Biopesticides.

Def:- Biopesticides are the naturally occurring substances from living organisms (Natural enemies) (or) their products (microbial products, phytochemicals) (or) their by-products (Semiochemicals) that can control pest by non-toxic mechanism.

★ Advantages of Biopesticides:-

1. Biopesticides are less harmful.
2. They are designed to affect only one specific pest or, in some cases, a few target organisms.
3. They are effective in very small quantities, and often decompose quickly thereby resulting in lower exposures and largely avoiding the pollution problems.
4. When used as a component of Integrated Pest management Program, biopesticides can contribute greatly.

★ Types of biopesticides:-

(A) Microbial Pesticides

(B) Plant - incorporated - Protectants (PIPs)

(C) Biochemical Pesticides

(D) Botanical Pesticides

(E) Biotic agents (Parasitoids & Predators)

(A) Microbial Pesticides:-

→ Microbial Pesticides are composed of microscopic living organism (virus, bacteria, fungi, Protozoa (or nematodes) (or toxin produced by these organisms.

→ These pesticides were applied as conventional insecticidal sprays, dusts (or granules.

→ These strength is nontoxic and non pathogenic to animals and Humans

→ These pesticides includes — insecticides, fungicides, herbicides and growth regulators of microorganism origin

Ex:- (1) Bacillus thuringiensis.

It controls lepidopterous pest → like American bollworm in cotton and stem borers in rice,

Mechanism of action- eaten injected by pest larvae, it releases toxins which damage the mid gut of the pest and killed it

(2) Agrobacterium radiobacter (Agrocin)

→ Agrobacterium radiobacter is used to treat roots during transplanting cheiks crown gall.

Crown gall is a disease in peaches, grape-vine, rose and various plant caused by soil borne pathogen, - Agrobacterium tumefaciens.

(3) Pseudomonas fluorescens (Phenazine)
used to control damping off caused by Pythium sp., Rhizoctonia solani Gaeumannomyces graminis.

(4) Trichoderma -
It is a fungicide acts against soil born disease such as root rot.
- This is also used against Nectria galligena that causes "silver leaf disease" of fruit trees by entering through Pruning wounds.

(5) Metarizium anisopliae -
It infects spitting bugs, Rhinoceros beetles.

(6) Beauveria bassiana,
Controls Colorado potato beetle.

(7) Verticillium lecanii →
Controls aphids and whiteflies.

(8) Nomuraea riley -
Controls Soyabean caterpillars.

(B) Plant incorporated Protectants (PIPs)

→ Pesticides substances that plant produce from the genetic material that have been added to the plant.

→ As the pest feed on such plants they will eventually die.

→ PIPs also known as "Genetically modified crops".

→ PIPs, A typical example is → use of "Bt-Protein" to develop PIP in a process called genetic engineering.

→ Bt-Protein causing death with in short time usually 48 hr, but it is safe to all vertebrates and environment.

(C) Biochemical Pesticides:-

- They are naturally occuring substance to control pest by Nontoxic mechanism.
- Biochemical pesticide includes substances as insect sex pheromones as that interfere with mating that attract insect pest to traps.

Ex:- Sex pheromone →

7, 8 - epoxy - 2 - methyl octadecane used to attract gypsy moth

(D) Botanical pesticides:-

→ These are naturally occurring plant materials that may be crude preparation of the plant part ground to produce a dust (or) powder that can be used in full strength (or) dilute form in a carrier such as clay, talc (or) diatomaceous earth.

Ex:- "Azadirachtin" effects the reproductive and digestive process of pest.

— several plant based insecticides as
→ Nicotinoids, → Natural pyrethrins

→ other ex: of Product in (Market) { Neem oil, Rotenone, Tobacco suspension.

(E) Biotic agents / Natural enemies:-

→ Two agents are there they are

(1) Predators:-

They consume several prey over the course of their development to other pest.

Ex:- Lay beetles, rove beetles, many ground beetles, Syrphid fly larvae spiders. ety,

② Parasitoids:-

Parasitoids are almost the same size as their hosts, and their development always kills the host insect.

Ex:- Bathyplectes, trichogramma exacrsia, mucidifusax etc.

Bioinsecticides

These are certain microorganism, which can control insect population called microbial insecticide or bioinsecticide.

Characteristics of Bioinsecticides:-

1. High specificity
2. Virulence
3. Persistence
4. Viability
5. Economic
6. Quality Control
7. Safety.
8. Stability.

Types:-

1. Bacterial insecticides
2. Viral "
3. Fungal "
4. Protozoal "

(1) Bacterial Insecticides:-

→ spore forming bacterial pathogens

Eg: Bacillus thuringiensis
B. Kanti morbis

B. popliae etc.

Non-spore forming bacterial pathogen

Eg:- Pseudomonas sp.
Streptomyces sp.
Strepto coccus " etc.

These are targeted → Lepidoptera organism (insect)
Larvae of mosquitoes & Blackflies

Marketed Product →
- Thuricide, Dipel
- Teknar, Vectobac
- Bactimos

(2) Viral insecticides:-

3 types → (a) Nuclear polyhedrosis virus
(b) Granulosis virus
(c) Cytoplasmic polyhedrosis virus

(a) Nuclear polyhedrosis virus:-

Mostly used viral insecticides:-

→ Baculovirus — got is a recombinant baculovirus.

MOA:-
- Entry into mid gut
- virus disintegration
- release virion → Invade cyto-plasm

and nuclei → Lysis of host cell.

Advantages of viral insecticide:-

→ High specificity
→ most reliable and safe
→ Large scale production cost is less

(3) Fungal insecticide:-

→ In 1935, first reported that fungus controlling the insect.
→ Approximately 700 sp. of fungi are pathogenic to insect.
→ They causes mycosis in many different arthropods.
→ They infect all stages of life cycle of the host.
→ Fungi penetrate the insect cuticle.

Ex:- Three main genera of fungi-
* Coelomomyce
* Lagenidium
* Culicinomyces

(4) Protozoal insecticide:-

→ Mainly microsporidia group of species

MOA:-

Entry into mid gut

↓

Multiplication

↓

Spreading

↓

Death of insect.

Advantages:-

→ These are very reliable and safe as they have high specificity

→ These are biodegradable in nature

→ Requires less conc. to control insect.

→ They don't alter the viability of biofertilizers.

Limitation of bioinsecticides:-

→ Less species of microbes are only suitable as bioinsecticide.

→ Low persistent Power.

→ Most of the time they give good result at the pilot scale but does not give same result in the field trial.