



## INTEGRATED PEST MANAGEMENT OF PINK BOLL WORM (*PECTINOPHORA GOSSYPIELLA*) IN COTTON

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### Introduction

The pink bollworm, *Pectinophora gossypiella*, is a significant pest affecting cotton and, to a lesser extent, okra. Its developmental stages and distinct morphological features are critical for effective monitoring and management practices in agricultural settings. Understanding these characteristics allows for precise identification and targeted control measures to mitigate the damage caused by this pest.

**Scientific Name:** *Pectinophora gossypiella* (Saunders) (Gelechiidae: Lepidoptera)

**Host Plants:** Cotton (*Gossypium spp.*)

### Morphological Characteristics:

#### 1. Adult Moth:

**Coloration and Markings:** The adult moth exhibits a dark brown hue with prominent black spots located on the forewings. The hind wings are fringed with hair-like structures along their margins, which is a notable distinguishing feature.

**Wingspan:** The wingspan of *P. gossypiella* ranges between 8 to 9 mm, a crucial measurement for accurate identification and differentiation from other moth species.



Adult Moth of pink bollworm



Larval stage of Pink bollworm

#### 2. Larval Stages:

**Early Instars (First and Second Instars):** The larvae during these developmental stages are characterized by their white coloration, which may serve as a camouflage or adaptive trait in their early developmental environment.

**Late Instar (Full-Grown Larva):** In contrast to the earlier instars, the fully mature larvae are distinguished by their pinkish coloration. The head capsule of the mature larva is brown, which contrasts with the pink body, hence the

common name “**pink bollworm**”. This coloration may be indicative of the larval stage's physiological changes and adaptation strategies.

### Nature of Damage

**Targeted Plant Parts:** The larval stage of *Pectinophora gossypiella* inflicts damage on multiple plant parts, including buds, flowers, and bolls. This damage is often extensive and detrimental to plant health and productivity.

**Entry and Feeding Behavior:** The larva creates an entry hole in the boll, which typically heals over without leaving external signs of infestation. Once inside, the larva feeds on the developing seeds and the inner contents of the boll. This feeding activity compromises the integrity and quality of the bolls.

### Consequences of Infestation:

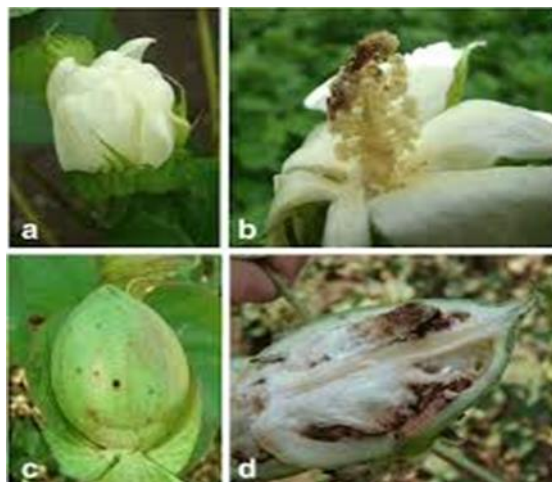
**Premature Boll Abscission:** Infested bolls may rot and fall off prematurely, leading to reduced yield.

**Compromised Boll Opening:** Mature bolls affected by the pink bollworm often fail to open properly, resulting in lint that is of poor quality.

**Reduced Ginning Percentage and Oil Content:** Infestation negatively impacts both the ginning percentage (the ratio of lint to seed) and the oil content of the cotton, diminishing the overall value of the harvest.



Pink bollworm larva damage on cotton boll



(a,b) Rosett flower formation in cotton

(c,d) Boll Damage by pink boll worm

### Larval Overwintering:

**Hibernation:** The larvae overwinter in double seeds, where they seek shelter to survive adverse conditions and continue development in the subsequent growing season.

**Infestation Peak:** The infestation level typically increases starting from November, correlating with seasonal changes and the availability of host plants.

### Life History

#### 1. Egg Stage:

**Oviposition:** Female moths deposit flat, white eggs singly on the underside of young leaves, shoots, flower buds, or directly on bolls. This strategic placement ensures that the emerging larvae will have immediate access to suitable feeding sites.

**Duration:** The egg stage lasts approximately 7 days, after which the eggs hatch into larvae.

#### 2. Larval Stage:

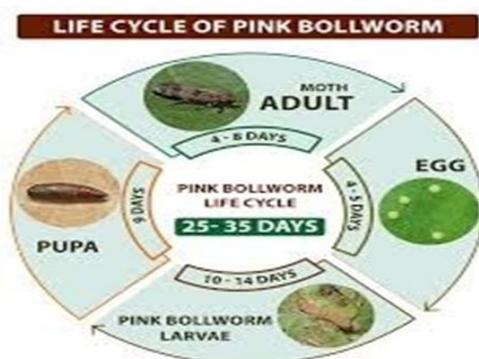
**Duration:** The larval period extends from 24 to 30 days. During this time, larvae undergo

several molts and feed voraciously on the host plant.

**Pupation:** Upon reaching maturity, the larvae exit the bolls through the feeding holes and move to the ground. They pupate among fallen leaves and debris, which provides a protective environment during the pupal stage.

### 3. Pupal Stage:

**Duration:** The pupal stage lasts between 6 to 20 days, depending on environmental conditions and the overall health of the larvae.



### 4. Adult Stage:

**Duration:** The adult moth stage is relatively short, lasting about 3 to 4 days. During this period, the moths engage in mating and oviposition to continue the lifecycle.

### 5. Generations per Year:

**Number of Generations:** *Pectinophora gossypiella* typically produces 4 to 6 generations per year. This high reproductive rate facilitates the rapid spread of the infestation and underscores the importance of timely and effective pest management strategies.

Understanding the detailed life history and damage characteristics of *Pectinophora gossypiella* is crucial for developing integrated pest management strategies and mitigating

the impact of this pest on cotton and okra crops.

### Control Measures

#### Cultural Control:

**Grazing by Sheep:** Allowing sheep to graze on fields after cotton harvest helps control larvae and pupae present in the remaining cotton stalks and debris.

**Use of Resistant Varieties:** Planting cotton varieties that are resistant to *Pectinophora gossypiella* can reduce infestation and damage.

**Avoiding Late Sowing:** Timely sowing helps reduce the period during which plants are susceptible to infestation.

**Removal of Alternate Hosts:** Eradicate alternate host plants that can harbour the pest and serve as a reservoir for reinfestation.

#### Physical and Mechanical Control:

**Hot Water Treatment:** Treating seeds with hot water at 60°C for a specified duration can effectively kill hibernating larvae and prevent their emergence.

**Seed Layering:** Spreading seeds in a thin layer during the summer months allows exposure to higher temperatures, which can kill larvae present in the seeds.

#### Pheromone and Light Traps:

**Sex Pheromone Traps:** Deploying 8 pheromone traps per hectare helps monitor and trap adult moths, reducing mating and subsequent egg-laying.

**Light Traps:** Installing light traps can capture adult moths, aiding in population monitoring and control.

**Biological Control:**

**Bt. Kurstaki Application:** Applying *Bacillus thuringiensis var. kurstaki* (Bt) at 1 kg/ha targets and controls larval populations through its insecticidal properties.

**Mating Disruption:** Using long twisted tubes (PB rope) at 150-200 per hectare disrupts mating by releasing synthetic sex pheromones.

**Neem Seed Kernel Extract:** Applying a 5% neem seed kernel extract serves as a natural insecticide and repellent.

**Release of Egg Parasitoid:** Introduce *Trichogramma chilonis* at 50,000 eggs per hectare at 10-15 day intervals to parasitize and control the eggs of *Pectinophora gossypiella*.

**Pupal Parasitoid:** Utilize the pupal parasitoid *Microbracon lefroyi* to target and control pupal stages.

**Chrysopa Release:** Release Chrysopa (lacewing) at 10,000 per hectare to prey on larvae and other pests.

**Chemical Control:****Insecticides:**

Quinalphos 25 EC: Apply at 0.05% concentration to control larvae and adults.

Carbaryl 50 WP: Use at 0.02% concentration to manage pest populations.

Thiodicarb 75 WP: Spray at 0.15% concentration for effective control.

Profenophos 50 EC: Apply at 0.75% concentration to target various developmental stages.

Implementing a combination of these control measures can significantly reduce the impact of *Pectinophora gossypiella* and enhance crop protection.

Integrated pest management (IPM) strategies that combine cultural, physical, biological, and chemical methods offer the most effective approach to managing this pest.