

Major Insect Pests and Their Control

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Insects play a dual role in agriculture—while some are beneficial as pollinators, predators, and decomposers, many others cause devastating losses to crops and stored produce. Insect pests are responsible for nearly 30–40% reduction in global agricultural productivity, directly threatening food security and farmer income. Understanding the diversity, biology, and ecology of major pests is the foundation for effective management. This article presents a comprehensive overview of the major insect pests affecting key agricultural crops, their damage symptoms, and effective control measures. It also discusses the principles of insect pest control, highlighting the importance of Integrated Pest Management (IPM), biological control, and ecological sustainability. By integrating traditional and modern approaches, farmers can manage pest populations below economic thresholds while protecting biodiversity and minimizing chemical dependency.

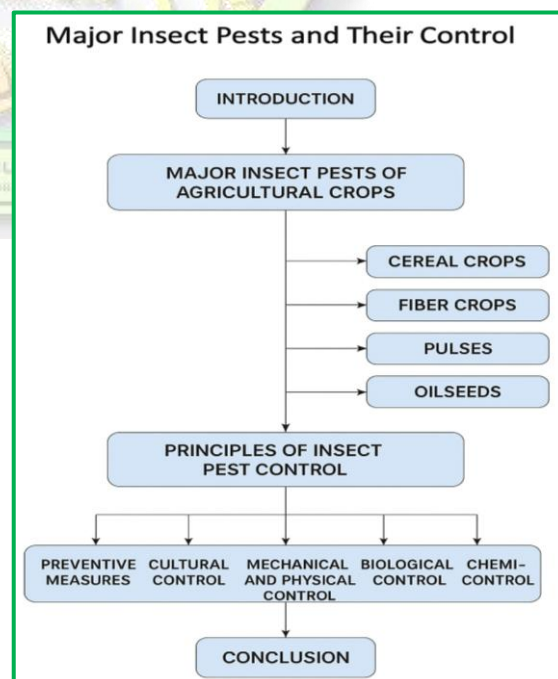
Introduction

Agriculture forms the backbone of most developing economies, and crop productivity largely depends on the effective management of pests and diseases. Insects constitute one of the largest groups of organisms on earth, with over one million known species. Out of these, only about 5–10% are considered pests causing damage to agricultural, horticultural, and stored commodities. Pest outbreaks have been recorded throughout history, and their impact has often been severe enough to cause famines and economic crises. For instance, the locust plagues of Africa and Asia have caused widespread crop devastation. Similarly, pests such as the bollworm in cotton or the brown planthopper in rice remain persistent challenges in Indian agriculture.

Insect pests damage crops in several ways:

1. **Direct feeding damage** — through chewing or sucking of plant parts such as leaves, stems, roots, and fruits.
2. **Indirect damage** — by transmitting plant pathogens (viruses, bacteria, fungi).
3. **Post-harvest losses** — by infesting stored grains and causing deterioration in quality and quantity.

Modern agriculture relies heavily on chemical insecticides; however, their indiscriminate use has led to pest resurgence, resistance development, and environmental pollution. Therefore, a more balanced, ecological, and sustainable strategy—Integrated Pest Management (IPM)—is now being promoted worldwide.



Major Insect Pests of Agricultural Crops

Agricultural crops can be broadly classified into cereals, pulses, oilseeds, fiber crops, vegetables, fruits, and stored grains. Each group is attacked by specific insect pests depending on the crop's growth stage, environmental conditions, and regional distribution.

1. Cereal Crops

Rice (*Oryza sativa*)

Major Pests:

1. Rice Stem Borer (*Scirpophaga incertulas*) – Larvae bore into the stem causing “dead hearts” and “whiteheads.”
2. Brown Planthopper (*Nilaparvata lugens*) – Sucks plant sap and causes “hopper burn.”
3. Gall Midge (*Orseolia oryzae*) – Produces silver shoots in rice plants.

Control Measures:

- Use resistant varieties like *IR-36*, *Pusa Basmati-1*.
- Avoid excessive nitrogen fertilizer.
- Release of biological control agents (*Trichogramma japonicum*, *Cyrtorhinus lividipennis*).
- Application of selective insecticides such as chlorantraniliprole or fipronil at ETL levels.

Wheat (*Triticum aestivum*)

Major Pests:

- Aphids (*Sitobion avenae*) – Cause stunted growth and reduce grain filling.
- Termites (*Odontotermes spp.*) – Damage roots and lower stems.

Control:

- Early sowing and seed treatment with imidacloprid.
- Field sanitation and soil drenching with chlorpyrifos before sowing.

2. Fiber Crops (Cotton)

Major Pests:

1. American Bollworm (*Helicoverpa armigera*) – Bores into squares, flowers, and bolls.
2. Pink Bollworm (*Pectinophora gossypiella*) – Feeds inside the boll.
3. Whitefly (*Bemisia tabaci*) – Sucks sap and transmits leaf curl virus.

Control:

- Grow *Bt cotton* varieties.
- Install pheromone traps for monitoring.
- Spray neem oil (3%) or biopesticides like *Beauveria bassiana*.
- Rotate insecticides to avoid resistance.

3. Pulses

Major Pests:

- Pod Borer (*Helicoverpa armigera*) – Attacks chickpea, pigeonpea, lentil.
- Aphids and Thrips – Transmit viral diseases and cause leaf curling.

Control:

- Deep plowing after harvest to kill pupae.
- Use pheromone traps and bird perches.
- Apply neem seed kernel extract (5%) or NPV sprays.

4. Oilseeds

a) Mustard (*Brassica spp.*)

- Mustard Aphid (*Lipaphis erysimi*) – Sucks sap causing distorted pods and reduced oil content.

Control:

- Early sowing and resistant varieties (*Varuna*, *Pusa Bold*).
- Sprays of neem oil or imidacloprid.

b) Groundnut

- Leaf Miner (*Aproaerema modicella*) and White Grubs (*Holotrichia spp.*) are common.

Control:

- Light traps, intercropping, and soil treatment with chlorpyrifos.

5. Vegetables

a) Tomato Fruit Borer (*Helicoverpa armigera*)

- **Damage:** Bores into fruits causing rotting.
- **Control:** Handpick larvae, release *Trichogramma chilonis*, use spinosad spray.

b) Cabbage Diamondback Moth (*Plutella xylostella*)

- **Control:** Crop rotation, use of *Bacillus thuringiensis*, and neem-based formulations.

c) Aphids and Whiteflies (various vegetables)

- **Control:** Use reflective mulches, sticky traps, and biological predators like *Chrysoperla carnea*.

6. Fruit Crops

(a) Mango Hopper (*Idioscopus clypealis*)

- **Damage:** Causes flower drop and reduces fruit set.
- **Control:** Pruning and sprays of imidacloprid or neem oil.

(b) Fruit Fly (*Bactrocera dorsalis*)

- **Damage:** Infests mango, guava, and cucurbits.
- **Control:** Field sanitation, methyl eugenol traps, and fruit bagging.

(c) Mealybug (in Grapes, Citrus, Papaya)

- **Control:** Removal of infested shoots and release of *Cryptolaemus montrouzieri* beetles.

7. Stored Grain Pests

Major Pests:

- Rice Weevil (*Sitophilus oryzae*)
- Pulse Beetle (*Callosobruchus chinensis*)
- Lesser Grain Borer (*Rhyzopertha dominica*)

Control:

- Sun-dry grains before storage.
- Clean stores thoroughly and use neem leaves or inert dusts.
- Fumigation with phosphine under airtight conditions.

Principles of Insect Pest Control

Effective pest management requires combining scientific understanding of pest biology with ecological and economic considerations. The major principles include:

1. Preventive Measures

- Selection of pest-free seeds and healthy planting material.
- Maintenance of field sanitation and proper drainage.
- Timely sowing and crop rotation to break pest life cycles.

2. Cultural Control

- Crop rotation, intercropping, and mixed cropping discourage pest buildup.
- Adjusting sowing time and spacing can minimize infestation.
- Removal and burning of crop residues to destroy overwintering stages.

3. Mechanical and Physical Control

- Handpicking and destruction of egg masses or larvae.
- Installation of light traps, pheromone traps, and sticky traps.
- Deep summer plowing to expose pupae to sunlight.

4. Biological Control

- Conservation and augmentation of natural enemies such as predators (*Coccinella septempunctata*), parasitoids (*Trichogramma spp.*), and pathogens (*Beauveria bassiana*).
- Use of microbial insecticides like *Bacillus thuringiensis* (Bt) and entomopathogenic nematodes.

5. Chemical Control

- Application of insecticides at the Economic Threshold Level (ETL) to prevent unnecessary sprays.
- Use of selective, less toxic insecticides to conserve natural enemies.
- Rotation of insecticides with different modes of action to prevent resistance.

6. Integrated Pest Management (IPM)

IPM combines cultural, biological, and chemical methods in a compatible way. The goal is to suppress pest populations below economic injury levels while minimizing risks to humans and the environment. IPM includes:

- Regular pest monitoring.
- Use of resistant varieties.
- Conservation of natural enemies.
- Judicious use of pesticides as a last resort.

Conclusion

Insect pests continue to be a major challenge to global agricultural productivity. The traditional dependency on chemical pesticides has provided quick relief but also resulted in severe side effects such as resistance, resurgence, and ecological imbalance. A sustainable future for agriculture lies in adopting Integrated Pest Management (IPM), which emphasizes the judicious use of all control methods in harmony with nature. Strengthening farmer education, pest surveillance, and community-based management will enhance the success of pest control programs and ensure food security, biodiversity conservation, and environmental safety.

References

1. Dhaliwal, G. S. & Koul, O. (2022). Insect Pests and Their Management in Indian Agriculture. Kalyani Publishers, New Delhi.
2. FAO (2023). Integrated Pest Management: Guidelines for Sustainable Agriculture. Food and Agriculture Organization of the United Nations.
3. NIPHM (2021). Field Crop Pest Surveillance and Management Manual. National Institute of Plant Health Management, Hyderabad.
4. Pedigo, L. P. & Rice, M. E. (2020). Entomology and Pest Management. Pearson Education, USA.
5. CABI (2021). Crop Protection Compendium: Insect Pest Management and Control. Wallingford, UK.