



**ROHINI**  
**COLLEGE OF ENGINEERING & TECHNOLOGY**  
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## **Department of Agricultural Engineering**

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Course Name : **Protected Cultivation**  
Course Code : **AI3015**  
Regulation : **R2021**  
Year/Semester : **III / 06**  
Faculty : **Mr. ARUNPANDIAN N ( Asst. Professor)**

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## **UNIT - II**

# **PROTECTED CULTIVATION OF VEGETABLE CROPS**

## **PART 4 : INTEGRATED PEST & DISEASE MANAGEMENT – THE ECOSYSTEM APPROACH**

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### **The IPDM Pyramid: Four-Tier Defense System**

#### **Tier 1: PREVENTION – The First Line (40% of effort)**

- Structural design:
  - Double door system with 3m separation
  - Positive pressure ventilation
  - 50 mesh insect screens (0.3mm opening)
- Sanitation protocols:
  - Foot baths with 2% Virkon S
  - Tool sterilization with 70% alcohol or bleach
  - Remove plant debris within 24 hours
- Genetic resistance:
  - Tomato: Ty genes for TYLCV, Mi gene for nematodes
  - Cucumber: Ccu gene for powdery mildew

#### **Tier 2: MONITORING – Early Warning System (30% of effort)**

##### ***Digital Monitoring Grid:***

- Yellow sticky traps: 4 traps/1000m<sup>2</sup>, changed weekly
- Blue sticky traps: For thrips monitoring
- Pheromone traps: 10 traps/ha for specific pests
- Scouting protocol:
  - Weekly: 1% plants examined systematically
  - Data recording: Pest incidence, life stages, hot spots

##### ***Action Thresholds by Pest:***

###### **Pest Threshold Sampling Method**

Whitefly 5 adults/plant or 10 nymphs Leaf turn, yellow traps

Thrips 2-3 thrips/plant Flower tapping, blue traps

Spider mites 5 mites/leaflet Leaf examination  
Aphids 10% infested plants Shoot tip examination

### **Tier 3: BIOLOGICAL CONTROL – The Living Arsenal (20% of effort)**

#### ***Bioagent Deployment Schedule:***

Pest Predator/Parasitoid Release Rate Frequency  
Whitefly Encarsia formosa 1 wasp/m<sup>2</sup> every 2 weeks Preventive  
Eretmocerus mundus 0.5 wasp/m<sup>2</sup> weekly Curative  
Thrips Amblyseius cucumeris 50-100/m<sup>2</sup> Weekly  
Orius laevigatus 1/m<sup>2</sup> every 2 weeks Flowering period  
Spider mites Phytoseiulus persimilis 5-10/m<sup>2</sup> initial, 2-4/m<sup>2</sup> maintenance As needed  
Aphids Aphidius colemani 0.1-0.5/m<sup>2</sup> At first sight  
Chrysoperla carnea 1 egg/plant or 1000 eggs/ha Heavy infestation

#### ***Conservation Biological Control:***

- Banker plants: Barley with bird cherry oat aphids for aphidius
- Flowering plants: Phacelia, Alyssum for adult parasitoids
- Artificial shelters: Corrugated cardboard for lacewing hibernation

### **Tier 4: INTERVENTION – Precision Strikes (10% of effort)**

#### ***Biorational Pesticides Arsenal:***

Category	Examples	Mode of Action	PHI
Botanicals	Neem (Azadirachtin 0.3%)	Growth regulation, antifeedant	1 day
	Pyrethrum (0.5%)	Nerve toxin	0 days
Microbials	Bacillus thuringiensis	Gut toxin (caterpillars)	0 days
	Beauveria bassiana	Contact mycosis	0 days
	Verticillium lecanii	Contact mycosis (aphids)	0 days
Insect Growth Regulators	Pyriproxyfen	Juvenile hormone mimic	7 days
	Cyromazine	Chitin synthesis inhibitor	7 days

Mineral Diatomaceous earth Physical abrasion 0 days  
Potassium soap Membrane disruption 0 days

## **Disease Management – The Invisible Enemy**

### ***Climate Management for Disease Suppression:***

Disease Favorable Conditions Preventive Climate RH Control  
Powdery Mildew 20-27°C, 50-70% RH <50% RH, >25°C or <15°C Morning venting  
Botrytis 15-25°C, >90% RH <85% RH, leaf dry by evening Night heating  
Downy Mildew 15-22°C, >90% RH, leaf wet <80% RH, prevent condensation  
Avoid leaf wet

### ***Biological Fungicides:***

- Trichoderma harzianum:  $10^8$  CFU/g, apply 5g/plant in planting hole
  - Pseudomonas fluorescens: Foliar spray  $10^9$  CFU/mL, weekly intervals
  - Bacillus subtilis: Root drench or foliar,  $10^8$  CFU/mL
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