

ADVANCED AND APPLIED CHEMISTRY

MODULE 7

FOOD CHEMISTRY- FOOD ADULTRATION

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Food Adulteration



Edible oils & butter/ghee



Edible oils
Argemone oil, mineral oil and castor oil
Butter and ghee
Margarine and Vansapati and starch

Lentils



Clay, stone, gravel, cobweb, insects, rodent hair, excreta and metanil yellow colour

Atta, Maida and Suji



Sand, soil, insects, cobweb, lumps, rodent hair and excreta and iron filings

Grains



Dust, pebble, stone, straw, weed seeds, damaged grain, weevilled grain, insects, rodent hair, excreta, Ergot (a fungus containing poisonous substance), Datura and argemone seeds

Milk & milk products

Water, starch, hydrated lime, sodium hydroxide and sodium carbonate, formalin, sugar and ammonium sulphate



Food colouring

Toxic dyes are used in oils and flavours in sweets (jalebis), snacks (gobi manchurian), biscuits, chips, pickles, ice creams and soft drinks



Monosodium glutamate



(MSG) (flour) (beyond safe limit) Chinese food, meat and meat products

Fuel

Fuel found in cans with street side



vendors are occasionally mixed with white kerosene that profits the seller. This particular mix harms the engine and combustion of your vehicle depending on the extent of adulteration

Sand



Water is sprayed on mud that is dug from vacant sites onto a wire mesh that separates the silt and leaves behind a residue of filter sand



Food Adulteration

- Definition: It is an act of
intentionally debasing the quality of food
offered for sale
either by the admixture /substitution of
inferior subs or
by removal of
some valuable ingredients.

When is food said to be adulterated ?

- Inferior or cheap sub is substituted .
- Constituent is wholly or partly abstracted.
- Article is prepared , packed or kept under insanitary condition.
- If there is rotten , decomposed or insects in the material.
- If it contains poisonous ingredient or diseased animals
- Unprescribed colored substance.
- Any prohibited or excessive preservative.
- If the standard is not maintained.

Who does this and why?

- Merchants and traders to make quick profit.
- Shortage and increasing prices
- Consumer demands
- Lack of awareness
- Indifference and lethargy among consumers
- Enforcement of food laws.
- Food adulterated is dangerous as it affects the health ,it may be toxic and deprive from essential nutrients.

Types of Adulteration

- Intentional : Added deliberately to increase the margin of profit.
- Incidental Intentional adulteration : Adulteration is bec of negligence, ignorance or lack of proper facilities.
- E.g. larvae in food, dropping of indents , pesticide residue .
- Prevention: Regular market surveys , Using safer pesticides like synthetic pyrethroids , washing vegs before cooking, teaching farmers to use pesticides .

Food - Intentional	Adulterant	Detection
Milk	Water	Pure milk will stop or flow slowly Adulterated milk will flow immediately when dropped on vertical surface
Milk	Urea	5ml milk in test tube ,add 2 drops of bromothymol blue solution . Blue color will indicate presence of urea in 10 mins
Mustard seeds	Argemone seeds	Argemone has rough surface ,white and mustard has yellow inside
Ice-cream	Washing Pd	Lemon juice ,bubbles are observed
Sugar	Chalk	Dissolve sugar in glass of water, Chalk settles down
Silver foil	Aluminum foil	Silver foil burns on ignition leaving white spherical ball ,aluminum is reduced to black grey ash
Honey	water	Cotton wick dipped in honey burns ,water will not burn and gives cracking sound.

Food - Intentional	Adulterant	Detection
Coffee	Chicory seeds , Tamarind seed powder	Sprinkle coffee pd on water ,it will float while chicory will settle down in few sec
Tea	Colored leaves Iron fillings Used tea	Rub leaves on white paper , artificial color comes out. Use magnet it will stick Sprinkle tea on wet filter ,red spots will be seen.
Red chilly pd	Radamine Brick pd	2 gm in 5 ml acetone , red color will be seen. It settles faster in water than chilli pd
Turmeric pd	Metanil yellow	Few drops of HCL –appears violet
Dal	Metanil yellow	Luke warm water add pulses and drop of HCL,pink color indicates presence of Metanil
Pure Ghee	Vanaspathi	1 tsp melted ghee to conc HCL and add pinch of cane sugar-shake well and keep for 5mins,crimson color in lower layer is seen
Black pepper	Papaya seeds	Float in alcohol, pepper will sink and papaya will float
Common salt	White pd stone	Spoon of salt in water ,chalk will give white color and other impurities will settle down

IIA –Incidental Intentional Adulteration	Food involved	Bad effects
Arsenic	Fruits , drinking water	Dizziness,chills,cramps ,
Barium	Food contaminated by rat poison	Muscular twitching
Cadmium	Fruit juice and soft drinks	Liver, kidney damage, multiple fracture, cancer
Cobalt	Water , beer	Cardiac failure
Copper	Acid foods	Vomiting,diarrhoea
Lead	Processed food, water	Brain damage, blindness
Mercury	Fish	Brain damage, blindness
Pesticides	All types of food	Damage to liver ,kidney, brain and nerves leading to death.
Antibiotics	Meat	Hardening of arteries , heart disease

Common food adulteration

- **Argemone seeds:** mixed with mustard seeds.
- Toxic in form of oil and seeds
- As it contains 2 alkaloids obtained from poppy plants .
- Closely resembles mustard seeds but surface is rough and uneven and has tail at one end.
- Found: Mumbai, Chennai, Bihar, West Bengal
- Disease: Beri Beri ,gastro intestinal disturbance , fever,rashes,swelling feet and leg, enlargement of liver, blindness, cancer , cardiac arrest.

Lathyrus (Kesari dal)

- Added with other pulses like masoor , black bengal gram ,chana dal,besan, as its staple food for low income people.
- Found: Madhya Pradesh , Bihar ,Bengal, Uttar pradesh.
- Effect: Paralysis , of lower limbs,stiffness in knee joints ,pain in ankle and knee joints

Toxic Colouring

- Colour introduces variety and makes it look attractive and appetizing.
- Used; ice cream , dairy products , biscuits, pastries , jelly , custard,
- Non permitted color :lead chromate , red ,yellow earth , dyes, peela rang (metanil),Rhodamine B (red)
- Used : dal , sweet meals like jalebies , laddoos, halwa, red chillies

Effect: abnormalities of bones ,eyes ,skin ,lungs , ovaries , mental retardation.

Common toxic colours

- Metanil Yellow
- Orange II
- Rhodamine B
- Blue VRS
- Auramine
- Malachite Green
- Ice candy, Faluda
- Halwa
- Red chillie pd and churan
- Sweets
- Sugar coated saunf/sopari
- Coconut



PFA-Prevention of Food Adulteration- 1954

- This act prohibits manufacture , sales and distributions of not only adulterated food but also food contaminated with microbes, toxicants and misbranded food.
- There are standards specified for pasteurized milk, milk powder ,infant milk food etc.

The Prevention of Food Adulteration Act, 1954

along with

• The Prevention of Food Adulteration Rules, 1955

as amended by

The Prevention of Food Adulteration (6th Amendment) Rules, 2008
(L.N.R. 75413), dated 27-10-2008 with effect from 27-10-2008

• The Delhi Prevention of Food Adulteration Rules, 2002

• The Gujarat Prevention of Food Adulteration Rules, 1961

• The Jammu and Kashmir Prevention of Food Adulteration Rules, 1966

• The Karnataka Prevention of Food Adulteration Rules, 1966

• The Madras (Tamil Nadu) Prevention of Food Adulteration Rules, 1961

• The Maharashtra Prevention of Food Adulteration Rules, 1962

• The Uttar Pradesh Prevention of Food Adulteration Rules, 1976

• The Fruit Products Order, 1955

• The Edible Oils Packaging (Regulation) Order, 1955

• The Atomic Energy (Control of Irradiation of Food) Rules, 1966

• The Vegetable Oil Products (Regulation) Order, 1968

• Procedure for taking the Sample of Vegetable Oil Products by the
Vegetable Oil Products Commissioner

• The Delhi Edible Oils (Procedure for Identification and
Declaration of Unadulterated Stocks) Order, 1998

• The Plastics Manufacture, Sale and Usage Rules, 1999

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The Food Safety and Standards Act, 2006

Food shall be deemed to be adulterated

- Not up-to standard.
- Other subs which affects the quality of the substance.
- Inferior or cheap subs used as substitute
- Subs has been wholly or partly abstracted
- Product has been prepared , packed or kept under unsanitary condition
- Poisonous or other ingredient which renders its content injurious to health.
- Prohibited preservative added to the product.
- Quality or purity falls below the prescribed standard

POISON IN YOUR FOOD

CHEMICALS/COLOURS USED IN FRUITS AND VEGETABLES

- ▶ **Calcium carbide** | Used to ripen fruits like mangoes, bananas
- ▶ **Copper sulphate** | Used to ripen fruits faster
- ▶ **Oxytocin** | Hormone used for faster growth of pumpkin, watermelon, brinjal, gourd, cucumber
- ▶ **Wax** | Adds shine on apples and pears

- ▶ **Cheap colours** | Green colour containing harmful chemicals such as metallic lead is applied to bitter melon & other leafy vegetables to give fresh look
- ▶ **Saccharin** | Used to sweeten the watermelons etc
- ▶ **Pesticides & herbicides** | Used excessively for growing fruits, vegetables

HEALTH HAZARDS

- ▶ Consumption of chemical-laden fruits and vegetables can prove disastrous for **digestive system, eyes & liver**
- ▶ Can result in **vomiting and diarrhoea** in children
- ▶ **Kidney failure**
- ▶ Oxytocin can lead to **damage of the brain**

WHAT YOU CAN DO

- ▶ Wash fruits & vegetables in lukewarm water before eating
- ▶ Use the locally-grown fruits and vegetables
- ▶ Always wash hands before preparing meals
- ▶ Remove & discard outer leaves of lettuce & cabbage

