

# Pink Bollworm Management



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## Pink Bollworm Life Cycle

The Pink Bollworm life cycle includes four stages. These are the egg, larva, pupa, and adult. The time required from egg to egg varies because of temperature and other conditions but generally is about one month during the summer months.

### Egg

Female pink bollworm moths lay eggs singly or, more commonly, in small groups. Eggs are white when first laid but then turn orange, and later the larval head capsule is visible prior to hatching. The eggs are small and difficult to see without some magnification. Eggs hatch in about three to four days after they are laid.

Eggs of the first field generation in the spring are often laid on vegetative cotton plants near cotton squares and sometimes on squares. Second and subsequent generation eggs are usually laid under the calyx of bolls.

### Larva

Larvae immediately begin to bore into squares or bolls after hatching. In squares, larvae complete most of their development before blossoming occurs and often cause rosetted blooms. Final development is completed in the blossom.

In bolls, larvae feed within one to five seeds to complete development before exiting and dropping to the soil for pupation. While moving from seed to seed, the larva causes damage by cutting through the lint with its mouthparts. Lint is also damaged as the larva tunnels out of

the boll.

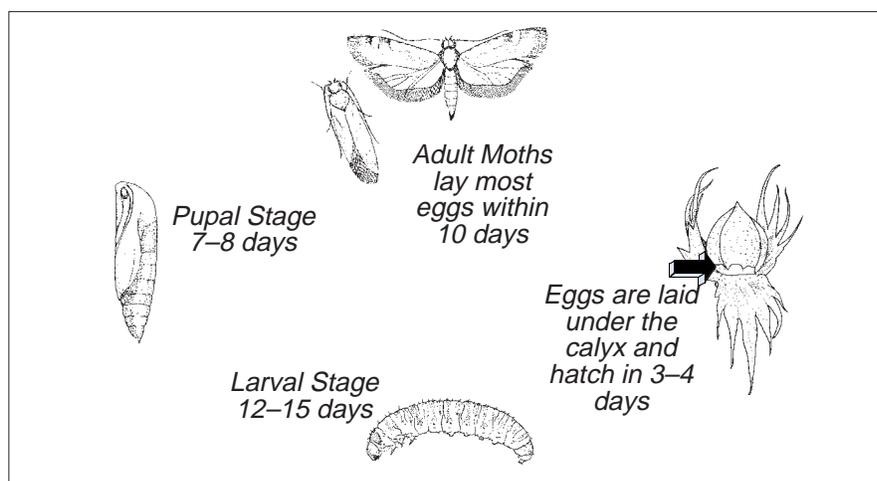
Larvae are white with a brown head when they hatch. They have four stages of growth (instars) and begin to turn pink in the fourth instar. They generally require 12–15 days to complete development after which they go into pupation.

### Pupa

It is in pupation that the pink boll-

eggs. After this preoviposition period the female lays most of her eggs in about ten days. Both male and female adults feed primarily on nectaries located on the bottom of cotton leaves and may live for one to two months.

The female produces a sex pheromone that aids the male in locating her for mating purposes.



*Pink Bollworm Life Cycle*

worm makes the drastic transformation from a larva to an adult moth. Most pupation occurs in the top layer of soil beneath cotton plants. The pupa is brown and approximately one-half inch long. It does not feed or move about during the pupal period of seven to eight days.

### Adult

Adult pink bollworms are mottled brown to gray moths and are about one-half inch long. They emerge from pupae in an approximately 1:1 male to female ratio. There is a time period of two to three days after emergence during which the female mates and prepares to lay

## Pink Bollworm Seasonal Cycle

Understanding the seasonal cycle of this pest species is key to exploiting cultural control techniques which can be responsible for season long control of the pink bollworm. The seasonal cycle is intimately tied to the cultivation of our cotton crop, because domestic cotton is the only host through most of the pink bollworm's range.



## Winter

The pink bollworm overwinters as a fully developed larva (fourth instar). During this period the pink bollworm is in a state of arrested development called diapause. The larva often spins a loose, silken web or cocoon in which it remains until the late winter and spring. Overwintering larvae may be found in bolls in the soil or on plants which remain unplowed through the winter. Often times the larvae may be found within the hollowed out seeds of undestroyed bolls. The larvae may also be found directly in the soil outside of seeds or bolls. In Arizona and southern California, about 50% of diapausing larvae live through the winter in the silken cocoons in the top two to three inches of soil while the other 50% remain in whole or fragmented bolls and squares.

gate through the cracking soil in order to emerge, dry their wings, and start the first field generation.

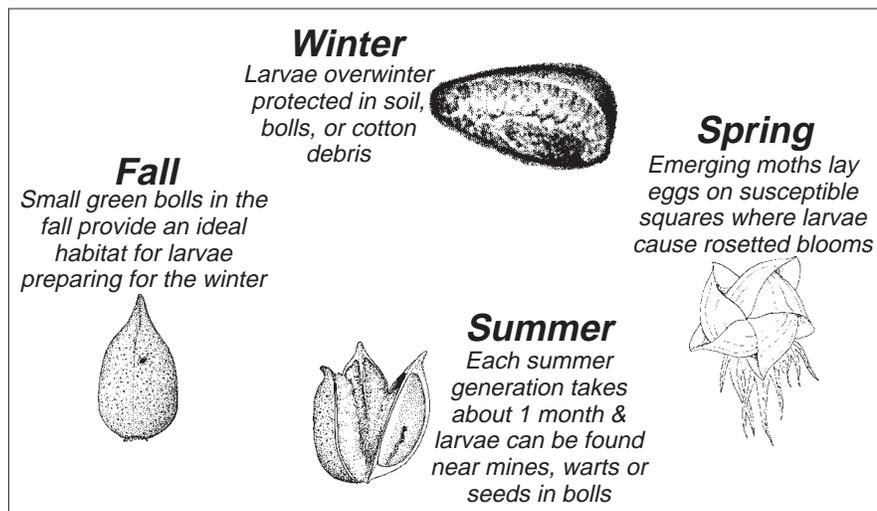
Adults move about searching for cotton and are capable of travelling long distances in order to reach susceptible cotton. Most flight occurs at night (especially midnight to 3 a.m.) when temperatures and wind conditions are moderate (i.e., > 50°F and < 10 mph). Mating occurs, and a gravid female must lay most of her eggs in about 10 days after emerging.

Squares which are capable of supporting pink bollworm larvae are deemed susceptible. This condition occurs when the sepals first part and the white petals become visible. Usually this corresponds to a 10-day old square. Up to this point of cotton development, pink bollworms cannot successfully colonize cotton and will

interfere with the proper development of the new boll. Occasionally, the larva can travel to the bottom of the flower and begin feeding at the tip of the newly developing boll.

## Summer

Fully developed larvae drop to the soil and pupate for seven to eight days before emerging as second generation moths. Each generation during the summer takes about 750 heat units (base 55°/86°F). This period is roughly equivalent to about one month in the low deserts. Depending on local conditions, pink bollworms are capable of passing through from one to four summer generations. The greater the number of generations that are possible for an area or allowed for by production decisions, the greater the chance is that damaging numbers will build-up. Once present on the plant, bolls become the preferred egg-laying site and feeding medium for the larvae.



*Pink Bollworm Seasonal Cycle*

Most overwintering occurs in the cotton field, although some may occur wherever cotton debris is deposited.

## Spring

Once diapause is completed, the larva begins to respond to temperature and moisture conditions and ultimately pupates in the spring. Though moths may be captured virtually any month of the year, most adults will emerge from pupae within the soil in the spring. Adults must navi-

perish. This is termed “suicidal emergence.” Thus, adult moths that emerge about ten days or more prior to susceptible square die without contributing to the first field generation.

Larvae from eggs laid on susceptible squares feed inside the squares and often cause rosetted blooms. Rosetted blooms are flowers which have had their petals tied together with silk by the developing larva. Most of the feeding at this stage is concentrated on the developing pollen grains and other floral parts. This can

## Fall

Some larvae begin to prepare for winter diapause in late August, and this diapause accelerates rapidly after mid-September as daylengths begin to shorten. Diapause is caused primarily by shorter days (reduced photoperiod) and lower temperatures ( $\leq 70^\circ\text{F}$ ), and therefore it predictably occurs at about the same time each year. A reducing percentage of pink bollworms continue to re-cycle throughout the fall months, and they can cause late season infestations. Limiting the number of small green bolls present after mid-September can drastically reduce the number of sites for pink bollworm re-cycling and overwintering. By late fall, if bolls are present, it is not unusual to have multiple larvae per boll present. These latest bolls on the top of the plant are generally immature, have poor lint characteristics, and contribute little or nothing to yield.

