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Classification Based On Mode of Entry

1. Stomach poisons
2. Contact poisons
3. Systemic poisons
4. Fumigant poisons

Stomach Poisons

Characteristics:

- Usually applied against chewing insect pests
- Also used to kill higher animals (Rodents, Jackals, Lizards)
- Applied by mixing in food
- Applied by mixing in attractant
- Available in formulations: sprays, dusts, dips or baits

- Pre-requisites for stomach poisons (to be acceptable for common use)

a. Should not damage the foliage

b. Should be insoluble in water

c. Should be potent/quickly kill the insects

d. Should be inexpensive

e. Should not be distasteful to insects

f. Should be stable

g. Should not break down easily

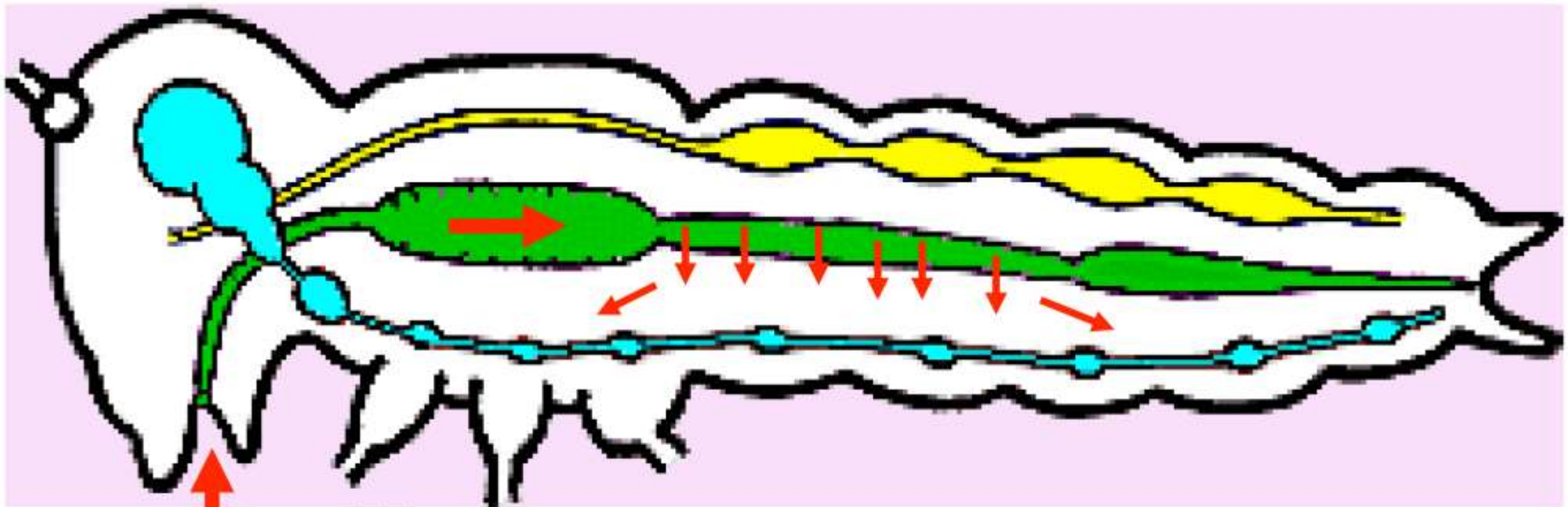
h. Should have good adhering ability

➢ These poisons include elements, inorganic & organic compounds

Examples

- **Elements:** Thallium, Phosphorous, Sulphur, Mercury etc.
- **Inorganic compounds:** Lead arsenate, Paris green, Sodium flouride, Sodium cryolite, Borax etc.
- **Organic compounds:** Organochlorines, Organophosphates, Carbamates, Synthetic pyrethroids etc.

Mode of entry: stomach



Insecticides

Stomach poison (insecticide): Bt toxin

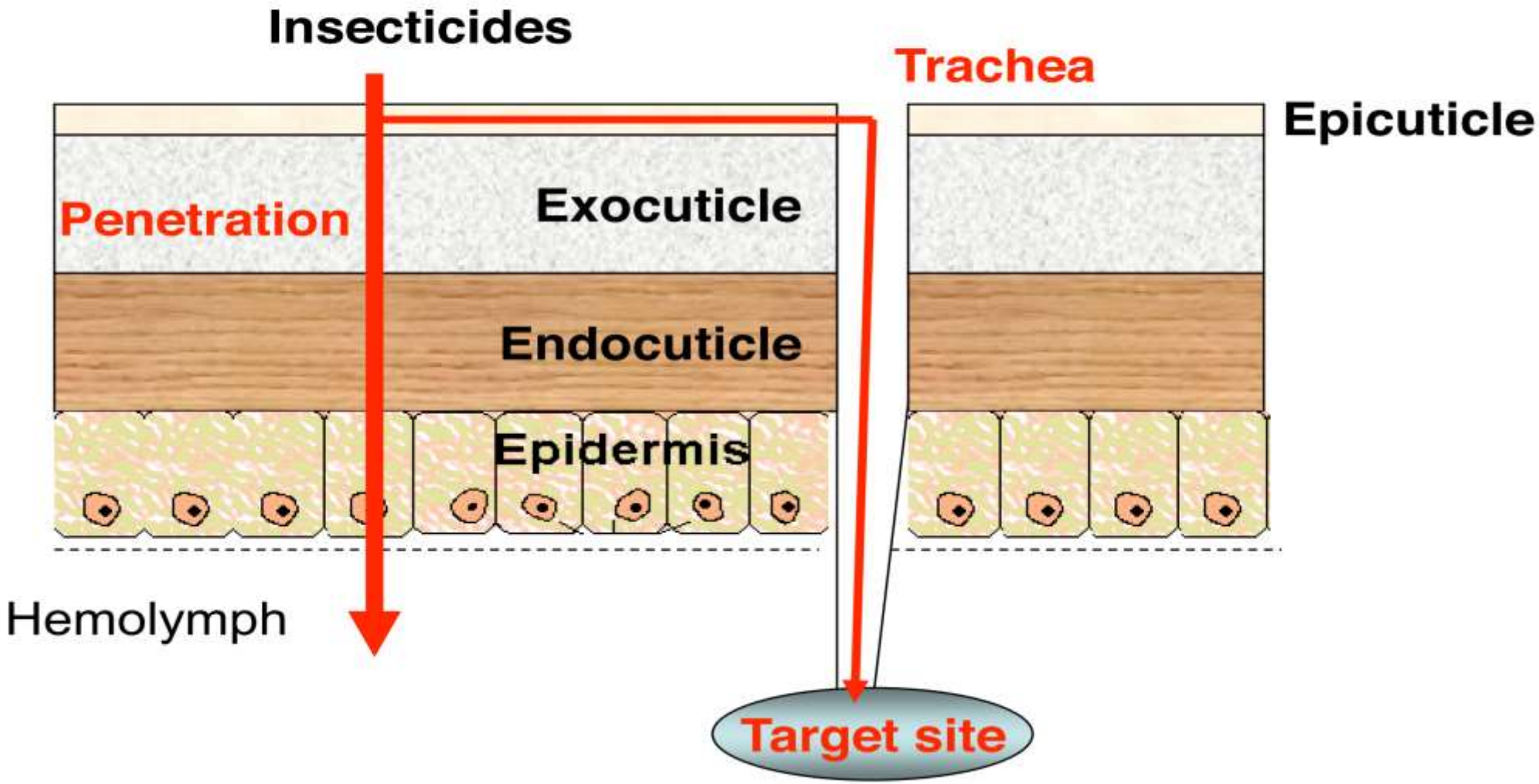
Contact Poisons

- Easily available in market
- Applied as dusts or sprays (either on bodies or to the places frequently visited by insects)

- Kill the insects by:
  - Clogging spiracles and respiratory system
  - Acting as nerve or general tissue poisons, after entering into blood through cuticle

- Highly lipophilic (readily absorbed by lipid present in epicuticle of insect exoskeleton)

Mode of entry: integument

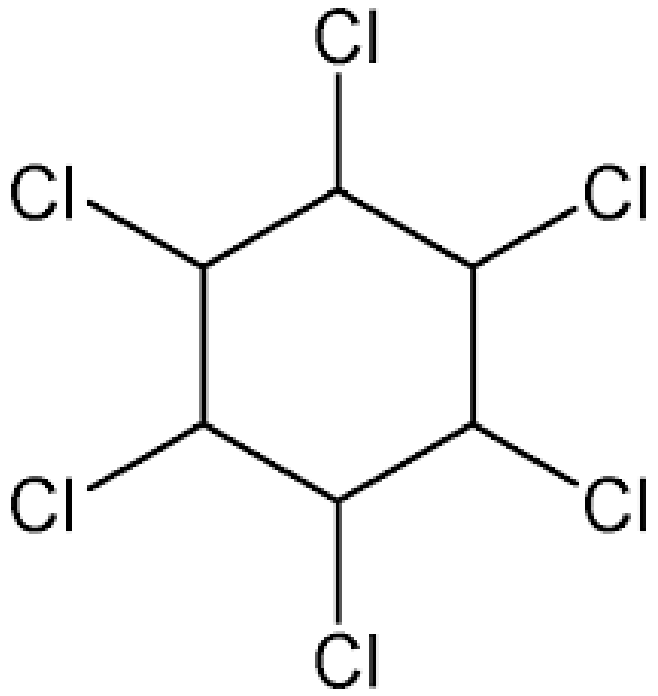


- Effect the sensory organs present in tarsi of legs
- Pre-requisites for contact poisons (to be acceptable for common use)

a. Should not be phytotoxic

- Most of insecticides damage citrus inflorescence, hence cant be applied when plants are in blossoms
- DDT & BHC applied in any form kills cucurbits

  hence, care is required



Benzene hexachloride (BHC)

b. Toxic to mammals & readily absorbed by skin

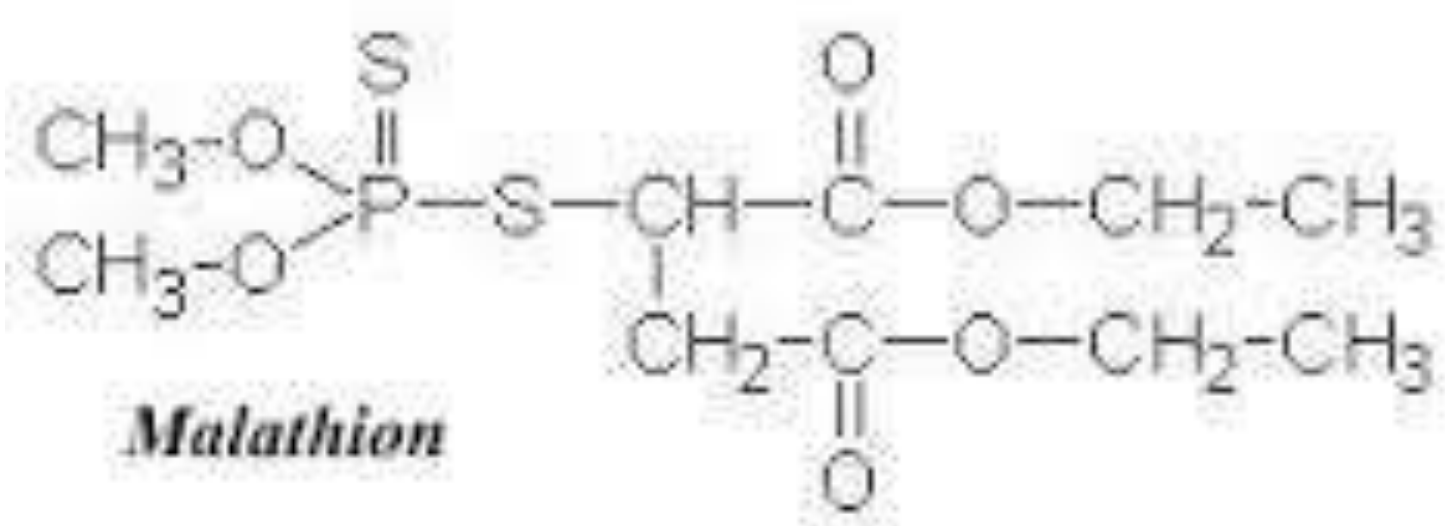
c. Parathion & Endrin may cause death of operator, if precautions are not taken

- Wide range is available in market
- Organic compounds are safe to human & domestic animals

(Nicotine sulphate, Anabasine, Neem extract, Dharek extract, Rotenone etc.)

(*Derris chinensis, Tobacco)*

- *Example*



Malathion

Systemic Poisons

- Chemicals when applied, are absorbed & translocated to various plant parts in amount lethal to insects which feed on them
- For insects having piercing M.P.s and suck cell sap by proboscis
- Translocation takes place by xylem vessel only (water & nutrients)

- These are harmless to natural enemies
- Most of these insecticides act as both stomach & contact poisons
- Examples
- Demeton (phosphorothioate)
- Phorate (organophosphate)

Types of Systemic poisons

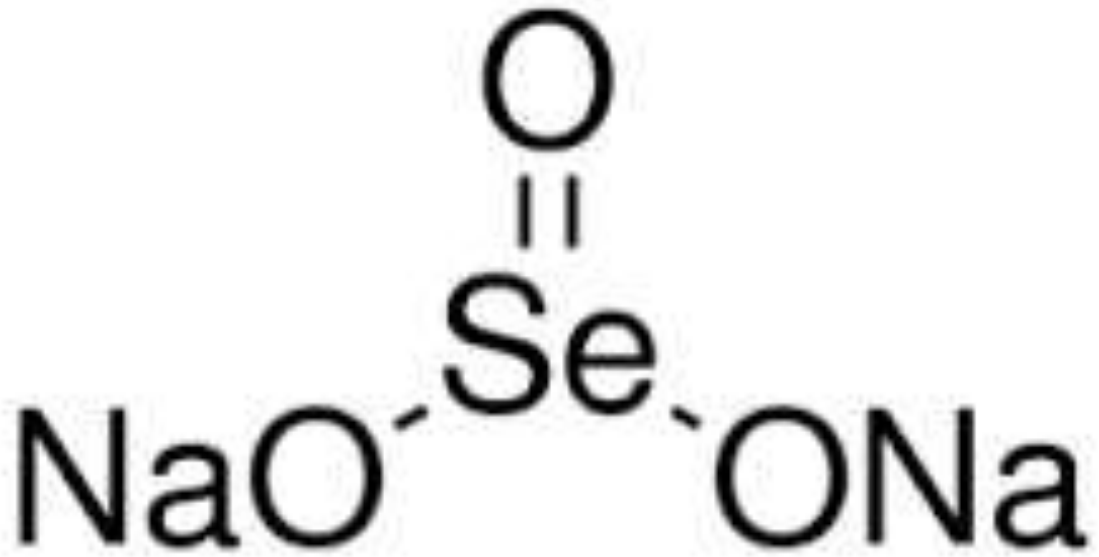
1. <u>Stable systemics:</u>

- These chemicals do not metabolize in the system (soil/environment/plant tissue)

Example:

Sodium selenate

(Na_2SeO_4)



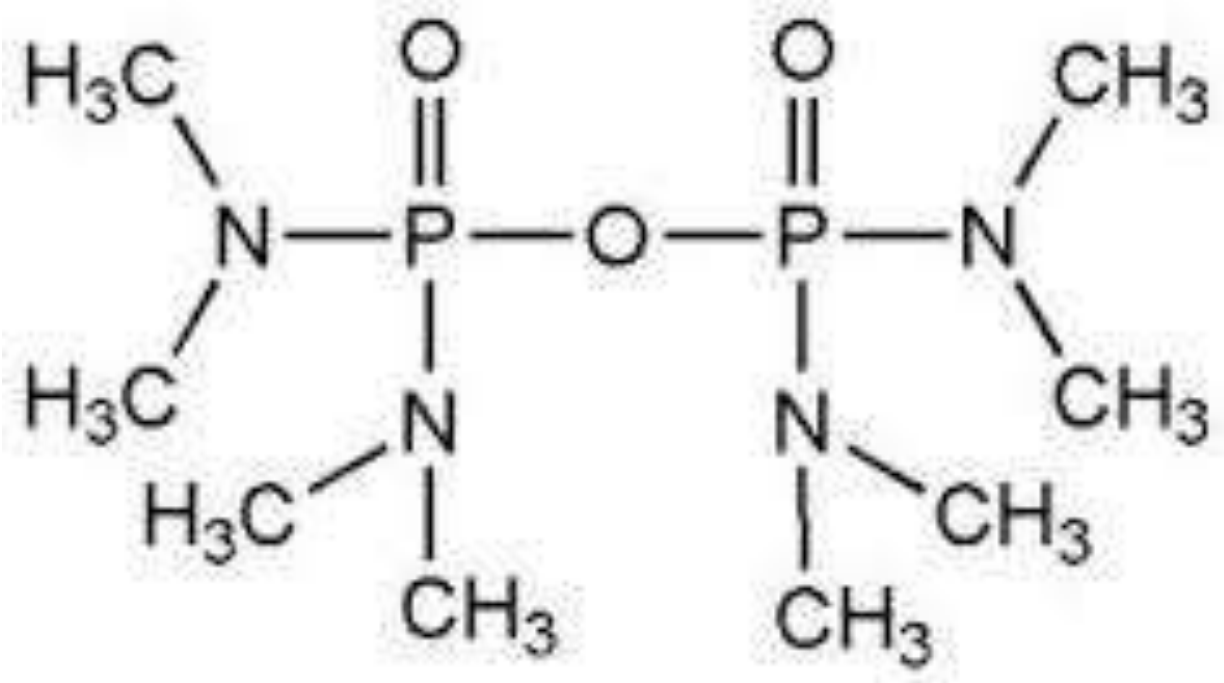
2. <u>Endolytic systemics:</u>

- Insecticides in which toxic compound is present in 98% in its original form, taken by insect body

Example:

Schradan

(Octa methyl tetra amide pyrophosphate)



3. Endo metatoxic systemics:

- These Insecticides are partly or wholly metabolized into other toxicants inside the plant themselves

- Three types:

a) Thioether family
b) Carbamate family
c) Other systemics

a) Thioether family:

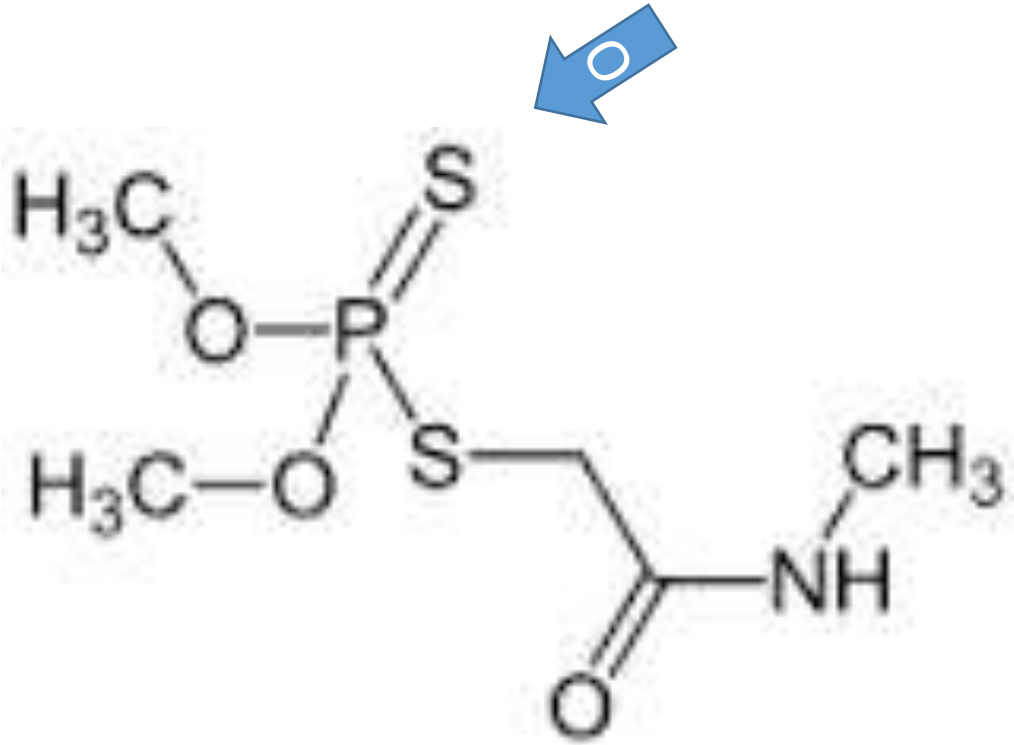
- These are **oxidized** in plants to sulphoxides & then to sulphones which are more toxic metabolites then parent compounds
- E.g. Phorate, Disulfoton, Demeton

b) Carbamate family:

- In such compounds, thion **Sulphur atom**

is replaced by **oxygen** in plant,

a much toxic compound is produced

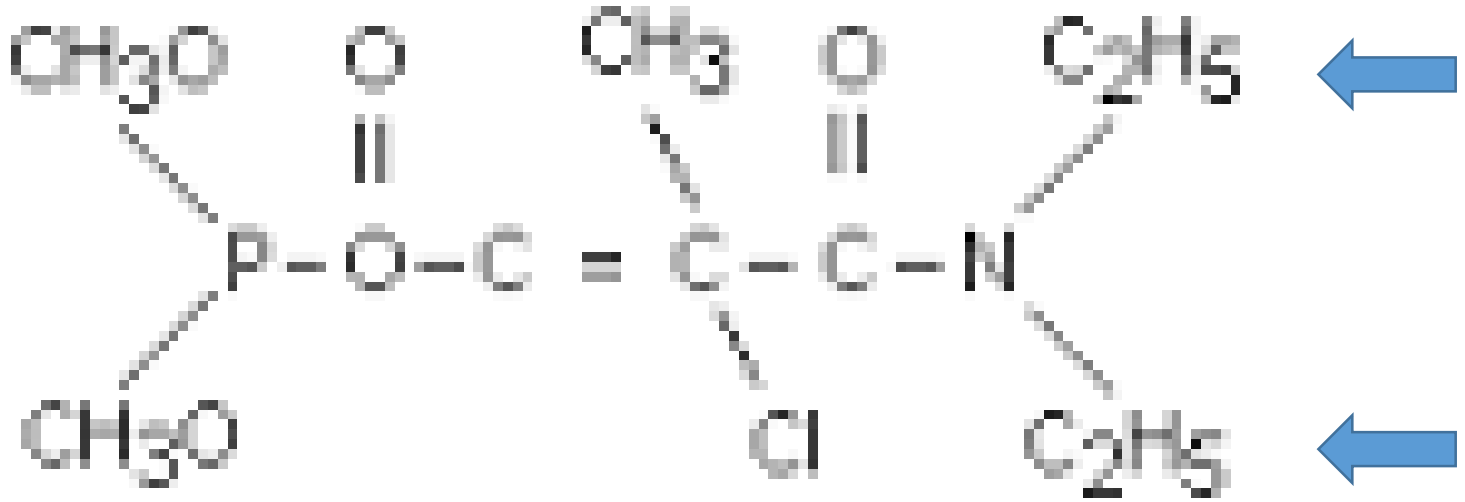


- E.g. Dimethoate

c) Other systemics:

- In these chemicals, one of the **ethyl group** is removed from parent compound and forms a more toxic compound
- E.g.

Phosphamidon



4. Loco-systemic insecticides:

- Less soluble in water, easily soluble in lipids
- Lipophilic in nature
- These chemicals enter in waxy cuticle of leaves and can diffuse short distances from the point of original contact
- These can travel from upper to the lower surface of leaf, hence called "**Translaminar insecticides**"
- Imp. for insects on low growing plants (Strawberries), where direct contact of spraying is impracticable
- After absorption, these chemicals are not readily removed by rain

Conti…

- Persistent for a few days to a few weeks

- Therefore, also known as “**Persistent contact poisons**”

3 types:

1. Malathion family
2. Parathion family
3. Diazinon family

Fumigants

- Insecticides that became gasses above 5^{o}c
- Enter in **Tracheal system,** circulates with hemolymph & absorbed by body tissues
- They are poisonous gasses either derived from solids or liquids

<u>Uses:</u>

- To kill stored grain insect pests
- Against insects found in animal sheds
- Against soil infesting grubs & nematodes
- Against scales infesting the nursery stock

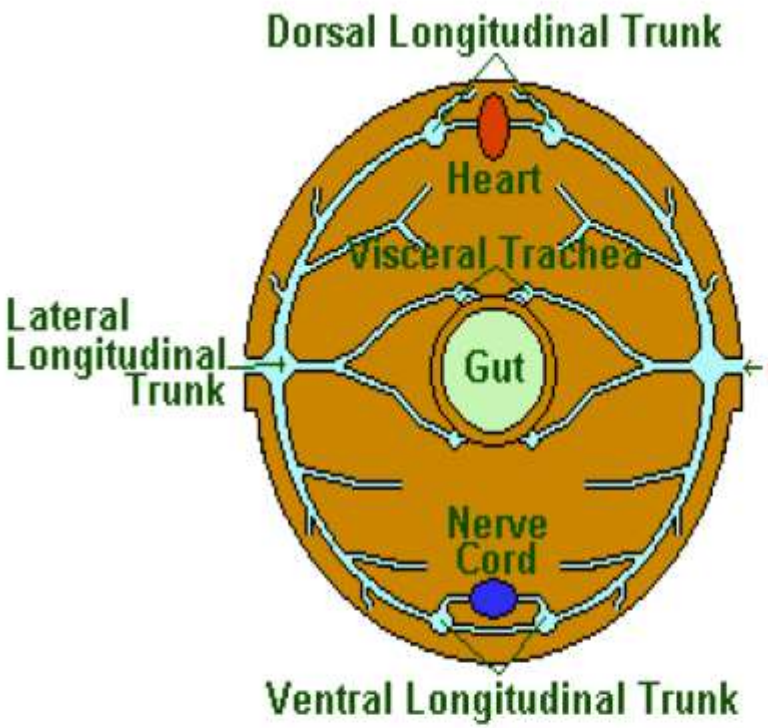
- Against borers in trees & wooden structures
- Against all kinds of greenhouse pests
- Against worms found inside the intestine of animals
- All fumigants are deadly poisons, great care is needed
- E.g. Nicotine, Hydrogen cyanide, Carbon bisulphide, Sulphur dioxide, naphthalene, Methyl bromide etc.

- Fumigants are dependent on temperature and atmospheric pressure

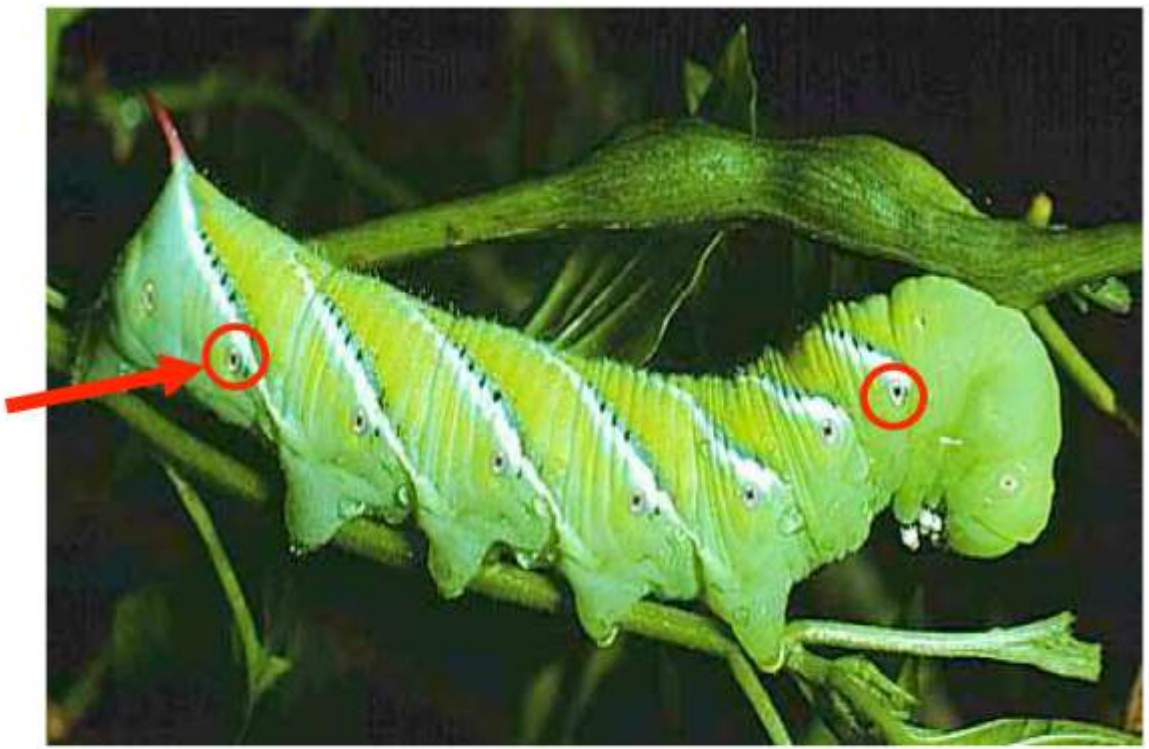
- In partial vacuum, penetration is very much enhanced

- At lower temp., longer exposure is required to kill the peststhan at room temp (21-37^{o}c)
- Insects mortality rate depends on:
- gas used for fumigation
- Dose rate
- Exposure time
- Absorption by food stuff
- Moisture level of food stuff

Mode of entry: spiracle and trachae



Spiracle



Useful properties of good fumigant:

- Should be volatile enough (Evaporative)
- Should penetrated deeply into store products
- Should be toxic or repellent to insects & mites
- Should be least toxic to humans
- Should not be corrosive
- Should not deteriorate seed quality
- Should not leave any toxic residues on food stuff

Hazards:

- Flammability of certain gasses
- Accidental poisoning of man