

Introduction to Pest and Disease Control

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Key concepts, strategies, and best practices for managing pests and plant diseases in agricultural, horticultural, and urban settings.

1. Why Pest & Disease Control Matters

Reason	Impact
Yield protection	Prevents loss of crops, timber, ornamental plants.
Food safety	Reduces mycotoxins, bacterial contamination, pesticide residues.
Economic stability	Saves farmer income, lowers market price volatility.
Environmental health	Limits spread of invasive species, protects biodiversity.
Human health	Controls vectors (mosquitoes, ticks) that transmit diseases.

2. Basic Terminology

Term	Definition
Pest	Any organism (insect, mite, nematode, weed, rodent, pathogen) that damages plants or interferes with production.
Pathogen	Microorganism that causes disease (fungi, bacteria, viruses, phytoplasmas, nematodes).
Host	Plant species that a pest or pathogen can infect.
Epidemic / Outbreak	Sudden increase in disease incidence or pest population.
Threshold	Pest density at which economic loss justifies control action.
Integrated Pest Management (IPM)	A decision-making framework that combines cultural, biological, mechanical, and chemical tools to keep pest damage below economic thresholds while minimizing risks.
Resistance	Ability of a pest or pathogen to survive a control measure that previously was effective.
Biocontrol agent	Living organism (predator, parasitoid, pathogen) used to suppress a pest or disease.

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3. The Integrated Pest Management (IPM) Process

1. Monitoring & Scouting

- Regular field inspections (visual, traps, remote sensing).
- Record pest species, life stage, population density, and damage.

2. Identification

- Use field guides, dichotomous keys, or molecular tools.
- Confirm the pest/pathogen before action.

3. Decision Thresholds

- Economic injury level (EIL) ? point where cost of damage equals cost of control.
- Action threshold set slightly below EIL to allow timely response.

4. Control Options (choose the most appropriate)

- **Cultural** – crop rotation, sanitation, planting dates, resistant varieties.
- **Physical / Mechanical** – traps, barriers, tillage, pruning.
- **Biological** – beneficial insects, microbial antagonists, nematodes.
- **Chemical** – selective pesticides, seed treatments, fungicides (used as a last resort).
- **Regulatory** – quarantine, certification, phytosanitary measures.

5. Implementation

- Apply chosen method according to label directions, timing, and safety protocols.

6. Evaluation

- Assess efficacy, record outcomes, adjust thresholds or tactics for next season.

4. Major Pest Groups & Typical Management Tactics

Group	Common Examples	Key Damage	Primary Management Strategies
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Insects	Aphids, corn earworm, beetles, whiteflies	Feeding, virus transmission, defoliation	+ Resistant cultivars
			+ Biological control (lady beetles, parasitic wasps)
Mites	Two-spotted spider mite, rust mite	Sap loss, leaf bronzing	+ Insecticide rotation
			+ Spraying water to dislodge
			+ Predatory mites (Phytoseiulus)