

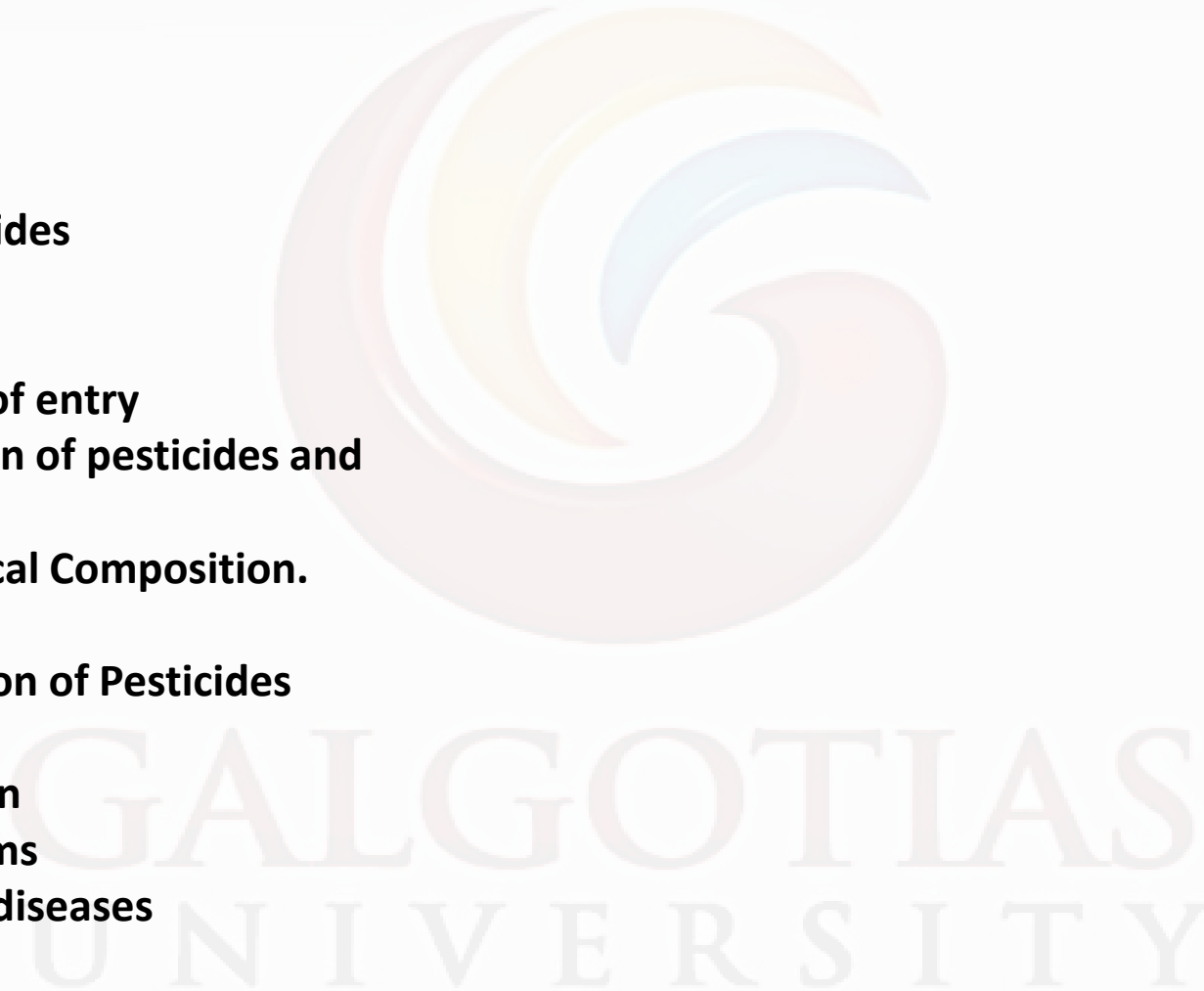
The logo of Galgotias University is a circular emblem with a stylized 'G' in the center. The 'G' is composed of three curved segments in shades of yellow, blue, and red. The background of the emblem is a light, multi-colored swirl.

TOXICOLOGICAL CLASSIFICATION OF PESTICIDES

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TOPIC COVERED

- **Definition Pesticides**
- **Classification –**
 - **Based on mode of entry**
 - **Based on function of pesticides and pest it kills**
 - **Based on Chemical Composition.**
- **WHO classification of Pesticides**
- **Impact on Human**
 - **General symptoms**
 - **Related Chronic diseases**



Pesticides

Pesticides are substances used in health sector and agricultural practices meant to avoid, terminate and lessen the damage of any pest.

Pest includes- Insects, plant pathogens, weeds, fish, some molluscs, birds, mammals, and microbes which thrive on humans for food, spread diseases and destroy properties etc.

These potent chemicals used in agriculture may harm person by-

- Accidental exposure either during their application to crops or
- Due to careless storage.

Classification of Pesticides

Difference in the chemical and physical properties of pesticides make them worthy to classify.

Drum suggested : 3 Popular methods of pesticides classification on following basis -

1. Mode of Entry
2. Pesticides function and pest it kills.
3. Chemical Composition of Pesticides.



Classification based on Mode of Entry

Systemic pesticides

These chemicals are absorbed by the organism and shows systemic action to untouched tissues.

E.g. -

2, 4
Dichlorophenoxyacetic acid (2, 4-D)

Non-systemic pesticides

Effective when came to physical contact with pest and hence also called contact pesticides
E.g. - paraquat etc.

Stomach Poisoning

Stomach poisons are acquired during feeding of pests. These insecticides kill the vector by destroying the midgut (or stomach) of the larvae.

E.g.- Malathion.

Fumigants

Kill the target pests by producing fumes which enter the body of pests through their respiratory system and causes death.

E.g. - Alphos

Repellents

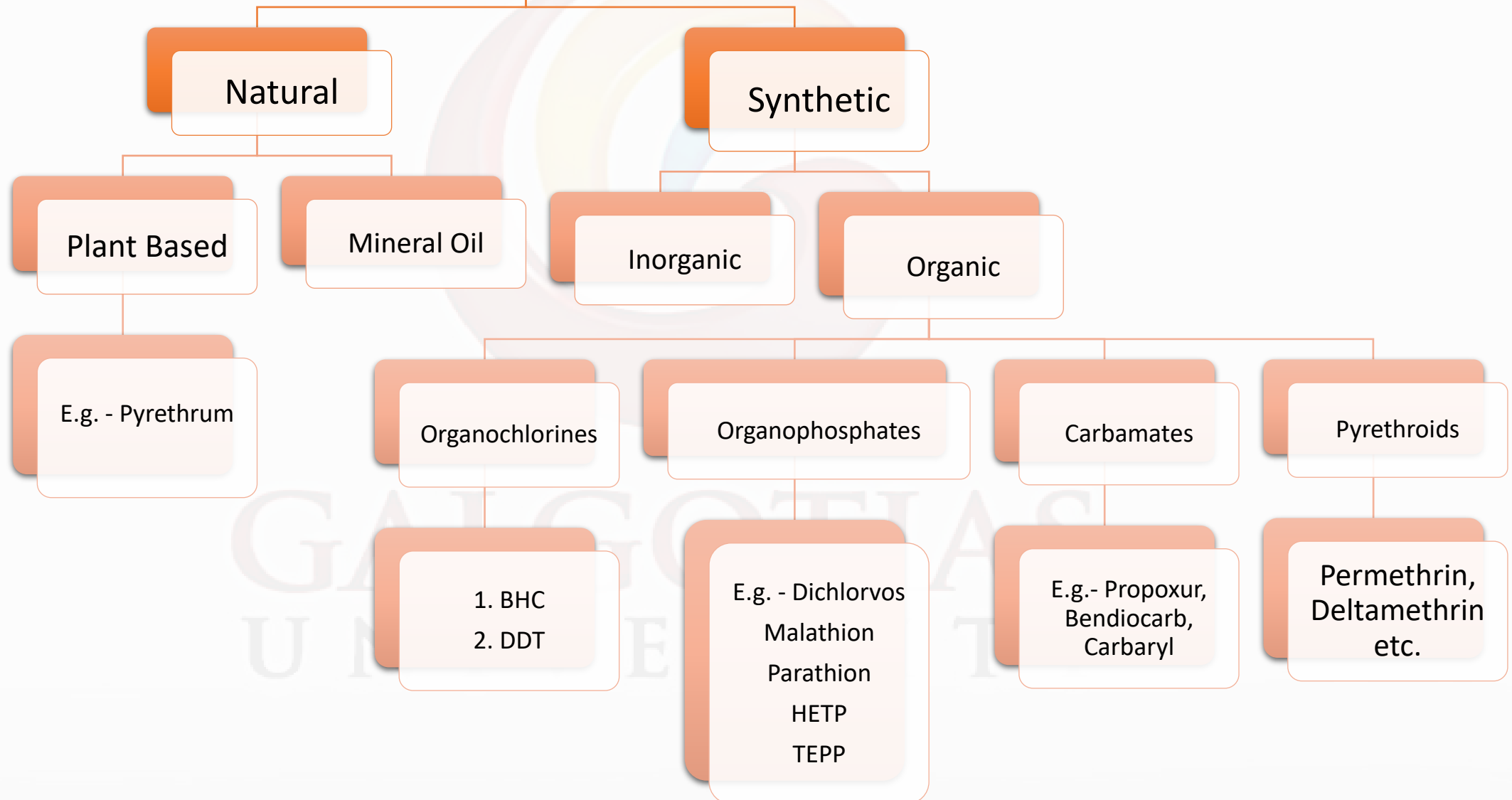
Distasteful nature keeps the pests away from treated place.

E.g. - Permethrin

Classification
Based on
Pesticide
Function and
Pest
Organism it
Kill

1. Insecticides - Kill insects and other arthropods. E.g. - Aldicarb
2. Fungicides - Kill fungi (including molds, blights etc. E.g. - Azoxystrobin
3. Bactericides - Kill bacteria E.g. - Copper complexes
4. Herbicides - Kill unwanted plants and weeds. E.g. - Atrazine
5. Acaricides - Kill mites that feed on plants and animals E.g. - Bifenazate
6. Rodenticides – To kill rodents such as mice . E.g. - Warfarin
7. Algaecides - Check or control growth of algae E.g. - Copper sulfate
8. Larvicides - Inhibits growth of larvae E.g. - Methoprene
9. Repellents -Repel pests by its taste or smell E.g. - Methiocarb
10. Desiccants - Act on plants by drying their tissues. E.g. - Boric acid
11. Ovicides - Inhibits the growth of eggs of insects and mite. E.g. - Benzoxazin
12. Virucides - Acts against viruses. E.g. - Scytovirin
13. Molluscicides – Terminate mollusc's like snail's which hamper growth of plants or crops. E.g. - Metaldehyde
14. Nematicides - Kill nematodes that act as parasites of plants E.g. - Aldicarb
15. Termiticides - Kills termites . E.g. - Fipronil

Classification based on Pesticide's Chemical Composition



Organophosphates (OPCs)

This group of pesticides are characterized with gut poison, fumigant poison and contact poison causes nerve poisoning. They are biodegradable, leads to minimum environmental pollution. They act as cholinesterase inhibitors due to nerve impulse transmission is disrupted at synapses leading to convulsion and twitching of muscles, paralysis and death. So, they are more toxic to vertebrates and invertebrates.

E.g.-Parathion, Diazinon, Malathion etc.

Organochlorines (OCs)

These are organic compounds linked with four or more chlorine atoms. This group of chemical is considered as the first synthesized pesticides.

Disrupt the nervous system of the pest causing convulsions and paralysis leading to subsequent death.

E.g. - DDT, lindane, aldrin, dieldrin etc.

Organic

Carbamates

These are similar to OPCs but origin is different. Organophosphates are product of phosphoric acid, whereas carbamates are obtained from carbamic acid. Carbamates also works on the same action principle of OPCs, they also inhibit the transmission of nerve signals resulting in the death of the targeted species.

E.g. – Carbaryl, Propoxur etc.

Synthetic pyrethroid pesticides

These are group of organic pesticide that can be synthesized by imitating the structure of natural occurring pyrethrin's. They are made structurally more stable than natural one .

E.g. – Permethrin, Cypermethrin etc.

Other Classes of Pesticides

BASED ON TOXICITY OF PESTICIDES

WHO (World Health Organisation) Classified Pesticides in 4 Categories based on their toxic behaviour and related health risks.

<i>WHO class</i>	<i>Toxicity level</i>	<i>LD₅₀ for the rat (mg/kg body weight)</i>		<i>Examples</i>
		<i>Oral</i>	<i>Dermal</i>	
Class Ia	Extremely hazardous	<5	<50	Parathion, Dieldrin
Class Ib	Highly hazardous	5–50	50–200	Eldrin, Dichlorvos
Class II	Moderately hazardous	50–2000	200–2000	DDT, Chlordane
Class III	Slightly hazardous	>2000	>2000	Malathion
Class IV	Unlikely to present acute hazard in normal use	≥ 5000		Carbetamide, Cycloprothrin

Impact on Human Health

Toxicity can occur due to exposure of Pesticides . It depends on the dose, organism, exposure routes and toxicants nature. Poisoning is studied under either acute or chronic categories and level of exposure is expressed in terms of **LD 50 and LC 50**.

Acute

- Headaches, skin rashes, body pain, nausea, dizziness, impaired vision and judgement, involuntary contraction of muscles, panic attacks and severe condition cases leads to coma and death.
- Every year globally **3 million cases been reported of Acute poisoning** in which 2 million Suicide attempt cases and rest are of occupational and accidental cases.

Chronic

- Prolonged and repetitive exposure of sub lethal doses of pesticides for a long duration of time – Chronic Poisoning
- teratogenic effect on foetus leading to birth defects, , and benign or malignant tumours occurrence, nerve disorders, genetic changes, blood disorders, endocrine disruptive effects, and reproductive ill - effects.

General Symptoms of Pesticides Poisoning

Mild poisoning

Any of the following:

- Irritation of the nose, throat, eyes or skin
- Headache

- Dizziness
- Loss of appetite

- Thirst
- Nausea
- Diarrhea

- Sweating
- Weakness or fatigue
- Restlessness
- Nervousness
- Changes in mood
- Insomnia

Moderate poisoning

Any of the mild symptoms, plus any of the following:

- Vomiting

- Excessive salivation

- Coughing
- Feeling of constriction in throat and chest
- Abdominal cramps
- Blurring of vision
- Rapid pulse

- Excessive perspiration
- Profound weakness
- Trembling
- Muscular incoordination
- Mental confusion

Moderate poisoning

Any of the mild symptoms, plus any of the following:

- Inability to breathe

- Extra phlegm or mucous in the airways
- Small or pinpoint pupils
- Chemical burns on the skin

- Increased rate of breathing
- Loss of reflexes
- Uncontrollable muscular twitching
- Unconsciousness
- Death

Pesticides related Chronic Diseases

Respiratory diseases (Asthma, Chronic obstructive pulmonary disease (COPD))

Neuro degenerative diseases including Parkinson disease, Alzheimer disease

Cancer (Brain, renal and Prostrate cancer)

Hormonal imbalances including infertility and breast pain

Cardio-vascular disease including artery diseases

Diabetes, birth defects and reproductive disorders.

References

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- Marrs, T. T., & Ballantyne, B. (Eds.). (2004). *Pesticide toxicology and international regulation* (Vol. 1). John Wiley & Sons.

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THANK YOU

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