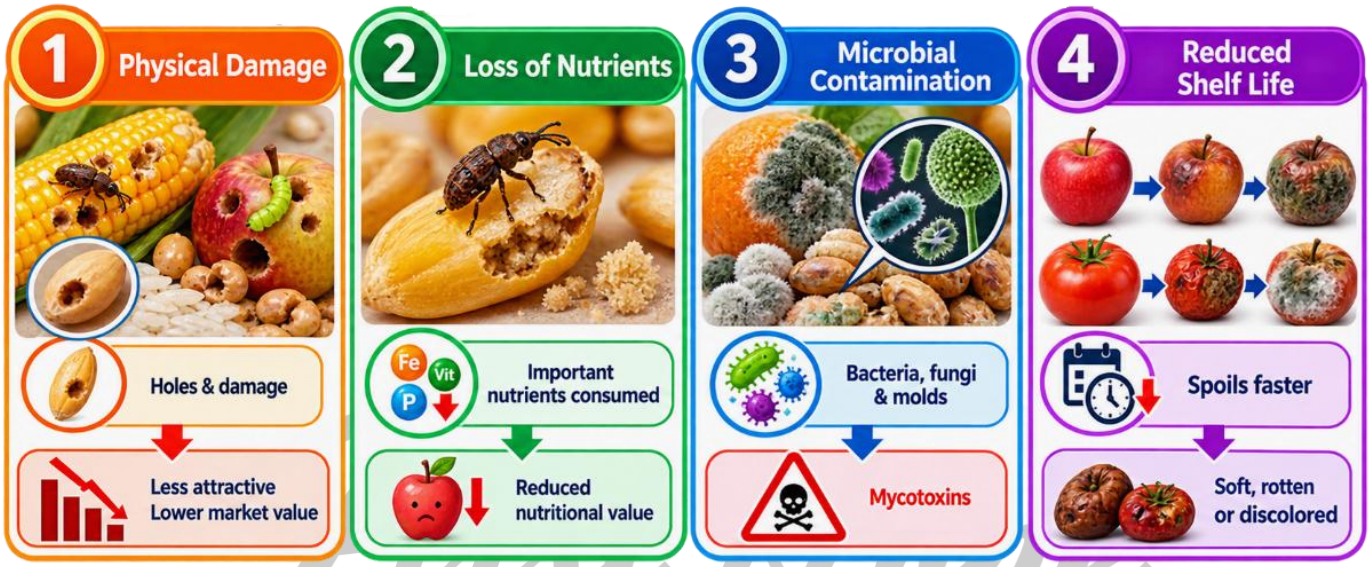
Pesticide Analysis

Effects of Pests and Insects on Various Foods

Basic Idea

- Pests and insects damage food crops during growth, harvesting, storage, and transportation.
- They reduce food quality, decrease yield, and may make food unsafe for human consumption.

Effects on Food



1. **Physical Damage**
   - Insects can make holes in grains, fruits, and vegetables.
   - Damaged food becomes less attractive and loses market value.
2. **Loss of Nutrients**
   - Pests consume important parts of crops.
   - This reduces the nutritional value of food.
3. **Microbial Contamination**
   - Damaged food is more easily attacked by bacteria, fungi, and molds.
   - Mold growth may produce harmful toxins such as mycotoxins.
4. **Reduction in Shelf Life**
   - Insect-damaged food spoils faster.
   - Fruits and vegetables become soft, rotten, or discolored.

Examples

- Grains may be damaged by weevils and beetles.
- Fruits may be attacked by fruit flies.

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- Vegetables may be damaged by caterpillars, aphids, and mites.
- Stored foods may be contaminated by insects, rodents, and fungi.

Importance

- Control of pests is necessary to protect food quantity and quality.
- Proper storage and handling reduce pest-related food losses.

Use of Pesticides in Agriculture

Basic Idea

- Pesticides are chemical or biological substances used to control pests that damage crops, stored foods, and agricultural products.
- Farmers use pesticides to improve crop yield, protect food quality, and reduce economic losses.

Objectives

- To protect crops from insects, weeds, fungi, and rodents.
- To increase agricultural productivity.
- To reduce post-harvest losses.
- To maintain food quality during storage and transport.

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Types of Pesticides

Type of Pesticide	Purpose	Examples
Insecticides	Control or kill insects	Malathion, Chlorpyrifos, DDT
Herbicides	Control unwanted weeds	Glyphosate, Atrazine
Fungicides	Control fungal diseases	Mancozeb, Carbendazim
Rodenticides	Control rats and mice	Zinc phosphide, Warfarin
Fumigants	Control pests in stored grains and warehouses	Phosphine, Methyl bromide

Proper Use

- Pesticides should be used in recommended doses.
- Pesticides should be applied at the correct time.
- Safety instructions on pesticide labels should be followed.
- Crops should be harvested only after the recommended waiting period.

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Risks of Improper Use

- Excess pesticide use can leave harmful residues in food.
- Incorrect application can harm humans, animals, and beneficial insects.
- Pesticides may contaminate soil, water, and air.

Importance

- Proper pesticide use supports food production.
- Safe pesticide practices help reduce health and environmental risks.

Pesticide Cycle

Basic Idea

- The pesticide cycle explains how pesticides move through the environment after they are applied to crops.
- Pesticides may remain on plants, enter soil and water, evaporate into air, or break down into other substances.

Main Steps in the Pesticide Cycle

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1. **Application**
   - Pesticides are applied to crops, soil, seeds, or stored products.
   - Application methods include spraying, dusting, seed treatment, and soil treatment.
2. **Deposition on Plants**
   - Some pesticide remains on leaves, fruits, vegetables, or grains.
   - These residues may stay on food if not degraded or removed.
3. **Movement into Soil**
   - Pesticides can fall onto soil during spraying.
   - They may bind to soil particles or move deeper through leaching.
4. **Movement into Water**
   - Rainfall or irrigation can carry pesticides into rivers, ponds, and groundwater.
   - This process is called runoff or leaching.
5. **Evaporation into Air**
   - Some pesticides evaporate from plant or soil surfaces.
   - Wind can spread pesticide particles to nearby areas.

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6. Breakdown

- Pesticides may break down by sunlight, microorganisms, water, or chemical reactions.
- Breakdown products may be less harmful or sometimes more harmful.

7. Entry into Food Chain

- Pesticides may enter plants, animals, and humans through food, water, or air.
- Persistent pesticides can accumulate in fatty tissues of animals.

Importance

- Understanding, the pesticide cycle helps control residue levels in food.
- It helps reduce environmental pollution and health risks.

Factors Affecting Pesticide Cycle

- Chemical nature of pesticide.
- Dose and frequency of application.
- Temperature and sunlight.
- Soil type and moisture.
- Rainfall and irrigation.
- Crop type and growth stage.

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Analysis of Organophosphorus and Organochlorine Pesticides

Basic Idea

- Organophosphorus and organochlorine pesticides are important groups of pesticides that require careful analysis because they can leave harmful residues in food and the environment.
- Analytical testing helps identify and measure these pesticides in food samples.

Organophosphorus Pesticides

Basic Features

- Organophosphorus pesticides contain phosphorus in their chemical structure.
- They are commonly used as insecticides.
- They usually break down faster than organochlorine pesticides.

Examples

- Malathion.
- Parathion.
- Chlorpyrifos.

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- Diazinon.

Organochlorine Pesticides

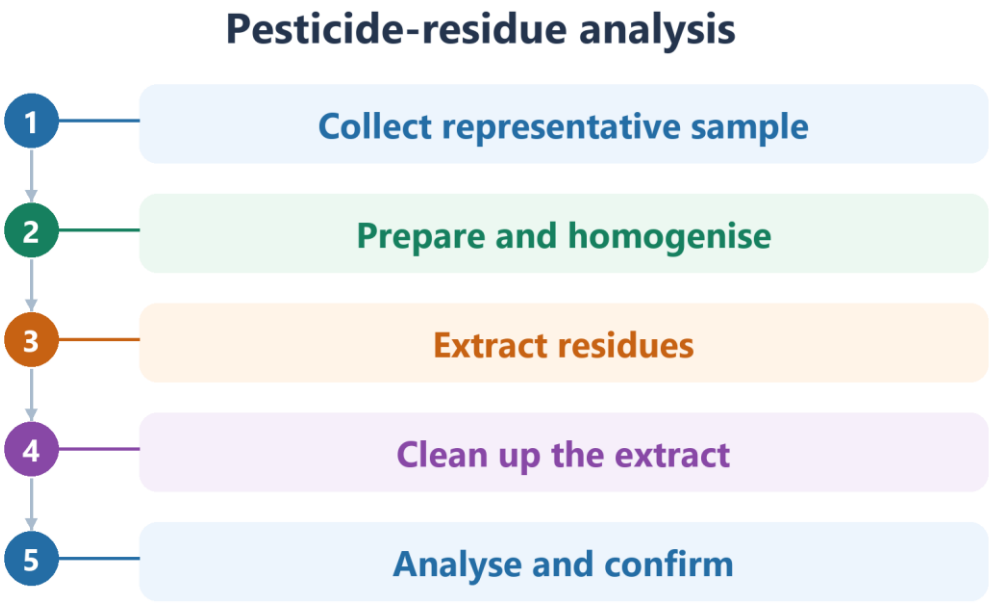
Basic Features

- Organochlorine pesticides contain chlorine in their chemical structure.
- They are persistent in the environment and can accumulate in fatty tissues.
- Many organochlorine pesticides are banned or restricted in several countries.

Examples

- DDT.
- Aldrin.
- Dieldrin.
- Lindane.
- Endosulfan.

Steps in Pesticide Analysis



Residue analysis requires representative sampling, suitable extraction, clean-up and instrumental confirmation.

1. Sample Collection

- Food samples are collected carefully to represent the whole batch.

2. Sample Preparation

- Samples are cleaned, chopped, ground, or homogenized.

3. Extraction

- Pesticides are extracted from the sample using suitable organic solvents.

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