Unit - 4

Food Safety Management

Objectives

- To know the food adulteration.
- To study some of the common food adulterants present in different food stuffs.
- To understand the food laws and regulations.
- To understand the requirement of FSSAI Act, 2006.
- To identify and classify types of food wastes.
- To know the methods for the food waste disposal.
- To impart knowledge on various acts, rules, regulations, standards, orders and laws related to food articles governing their manufacturing, import, export, storage, distribution and sale.
- To know and understand the various national and international standards for different food articles in detail.
- To understand the food regulation mechanism in our country.

Food adulteration and food waste management can be controlled by Food Laws and Regulations

Food adulteration has become a very common practice in our country and we are consuming these foods almost every day, which have numerous harmful effects to our health. Everyday we hear the news, how the unhygienic and spurious food are entering into our houses. Adulteration of food has many effects on individuals as well as on the community health.

Every nation needs an effective food legislation and food control service to promote a safe, honestly presented food supply, and to protect consumers from contaminated, adulterated, and spoiled foods. Generally the food law is divided into two parts: a basic food act and regulations. The act itself sets out broad principles, while regulations contain detailed provisions.

According to UN estimates, 40 percent of the food produced in India is either lost or wasted. This food wastage however, is not limited to one level alone but perforates through every stage; from harvesting, processing, packaging, and transporting to the end stage of consumption.

The major challenge for many developing countries like India is in the process that the food undergoes before it reaches the end-consumer. Although food wastage is a global problem, India stands a chance to convert this into an opportunity. The world's second most populous country needs to reduce its food wastage to feed the 194 million undernourished Indians who go hungry daily. It is important that technology is adopted at every stage of the supply chain to overcome this problem.

8 Food Adulteration

Contents

A nutritionally balanced diet is essential for maintaining good health. It should be wholesome, hygienic and safe. However, the producers, manufacturers and sellers are adulterating the food to gain maximum profit. It decreases the quality and wholesomeness of food. Consumption of such adulterated food may sometimes endanger the health of the consumer.

8.1 FOOD ADULTERANTS AND FOOD ADULTERATION

Definition: The substance, which lowers or degrades the quality of food material, is called an adulterant.

Food Safety and Standard Act, 2006 has given the definition of food adulteration as follows:

Definition: Food Adulteration refers to the process by which the quality or the nature of a given food is reduced through addition of adulterants or removal of vital substance.

The new concept has been established for food adulteration as unsafe food, which means an article of food which is injurious to health. Basically, during food adulteration, small quantity of non-nutritious low cost substances are added intentionally to food.

Causes of food adulteration:

- To make maximum profit from food items by fewer investments.
- To increase quantity of food production and sales.
- Lack of consciousness of proper food consumption.
- Lack of effective food laws

Types of food adulteration:

1. **Intentional adulteration:** The adulterant substances are added as a deliberate act with intention to increase profit. e.g. sand, marble chips, stones, chalk powder, etc.

2. **Incidental adulteration:** Adulterants are found in food due to negligence, ignorance or lack of proper facilities e.g. Packaging hazards like larvae of insects, droppings, pesticide residues, etc.

3. **Metallic adulteration:** The metallic substances are added intentionally or accidentally e.g. arsenic, pesticides, lead from water, mercury from effluents, tin from cans, etc.

8.2 COMMON FOOD ADULTERANTS AND THEIR IDENTIFICATION

Following are the main food adulterants commonly used in food:

i. **Chalk powder:** Wheat flour, maida and asafoetida are adulterated by chalk powder.

ii. **Washing soda:** Bura sugar may be adulterated with washing soda.

iii. **Starch:** It can be added in milk for thickness and also in turmeric powder to increase the weight.

iv. **Colour:** Metanil yellow colour is used to adulterate bengal gram and red gram dals. Turmeric power is coloured with metanil yellow. Chilli powder is coloured with congo red colour. Tea leaves are adulterated with exhausted tea leaves, which are dried, powdered and artificially coloured. Inedible colours are also added in processing of jelly and jam.

v. **Sawdust:** It is used to adulterate chilli powder, coriander powder or tea powder.

vi. **Chicory:** Coffee is adulterated with chicory powder.

vii. **Iron filings:** Most of the time iron filings are added in semolina (rawa) to increase the weight.

Test for identification:

There are some simple tests for detecting the above adulterants in food. Some of these test can be done at home. These tests are as follows :

Table 8.1 : Tests to detect food adulteration

Name of the food	Adulterants	Tests
Asafoetida (*Hing*)	Soap stone (pumice stone) or other earthy matter.	• Shake a little quantity of powdered sample with water. Soap stone or earthy matter settles at the bottom.
	Chalk powder	• Shake sample with carbon tetrachloride. Asafoetida will settle down. Decant the top layer and add dilute HCl to the residue. Effervescence shows presence of chalk.
Sugar	Washing soda	• Add HCl to a little of sugar (bura) . • Effervescence shows presence of washing soda.
		• When red litmus is put in sugar solution, it turns blue due to washing soda.
Milk	Starch	• Addition of iodine solution to milk give a blue colour if starch is present.
	Addition of water or removal of fat	• Measure the specific gravity with lactometer. • Specific gravity of normal milk is between 1.028 to 1.034. Hence, addition of water to milk tends to decrease the specific gravity of milk.

Turmeric	Starch	• Addition of iodine solution to turmeric solution gives blue (dull green) colour if starch is present.
	Metanil Yellow	• Add few drops of conc. HCl to turmeric solution. Appearance of violet colour indicates presence of metanil yellow.
Chilli powder	Saw dust and red colour	• Sprinkle chilli powder sample on the surface of water. Sawdust floats. Added colour will change the colour of water.
Coffee	Chicory	• Sprinkle coffee powder sample on the surface of water in glass. Coffee floats while chicory sinks leaving a trail of colour.
	Powder of roasted date seeds or tamarind seeds	• Place the sample on the white filter paper and spray 1 % sodium carbonate solution. Dates/ tamarind seeds if present, stain the blotting paper red.
Semolina	Iron filings	• Pass magnet through the semolina (rawa). Iron filings will cling to the magnet.
Tea powder	Iron filings	• Pass magnet through the tea powder. Iron filings will cling to the magnet.
	Exhausted tea leaves, dried and powdered with artificial colour	• Sprinkle the powder on wet white blotting paper. Spots of yellow and red colour appearing on paper indicates that tea is artificially coloured.
Coriander powder	Horse dung powder	• Soak the sample in water. Horse dung will float which can be easily detected.
Cloves	Oil extracted cloves	• Cloves appear shrunken and floats on water.
Pure ghee (Desi ghee)	Vanaspati ghee	• Dissolved one tea spoon of sugar in 10ml of HCl. Add 10 ml of melted ghee and shake thoroughly for 1 minute. Allow it to stand for 10minutes. Pink-red colour indicates presence of vanaspati.
Edible oil	Argemone oil	• Add 5 ml concentrated Nitric acid to 5 ml oil sample. Shake carefully. Allow to separate. Yellow, orange yellow, crimson colour in the lower acid layer indicates adulteration.

Do you know ?

Argemone oil is extracted from argemone seeds. It is mixed with other edible oils to increase their quantity. Consumption of such adultrated oil leads to health disorders.

Detection of water in milk

Detection of detergent in milk

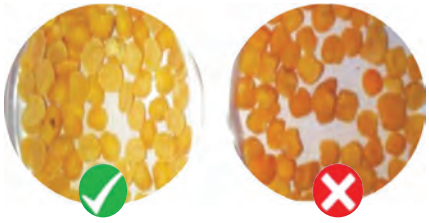
Detection of starch in milk

Detection of chalk powder in sugar

Detection of foreign resin in asafoetida

Detection of soap stone in asafoetida

Detection of synthetic colour in chilli powder



Detection of kesari dal in red gram dal

Detection of added colour in food grains

Detection of papaya seeds in black pepper

Detection of argemone seeds in mustard seeds

Detection of sawdust in powdered spices

Detection of ergot in food grains

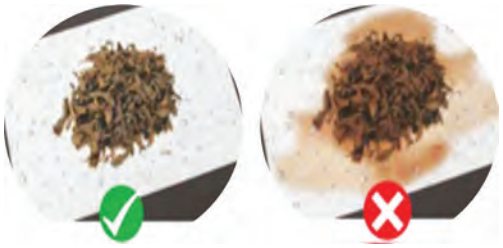
Detection of iron filing in atta/maida/suji

Detection of synthetic colour in turmeric

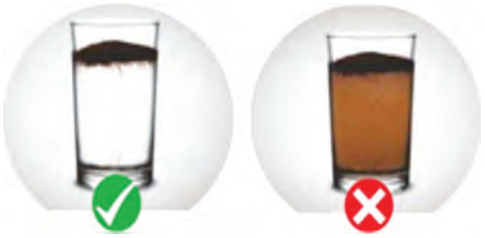
Detection of synthetic colour in green chilli

Detection of clay in coffee

Detection of colour in supari pan masala



Detection of coloured, exhausted tea powder



Detection of chicory powder in coffee

Fig 8.1 : Common food adulteration detection tests observations

Do you know ?

FSSAI has launched 'Detect Adulteration with Rapid Test (DART)' booklet for common quick tests for detection of food adulterants at household by the citizens themselves so as to induce awareness among the consumers about food safety.

Do you know ?

The Ministry of Health and Family Welfare is responsible for ensuring safe food to the consumers. Keeping this in view, a legislation called "Prevention of Food Adulteration Act, 1954" was enacted. The objective was to ensure pure and wholesome food to the consumers and also to prevent adulteration. This act has been repealed ever since the Food Safety and Standards Act, 2006 (FSSA, 2006) has been enforced. FSSA 2006 is now the only compulsory food standard in India.

8.3 EFFECT OF ADULTERATION ON HEALTH

Adulteration of food cause several problems in human beings. Some adulterated food stuff and its harmful effects are as follows.

Table 8.2: Adulterants and their harmful effects

Food Article	Adulterant	Harmful Effects
1. Bengal gram and red gram *dal*	Kesari dal	Lathyrism, Cancer
2. Tea	Coloured, exhausted tea leaves	Liver disorder
3. Coffee powder	Tamarind or date seed powder	Stomach disorder, diarrhoea
	Chicory powder	Giddiness and joint pains
4. Milk	Unhygienic water and starch	Stomach disorder
5. Khoa	Starch and less fat content	Stomach disorder
6. Wheat and other food grains (Bajra)	Ergot (a fungus containing poisonous substance)	Poisonous
7. Sugar	Chalk powder	Stomach disorder
8. Black pepper seeds	Papaya seeds and light berries	Stomach and liver problems
9. Mustard seeds	Argemone seed	Epidemic dropsy and glaucoma
10. Edible oils	Argemone oil	Loss of eyesight, heart diseases, tumour.
	Mineral oil	Damage to liver, cancer
	Castor oil	Stomach problem
11. Asafoetida	Foreign resins, soap stones or other earthy materials	Dysentery
12. Turmeric powder	Yellow aniline dyes	Cancer
	Non permitted colours like metanil yelllow	Highly carcinogenic
13. Chili powder	Brick powder, sawdust	Stomach disorder
	Artificial colour	Cancer
14. Sweets, Juices, Jam	Non permitted coal tar dye (metanil yellow)	Toxic substance Cancer
15. Jaggery	Washing soda, chalk powder	Vomiting, diarrhoea
16. Pulses (green peas and *dal*)	Coal tar dye	Stomach pain, ulcer
17. *Supari* (coloured and scented)	Colour and saccharin	Cancer

8.4 Mitigation measures for addressing food adulteration

- There must be proper surveillance for implementation of food laws.
- There should be monitoring of the activities with periodical records of hazards regarding food adulteration.
- There should be periodical training programmes for Senior Officer/Inspector/Analysts for food safety.
- There should be consumer awareness programmes organized by holding exhibitions/seminars/ training programmes and publishing pamphlets.
- There should be strict actions regarding the legal punishment for those who are involved in food adulteration activities.
- There should be help and support from National and International Organisation/ NGOs for implementation of food laws

Points to remember

- Adulteration makes the food items unsafe and unhygienic for use.
- Food adulteration can lead to slow poisoning and various kind of diseases, which can even result in death.
- Adulterated food is dangerous because it may be toxic and can affect the health and it could deprive nutrients essential for proper development.
- Chalk powder, washing soda, starch, restricted colours, saw dust, and iron filings are some of the common food adulterants.
- There are various tests to detect food adulteration.

Exercise

Q. 1 a. Select the most appropriate options.

i. Article of food which is injurious to health is _____ food.

a. Safe b. Unsafe
c. Nutritious d. Healthy

ii. _____ is added for thickening of milk.

a. Starch b. Oil
c. Protein d. Chicory

iii. Turmeric is adulterated with_____ colour.

a. Golden b. Metanil yellow
c. Saffron d. Congored

b. Match the pairs.

A		B	
i.	Powdered sugar	a.	Papaya seeds
ii.	Coffee	b.	Iron filings
iii.	Kesari dal	c.	Washing soda
iv.	Edible oil	d.	Bengal gram dal
v.	Semolina	e.	Chicory
vi.	Black pepper	f.	Argemone oil
		g.	Saw dust

c. Do as directed.

i. Write true or false.

Bura sugar is adulterated with washing soda.

ii. Select the odd word.

Chalk powder, Sawdust, Iron fillings, Chilli powder.

iii. Who am I :
Clue : I am used to adulterate milk

S			R		

iv. Unscramble the word with the help of clue:

Clue: I am used in adulteration of coffee

O Y R C C H I

Q. 2 Short Answer Questions.

i. Write the test to detect adulteration in the following

1. Pure Ghee
2. Powdered sugar
3. Milk
4. Tea leaves

ii. State the adulterants used to adulterate the following food.

1. Jaggery
2. Asafoetida
3. Edible oil
4. Black pepper seeds
5. Coffee

Q. 3 Long answer questions.

i. Name the common food adulterants and write the tests to detect them.

ii. State the some harmful effects of common food adulterants

Project:

Collect five samples of the following food products from different areas which are sold without packing.

1. Turmeric powder
2. Chilli powder
3. Coriander powder
4. Milk

Perform adulteration test on the samples, evaluate the quality and write a report.