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Pesticides of Natural origin



Pesticides:

Introduction:

- ▶ **Pest:** Any animal, plant or microorganisms that causes trouble, injuries or destruction.
- ▶ Some insects destroy or cause heavy damage to valuable crops such as medicinal plants, rice, wheat, cotton and corn.
- ▶ **Pest includes:** Bacteria, fungi, rats and weeds such as ragweed and poison ivy.
- ▶ **Pesticide:** 2 types are synthetic and natural origin.
- ▶ **Methods of pest control:**
 1. Natural control
 2. Artificial control: Mechanical control, Agricultural control, Chemical control, Biological control.

Classification of pesticides:

- ▶ Classified according to the pest they control.
 1. Insecticides
 2. Herbicides
 3. Fungicides
 4. Rodenticides

Characteristics of ideal pesticides:

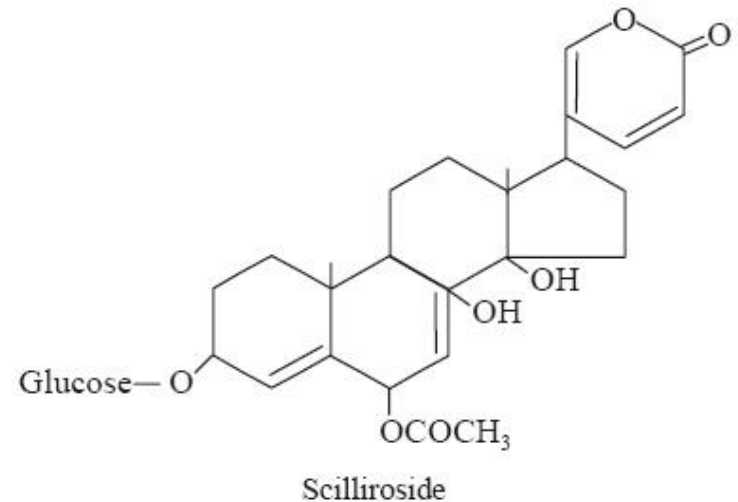
- ▶ Should have a high margin of safety for plant and animals, causing very little or no damage to foliage or live stock respectively.
- ▶ It should be safe.
- ▶ Easy to handle and apply.
- ▶ Should not show toxicity in case of warm blooded animals
- ▶ Should not have inflammable or explosive characters
- ▶ Should retain safety and palatability of the food products exposed to insecticides and should not show residual effects of pesticides.
- ▶ Should be easily available at affordable cost.

Red Squill:

Biological source: It consist of whole bulb or dried scales and powder of *Urginia maritima*, family *Liliaceae*.

- ▶ It is distinguished from the white variety on the basis of its reddish color.

Chemical constituents: Cardiac glycosides and an active principle scilliroside which is very toxic to rats.



Red squill:

Uses:

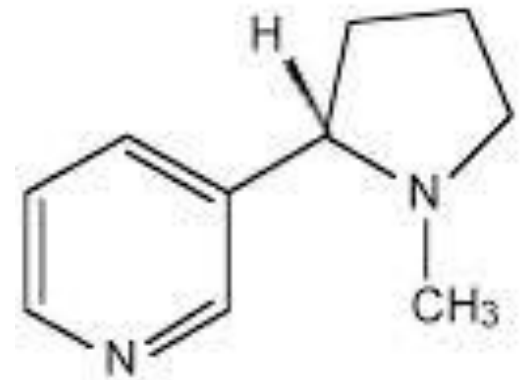
- ▶ It acts on CNS of rodents.
- ▶ Unlike other mammals, rodents do not regurgitate the red squill and death follows convulsions and respiratory failure.
- ▶ Red squill is not considered acceptable to animals other than rodents but poisoning has been reported in cattle, sheep, chicken and dogs.
- ▶ It is incorporated as a pesticide in rat pestes.
- ▶ As a poison for animals is prohibited in England and considered as a cruel poison.

Nicotin or Tobacco:

Biological Source: Dried leaves of *Nicotiana tabacum*, family Solanaceae.

Chemical constituents:

- ▶ Pyridine-piperidine type of alkaloids
- ▶ Most prominent is Nicotine.
- ▶ Other alkaloids are nornicotine and anabasine.



Nicotine

Nicotine

Uses:

- ▶ Exerts stimulant effect on heart and CNS
- ▶ Powerful quick acting poison
- ▶ Even 40mg of dose is fatal to humans.
- ▶ Controls wide range of insects.

Pyrethrum:

Synonym: Insect flowers, Dalmation
Insect flowers.

Biological source: These are
expanded flower heads of
Chrysanthemum cinerariaefolium
family *compositae*. It should
contain NLT 0.7% of total
pyrethrins.

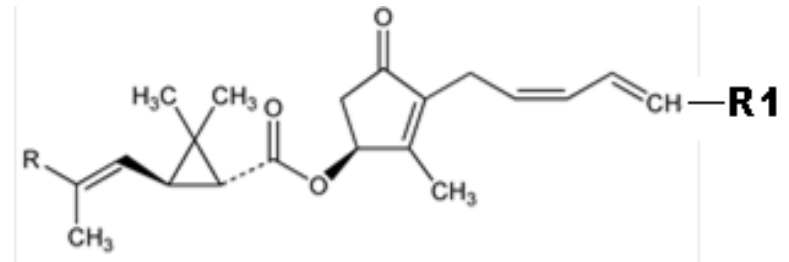
Geographical source: Yugoslavia
(Dalmatia), Japan, Brazil, Kenya,
Zaire, Tanzania and India. Jammu
and Kashmir are the major areas
of cultivation in India.



Pyrethrum:

Chemical constituents:

- ▶ Insecticidal principles of pyrethrum are located in the oleoresin secretion of floral parts (achenes) of partially open or closed flowers.
- ▶ Pyrethrin-I and II are the main active constituents.
- ▶ Cinerin I and II, Jasmoline I and II all these are esters.
- ▶ Allethrin I and II, these are the synthetic analogues of naturally occurring insecticides i.e. pyrethrin, cinerin and Jasmoline.
- ▶ Pyrethrosin, pyrethrol and sesquiterpene lactones.



Ester	R I	R
Pyrethrin-I	CHCH-CH ₂	CH ₃
Pyrethrin-II	CHCH-CH ₂	COOCH ₃
Cinerin-I	CHCH ₃	CH ₃
Cinerin-II	CHCH ₃	COOCH ₃
Jasmolin-I	CHCH ₂ CH ₃	CH ₃
Jasmolin-II	CHCH ₂ CH ₃	COOCH ₃

Pyrethrum:

Uses:

- ▶ Since long used as an insecticide and as contact poison.
- ▶ Paralyzes different types of insects in short time.
- ▶ Shows rapid toxicity towards different pests, but very low toxicity in mammals.
- ▶ Previously it was used in the form of powder or extracted with odorless kerosene.
- ▶ The extracts containing about 20 % of pyrethrins, are used in the form of dust, wettable powder, emulsion, concentrate kerosene solution and aerosol.
- ▶ Pyrethrum extract is mixed with other insecticides which enhance the action of pyrethrum by synergistic effect, it is used to kill different plant insects and also flies and mosquitoes.

Neem:

Synonym: Margosa

Biological source: It consist of all aerial parts of plant *Azadirachta indica*, family *Meliaceae*.

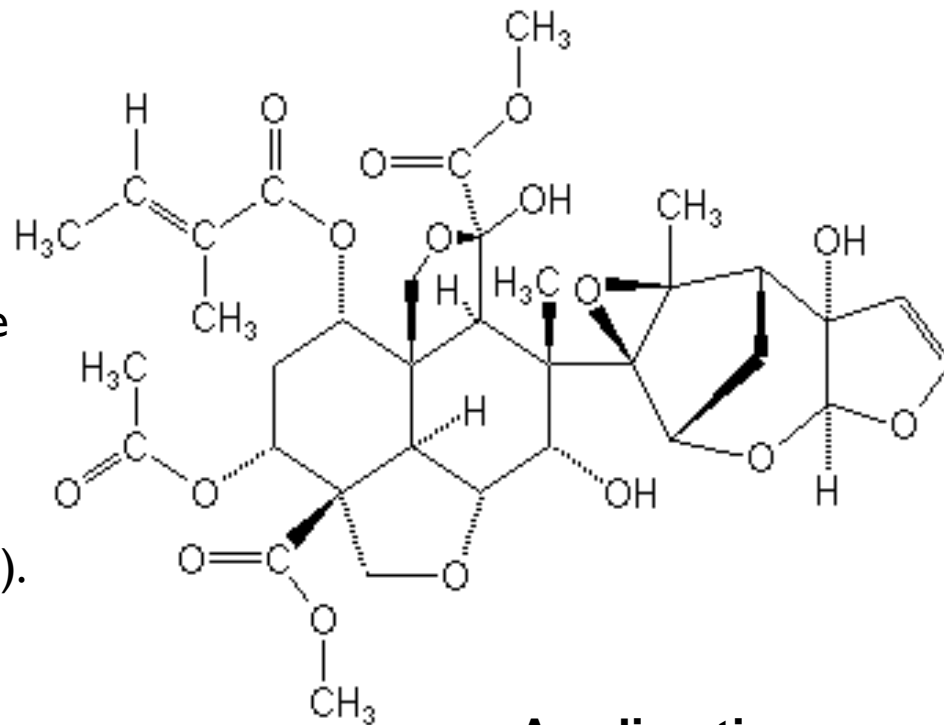
Geographical source: India, Bangladesh, Pakistan, Thailand, Malaysia, Mauritius, Fiji, South Africa and East Africa.



Neem:

Chemical constituents:

- ▶ Diterpenes: Sugiol, Nimbiol (bark)
- ▶ Triterpenes: β -sitosterol, stigmasterol (leaf)
- ▶ Limonoids: Maliantriol, Nimbidinine (Seed oil), Nimbendiol and **Azadiractin** (seed).
- ▶ Sulphours compounds: Number of cyclic tri and tetrasulphides (leaves).
- ▶ Flavonol glycosides: Nimaton, quercitin, myrecitin, Kaempferol.
- ▶ Neem leaves contain not less than 1.0 % w/w of Rutin.



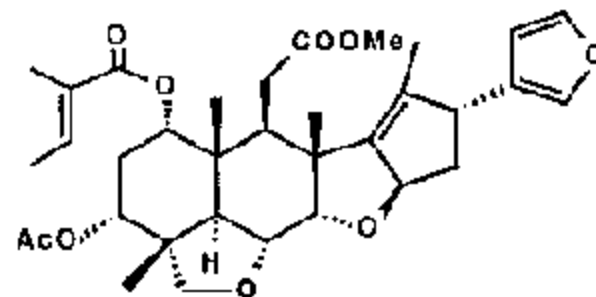
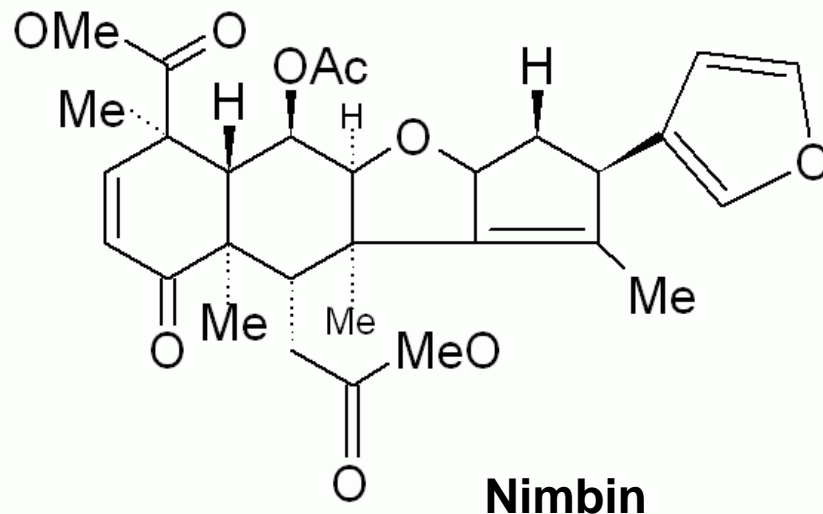
Azadiractin

Neem

- ▶ Neem oil contains 2% bitters, which are sulphur containing compounds nimbin, nimbidin, nimbinin and nimbiol.
- ▶ Azadirachtin-K, new tetraterpenoid has been isolated from seed kernels of neem alongwith other compounds such as nimbolide, olichinolide B, nimbin, 6-deacetyl nimbin, salanin and azadiradione.

Uses:

- ▶ Studied significantly and reported that it contains different chemicals which have insect repellent, insecticide, antifeedant, nematicide and antimicrobial properties.
- ▶ Seed oil has spermicidal activity.



Neem

- ▶ Leaves: Azadiractin- insect repellent
Meliantriol and Salanin- anti-feedant
- ▶ Seeds: Nimbin, Nimbidin- antiviral action
Azadirachtin- insect repellent
- ▶ Flowers: Nimbosterol, myristin, Kaempferol- insecticidal
- ▶ Fruit: Deacetyl azadirachtinol- paralyses insects
- ▶ Bark: Nimbin, Nimbinin, Nimbidin- antiviral action
Margolone, margolonone- antibacterial
- ▶ Roots: Excellent for reforestation, compounds with antibacterial and antifungal properties.