

Natural Pesticides

Introduction of Natural Pesticides

Overview

- In Pharmacognosy, which is the study of crude drugs obtained from natural sources such as plants, animals, and minerals, the study of natural pesticides holds significant importance.
- Natural pesticides are substances derived from natural sources—primarily plants, but also microorganisms and minerals—that are used to control pests (insects, weeds, fungi, rodents, etc.) without synthetic chemical synthesis.
- Natural pesticides are known as biopesticides and offer an eco-friendly, biodegradable, and less toxic alternative to synthetic pesticides.



- In pharmaceutical sciences, particularly pharmacognosy, these agents are studied not just for pest control but also for their chemical constituents, mechanism of action, and potential therapeutic applications.
- Natural pesticides include botanical pesticides, microbial pesticides, and mineral-based pesticides.
- Among these, botanical pesticides are most studied in pharmacognosy due to their plant origin.

Importance of Studying Natural Pesticides

- Helps in identifying safe, sustainable, and biodegradable alternatives to synthetic pesticides.
- Promotes the use of ethnomedicinal knowledge where plants are traditionally used to repel insects or pests.
- Aids in pharmaceutical applications by isolating bioactive constituents that might have therapeutic potential.
- Encourages green chemistry and reduces toxic residue accumulation in ecosystems.

Examples of Natural Pesticides

Nicotine

- **Biological Name:** *Nicotiana tabacum*



- **Synonym:** Tobacco
- **Biological Source:** Leaves of *Nicotiana tabacum* (Family: Solanaceae)
- **Method of Preparation:**
 - Curing and drying of leaves
 - Extraction using acidified water or organic solvents
 - Concentration to obtain nicotine sulfate
- **Characteristics:**
 - Colorless to yellow-brown oily liquid
 - Strong odor and acrid taste
 - Highly volatile and hygroscopic
- **Chemical Constituents:**
 - Nicotine (alkaloid)
 - Nornicotine, anabasine (minor alkaloids)
- **Uses:**
 - Contact and fumigant insecticide
 - Effective against aphids and mites
 - Used in organic gardening (now limited due to toxicity)

Pyrethrum

- **Biological Name:** *Chrysanthemum cinerariifolium* or *Tanacetum cinerariifolium*



- **Synonym:** Dalmatian pyrethrum

- **Biological Source:** Dried flower heads of *Chrysanthemum cinerariifolium*, Family: Asteraceae
- **Method of Preparation:**
 - The flowers are harvested and dried.
 - The dried flowers are powdered and extracted using solvents (e.g., hexane or ethanol).
 - The extract is concentrated and formulated as pyrethrin-rich pesticide formulations.
- **Characteristics:**
 - Yellowish-brown powder.
 - Strong aromatic odor.
 - Light-sensitive and unstable in alkaline medium.
- **Chemical Constituents:**
 - Pyrethrins I and II, Cinerins I and II, and Jasmolins I and II
 - These are esters of chrysanthemic acid and pyrethric acid with alcohols like pyrethrolone.
- **Uses:**
 - Used as a natural insecticide for home and agricultural use.
 - Acts on the nervous system of insects, leading to paralysis and death.
 - Used in lice treatment shampoos and mosquito repellents.

Neem

- **Biological Name:** *Azadirachta indica* A. Juss.



- **Synonym:** Margosa tree, Indian lilac
- **Biological Source:** Seeds, leaves, and bark of the tree. Family: Meliaceae
- **Method of Preparation:**
 - **Neem oil** is extracted by cold pressing or solvent extraction of seeds.
 - Leaves are dried and powdered for aqueous extract.
 - Bark and seeds are decocted for bioactive compounds.
- **Characteristics:**

- Bitter in taste.
- Greenish-brown in color.
- Strong pungent odor.
- **Chemical Constituents:**
 - **Azadirachtin** (main pesticidal compound)
 - Nimbin, Salannin, Nimbidin, Gedunin
 - Triterpenoids and limonoids
- **Uses:**
 - Used as an **antifeedant, growth regulator, repellent, and sterilant** for insects.
 - Controls over 200 species of pests including aphids, beetles, and caterpillars.
 - Also used in pharmaceuticals for **antifungal, antibacterial, and anti-inflammatory** properties.

Rotenone

- **Biological Name:** Derived from *Derris elliptica*, *Lonchocarpus spp.*



- **Synonym:** Cube root, Fish poison
- **Biological Source:** Roots of *Derris elliptica*, Family: Fabaceae
- **Method of Preparation:**
 - Roots are dried and ground into powder.
 - Rotenone is extracted using organic solvents like chloroform or ethanol.
 - Purified via crystallization or chromatography.
- **Characteristics:**
 - White to light yellow crystalline solid.
 - Practically insoluble in water, soluble in organic solvents.
- **Chemical Constituents:**
 - **Rotenone** (isoflavonoid compound)
 - Other rotenoids: deguelin, tephrosin

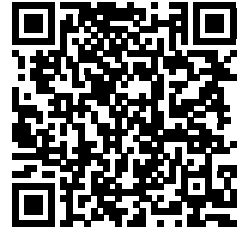


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