IV	Atta, Maida Suji (Rawa)	Sand, soil, insects, webs, lumps, rodent hair and excrete	These can be identified by visual examination.	
		Iron filings	By moving a magnet through the sample, iron filings can be separated.	
V	Besan	Khesari Flour	Add 50 ml of dilute Hydrochloric acid to 10 gins. of sample and keep on simmering water for about 15 minutes. The pink colour, if developed, indicates, the presence of Khesari flour	The test is only for Khesari del (Metanil yellow, if present will give a similar colour even without simmering).
D	SPICES AND CONDIMENTS			
I	Whole spices	Dirt, dust, straw, insect, damaged seeds, other seeds, rodent hair and excrete	These can be examined visually	
(a)	Black pepper	Papaya seeds	Papaya seeds can be separated out from pepper as they are shrunken, oval in shape and greenish brown or brownish black in colour.	
		Light black pepper	Float the sample of black pepper in alcohol (rectified spirit). The black pepper berries sink while the papaya seeds and light black pepper float.	
		Coated with mineral oil	Black pepper coated with mineral oil gives Kerosene like smell.	

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(b)	Cloves	Volatile extracted (exhausted cloves) oil	Exhausted cloves can be identified by its small size and shrunken appearance. The characteristic pungent of genuine cloves is less pronounced in exhausted cloves.	
(c)	Mustard seed	Argemone seed	Mustard seeds have a smooth surface The argemone seed have grainy and rough surface and are black and hence can be separated out by close examination. When Mustard seed is pressed inside it is yellow while for Argemone seed it is white	Use magnifying glass for identification.
II	Powdered spices	Added starch	Add a few drops of tincture of Iodine or Iodine solution. Indication of blue colour shows the presence of starch.	Iodine test for added starch is not applicable for turmeric powder.
		Common salt	Taste for addition of common salt	
(a)	Turmeric powder	Coloured saw dust	Take a tea spoon full of turmeric powder in a test tube. Add a few drops of concentrated Hydrochloric acid. Instart appearance of pink colour which disappears on dilution with water shows the presence of turmeric If the colour persists, metanil yellow (an artificial colour) a now permitted coal tar colour is present.	This test is only for Metanil yellow
		Chalk powder or yellow soap stone powder	Take a small quantity of turmeric powder in a test tube containing small quantity of water. Add a few drops of concentrated Hydrochloric acid, effervescence (give off bubbles) will indicate the presence of chalk or yellow soap stone powder	

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(b)	Chillies powder	Brick powder, salt powder or talc. powder	Take a tea spoon full of chillies powder in a glass of water. Coloured water extract will show the presence of artificial colour. Any grittiness that may be felt on rubbing the sediment at the bottom of glass confirms the presence of brick powder/sand, soapy and smooth touch of the white residue at the bottom indicates the presence of soap stone.	This test is only for earthy material.
		Water soluble coal tar colour	Water soluble artificial colour can be detected by sprinkling a small quantity of chilies or turmeric powder on the surface of water contained in a glass tumbler. The water soluble colour will immediately start descending in colour streaks	
		Oil soluble coal tar colour	Take 2 gins of the sample in a test tube, add few ml of solvent ether and shake. Decant ether layer into a test tube containing 2 ml of dilute Hydrochloric acid (1 ml HOL plus 1 ml of warer). Shake it, the lower acid layer will be coloured distinct pink to red indicating presence of oil soluble colour	See also Appendix-I
III	Hing	Soap stone or other earthy mailer	Shake little portion of the sample with water and allow to settle. Soap stone or other earthy mailer will settle down at the boilom.	In compounded hing due to presence of starch, a slight turbid solution, may be produced. However, this will settle down after keeping
IV	Saffron	Dried tendrils of maizecob	Genuine saffron will not break easily like artificial. Artificial saffron is prepared by soaking maize cob in sugar and colouring it with coal tar colour. The colour dissolves in water if artificially coloured. A bit of pure saffron when allowed to dissolved in water will continue to give its saffron colour so long as it lasts	

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D	MISCELLANEOUS FOODS			
I	Common salt	White powdered Stone	Stir a spoonful of sample of salt in a glass of water. The presence of chalk will make solution white and other insoluble impurities will settle down.	
II	Tea leaves	Exhausted tea or tur or gram dal husk with colour	<p>Take a filter paper and spread a few tea leaves. Sprinkle with water to wet the filter paper. If coal tar colour is present it would immediately stain the filter paper. Wash the filter paper under tap water and observe the stains against light</p> <p>Spread a little slaked lime on white procelain tile or glass plate, sprinkle a little tea dust on the lime. Red, orange or other shades of colour spreading on the lime will show the presence of coal tar colour. In case of genuine tea, there will be only a slight greenish yellow colour due to chlorophyll, which appear after some time.</p>	
		Iron filings	By moving a magnet through the sample, iron filings can be separated	
III	Coffee	Chicory	Gently sprinkle the coffee powder sample on the surface of water in a glass. The coffee floats over the water but chicory begins to sink down within a few seconds. The falling chicory powder particles leave behind them a trail of colour, due to large amount of caramel	

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		Tamarind seeds powder and date seed powder	Sprinkle the suspected coffee powder on white filter/blotting paper and spray 1 per cent sodium carbonate solution on it. Tamarind and date seed powder will, if present, stain blotting paper/filter paper red.	
IV	Supari Pan Masala	Colour	Colour dissolves in water.	
		Saccharin	Saccharin gives excessive and lingering sweet taste and leaves bitter taste at the end.	
V	Catachu powder	Chalk	Chalk gives effervescence (gives off bubbles) with concentrated Hydrochloric acid	This test is only for Chalk.
VI	Silver leaves	Aluminium leaves	<p>(i). On ignition, genuine silver leaves burn away completely, leaving glistening white spherical ball of the same mass whereas aluminium leaves are reduced to ashes of dark grey blackish colour.</p> <p>(ii), Take silver leaves in test tube, add diluted Hydrochloric acid. Appearance of turbidity to white precipitate indicates the presence of silver leaves. Aluminium leaves do not give any turbidity or precipitate.</p> <p>(iii) Take a small portion of metal leaves and add a few drops of concentrated Nitric acid. Silver leaves will completely dissolve whereas aluminium leaves will remain undissolved.</p>	
VII	Vinegar	Mineral acid	Test with the Metanil yellow indicator paper, in case, the colour changes from yellow to pink, mineral acid is present	See Appendix -I

APPENDIX I

METHOD FOR TEST

1. **Test for Metanil Yellow:** Take some sample in a test tube and add some amount of water, shake well. Add few drops of diluted hydrochloric acid, violet colour in the water portion indicates the presence of Metanil yellow.
2. **Test for Starch:** Boil the sample with some water in a test tube, cool and add a few drops of iodine solution. Appearance of blue colour indicates the presence of starch.
3. **Baudouin test :** Take about one tea spoon full of melted ghee or butter with equal quantity of concentrated hydrochloric acid in a test tube and add to it a pinch of sugar. Shake well and allow to stand. Appearance of crimson red colour shows the presence of vanaspati of Margarine
4. **Boric acid test for Turmeric :** Take a small amount of sample in a test tube, add some water and shake. Dip Boric acid paper. If it turns pink, turmeric is present Boric acid paper, can be prepared by dipping a strip of filter paper in the Boric acid solution provided in the kit. Boric Acid solution can be prepared by dissolving 5 gms. of boric acid in 100 ml concentrated Hydrochloric acid.
5. **Metanil yellow indicator paper:** Metanil yellow indicator paper can be prepared by dipping a strip of filter paper in metanil yellow solution (1 gm Metanil yellow coal tar colour dissolved in 100 ml of water).
6. **Oil soluble coal tar colour :** Take a small quantity of chillies powder in a beaker and add 5 ml of rectified spirit (alcohol). Dip a small piece of white silk for two minutes. Remove the silk piece and wash with water, If the silk cloth is permanently dyed, it indicates the presence of oil soluble coal tar colour

APPENDIXII

LIST OF APPARATUS AND REAGENTS FOR DEVELOPING A SIMPLE KIT

APPARATUS:

1. Magnifying Glass
2. Spatula
3. Magnet
4. Forcep
5. Lactometer
6. Beaker
7. Petri dishes
8. Dropper
9. Reagent Bottles
10. Spirit lamp

REAGENTS:

1. Hydrochloric acid
2. Nitric acid
3. Petroleum ether
4. Solvent ether
5. Rectified sprit
6. Iodine/Tincture of iodine
7. Potassium Hydroxide
8. Ammonium Molybdate
9. Boric acid
10. Sodium Carbonate
11. Metanil yellow powder
11. Test tube ordinary
12. Test tube stoppered
13. Glass rod
14. Test tube stand
15. Small plastic tray white
16. Porcelain tile white
17. Glass Cylinder
18. Glass Marking Pencil
19. Filter Paper
20. White silk cloth
21. Cotton

PRECAUTIONS TO BE TAKEN

CAUTION

1. The testing kit should be kept beyond the reach of the children as it contains harmful chemicals
2. Solvent ether is highly inflammable. Kept it away from fire.
3. Acids are high corrosive. In case of acid burn, wash immediately with cold water containing sodium bicarbonate (Meetha soda)
4. Use gloves while performing the tests.

In case of further clarification regarding tests, Director, Central Food Laboratories, Ghaziabad; Kolkata; Mysore; Pune; or Assistant Director General (PFA), Director General of Health Services, Nirman Bhavan, New Delhi-110011 may be contacted.