Unit 6

GP8A93

SPICES, FOOD ADDITIVES AND FOOD ADULTERATION

Spices and aromatics are the very heart of Indian cooking. It has been used since ancient times and mentioned in Vedas, Egyptian Papyruses and the Old Testament. Food additives are substances added to food to preserve flavour or enhance its taste. It's been used for centuries. Due to increase in population and more demand for food the food adulteration is caused in today's world. An idea about spices, food additives and food adulteration helps us proper selection and usage.

In this lesson, the students will be able to:

- know the role of spices in Indian cookery.
- know the nutritive value, medicinal use and functional use of various spices in cookery.

Spices, food additives and food adulteration

- acquire knowledge of using how to use food additives.
- detect food adulterants in the foods available at home.

6.1 Spices

A spice is a seed, fruit, root, bark or leaf of plant substance primarily used for flavouring, colouring and preserving food. Spices are distinguished from herbs while the herbs are the leaves, flowers or stems from plants used for flavouring or as a garnish. In the culinary arts, the word ***spice means "Any dried part of a plant, or bay leaf which is used as spice and it used for seasoning and flavouring a recipe, but not used as the main ingredient".***

6.1.1 Role of spices in Indian cookery

- Spices add flavour to food, make the food palatable and add variety in the daily diet.
- Spices stimulate salivation, acid secretion and digestive enzymes.
- Spices like turmeric, pepper have medicinal values such as anti-inflammatory, anti-bacterial, stimulant and antioxidant properties.
- Spices help in improving the impaired blood glucose levels in the body and control diabetes.
- Spices reduce cholesterol levels and useful in preventing heart diseases.
- Spices act as preservatives, thus prolongs the shelf life of foods.

ACTIVITY - 1

Does the spice available in your home fulfill the following? Please tick ☑ or ☒

1. Increases food quantity: ☐
2. Adds flavour to food: ☐
3. Gives colour to food: ☐
4. Enrich taste of food: ☐
5. Increase nutrient value: ☐

6.1.2 Nutritional Value of Spices

Spices are usually used in small quantities to flavour a dish. They add few calories to meal and cause a less impact on the nutritive value of foods. Spices add calories to food in negligible amount, even though many spices made from seeds contain high portions of fat, protein and carbohydrate when used in larger quantities.

DO YOU KNOW...?

Food Fact: India is the major producer, consumer and exporter, of spices in the world. India produces about 60 lakh MT of spices which 6.9 lakh MT(11%) is been exported to 150 countries. (*Source: Ministry of Spice Board of India)MT-Metric tone

DO YOU KNOW...?

India is said to be the home of Spices. World most expensive spice is saffron and second most expensive spice is cardamom. (*Source: Indian Spice Board. Com). In India Kerala produces 95% of total pepper output.

6.1.3 List of Indian Spices and its uses

Table 6.1 List of Indian Spices and its uses

S.No.	Name of the Spices	Tamil name	Parts which is been used	Functional/Medicinal uses
1.	All spice 	-	Seeds	Flavouring agent in cakes, breads and cookies.
2.	Asafoetida 	Perunkayam	Resin from the tree	Helps in digestion, has Anti flatulence properties, good for bronchitis and whooping cough.
3.	Bay leaves 	Brinji ilai	Dried leaves from bay tree	Flavouring agent in curry and rice preparation.
4.	Cardamom 	Elakkai	Fruit pod	Helps in removing fat, cure for skin and urinary problems.
5.	Red chilli 	Kaindha milagai	Seeds/Fruit	Rich in vitamin-A, used for spicy dishes
6.	Green Chilli 	Paccha milagai	Fruit from plant	Rich in vitamin-A, used as flavouring agent in curries
7.	Fenugreek seeds 	Vendhayam	Seeds from fenugreek plant	Used to reduce blood sugar level carminative, and relieves anorexia.
8.	Garlic 	Poondu	Bulb from garlic plant	Helps in digestion, appetizer and stimulant. It has an antibiotic factor Allin in it which prevents cancer.
9.	Ginger 	Inji	Stem of the plant	Helps in digestion, anthelmintic.

10.	Clove 	Krambu/ lavangam	Flower buds	Used as refrigerant, helps in digestion, stimulant, anti spasmodic, antibacterial. Relieves tooth ache.
11.	Cinnamon 	Pattai	Bark of the tree	It is diuretic, given as tonic, analgesic and anti-inflammatory.
12.	Coriander Seed 	Dhaniya/ kothumali vidhai	Seeds	Used as flavouring and thickening agent. Analgesic and anti-inflammatory.
13.	Cumin seed 	Jeeragam	Seed	Used to cure constipation, acts as galactogogue, uterine and nerve stimulant.
14.	Aniseed 	Sombu	Seed of ajwain family	Helps in relieving flatulence, induce perspiration, used in asthma medicine.
15.	Mustard 	Kadugu	Seeds of mustard plant	Anti inflammatory cures skin disease, thermogenic.
16.	Pepper 	Milagu	Dried fruit	Used to cure fever, asthma, cough, arthritis helps in digestion and flatulence.
17.	Poppy seeds 	Kasakasa	Seed	Acts as skin moisturizer, used in internal haemorrhages, diarrhoea and dysentery.

18.	Star anise 	Annasi mogu	Seed	Used as Anti-influenza drug, deodorant, helps in digestion.
19.	Turmeric 	Manjal	Stem	Anti septic, appetizer cures skin diseases, asthma, cough, bronchitis, inflammations, ulcers, intestinal worms and skin discolouration.
20.	Tamarind 	Puli	Fruit pulp from tamarind tree	Used as flavouring and souring agent. Used as laxative, helps in gastropathy.
21.	Saffron 	Kunguma poo	Stigma the plant	Used as colouring agent. acts as stimulant, helps in curring bronchitis, fever, epilepsy, skin diseases.
22.	Ajwain 	Omum	Fruit	Helps in digestion and has anti flatulence properties.
23.	Nutmeg 	Jathikai	Seed	Used as flavouring agent. has anti-bacterial, antiseptic and anti microbial properties.
24.	Mace 	Jathi pathri	Dried aril of nutmeg(outer covering of nutmeg)	Used as flavouring agent. Has anti microbial property.
25.	Dill 	Sadakuppi	Seeds and leaves are used	Used as flavouring and curing agent. Has anti pyretic property.

26.	Fennel 	Sombu	Bulb, foliage and seeds of anise were used	Used as flavouring agent. Similar to anise. Prevents cardiac problems.
27.	Vanilla 	Vanilla beans	Seeds of vanillin plant	Used as flavouring agent. Cures stomach ailments.
28.	Curry leaf 	karuvepillai	leaves	Used as flavouring agent and garnishing agent.

Garam masala used in all curry preparations in India is a mixture of eight spices- cloves, cinnamon, black pepper, mace, bay leaf, cardamom, cumin, coriander seeds

6.2 Food additives

According to Food Protection Committee of the Food & Nutrition Board, Food additives may be defined as "A substance or mixture of substances, other than a basic food stuff, which is present in a food as a result of any aspect of food production, processing, storage or packaging". The term does not include chance contaminants.

Food additives are substances which are added to food which either improve the flavour, texture, colour, chemical preservatives ,taste, appearance or function as processing aid.

6.2.1 Need for food additives

- It provides protection against food spoilage during storage, transportation, distribution and processing.
- It is included in the preparation of convenience foods like jams and jellies.
- To fortify or enrich the foods.
- It is used to add colour, flavour, firmness and retards or hastens chemical reaction in food.
- To maintain nutritional quality of food.
- Used as a preservative and colouring agent.

6.2.2 Classification of food additives

The food additives can be classified as following:

- Preservatives
- Colouring agents
- Anti oxidants
- Artificial sweeteners

- Flavouring agent
- Emulsifiers, Stabilizers and Thickeners
- Flour improvers
- Humectants
- Curing agents
- Chelating agents
- Leavening agents

1. Preservatives

Preservatives are the compounds used to prevent and retard the microbial spoilage of food. They are classified in to

i. Class I and

ii. Class II preservatives.

Class I preservative: They are natural substances and addition of it in food is not restricted. Eg. Salt, sugar, honey, vegetable oil, spices etc.

Class II preservative: They are chemical substances which should be included in food in a restricted quantity. Eg. Benzoic acid, Sorbic acid etc.

2. Colouring agents

It is a dye, pigment or substance to impart colour in the food. It is classified into

i. Natural colours (Naturally available Eg. Turmeric)

ii. Synthetic colours (Synthesised from fruits, vegetables and chemicals Eg: Tartrazine, sunset yellow)

3. Artificial sweeteners

These are said to be sugar substitute which contains less energy, which are not produced naturally. Eg. Saccharin, Aspartame, Dulcin etc.

4. Anti Oxidants

Antioxidants are added to oils and fats to prevent oxidative rancidity Eg. Ethyl Propyl, Octyl Gallates etc

5. Flavouring agents

They form a divergent group of organic compounds both natural and synthetic in nature. Eg. Menthol, vanillin etc.

6. Emulsifiers, Stabilizers and Thickeners

A variety of organic compounds form the group of emulsifiers, stabilizers and thickening agents Eg. Guar gum, Gelatin, Agar-agar etc.

7. Humectants

These are moisture retention agents. It controls viscosity, texture, bulking, retention of moisture, reduction of water activity, control of crystallization and improvement of softness. Eg. poly hydroxyl alcohols.

ACTIVITY - 2 and 3

Find the additive present in various food packets available in the market.

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....

Is it healthy, delicious and can be taken regularly? If Yes/No. Give reasons?

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8. Flour improvers

These are bleaching and maturing agents used to bleach and mature the flour. Eg. Benzyl peroxide.

9. Curing agents

These are additives to preserve meat, give them desirable colour, flavour, and discourage microbial growth. Eg. Sodium nitrite

10. Chelating agents

These are anti oxidants. They serve as scavengers of metals which catalyze oxidation. Eg. Ethylene Diamide Tetraacetic Acid(EDTA)

11. Leavening agents

Leavening agent causes expansion of dough and batter by releasing gas and gives porous structure. Eg. Yeast , Baking powder and baking soda

6.2.3 Harmful effects of food additives

1. **Hydrogenated Fats—** It cause cardiovascular disease and obesity
2. **Artificial Food Colors—** It leads to allergies, asthma and carcinogenic
3. **Nitrites and Nitrates—** Carcinogenic
4. **Sulfites (sulfur dioxide, metabisulfites, and others)—** It leads to allergy and asthmatic reactions
5. **Sugar and Sweeteners—** It leads to obesity, dental cavities, Hypoglycemia and diabetes.
6. **Artificial Sweeteners** (Aspartame, Acesulfame K and Saccharin)—It cause behavioral problems, hyperactivity, allergies. T**he government has given statutory warning against the use of any artificial sweetener for children and pregnant women foods.**

7. **Preservatives (BHA, BHT, EDTA, etc.)**— causes allergic reactions, hyperactivity, and liver problems
8. A**rtificial Flavours**— leads to allergic and behavioral problems
9. **Refined Flour**— low-nutrient calories, carbohydrate imbalances, altered insulin production
10. **Salt (excessive)**- Increase in blood pressure

6.3 Food Adulteration

Food is the basic necessity of life. The quality and safety aspects of food are paramount significance, but the major problem we face is Food ***Adulteration. Adulteration is defined as the process by which quality or the nature of a given substance is reduced through***

i. The addition of a foreign or an inferior substance

ii. The removal of a vital element.

The word adulterated implies on element of deceit. It means mixing the food with something inferior or spurious.

Adulterant is defined as any material which is employed or which could be employed for the purpose of adulteration.

ACTIVITY - 4

Mention the additives present in various food items?

S.No.	Name of the food item	Additive present
1.	Cake	
2.	Ice creams	
3.	Squash, jam and jellies	
4.	Bottle drinks	
5.	Maida	
6.	Pickles	
7.	Cookies	
8.	Kesari	
9.	Cooking oil	
10.	Pastries	
11.	Fastfoods	
12.	Noodles	
13.	Chocolates	
14.	Candy	
15.	Canned items/foods in tin	

6.3.1 Types of Food Adulteration

Foods may be adulterated either intentional or incidental at all stages from production to selling.

1. Intentional Adulteration
2. Incidental adulteration

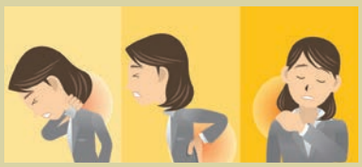
Intentional Adulteration

Adulterant is added knowingly to increase profit. This type of adulteration includes intentional addition, substitution or addition or removal of substances which adversely affects the quality of food. Eg. Sand, marble chips, Earth and other filth.

Incidental Adulteration

Incidental contamination is due to ignorance, negligence or lack of proper facilities. Eg. Toxic metals, presence of bacterial and fungal contaminants.

6.3.2 Flow chart depicting health problems of food adulteration



Nervous damage

Fever

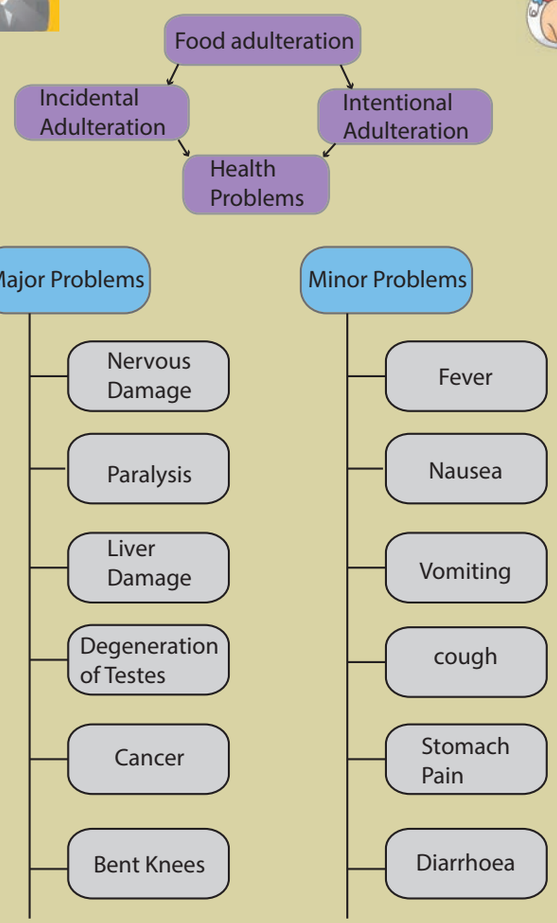
Vomiting

Paralysis

Cough

Bent kness

Diarrhoea



6.3.3 Methods to detect Food Adulteration

There are two methods to detect food adulterants. They are

1. Physical test

2. Laboratory chemical test

1. Physical test

It is conducted by observation or visual examination using our senses like taste, smell, and vision and also using lactometer.

2. Laboratory chemical test

Swaminathan.M has devised an instructional manual to detect food adulterant harmful effects on health is given below.

Table 6.2 Food Adulterants and its harmful effects.

S.No.	Food group	Adulterant	Harmful effects on health
1.	Cereals, wheat and other food grains	Ergot	Nausea, vomiting, Gastric pain burning sensation in extremities
2.	Pulses and legumes Dhal	Kesari Dhal and toxic dyes	Leads to lathryism.
3.	Milk and milk products Milk, Khoa, Bura cheese	Starch	Diarrhoea and vomiting
4.	Sugar and Jaggery	Washing soda	Diarrhoea, vomiting
	Honey	Invert sugar	Nausea, vomiting
	Jaggery	Washing soda Chalk powder	Diarrhoea, vomiting
5.	Edible oils and fats	Argemone oil Mineral oil Karanja oil Castor oil	Gastric problems, carcinogenic, skin problems
	Ghee & butter	Vanaspati Mashed potatoes and starches	Flatulence, gastric problems
6.	Spices & condiments Turmeric powder	Yellow aniline dyes. Non permitted colorants like metanil yellow	Causes giddiness, weakness, cyanosis, vomiting and are carcinogenic
	Chilli powder	Brick powder	Leads to gastric pain, cholic pain and indigestion

	Asafoetida(Devil's Dung)	Foreign resins galbanum and Colophony resin	Dysentry.
	Black pepper	Papaya seeds, rotten pepper and light berries	Stomach and liver problems.
7.	Beverages Coffee powder	Tamarind and date seed powder	Diarrhoea, stomach disorder.

Table 6.3 Test for determining common adulterants present in food at home level

S.no.	Food item	Adulterant	Test
1.	Asafoetiida	Resin or scented gum and coloured	Dissolve asafoetida in water. Pure asafoetida will form a milky white solution.Burn it on a spoon. Burning like camphor indicates pure asafoetida.
2.	Sugar	Chalk powder	Dissolve in a glass of water. Chalk will settle down at the bottom indicates adulterant present.
3.	Cardamom	Oil is removed and pods are coated with talcum powder	On rubbing talcum will stick to the fingers. On testing if there is hardly any aromatic flavour it indicates removal of essential oil.
4.	Chilli powder	Saw dust and colour	Sprinkle on the surface of water, saw dust floats. Added colour will make the water coloured.
5.	Coffee	Chicory	Shake a small portion in cold water. Coffee will float while chicory will sink making the water brown.
6.	Coriander powder	Powdered Horse dung	Soak in water. Horse dung will float which can be easily detected.
7.	Cloves	Oil may be removed	If so cloves may be shrunk in appearance
8.	Cumin seeds	Grass seeds coloured with charcoal dust	If rubbed in hand fingers will turn black
9.	Rava	Iron filling to add weight.	Pass magnet through the rawa. Iron fillings get attracted to magnet.

10.	Betelnut powder	Saw dust and artificial colour.	Sprinkle in water saw dust will float and added colour will dissolve in water.
11.	Milk	water.	Pour few drops of milk on a polished surface. Pure milk leaves a white trail while flowing and the adulterated milk will flow without leaving a mark.
12.	Sago	Sand and talcum	Pure sago swells on burning and leaves hardly any ash.
13.	Honey	Sugar plus water	A cotton wick dipped in honey is burnt. If adulterated with water, cotton wick will not burn or burns with a cracking sound.
14.	Tea dust	Used tea leaves dried, powdered and artificially coloured	Sprinkle the dust on the wet white filter paper. Spots of yellow, pink and red appearing on the paper indicates that the tea is artificially coloured.
15.	Black pepper	Papaya seeds	Papaya seeds are shrunken and greenish brown in colour. It has repulsive flavour while black pepper has pungent and hot flavour.
16.	Coconut oil	Any other oil	Keep the bottle of coconut oil in refrigerator. It solidifies while the adulterant does not.
17.	Cinnamon	Coloured Cassia bark	Added colour comes off in water.
18.	Bajra	Ergot	Immerse in salt water. Fungus floats on top of water.
19.	Common salt	Chalk powder	Dissolve in water. The water turns white and indicates presence of chalk powder.
20.	Saffron	Maize fibres coloured and scented	Pure saffron is tough. Adulterated saffron is brittle and breaks easily.

6.4 Food laws in our country

The Indian parliament has passed the Food Safety and Standards Act, 2006 that overrides all other food related laws. Such as:

- Prevention of Food Adulteration Act, 1954
- Fruit Products Order, 1955

- Meat Food Products Order, 1973
- Vegetable Oil Products (Control) Order, 1947
- Edible Oils Packaging (Regulation) Order 1988
- Solvent Extracted Oil, De-Oiled Meal and Edible Flour (Control) Order, 1967,
- Milk and milk Products Order, 1992 etc are repealed after commencement of FSS Act, 2006.

1. Agricultural Produce (Grading & Marketing) Act -1937

Regulation

- Grade and standards are prescribed for Agricultural & Allied Commodities grading, sorting as per quality attributes and inspection are included.

Special features

- Activity based on marketing and grading at producer's level. AGMARK certification.

2. Bureau of indian standards (bis)

Regulation

- Prescribing of grade standards, formulation of standards, specification of foods standards for limit of toxic compounds as applicable.
- Implementation of regulation by promotion through its voluntary and third party certification system, specifying of packaging and labeling requirements.

Special features

- General cover on hygienic conditions of manufacture, raw material quality & safety are given. Quality and safety oriented standards.

Natural + Medicine

All Natural

Natural + Chemicals

All Chemicals

Summary

- Spice means "Any dried part of a plant, or bay leaf used as spice and used for seasoning and flavouring a recipe, but not used as the main ingredient".
- Spices can be utilized as thickening, souring, curing, leavening, flavouring and colouring agent.
- Food additive is "A substance or mixture of substances, other than a basic food stuff, which is present in a food as a result of any aspect of food production, processing, storage or packaging".
- Food additives can be classified as preservatives, colouring agents, antioxidants, artificial sweeteners, flavouring agent, emulisifiers, stabilizers, thickeners, flour improvers, humectants, curing agents and leavening agents.
- Adulterant is any material which is employed or which could be employed for the purpose of adulteration.
- Food adulteration is classified as incidental and intentional.

Glossary

Terms	Meaning
Aromatics	Having a pleasant and distinctive smell.
Flavouring agent	A substance used to give a different, stronger or more agreeable taste to food or drink.
Colouring agent	A substance added to food to give colour to make it more appealing.
Thickening agent	A substance added to food to give dense appearance.
Curing agent	A preservation method by adding salt to food or by smoking.
Souring agent	A substance added to food to give sour taste.
Stimulant	A substance that raises levels of physiological or nervous activity.
Anti flatulence	Removal of gas from the alimentary canal.
Carminative	A drug used to relieve flatulence.
Anorexia nervosa	Psychological disturbance resulting in a refusal to eat.
Antispasmodic	The nature of cough or nature of spasm is reduced or opposed.
Diuretic	A drug used to increase passing of urine.
Analgesic	A drug used to relieve pain.
Galactogogue	A substance that promotes lactation in human or animals.
Thermogenic	Relates to or involve in the production of heat.
Laxative	A drug tends to stimulate or facilitate evacuation of bowels.

Anti pyretic	A drug against fever
Carcinogenic	Having the potential to cause cancer
Ergot	Fungus that grows on grasses and cereal grains
Lathyrism	Disease caused by excessive intake of chick pea
Lactometer	An instrument used to measure the density of milk
Flatulence	The accumulation of gas in alimentary canal
Gastropathy	It refers to changes in the mucosa of stomach in patients with portal hypertension

Questions

Part-A

Choose the correct answer (1 marks)

1. _____ are said to be the heart of cooking.
   a. spices
   b. meat
   c. milk
   d. pulses

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2. _____ is the major producer of spices.
   a. china
   b. India
   c. Japan
   d. Delhi
3. Spices add few _____ to meal.
   a. calories
   b. taste
   c. flavour
   d. size
4. _____ is also known as "Devil's Dung".
   a. nutmeg
   b. mace
   c. asafoetida
   d. dill
5. _____ is a mixture of eight spices.
   a. coriander powder
   b. garam masala
   c. amchoor powder
   d. musted powder
6. _____ are substances which are added to food to improve the flavour, texture and colour.
   a. food adulteration
   b. food colour
   c. food additive
   d. food taste
7. To _____ or _____ food, additives are included.
   a. fortify, enrich
   b. increase, decrease
   c. taste, cook
   d. smell, cook

8. _____ are said to be sugar substitute.

a. flavanoids

b. humectants

c. artificial sweeteners

d. sweets

9. Antioxidants are added to oils to prevent _____.

a. flavour

b. rancidity

c. smoking

d. colouring

10. The word _____ implies on element of deceit.

a. adulterated

b. additive

c. preserve

d. ranciduty

11. _____ is for willful profit.

a. incidental adulteration

b. intentional adulteration

c. situation adulteration

d. adulteration

12. _____ is due to ignorance, negligence or lack of proper facilities.

a. incidental adulteration

b. intentional adulteration

c. food additive

d. situation adulteration

13. Kesari dhal added in dhal leads to _____.

a. lathyrism

b. lead poison

c. diarrhoea

d. dieases

14. Metanil yellow dyes are _____.

a. putrified

b. carcinogenic

c. curative

d. colour

Part – B

write short answers (2 marks)

1. What are spices?
2. List three spices used daily in Indian cookery
3. Define food additive
4. List any three food additives
5. Classify the colouring agent
6. Define humectants
7. Give two examples for emulsifiers
8. What is a preservative
9. Define adulterant
10. Define adulteration

Part – C

Answer in Brief (3 mark)

1. What is the role of spices in cookery
2. Explain five spices used in Indian cookery

3. Enlist the medicinal value of any five spices
4. Explain the need for food additives
5. Write short note on preservatives
6. Classify the types of adulteration
7. Write any five harmful effects of adulteration

Part-D

Answer in detailed (5 mark)

1. Explain the different types of spices and its uses in detail?
2. Classify the types of food additives. Explain any three in detail?
3. Illustrate the flow chart of food adulteration?
4. Explain any five methods to detect food adulteration of any four food groups?

ACTIVITY - 5

1. Identify the food adulterant present in the following food items