AGRICULTURAL CHEMICALS: PESTICIDES

- Agricultural chemicals are those chemicals that are employed for enhancing crop yield and protection of crops.
- Pest represents any organism that is harmful for domesticated organisms and human interests by destruction of food articles, irritation, blood loss, disease.
- Some chemicals are used to destroy or repel pathogens, weeds & other pests, these are called **pesticides**.
- **Millardet** discovered first pesticide in 1882 that is called **Bordeaux mixture** (after the name of the university).
- Commonly used household pesticides are **Baygon spray (Propoxur, a carbamate), finit/flit (having** malathion, an organophosphate), mosquito repellent cakes coils and BHC (benzene hexachloride).

Types of Pesticides :

It is based on the types of pests killed or controlled.

- (i) Herbicides or weedicides : These kill weeds in agriculture, horticulture and forest management. On the basis of mode of action, there are selective and non selective herbicides, contact herbicides, translocated herbicides, foliage applied and soil applied herbicides. e.g. triazines, carbamates, auxin derivatives like 2, 4–D & 2, 4, 5–T.
- (ii) Fungicides : These are employed to control the fungal infections in plants. They can be classified into two types Inorganic (e.g. bordeaux mixture, burgandy mixture, sulphur, lime sulphur, mercuric chloride) and organic (e.g. Oxanthins, carbamates, mercury compounds).
- (iii) Insecticides : They kill or repel insects they can be poisonous on ingestion or contact poisons or fumigants. Natural forms like dried leaves of margosa (vern, Neem) are added to drive away insects from stored grains and clothes. Crushed leaves of Boeninghausenia albifora are used for protection against flees and mosquitoes. Pyrethrum and nicotine are two natural insecticides. First commercial bioinsecticide is sporeine developed in Germany.
- (iv) Nematicides : They are used to kill or repel nematodes e.g. Chloropicrin, methyl bromide, ethylene dibromide.
- (v) Algicides : In water body, algal pathogens and algal blooms are controlled by them e.g. Copper sulphate.
- (vi) Rodenticides : Rodents are killed or repelled by these pesticides e.g. Zinc sulphate, sodium fluoroacetate, warfarine, red squill.

Synthetic pesticides :

These can be divided into six groups.

(i) Organochlorines / Chlorinated hydrocarbons : These are nonbiodegradable persistent pesticides that are fat soluble and accumulated in the stored fats of all organisms & toxic. They show biomagnification e.g. DDT, BHC, alderin, endrin, dieldrin, endosulphan. Out of them DDT has been banned in many countries because the former shows biomagnification and causes some abnormalities like cancer, cirrhosis of liver malfunctioning of sex hormones, thinning of bird egg shells.

- (ii) Organophosphates : These are esters of phosphoric acid and its dervatives, e.g. Malathion (an ingredient of finit / flit), parathion TEPP (tetraethyl pyrophosphate) fenitrothion. They are highly toxic acetylcholinesterase inhibitors.
- (iii) Carbamates : They are structurally similar to acetylchloline and, therefore, bind with enzyme acetylcholine esterase. They form three type of pesticides (a) Fungicides like dithane M-22, dithane M-45, dithane Z-78, dithane S-31 (b) Insecticides like Baygon (Propoxur), Temik (aldicarb) (c) Herbicides like Thiocarbamates, phenyl carbamates.
- (iv) Pyrethroids : Pyrethrum is extracted from inflorescence of Chrysanthemum species like C. marshailli, *C. cinerarifolium* and *C.coccineum* having broad spectrum effect.
- (v) Triazines : They are Urea derivatives and used for removing weeds in Tea, Cotton and Tobacco, e.g. atrazine, simazine.
- (vi) Auxin Derivatives : these are usually weedicides like 2, 4-D & 2, 4, 5 -T, dicamba, dinitrophenol, dalapan.

Resonate the Concept

• First inorganic fungicide was developed by R.M.A. Millardet (1882) against downy mildew (*Plasmopara viticola*) of Grape-Vine at the University of Bordeaux and commonly known as Bordeaux mixture. It consists of copper sulphate, lime and water (e.g., 4 : 4 : 50), burgandy mixture consists of copper sulphate (5 lbs), sodium carbonate (0.25 lbs) and water (50 gallons).

Action of Pesticide :

- Insecticides perform impairment of nerve conduction and some times perform respiratory arrest to kill insects.
- In other hand herbicides block PSII and occasionally phloem transport to kill plants.

Integrated pest Management (IPM) :

 In this method, natural methods are employed for pest control like biological control, crop rotation, mechanical control, use of resistant varieties, sanitation, & cultrural practices with minimum use of pesticides.

Organic Farming :

• Development of crops by the use of manures, fertilizers and pesticides of biological origin, resistant varieties, crop rotation, intercropping is called **organic farming**.