PRACTICAL 13 ADULTERATION

Structure

13.1 INTRODUCTION

Unit 8 in the theory Course deals with adulteration—the concept, common adulterants, their harmful effects, common adulteration tests etc., we suggest you look up the Unit before you start with this practical.

This practical will provide you a practical experience in detecting and analyzing some of the adulterants commonly used to adulterate foods.

Objectives:

After undertaking this practical, you will be able to:

- define adulteration,
- recognize the different types of adulteration,
- check some common adulterants in some commonly consumed foods, and
- detect some common adulterants found in food.

13.2 ADULTERATION: BASIC CONCEPT

Food adulteration is the *change in original composition and quality of food by adding, removing or substituting some ingredients of food, which affects adversely the nature, substance and quality of food.* According to PFA 1954, any ingredient, which is present in food and is injurious to health, is an adulterant. Common adulterants are like animal fat in vanaspati, non-permitted colours in soft drinks, milk products etc. Adulteration can be natural, intentional or unintentional. All foods are subjected to some sort of adulterations depending on the ethical values and goals of the adulterator. Prevention of adulteration is a must and is a responsibility of both Government and the consumers. The laws relating to unfair practices injurious to health and adulteration of foods needs to be amended and implemented strictly. Government has to be assisted by the consumers, voluntary organizations, media and manufacturers to avoid the practice of adulteration. Consumers have to be more vigil while purchasing. They should buy branded products with known quality and items having quality marks like ISI, FPO etc. When the product is not of good quality, they should lounge a complaint through consumer organizations. The parameters of quality are the grades, standards and specifications laid down by the Government or expert bodies constituted for the purpose.

Let us next look at the types of adulteration.

13.3 TYPES OF ADULTERATIONS

As mentioned above, adulteration can be natural, intentional or unintentional. We have also studied about this aspect in Unit 8 in the theory part. Let us once again recapitulate about the types of adulteration.

Natural Adulteration

These are the chemicals, organic compounds or radicals which are naturally present in the food and are harmful to the health. Some get destroyed by cooking and processing while others may enter in the body and cause disease e.g. many toxic varieties of mushrooms, fish, sea foods etc. A number of toxins are present in pulses and legumes like, saponins, trypsin inhibitors, haemaglutinins, alkaloids etc. Some of these are carcinogenic while others cause damage and malfunctioning of organs.

Unintentional Adulteration

These are the contaminations occur unknowingly or incidently in the food during harvesting, handling, transportation, processing, storage, distribution etc. because of ignorance or carelessness or lack of proper facilities. These adulterations may occur because of pesticides and insecticide residues, microorganisms, heavy metals like arsenic, copper, etc. These are injurious to health if consumed for a long time and may lead to organ failure and even death. For example, shellfish contain toxins derived from plankton on which it lives. Argemone oil may contaminate mustard oil accidently.

Intentional Adulteration

In intentional adulteration, the substance is added, removed or substitute knowingly by the adulterator for the purpose of making money. A large proportion of products available in market are adulterated. Examples: adding water into milk, if the water is contaminated with pathogens, it lead to food borne diseases; use of caustic soda, urea and soap solution to make synthetic milk containing pesticides; adding unhygienic animal fat from goat or pig into milk to make it creamy; adding non-permitted colours like textile dyes, lead chromate, etc. in sugar and confectioneries; using gum and resins in hing etc. All these are injurious to health.

All types of food adulterations whether done intentionally or unintentionally are harmful to health and may lead to illnesses varying from simple diarrhoea to fevers, gastrointestinal disturbances, liver and kidney diseases, lathyrism, favism, eye damage, organ failure and even death. To avoid these, it is essential to check the presence of adulterants in the food. Foods commonly adulterated in India include milk and milk products, salted products, cereals and pulses, spices, sweets and sweeteners, edible fats and oil, beverages etc.

Exercises 1-6 provided in this practical focus on detecting adulterants in some of these commonly consumed foods. So let us get started.

EXERCISE 1

DETECTION OF METANIL YELLOW IN A GIVEN FOOD SAMPLE

Date : .....

Aim : To detect the presence of metanil yellow in a given food sample.

Requirements

Material : Turmeric powder, other spices, pulses of yellow or orange colour.

Reagent : Concentrated hydrochloric acid (HCl)

Equipments and Glasswares : Funnel, filter paper, test tubes, test tube rack, dropper.

Theory/Principle:

Non-permitted colours like lead chromate, metanil yellow, auramine, rhodamine B are used to brighten the foods especially spices, pulses, beverages etc. These are harmful for the health and may lead to testicular degeneration in males, pathological lesion in vital organs, anaemia etc.

Procedure:

Carry out the exercise following the steps enumerated herewith.

1. Suspend the food sample in water and shake vigorously.
2. Filter the sample and dilute it till it is almost colourless.
3. Add few drops of concentrated HCl to a small portion of diluted sample and observe for a colour change.
4. Magenta red colour is a positive test i.e. metanil yellow is present.

Precautions:

1. One should be careful while using concentrated HCl otherwise it may result in burn.
2. Amount of concentrated HCl in all samples should be same.

Observations and Results:

Record your observations in the format given herewith:

Observations		**Results**
Sample Tested	**Colour Change**	**Presence of metanil yellow (+ / –)**

Inference/Conclusion:

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Submit the exercise for evaluation.

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Counsellor Signature

EXERCISE 2

CHECK THE PRESENCE OF RHODAMINE B IN THE GIVEN FOOD SAMPLE

Date : .....

Aim : To check the presence of Rhodamine B (red colour) in the given food sample.

Requirements

Material : Whole and powdered red chillies, other spices, pulses, legumes.

Reagent : Paraffin oil or mineral oil.

Equipment & Glassware : Cotton Swab, petri plate

Theory/Principle:

Addition of artificial colours to pulses, spices and tea is not permitted by PFA act. But certain colours, which contain lead, arsenic, copper etc. may be added to them by manufacturers and it may cause symptoms like anaemia, brain damage etc.

Procedure:

Conduct the experiment following the procedure given herewith:

1. Pour liquid paraffin or mineral oil in a Petri dish.
2. Soak the cotton swab in it.
3. Rub the swab on the surface of a red chilli and observe it for a red colour.
4. Red colour on cotton is a positive test.
5. For chilli powder, shake small quantity (1 tea spoon) of it with paraffin oil. Keep it for 15 minutes with intermittent shakings. Check the colour.

Precautions:

1. Sample should be clean and dry.
2. Dispose off the paraffin oil carefully, so that it does not contaminate food/food surface.

Observations and Results:

Record your observations in the format given herewith:

Sample	Colour of the Cotton/ Medium	Rhodamine B presence (+/ –)

Inference / Conclusion:

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Submit the exercise for evaluation.

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Counsellor Signature

EXERCISE 3

TEST THE PRESENCE OF SUGAR IN HONEY

Date : .....

Aim : To test for the presence of sugar in honey.

Requirements:

Materials : Honey of different brands.

Reagents : Ether, Resorcinol (1% Resorcinol solution in conc. HCl), conc. HCl

Equipments & Glassware : Mortar & Pestle, evaporating dish.

Theory/Principle:

It is a common practice to mix sweet syrupy liquid with the honey. Although the addition of pure sugar does not pose any health hazard but it is a case of misleading the consumers.

Procedure:

1. Mix 5 grams of honey with 5 ml ether in a mortar and pestle.
2. Decant off the ether extract into an evaporating dish.
3. Repeat the process by treating the extract with ether and decant ether into the porcelain dish. Evaporate the collected ether (in porcelain) gently on a water bath and collect the residue.
4. Add 2 drops of resorcinol and 1 drop of concentrated HCl to the remaining residue.
5. Positive test is indicated by a cherry red colour, i.e. presence of sugar.

Precautions:

1. Keep the reagents at cool place.

Observations and Results:

Record your observations in the format given herewith:

Observations		**Results**
Sample	**Colour change**	**Sugar present (+/–)**

Inference / Conclusion:

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Submit the exercise for evaluation.

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Counsellor Signature

EXERCISE 4

DETECTION OF $NaHCO_3$ (CHALK) IN FLOUR

Date : .....

Aim : To detect $NaHCO_3$ (Chalk) in flour.

Requirements

Materials : Flour samples (wheat flour, maize flour, pulse flour, rice flour).

Reagent : Dilute HCI, Distilled Water

Equipments & Glassware : Test tubes, test tube rack, beaker, bunsen burner

Theory/Principle:

Talc, chalk powder etc. is used as adulterant in flour. These may impair the normal smooth functioning of the body. Presence of $NaHCO_3$ (Chalk) in the flour can be tested by treating it with hot HCl. Positive reaction is indicated by emergence of carbon dioxide (CO_2) in the form of effervescence or gas bubbles.

Procedure:

Carry out the experiment following the procedure given herewith:

1. Take a teaspoon of flour in a test tube and shake it with 10 ml distilled water.
2. Warm 20 ml dilute HCl in a beaker to 50-60^oC and add to the test tube containing flour.
3. Observe for the effervescence. If gas bubbles are released, it indicates the presence of chalk in flour.

Precautions:

Same as in earlier experiments.

Observations and Results:

Record your observations in the format given herewith:

Observations		**Results**
Sample	**Release of Effervescence (+–)**	**Presence of Chalk (+ /–)**

Inference / Conclusion:

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Submit the exercise for evaluation.

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Counsellor Signature

EXERCISE 5

CHECK FOR THE PRESENCE OF VANASPATI AND RANCIDITY IN THE GHEE

Date : .....

Aim : To check for the presence of vanaspati and rancidity in the ghee.

Requirements

Material : Ghee (2 samples A & B).

Reagents : HCI, furfural solution (2% prepared in 95% absolute alcohol), phloro glucinol solution (0.1%) in diethyl ether.

Equipments & Glassware : Pipettes, test tubes, test tube racks.

Theory/Principle:

Cheap edible and nonedible oils like argemone oil, white oil, tea seed oil etc. are used as adulterants in more expensive oils like coconut oil, sesame oil etc. which can cause damage to body tissues and other ailments on consumption. Sometimes the oil becomes rancid and are sold as such or mixed with good oils. Use of rancid oil results in destruction of vitamins A and E in foodstuffs. Sometimes, animal body fat is added in ghee or vanaspati as adulterant. Use of relatively cheaper vanaspati in ghee is also quite common, though it does not pose any serious health problem.

Procedure:

Carry out the steps enumerated herewith for conducting this exercise.

For Vanaspati Checking:

1. Take 5 ml of ghee in a stoppered test tube.
2. Add 5 ml of concentrated HCl and shake.
3. Add 5 ml of 2% furfural solution and shake. Observe for the colour in acid layer.
4. Development of pink colour in acid layer indicates the presence of vanaspati.

Rancidity Test:

1. Take 5 ml of melted ghee in a test tube.
2. Add 5 ml of concentrated HCl and shake.
3. Add 1 ml of 0.1% Phloroglucinol and observe for development of a colour. If pink colour develops, it is a positive test, i.e., ghee is rancid.

Precautions

1. One should be careful while handling concentrated HCl.

Observations and Results:

Record your observations in the format given herewith:

Observations on colour change	Results
For Vanaspati	
Sample A	
Sample B	
For Rancidity Test	
Sample A	
Sample B	

Inference/Conclusion:

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Submit the exercise for evaluation.

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Counsellor Signature

EXERCISE 6

CHECK THE MILK FOR PRESENCE OF PROTEINS, UREA, SUGAR AND STARCH

Date : .....

Aim : To check the milk for presence of proteins, urea, sugar and starch.

Requirements

Materials : Milk samples A and B. (Take any 2 milk samples)

Reagents : Alcohol, dimethyl amino benzaldehyde solution (DMAB), Resorcinol.

Equipments & Glassware : Test tubes, test tube rack, pipettes.

Theory/Principle:

Being cheap and easily available, starch is used as a filler in milk, milk powder and milk products. If the starch added is pure, it produces no health hazard.

Procedure:

Follow the steps enumerated herewith for detecting protein, urea, sugar and starch.

For Protein Test

1. Add 0.5 ml of alcohol to 0.5 ml milk. Alcohol helps in curdling the milk.
2. Observe for the curdling of milk.
3. Pure milk shows curdling, whereas, no curdling can be seen with synthetic milk as it contains starch, detergent, urea, etc.

For Urea Test

1. To 0.5 ml of milk add 0.5 ml of DMAB solution (prepared by dissolving 0.4 gm of p-dimethyl amino benzaldehyde powder in 250 ml of alcohol and 23 ml of concentrated HCl).
2. Observe for the colour change.
3. Change of colour from white to yellow shows adulteration in the sample.

For Sugar Test

1. Take 0.1 ml of milk sample in a test tube.
2. Add 0.2 ml of resorcinol solution (0.05 gm of resorcinol in 100 ml of dilute HCl 1part HCl:2 parts of distilled water).
3. Boil for 30 seconds and observe for colour change.
4. Appearance of off-white colour indicates positive test.

For Starch Test

1. Take 1 ml of milk sample in a test tube.
2. Add few drops of iodine solution. (2.5 gm of iodine is dissolved in water and then volume is made up to 200 ml.)
3. Examine for colour change. Appearance of blue colour indicates the presence of starch in milk.

Precautions:

As discussed earlier.

Observations and Results:

Record your observations in the format given herewith:

Observations			Results
Colour Change in	**Sample A**	**Sample B**	
Sugar Test			
Protein Test			
Urea Test			
Starch Test			

Inference/Conclusion:

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Submit the exercise for evaluation.

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Counsellor Signature

Before you finish this exercise, please answer the questions given herewith. This will help you check your understanding on this topic.

13.4 REVIEW QUESTIONS

1. What is meant by Food Adulteration and Adulterants?

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2. What is the difference between Intentional and Unintentional Adulterations?

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3. Name some common adulterants in food.

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4. Mention the colour change in following tests for adulterants:

   — For Metanil Yellow .....

   — For Rancidity in Ghee .....

   — For Protein Test in Mil .....

   — For Urea presence in Milk .....

   — For Sugar in Honey .....

   — For Rhodamine B .....

Now submit your responses for evaluation.

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Counsellor Signature

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