

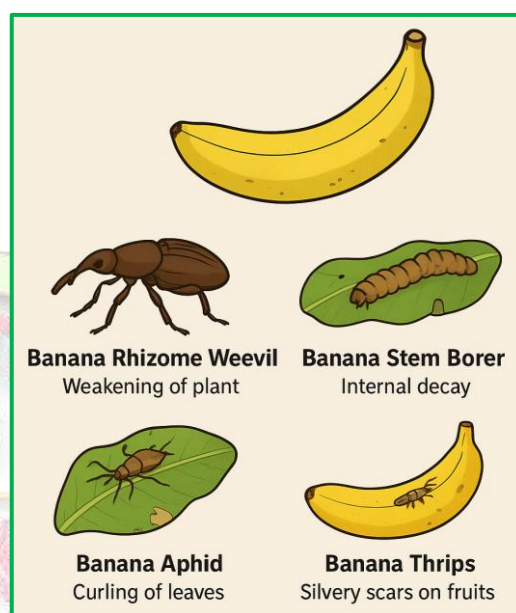
Control Measures of Banana Pests

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Banana (*Musa spp.*) is one of the most important tropical fruit crops grown worldwide for its economic and nutritional significance. However, banana production is severely affected by a wide range of insect pests and nematodes that cause substantial yield losses and deterioration in fruit quality. The control of banana pests is essential for maintaining productivity and ensuring sustainability. Pest management in banana includes preventive, suppressive, and integrated approaches using cultural, mechanical, biological, and chemical control methods. The combination of these approaches under the Integrated Pest Management (IPM) framework provides effective, eco-friendly, and long-term solutions. This article provides a comprehensive description of the major banana pests and their detailed control measures for sustainable banana cultivation.



Introduction

Banana (*Musa spp.*) is one of the most consumed fruit crops in tropical and subtropical regions. It ranks among the top fruits in terms of production and consumption globally, providing essential carbohydrates, vitamins, and minerals. India is the largest producer of bananas, with major cultivation areas in Tamil Nadu, Maharashtra, Kerala, Gujarat, Andhra Pradesh, and Karnataka. However, banana cultivation faces significant challenges due to various pests that attack different parts of the plant — roots, pseudostem, leaves, and fruits. The banana rhizome weevil, stem borer, aphids, thrips, and nematodes are the most damaging pests responsible for poor yield and reduced fruit quality. Pest infestation not only causes direct physical damage but also transmits viral diseases like Banana Bunchy Top Virus (BBTV). Effective pest control measures are therefore essential to maintain yield, reduce economic loss, and ensure sustainable banana farming. Integrated pest management (IPM) provides a balanced strategy combining preventive, biological, and chemical control techniques for effective long-term management.

Major Pests of Banana

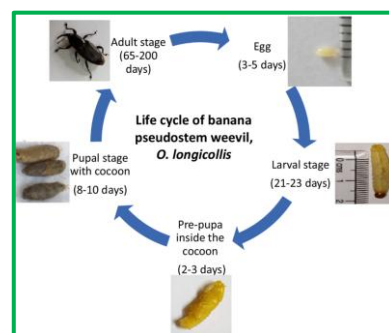
Banana Rhizome Weevil (*Cosmopolites sordidus*)

- **Nature of Damage:** Adult weevils lay eggs on the rhizome surface. Grubs bore into the rhizome, forming tunnels filled with frass, which disrupts nutrient and water transport, resulting in plant weakening.

- **Symptoms:** Yellowing and wilting of leaves, tunneling in rhizome, reduced vigor, and poor bunch formation.
- **Losses:** Yield reduction up to 50% in severe infestations.

Banana Stem Borer (*Odoiporus longicollis*)

- **Nature of Damage:** The larvae bore into the pseudostem, feeding on soft tissues, leading to internal decay.
- **Symptoms:** Oozing of gum and frass through holes in the pseudostem, withering of leaves, and premature death of plants.
- **Impact:** Reduces fruit size, quality, and may lead to total crop loss in neglected plantations.



Banana Aphid (*Pentalonia nigronervosa*)

- **Nature of Damage:** Aphids suck sap from tender shoots and young leaves, causing curling, stunted growth, and yellowing.
- **Importance:** It acts as a vector for *Banana Bunchy Top Virus (BBTV)*, one of the most destructive diseases of banana.
- **Symptoms:** Bunched appearance of leaves, dark green streaks on leaf midrib and petiole.

Banana Thrips (*Chaetanaphothrips signipennis*)

- **Nature of Damage:** Thrips feed on the epidermal cells of fruits and flowers, causing silvery or rusty scarring on the peel.
- **Symptoms:** Silver patches and corky scars on fruits, reducing market value.
- **Losses:** Mainly cosmetic but leads to economic loss due to poor appearance.

Nematodes (*Radopholus similis*, *Meloidogyne spp.*, *Pratylenchus spp.*)

- **Nature of Damage:** Nematodes attack banana roots and rhizomes, causing lesions and root decay.
- **Symptoms:** Yellowing of leaves, reduced root mass, plant toppling, and stunted growth.
- **Impact:** Responsible for yield losses up to 40% under high infestation.

Control Measures of Banana Pests

Cultural Control Measures

1. **Field Sanitation:** Remove all infested plant residues and rhizomes from the field after harvest to destroy pest breeding sites.
2. **Use of Healthy Planting Material:** Always select pest-free, tissue-cultured, or healthy suckers for planting.
3. **Crop Rotation:** Rotate banana with non-host crops like legumes, paddy, or sugarcane to break the pest life cycle.
4. **Proper Drainage and Spacing:** Avoid waterlogging and overcrowding, as these create favorable conditions for pest buildup.
5. **Intercropping:** Grow marigold or garlic along with banana to repel insects naturally.
6. **Desuckering:** Remove unwanted suckers regularly to prevent pest hiding and improve aeration.
7. **Field Hygiene:** Regular removal of dried leaves and pseudostem sheaths reduces shelter for weevils and borers.

Mechanical and Physical Control

1. **Pseudostem Traps:** Use freshly cut pseudostem pieces as traps for banana weevils; check weekly and destroy trapped adults.
2. **Pheromone Traps:** Use *Cosmolure* pheromone traps @ 10–15 per hectare to attract and kill male weevils.
3. **Hot Water Treatment:** Treat banana suckers in hot water (52°C for 20 minutes) before planting to eliminate weevil eggs and nematodes.
4. **Manual Collection:** Manually remove and destroy infested pseudostems and plant residues to prevent pest multiplication.

Biological Control Measures

1. **Entomopathogenic Fungi:** Application of *Beauveria bassiana*, *Metarhizium anisopliae*, or *Paecilomyces lilacinus* effectively controls banana weevils and nematodes.
2. **Predators and Parasitoids:**
 - Ladybird beetles (*Cheilomenes sexmaculata*) and lacewings (*Chrysoperla carnea*) feed on aphids.
 - Predatory mites and spiders help in controlling thrips naturally.
3. **Nematode Antagonists:** *Pochonia chlamydosporia* and *Trichoderma harzianum* suppress root-knot and burrowing nematodes.
4. **Botanical Pesticides:** Neem oil (3%) or neem seed kernel extract (5%) can be sprayed to control aphids and thrips.
5. **Organic Amendments:** Application of neem cake (250 g/plant) reduces nematode population and improves soil health.

Chemical Control Measures

(Use only when pest population exceeds the economic threshold level.)

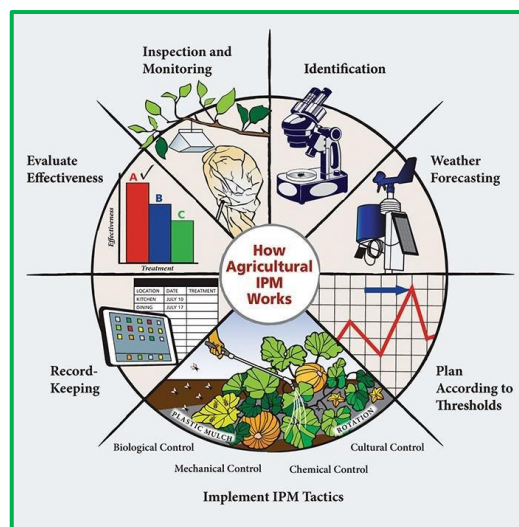
1. **For Rhizome and Stem Borers:**
 - Apply chlorpyrifos 0.05% or imidacloprid 0.03% as a soil drench around the pseudostem base.
 - Inject dichlorvos (0.1%) in infested pseudostems followed by sealing with mud.
2. **For Aphids:**
 - Spray dimethoate (0.05%) or imidacloprid (0.01%) on tender leaves and shoots.
3. **For Thrips:**
 - Apply fipronil (0.01%) or lambda-cyhalothrin (0.003%) during fruit bunch development.
4. **For Nematodes:**
 - Mix carbofuran 3G @ 30 g/plant in the soil near the root zone.
 - For severe infestation, apply phorate 10G @ 25 g/plant.

Note: Overuse of chemicals should be avoided. Always rotate chemicals with different modes of action to prevent resistance.

Integrated Pest Management (IPM)

The IPM approach integrates cultural, biological, and chemical control methods for sustainable management.

- **Monitoring:** Regular field inspection and use of pheromone traps for pest surveillance.
- **Threshold-based Action:** Apply pesticides only when pest population exceeds the Economic Threshold Level (ETL).
- **Resistant Varieties:** Plant resistant or tolerant cultivars like 'Nendran,' 'Rasthali,' and 'Robusta.'
- **Use of Biocontrol Agents:** Apply *Trichoderma* spp. and *Beauveria bassiana* at regular intervals.
- **Botanical Integration:** Neem-based sprays in combination with fungal biocontrols enhance effectiveness.
- **Eco-friendly Practices:** Promote biodiversity and avoid indiscriminate pesticide use to conserve beneficial organisms.



Advantages of Integrated Control

1. Reduces pesticide dependence and production costs.
2. Preserves natural enemies of pests.
3. Improves soil and environmental health.
4. Maintains yield quality and sustainability.

5. Prevents pest resistance and resurgence.

Conclusion

Effective management of banana pests is essential for sustainable production. A combination of preventive, biological, and selective chemical measures ensures long-term pest suppression. Reliance solely on chemical pesticides leads to resistance, residue hazards, and environmental pollution. Integrated Pest Management (IPM) offers an eco-friendly, cost-effective, and sustainable solution by balancing biological, cultural, and chemical control methods. Adoption of IPM practices ensures healthy banana crops, higher yields, and reduced environmental impact.

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