BIOLOGICAL CONTROL - DEFINITION – HISTORY - CLASSICAL EXAMPLES - FACTORS GOVERNING BIOLOGICAL CONTROL

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C. Microbial Control

Defined as control of pests by use of microorganisms like viruses, bacteria, protozoa, fungi, ricketsia and nematodes, which kill their host or debilitate the future generations

Qualities of Insect pathogens…

- Host specificity/suitable strain
- Virulence
- Toxin production
- Rapid Spreading of disease
- Persistent for long time (self-life)
- Amenability to mass culture
- Cost effective and Economical
- Safe to non-target organisms

Microbial Agents

I. Entomopathogenic fungi

- Fungi that can act as parasites of insects and kill or seriously disable them
- Over 950 species are pathogenic to arthropods
- 20 have been exploited

Symptoms of fungal infection

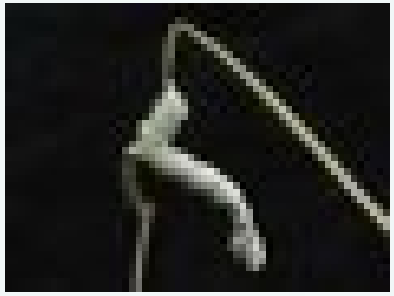
- Loss of appetite, irritability and paralyses
- Discoloured patches on integuments and increased acidity in blood
- The body hardens and covered by dense white mycelial mat
- Mummified larvae adhere to leaves, stem and fruiting body with upright position on its prolegs at the time of death
- Death occurs with in 4-7 days depending on host insects and environmental conditions

Fungi	Target host	
Metarhizium anisopliae	Coleopterans, soil inhibiting pests, BPH, Grasshoppers	Green muscardine fungus
Beauveria bassiana	Lepidopetrans, Coleopterans, leaf hoppers, plant hoppers, whiteflies	White muscardine fungus
Verticillium lecanii	coffee green scale	White halo fungus
Nomuraea rileyi	Sucking pests	
Hirsutella thompsani	Mites	

Metarhizium

Beauveria

Verticillium



Nomuraea

1. Adhesion of the spore to the host cuticle

2. Spore germination

3. Penetration of the cuticle

4. Growth in the hemocoel

5. Death and saprophytic feeding

6. Hyphal reemergence and sporulation

Mode of action of entomopathogenic fungi

Field applications.....

Fungus	Host insect	Dosage
Metarhizium anisopliae	White grub, sweet potato weevil, BPH, DBM, Rhinoceros beetle, termite, grass hoppers, caterpillars	1-2 kg/ac spray 10-15 kg with 50 kg FYM/ vermicompost soil application
Beauveria bassiana	Leaf hoppers, plant hoppers, whiteflies, caterpillars and DBM	0.4-1.0 kg/ac Foliar spray
Verticillium lecanii	coffee green scale, Leaf and plant hoppers, coffee berry borer etc	0.4-1.0 kg/ac Foliar spray
Nomuraea rileyi	Leaf eating Caterpillars, *S. litura, H. armigera, T. archalsia, M. separata, A. ipsilon* etc.	0.4-1.0 kg/ac Foliar spray
Hirsutella thompsani	Coconut Mites	1-5 g/ l of water

II. Entomopathogenic viruses

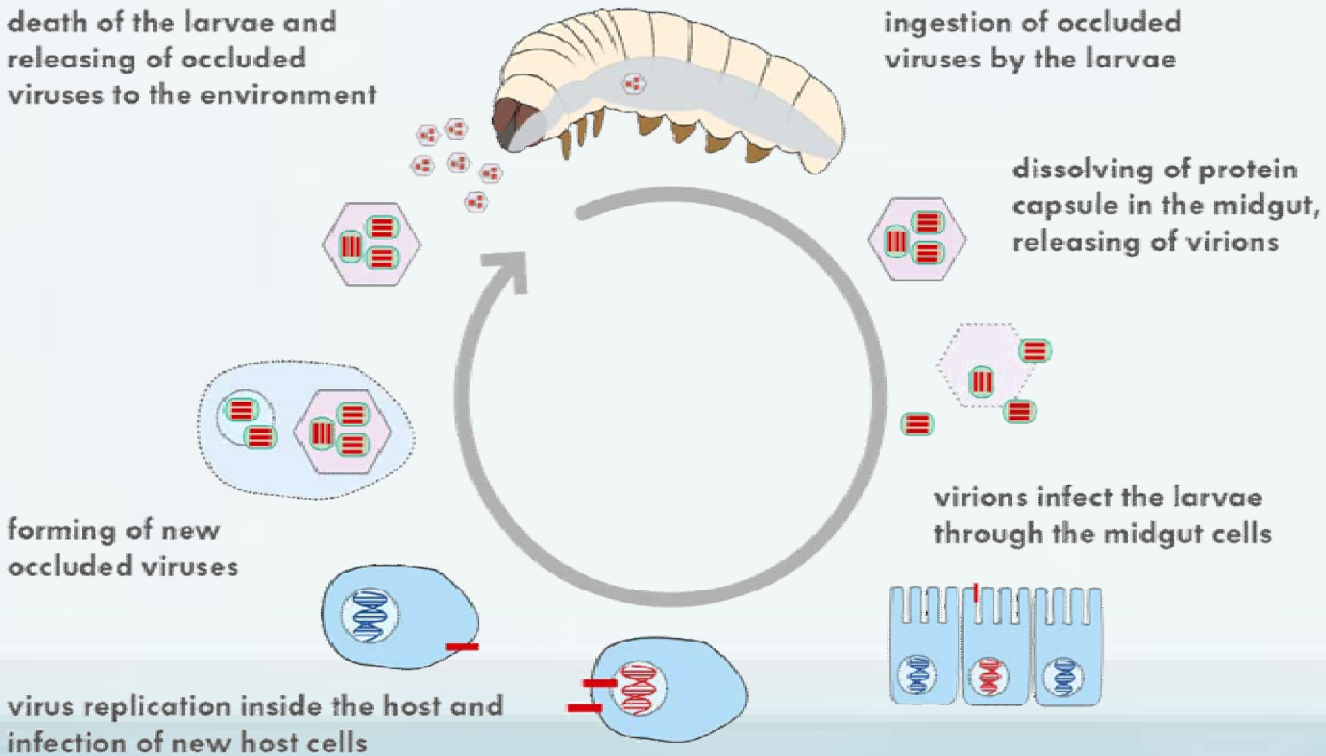
- Viruses coming under family *Baculoviridae* cause disease in lepidoptera larvae.

Two types of viruses are common.

NPV (Nucleopolyhedro virus) e.g. HaNPV, SlNPV

GV (Granulovirus) e.g. CiGV

Mode of Action



II. Entomopathogenic viruses

Symptoms

- Lepidopteran larva become sluggish, pinkish in colour, lose appetite,
- Body becomes fragile and rupture to release polyhedra (virus occlusion bodies).
- Dead larva hang from top of plant with prolegs attached (Tree top disease or ñWipfelkrankeitò)

NPV

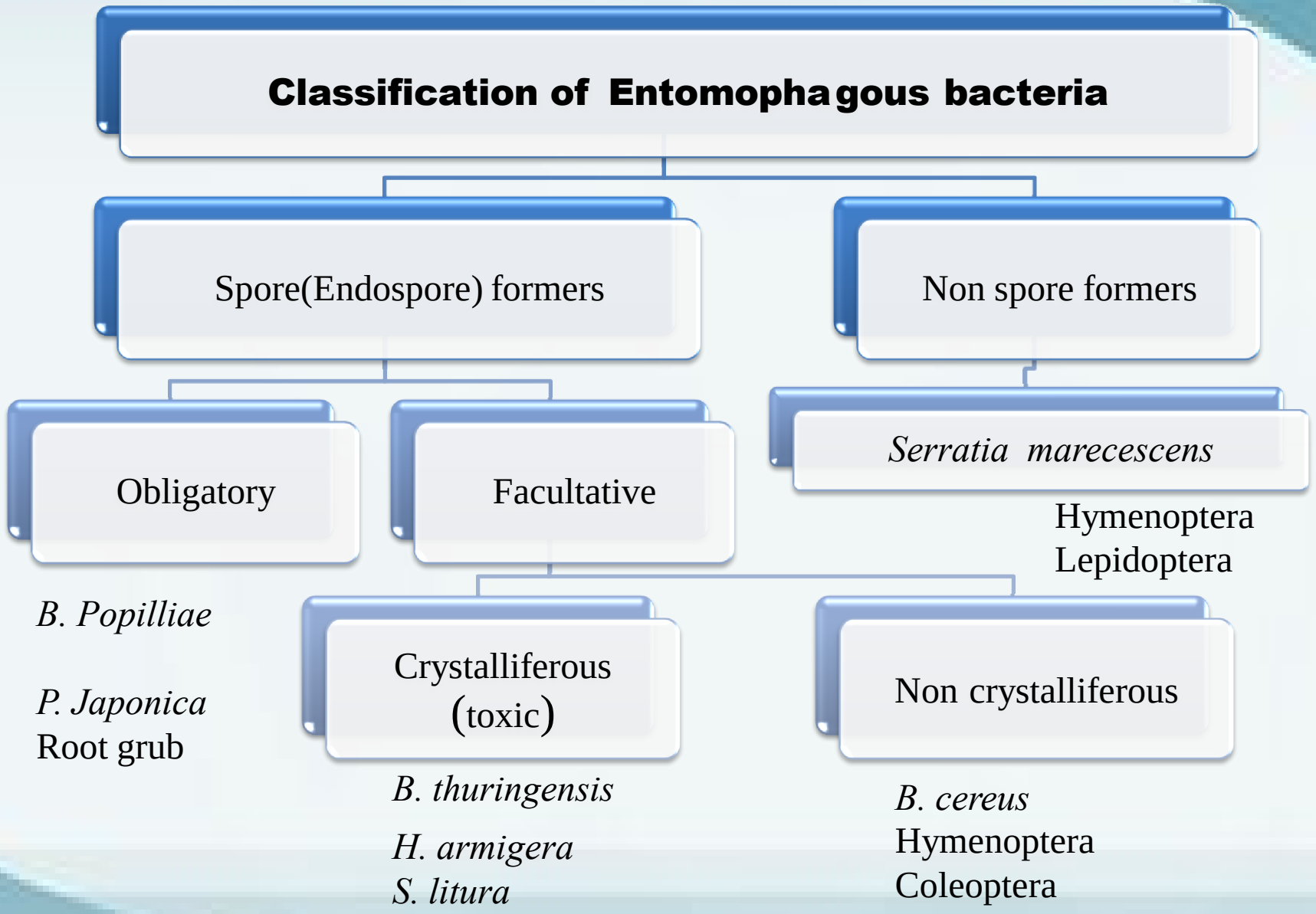
GV

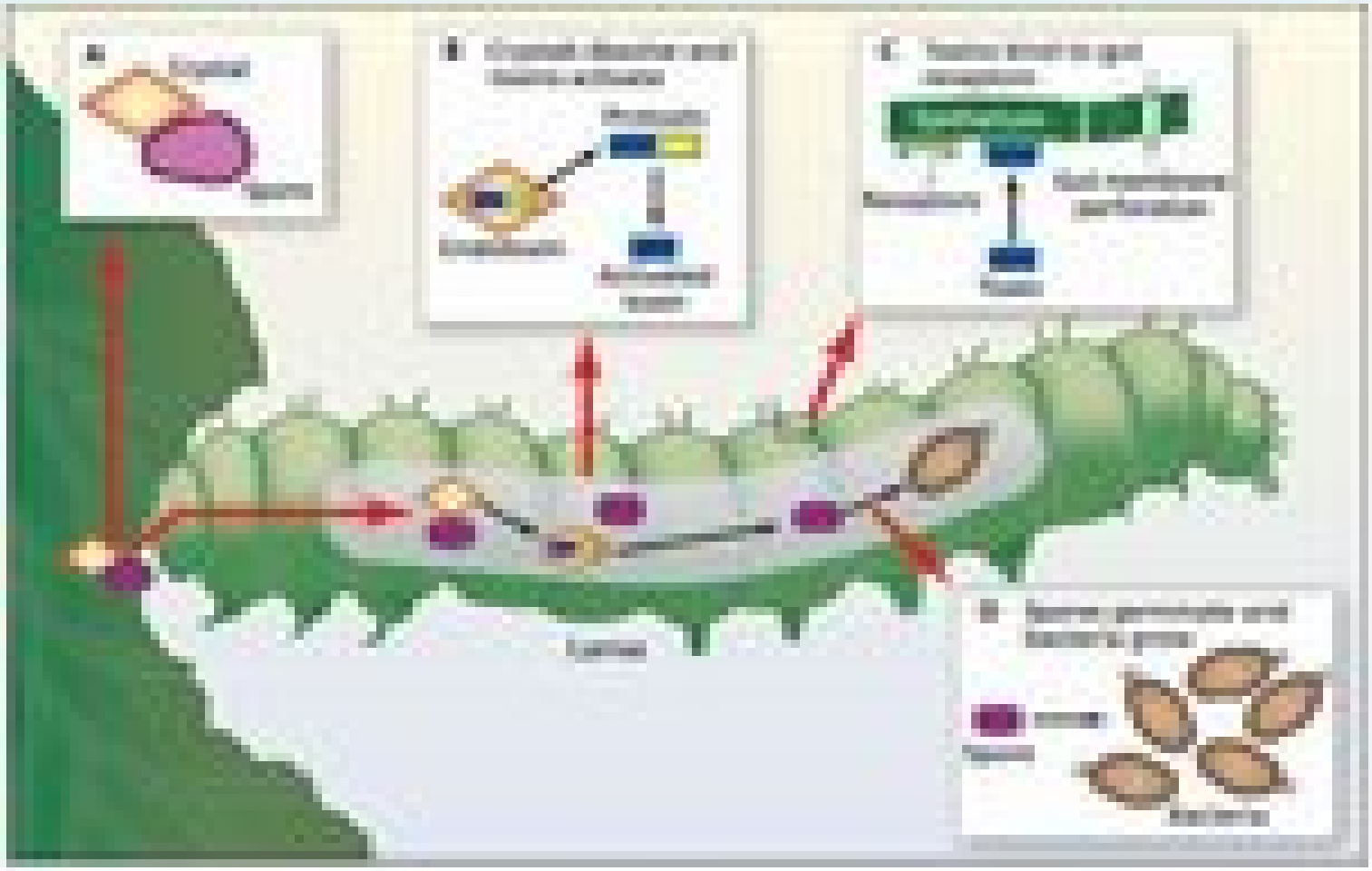
CPV (Cytoplasmic Virus)

Field applications.....

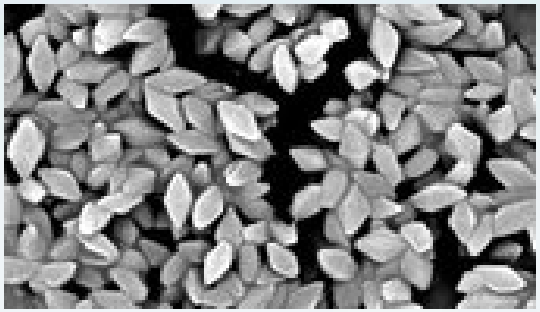
Virus	Target pest	Crop	Dosage
*Ha*NPV	*H. armigera*	Tomato, Lablab, Chickpea, Groundnut, Sunflower, Tur, Cotton	250 LE/ha
*Sl*NPV	*S. litura*	Groundnut, Tobacco, Soybean, Crucifers, Cotton	250 LE/ha
*Ma*NPV	*M. separata*	Maize, Sorghum	250 LE/ha
*Aa*NPV	*A. albistriga*	Groundnut	250 LE/ha
GV	*C. infusculetus*	Sugarcane	250 LE/ha

III. Entomopathogenic bacteria





Mechanism of action of Bacillus thuringiensis



Bt (Bacillus thuringiensis)

Bs (Bacillus sphaericus)

Pf (Pseudomonas fluorescens)

Symptoms of bacterial infection

- Stoppage of feeding
- Regurgitation and diarrhea due to gut paralysis
- Body darkens with dark body fluid, tissue disintegrated and with putrefied odour