



# BUG BIZ

Pest Management and Insect Identification Series



## *Pectinophora gossypiella*, Pink Bollworm (Lepidoptera: Gelechiidae)

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### Description

The pink bollworm (*Pectinophora gossypiella*) has been, historically, a serious pest of cotton in Louisiana and continues to be a threat in other cotton growing regions of the world. Adult moth wingspan range from 1/2 to 4/5 of an inch (12 to 20 mm). The bodies are dark brown, and the forewings are narrow and light brown in color with darker irregular spots. Hindwings are pale gray, darker along the margins, and lined with long, gray hairs (setae). The tips of the hind wings are elongated into a fingerlike process (the “accusing finger”), which is similar to other moths in the family Gelechiidae. Eggs are minute, 1/50 of an inch (0.5 mm) in diameter, and white or cream-colored. Larvae are plump, pale cream colored, with orange or pink bands when mature, thus the common name. Mature larvae may reach slightly less than 1 inch (25 mm) in length. Pupae are reddish brown.

### Life Cycle

A generation of pink bollworms can be completed in around one month or slightly less under optimal conditions (approximately 82 F; 28 C), longer in cooler weather. Eggs are deposited in the vicinity of cotton bolls and the young larvae immediately burrow into the bolls and feed internally. Larvae undergo four growth stages (instars) before exiting the bolls and dropping to the ground to pupate. Adults emerge around nine days later. Pink bollworms are specialists of plants in the family Malvaceae. Larvae damage cotton by feeding internally on developing bolls, eventually feeding on the young seed. Larvae chew through the cotton lint to reach the seeds. Damage symptoms include bud drop, deformation of flowers, discoloration and loss of lint, and destruction of seeds. This leads to reduced yields of both lint and seeds. Agricultural damage is mainly limited to cotton, but okra and some other plants in the family may serve as occasional hosts.

Under favorable conditions, up to six generations annually can be completed in warmer parts of the infested



Pink bollworm, adult (Mississippi State University, Mississippi State University, Bugwood.org, Creative Commons 3.0).



Pink bollworm, larvae (Peggy Greb, USDA Agricultural Research Service, Bugwood.org, Creative Commons 3.0).

region. Adverse conditions can prompt long periods of inactivity (diapause), which may result in resurgences of infestations the following year and up to several years later. Dispersal of adult moths can result in infestations in more northern parts of the infested region.

## Ecological Significance and Pest Status

Pink bollworm is hypothesized to have originated in western Australia, via the extensive Indonesian Archipelago, and eventually to perennial cotton in Egypt during the early 20th century, then to cotton growing regions in other parts of the world. After first detection in the U.S. (Texas) during 1917, it became a serious pest of cotton throughout southern U.S. In Louisiana, the species was first documented during the early 1920s, but was eliminated through quarantine programs that restricted where cotton was grown in the southwestern part of the state. By the late 1950s, it had returned to Louisiana and most other cotton growing areas of eastern U.S. The species was the subject of an intense research program by U.S. Department of Agriculture and serves as a good example of how a detailed understanding of the life history of a pest can contribute to effective management through a combination of cultural, chemical, and quarantine programs that are now referred to as integrated pest management.

Quarantines and a combination of sterile male releases and use of *Bacillus thuringiensis*-based pesticides have resulted in eradication from cotton growing regions in southern and eastern U.S. Concerns about resurgence of pink bollworm and the impact of climate change on expanding potential infestations north make the species a top monitoring priority among agricultural interests and the USDA.

## Control

Modern management of pink bollworm in the U.S. is mainly based on methods used in irrigated cotton in California, where the species continues to be a periodic pest.

**Cultural.** Late planting and careful timing of late season irrigation mitigates establishment of infestations during spring and reduces late season infestations that may overwinter. Since pupation occurs in soil, debris removal, plowing under, allowing dropped squares to dry and crop rotation all help reduce populations in various circumstances. Trap crops and resistant varieties are also utilized as part of a well-planned management program.

**Biological.** The wasp parasitoids *Trichogramma confusum* (Trichogrammatidae), *Dibrachys cavus* (Pteromalidae), *Apanteles oenone* and *Chelonus* species (Braconidae), as well as other natural control agents, are known to attack pink bollworms in various parts of the world, but establishing and conserving viable populations in cotton fields have been difficult due to insecticide application for other cotton pests.

**Chemical.** Insecticidal control is difficult due to the internal feeding habits of the larvae. Synthetic pyrethroids, organophosphates, and microorganism derived insecticides (Spinosid and *Bacillus thuringiensis* formulations) are recommended for use against the species, but conventional insecticides target only adult moths.



Pink bollworm, life cycle (Art Cushman, USDA Systematics Entomology Laboratory, Bugwood.org, Creative Commons 3.0).

**Pheromonal.** Gossyplure was first synthesized during 1985 in Norway. It is the most widely used sex pheromone specific to pink bollworm. Pheromone dispensers located in cotton fields attract male pink bollworms in preference to females, thus inhibiting mating potential and suppressing populations. When used with other methods, gossyplure has had a significant impact in controlling and eliminating pink bollworm in many cotton growing regions.

**Molecular.** *Bacillus thuringiensis* (Bt) is a ubiquitous soil bacterium that produces a protein toxic to insects. Transgenic cotton contains Bt genes that are inserted via a carrier bacterium, among other methods. These modified plant strains express the toxin and prevent damage from a variety of moth pests without the use of additional insecticides. Bt cotton is effective in preventing damage from pink bollworm and other Lepidoptera. Some risk of resistance is involved and crops are planted in a pattern that combines high doses of Bt with trap crops that do not contain Bt. The trap crops ensure that non-resistant populations are always available to suppress resistance development.

## References

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