

INSECTICIDE FORMULATIONS

- **AI = active ingredient**, chemicals that are responsible for the pesticidal effect
- **Inert ingredient** = any substance in a pesticide formulation having no pesticidal action
- **Formulation** = the way a pesticide is prepared for practical use
- **Carrier** = inert liquid or solid added to an active ingredient to prepare a pesticide formulation

What?

Formulations of Insecticides: processing of the toxic substance to improve its

properties of storage

handling

application

effectiveness and

safety to the applicator and environment and profitability

It is the **final physical condition** in which insecticide is sold

Why?

- To come into **direct contact** with the pest or leaf
- **Uniform and persistent deposit** upon the plant surface
- Since **very small quantity of toxicant** is required to be **distributed over a large area**
- Formulated in a form suitable for use as a **spray, dust or fumigant**

1. Dusts (D):

- **ready to use insecticides in powder form**
- Diluted by a suitable **finely divided carrier**
- Carrier may be an **organic flour or pulverized mineral or clay**
- Toxicant ranges from **0.15 to 25%**
- Particle size is **less than 100 microns**
- With **Decrease** in particle size, the toxicity **increases**
- Easy to apply, **less labour** and water is not necessary
- Loss of chemical occurs due to **wind drift**
- Done in calm weather, **early morning hours when the plant is wet**
- **Eg.** HCH 10% dust; Endosulfan 4% D

2. Granules or Pelleted insecticides(G):

- Ready to use **granular forms**
- Composed of a **base fused with the toxicant**
- Particle size **0.25 to 2.38 mm**
- Contains **1 to 10%** concentration
- Applied in **water or whorls of plants or in soil**
- Action may be by **vapour or systemic**
- **very little drift and no undue loss of chemical**
- Undesirable contamination is prevented
- **Residue problem is less**
- Release of toxicant is achieved over a **long period**
- Easy for application **as water is not required**
- **Less harmful for natural enemies**

Eg: Carbofuran 3G, Phorate 10 G, Cartap hydrochloride 4G

3. Wettable Powders (WP): It is a powder formulation

- To be **diluted with water** and applied
- Yields a **stable suspension** with water
- **Active ingredient** (toxicant) ranges from **15 to 95%**
- Toxicant is blended with a **diluent**, a **surfactant** and **an auxiliary material**
- Sometimes **stickers** are added to improve retention on plant surface
- Loss of chemical **due to run off**
- More water is required

Eg: Carbaryl 50%WP, Thiodicarb 75%

4. Emulsifiable Concentrates(EC):

- Contains the **toxicant**, a **solvent** and **an emulsifying agent**
- Yields an emulsion of **oil-in water** type, with water
- Active ingredient (toxicant) ranges from **2.5 to 100 %**
- When sprayed the solvent and water evaporates quickly leaving a deposit of toxicant
- The emulsifying agents are **alkaline soaps, organic amines etc.**
- Eg: Endosulfan 35EC, Profenophos 50EC

5. Soluble Powder or Water Soluble Powder (SP or WSP): readily soluble in water

- Surfactants improves the **wetting power** of the spray fluid
- **Anti-caking agent** is added which prevents formation of lumps in storage
- Usually contains a **high concentration of toxicant** **Eg:** Acephate 75 SP

6. Suspension Concentrate (SC):

- Active ingredient is absorbed on to a **filler which is then suspended in a liquid matrix** (water)
- It is not dusty and easier to disperse in water **Eg:** Imidacloprid 50 SC

7. Flowables (F): When an **ai is insoluble**, a flowable formulation is developed

- Toxicant is **milled with a solid carrier** and dispensed in a small quantity of water
- Prior to application it has to be diluted with water
- Flowables do not usually clog nozzles and require only moderate agitation **Ex;** Methoxyfenozide(Intrepid 2F)

8. Water Dispersible Granules (WDG): appears as small pellets or granules

- When the granules are mixed with spray water, they break apart and, with agitation, the active ingredient becomes distributed throughout the spray mixture. **Ex: Thiamethoxam 25 WDG**

9. Solutions: water insoluble but soluble in organic solvents like amyl acetate, kerosene, xylene etc.,

- Some toxicants are dissolved in organic solvents and used directly for the control of household pests. Eg. Baygon

10. Concentrated insecticide liquids: the toxicant at highly concentrated level is dissolved in non-volatile solvents

- Emulsifier is not added
- Generally applied from **high altitudes** in extremely fine droplets
- **Never diluted with water** at ultra volume rate
- There is greater residual toxicity and less loss through evaporation
- Active ingredient ranges from 80-100% **Eg:** Malathion, Bifenthrin, Fenitrothion.

11. Insecticide aerosols:

- Toxicant is suspended as minute particles 0.1 to 30 microns in air as fog or mist
- The toxicant is dissolved in a liquified gas and if released through a small hole
- causes the toxicant particles to float in air with rapid evaporation of the released gas **Eg:** Allethrin

12. Fumigants: volatile at ordinary temperature and sufficiently toxic is known as fumigant

Most fumigants are liquids held in cans or tanks

They are mixtures of two or more gases

places not easily accessible to other chemicals can be easily reached **Eg;** Aluminium phosphide

13. Microencapsulation: consist of dry and liquid pesticide particles enclosed in tiny plastic capsules

- Mixed in water and sprayed
- The capsule slowly releases the pesticide
- Prolong the active life of the pesticide by providing timed release of the active ingredient **Ex:** Lambda-cyhalothrin

14. Baits: In baits, **a.i is mixed with edible substance**

- These are always **stomach poisons**
- made up of 3 components, Poison (Insecticide carbaryl), Carrier or base(Rice bran), and Attractant (Jaggery) at ratio of **1:10:1**
- Poison should be strong and easily soluble
- Base is the **filler like rice bran** with just enough water

14. Insecticide Mixtures: Involve combinations of two or more insecticides in the right concentration into a single spray solution

- savings in labor costs
- The use of pesticide mixtures may result in synergism or potentiation (enhanced efficacy) and the mitigation of resistance

Ex: Chlorpyrifos 16% + Alphacypermethrin 1% EC

Chlorpyrifos 50% + Cypermethrin 5% EC