



# **BOTANICAL CONTROL**

The insecticides of plant origin extracted from seeds, flowers, leaves, stem and roots, are termed as botanical insecticides. Insecticides of plant origin unlike synthetic organic insecticides are safer to use but since they are expensive and lack residual toxicity, their use has been limited in the country.

In nature more than, 2400 plant species are reported to have pesticidal properties. The important families having pesticidal properties are

<b>Plant family</b>	<b>No. of plant having pesticidal property</b>
Meliaceae	> 500
Myrtaceae	72
Asteraceae	70
Euphorbiaceae	65
Leguminosae	60
Fabaceae	55

## **Neem (*Azadirachta indica*) (Meliaceae)**

Posses medicinal, insecticidal, insect repellent, antifeedant, growth regulatory, nematicidal and antifungal properties.

Contains a number of components such as **Azadirachtin, salannin, nimbin, epinimbin and nimbidin.**

Gives insecticidal, insect repellent, ovicidal, Antifeedant and growth regulator characters.

Azadiractitin disrupts moulting by antagonizing the insect hormone ecdysone. Azadiractitin Acute oral LD<sub>50</sub> for rat is 5000mg/kg, Acute dermal for rabbit is >2000mg/kg

### **Preparation of Neem Seed Kernel Extract (NSKE 5%):**

1. Take 50 g of powdered neem seed kernels, soak it in one litre of water for 8 hours and stir the contents often.
2. Squeeze the soaked material repeatedly for better extraction of the azadirachtin in the aqueous suspension.
3. Filter the contents through muslin cloth.
4. Make the filtrate to one litre.
5. Add 1ml teepol or triton or sandovit or soap water (2%) and spray



### **Preparation of Neem Cake Suspension:**

1. Soak one kg of neem cake in 5 liters of water for 2 days and filter It through muslin cloth.
2. Dissolve 200 g of soft soap in the filtrate and make upto 10 L of water before spraying.
3. Controls tobacco cutworm, leaf miners of citrus, groundnut, tomato and beans etc.

## Insecticidal Activity

- Dried powder of neem leaves are used against stored grain insect pests.
- Leaf extracts showed insecticidal property against Lepidopteran pests.
- Desert locust *Schistocerca gregaria* avoids feeding on neem leaves.
- Neem leaves are found as **attractants to white grub *Holotrichia*** adults.
- Neem seed/ kernel extract showed insecticidal properties against a number of sucking pest.
- Neem oil can be used against storage insect pests @ 1 to 2% and field insects @ (0.2 -0.4%, 1 to 2% 5% or 10% neem oil)
- Neem products are **safer to honey bees, parasitoids, predators.**
- Commercial formulations of neem are available in 1000 ppm, 1500 ppm and 300 ppm in the market.
- Some of the neem formulations are **Margosan, Neemark, Neemrich, Achook, Nimbicidine** etc.



# Nicotine (Solanaceae)

Found in the **leaves** of *Nicotiana tabacum* and *N. rustica* from **2% to 14%**.

**Nicotine sulphate**- contact insecticide with marked fumigant action in the control of sucking insects.

More stable and less volatile and is a nerve poison.

Highly toxic when absorbed through the cuticle, trachea or injection.

Affects the ganglion blocking conduction at higher levels.

Contains **40% alkaloid**, is safer and is more convenient to use.

Free alkaloid is liberated by the addition of soap lime or ammonium hydroxide to the spray solution.

Dust formulation of nicotine sulphate releases **nicotine in the presence of moisture**

## **Tobacco decoction:**

1. Useful for controlling aphids, thrips etc.
2. Prepared by boiling 1kg of tobacco waste in 10lts of water for 30 minutes or steep it in cold water for a day.
3. Make it up to 30 litres and add about 90gm of soap.
4. Addition of soap improves wetting, spreading and killing properties.
5. Does not leave any harmful residue on treated surface.
6. LD<sub>50</sub> for rat oral- 50-60 mg/kg.



## Rotenone (Fabaceae)

1. From the **roots** of derris plant which many contain 4 to 11% rotenone
2. Principal commercial sources are *Derris elliptica* and *Lonchocarpus utilis*.
3. Rotenone occurs in **Derris roots (4-9%), Lonchocarpus (8-11%)**
4. **Oxidizes to non-insecticidal** compound in the presence of **light and air**
5. Hence rotenone residues are difficult to find after 5 to 10 days in normal sunlight
6. Insects show a steady decline in oxygen consumption followed by paralysis and deaths
7. **Highly toxic to fishes** and to most insect species but almost harmless to warm blooded animals except **pigs**
8. LD<sub>50</sub> to white rat oral-130 to 1500
9. Dust or spray containing 0.5 to 1.0 per cent and 0.001 to 0.002 per cent rotenone are used commercially



# Plumbagin:

1. Naturally occurring **Napthoquinone** of plant origin from the **roots** of *Plumbago europea* (Plumbaginaceae)
2. Known for its medicinal, antifertility, antimicrobial, molluscicidal, nematocidal and other pharmacological properties
3. Yield of plumbagin ranges between **0.5-3.0 %** on dry weight basis
4. The cold alcoholic extract (5%) of roots of *P. zeylanica* was toxic to Castor Hairy caterpillar, *Euproctis fraterna* larvae as contact spray.
5. 5% petroleum ether extracts of *P. zeylanica* root against *Spodoptera litura* and *Dysdercus koenigii* etc.



## Pyrethrum:

From dried flower heads of *Chrysanthemum cinerariaefolium* (Asteraceae)

The actual chemical ingredients having insecticidal action are identified as five esters

They are: Pyrethrin I, Pyrethrin II, Cinerins-I and Cinerin-II and Jasmoline

Predominately found in achenes of flowers from **0.7 to 3 %**

The esters are derived from the,

1. Two acids – Chrysanthemic acid and Pyrethric acid
2. Three alcohols – Pyrethrolone, Cinerolone and Jasmolone

Active principles/Esters

Pyrethrin I = Pyrethrolone + Chrysanthemic acid

Pyrethrin II = Pyrethrolone + Pyrethric acid

Cinerin I = Cynerolone + Chrysanthemic acid

Cinerin II = Cynerolone + Pyrethric acid

Jasmolin II = Jasmolone + Pyrethric acid



- Prepared by grinding the flowers
- The powder mixed with a diluent such as talc or clay is known as pyrethrum dust
- It is prepared just before use as it gets deteriorated rapidly
- Also used as emulsions, solutions, and aerosols
- Unstable to light, air moisture and alkali
- Residues deteriorate very rapidly after application
- Powerful contact insecticides but appear to be poor stomach poisons
- A characteristic action of pyrethroid is the rapid paralysis or ‘knock down’ effect and substantial recovery that follow it
- This recovery is due to rapid enzymatic detoxification in the insect
- To bring about mortality equivalent to knock down effect three times increase in dosage may be required

## Properties

1. Highly unstable in light, moisture and air
2. Have no residual effect
3. Paralyse by more contact
4. Gains entry through spiracle and cuticle
5. Act on central nervous system
6. Having rapid knock down effect
7. Practically no mammalian toxicity
8. Good insecticides against household and cattle pests



## Sabadilla:

- It is an alkaloid found in seeds of tropical lily *Schoenocaulon officinale* (fam: Liliaceae)
- The alkaloid mainly, **Cevadine and Veratridine** act as nerve poisons
- It is harmful to pollinator, **honey bees**



## Ryanodine:

- It is an alkaloid derived from woody stems of South American shrub, *Ryania speciosa* (Fam; Flacourtaceae)
- Activity: It acts as muscular poison by blocking the conversion of ADP to ATP in striated muscle.
- It acts as slow acting stomach poison and causes insects to stop feeding after they eat it.
- It is reportedly effective against thrips and worms.
- It is used as dust (20-40%)



## **Petroleum Oil:**

Oils with UR (Unreacted residue) value 50-90% are dormant oils. (Phytotoxic)

Oils with UR value 90-96% are summer oils. (Safer)

**Nereistoxin** is an insecticide of animal origin isolated from a marine annelid (*Lumbrinereis heteropoda*)



**Quassia** is obtained from **bark** of *Quassia amara* (Alkaloid – Quassin and Neoquassin)

**Tephrosin** is present in **leaves and seeds** of *Tephrosia vogelli*

**Acorus** is extracted from the **roots and seeds** of sweet flag, *Acorus calamus*

**First systemic organic insecticide** is **Sodium fluoacetate** from South African Plant, (*Dichapetalum cymosum*)

