21.PESTICIDE FORMULATIONS

Pesticides are formulated to make their application easier and to improve their effectiveness under field conditions. Formulation also improve the properties, storage, handling and safety.

Formulation is the process by which the active ingredients are made ready to be used by mixing with liquid or dry diluents by grinding or by addition of emulsifiers, stabilizers and other formulation adjuvant to form a commercial product.

Classification of Formulations

a) Dry formulations

- Dusts
- Wetable Powders
- Crannels
- Seed disinfections
- Others

b) Liquid Formulations

1. Emulsion concentrates
2. Oil concertrates
3. Others

c) Others

A) DUSTS

Dusts consist of a mechanical mixture of the active ingredients with or without an inert diluent pulverized to a particle size of 3 to 30 μ. Dusts can be classified as follows:

1. Undiluted toxic agent (sodium fluoride)
2. Toxic agent with an active diluent (rotenone with sulphur)
3. Toxic agent with an inert diluent (DDT with pyrophyllite)
4. Inert dusts (silica)

Insecticides like calcium arsenate, sodium fluoride ground pyrethrum flowers may be applied as dusts with diluent.

Others like rotenone can be mixed with insectides like sulphur and applied. Others may be diluted with inert materials like talc in order to cover more area and also to reduce the phytotoxicity of the chemical or to improve the chemical or physical properties.

When inert materials like silica, saw dust, ash are used they may cause abrasions on the pest surface or absorb moisture and desiccate them.

Method of Manufacture

Two methods are employed

1. Ball Mill Method
2. Solvent Mix Method / Toxicity Spray Method

1. Ball Mix Method

In this method the ingredients *viz*., the active ingredients and fillers like soap stones, talc or pyrophyllite are intimately ground in a Ball Mill and mixed together by the blending operations of a mechanical mixture. In the grinding process, heat develops and increase the temperature, which melts the pesticide and thus gives a fine coating on the inert material. Also in the grinding process the pesticide particles get distributed among the diluents. Consequently grinding of the active ingredient together with the diluent gives a more efficient formulation than separate grinding of the ingredients with subsequent mixing. The finer the grinding more effective is the dust. However lumps may be formed in this process and these lumps are broken into fine particles by means of a powerful jet of air introduced from the sides. Particles of certain size alone are taken upstream by the jet of air and those heavier than the limit prescribed fall back in the ball mill to be ground again.

2. Solvent Mix Method/Toxicant Spray method

The toxicant in the form of a liquid is sprayed into the dust mixture during the blending the blending process. The solvent may be allowed to evaporate or it may be a higher boiling solvent of a petroleum fraction.

3. Bulk Density

It depends upon particle size, shape and actual density. It is an indication of fluffiness. A good diluent is one which weights 300-450 kg/m^3 (0.3 g/cc). Lighter materials have low carrying power and remain in the air for a longer time. Heavier materials fall rapidly.

4. Particle Density

Particle density is the actual density of the solid materials, only as if there were no air spaces between them. It affects the feeding in the duster. Carrying power segregation and settling of dust depend upon particle density.

5. Electrostatic Charge

It is produced due to the friction between particles and the dusting equipment. Materials with high silica give type charge to the blower and recharge to the dust steam.

Electrostatic charges on particles affect the attraction of dusts to the plant surfaces and dust distribution.

6. Flowability

It indicates the feed rate of dusting equipment. The angle of slope which is a measure of flowability is measured by allowing the dust to fall through a funnel upon disc. Greater the angle poorer is the flowability. Dust with fibrous or needle shaped particles have a slower feed rate than dusts with spherical particles.

7. Other Properties

a) Hardnes -causes abrasikon of the equipment

b) Absorption -affects caking

c) Asorption -tendency to form lumps

Though dusting is less effective compared to spraying it is suitable in areas of water scarcity. Usually 10-50 kg is applied.