

COOPERATIVE EXTENSION WORK  
IN  
AGRICULTURE AND HOME ECONOMICS  
STATE OF OKLAHOMA

D. P. TRENT, Director

OKLAHOMA AGRICULTURAL AND  
MECHANICAL COLLEGE AND  
UNITED STATES DEPARTMENT OF  
AGRICULTURE, COOPERATING

EXTENSION SERVICE  
COUNTY AGENT WORK  
STILLWATER, OKLAHOMA

*Distributed in Furtherance of the Acts of Congress of May 8 and June 30, 1914*

---

---

Circular No. 247.

General Series 86.

---

---

# The Pink Boll Worm<sup>1</sup> of Cotton

By

C. E. SANBORN,

Head of Entomology Department

C. S. RUDE,

Extension Entomologist

The worst cotton pest of the world, viz., the pink boll worm, now prevalent in Mexico, Arizona, New Mexico and Texas, has during the last ten years been slowly but surely approaching Oklahoma cotton fields. This new dangerous pest, if allowed entrance, could together with the cotton boll weevil, cotton flea hopper and other local pests, soon entirely destroy the cotton industry of this state. In countries where it has become established a loss of from 20 to 30 per cent of the cotton crop has occurred.

Last year (1927) Oklahoma produced 1,036,606 five hundred pound bales of cotton and 518,303 tons of seed, valued at \$96,032,396 and \$19,244,988 respectively, the total value<sup>2</sup> of which was \$115,277,384. According to an average (25%) of the above percentage of loss, the pink boll worm damage could have amounted to \$28,819,346. Furthermore, and in addition to this loss, there would also have been an inferior grade of lint and a lower quality of oil, together with the possibility of quarantines against Oklahoma by other states and the Federal government, probably making it not only impossible to ship cotton products, but also perhaps a great many other articles of commerce, household goods, etc., to points outside of Oklahoma.

---

<sup>1</sup>*Pectinophora gossypiella* Saunders. This insect is not known to be present in Oklahoma, although a great deal of seed and other material have already been introduced from infested areas. One or more infestations are likely to be found at any time. It is on account of such alarming conditions that this bulletin is issued.

<sup>2</sup>Data furnished by Mr. Ronald Betts in the Agricultural Economics Department of the Oklahoma A. and M. College.

## METHODS OF DISSEMINATION

These cotton products in which the pink boll worm may develop and hibernate not only afford excellent winter protection but also carriage facilities, either in large or small quantities. For instance, shipments may be made in freight cars, motor trucks, or by automobile. Only a small amount of infested material, not larger than a cotton seed, is sufficient to establish an infestation hundreds of miles distant from its origin.

Cotton growers who have been importing seed, and those living near railroads and state and Federal highways leading toward the infestations as previously mentioned and shown on map (Fig. 7) should be on the alert by making frequent and careful local inspections in order to prevent the establishment of this pest. After an infestation has started it can become extended by flight, i. e., the adult moths may proceed from one field to another, doubtless aided to a marked extent by wind. Unfortunately for Oklahoma the prevailing summer winds are such as to aid its entrance from distant infestations.

For the above reasons it is deemed advisable to send out this brief circular of information so that all persons interested in Oklahoma cotton culture may be better prepared to prevent the establishment of this new pest within our boundary lines.

The cottonseed worm, as the pink boll worm is sometimes called because of its habit of feeding principally within cotton seed, was first noted in India in 1842. From this source it became established in Egypt and other countries. From Egypt it was carried in cotton seed to Mexico in about 1911. Although it was carried in seed into Arizona in 1913, and Newport News, Virginia, in 1916, it never became really established in the United States until it got into Texas from Mexico in 1917. This latter and other early infestations in Texas<sup>3</sup> and Louisiana have been eradicated by cleaning up infested fields and by withholding the planting of cotton for a number of years. In western Texas, New Mexico and Arizona, however, the worm still exists. It also prevails in Mexico, from whence continuous infestations seem to be partially augmented.

Southwestern Oklahoma cotton growers are only about one hundred and fifty miles (see map, Fig. 7) from the newly infested Texas counties, viz., Dawson, Andrews, Martin, Howard, Ector, Midland and Glasscock, and about two hundred and fifty miles from the Carlsbad and Roswell, New Mexico, infestation.

---

<sup>3</sup>Ernest E. Scholl, 1919, Report of the Pink Boll Worm of Cotton, Texas Department of Agricultural Bul. No. 65.

This report by Mr. Scholl, now Assistant Director of Extension work in Oklahoma, was written while he was Chief Entomologist of the Texas Department of Agriculture, Austin, Texas. It was due largely to Mr. Scholl and his cooperation with the late Dr. W. D. Hunter, who as a member of the Federal Horticultural Board was in charge of the Federal work in Texas, that the infestations in eastern Texas were exterminated. The electrotypes herein used except Fig. 7, which was prepared by him, were borrowed by Mr. Scholl from Mr. R. E. McDonald, Entomologist of the Texas Department of Agriculture. The writers hereby not only acknowledge these favors, but also direction by Mr. Scholl on two trips into the infested area of west Texas and northern Mexico.

LIFE HISTORY<sup>4</sup>

"The eggs of the pink boll worm are laid singly or in groups on all parts of the plant above ground, about 50 per cent of them being laid on the green bolls. In Mexico the favored position is at the base of the boll, between the boll wall and calyx. Often more than 50 eggs and shells have been found on a single boll. It is estimated that a female will deposit in the neighborhood of 100 eggs. These hatch in from 4 to 12 days.

"The larva, on hatching, proceeds to bore its way into either a square or a boll. Squares are preferred early in the season, before the green bolls have become three-fourths grown. The square, even though it contains a larva, usually develops into a bloom. If the larva has attained nearly full development before the bloom opens it webs the ends of the petals together, and on opening they do not flare out normally; the bloom presents a rosetted appearance and is easily distinguished as infested. The infested bolls sometimes become recognized by a reddish or blackened discoloration which follows attack. Close examination will also reveal the small entrance holes of the larvae. But the only conclusive evidence of infestation is the larvae within the boll, as disclosed by dissection.

"The food of the larva is the seed within the boll. It devours one seed and generally proceeds to the next one above. Ordinarily a single larva does not make its way outside of the lock which it first invades, but occasionally the adjoining lock may be entered. It is to be noted that the larva restricts itself to the interior of the boll and never makes its way to the outside for the purpose of reaching another boll.

"During the summer the full-grown larva either cuts a hole in the outer boll wall for the emergence of the moth and pupates immediately under it, or drops to the soil and pupates within the surface layer of soil or under trash on the surface. In the fall the majority of the larvae remain in the bolls for hibernation. Often the larva protects itself by webbing two seeds together, the attachment being made to the openings brought into contact by the insect. These "double seeds" are characteristic of the work of the insect. Since usually they are not destroyed in the process of ginning, they furnish the best means of determining quickly whether any lot of seeds is infested.

"During the summer the larval stage occupies from 20 to 30 days. Late in the season this stage may be more or less indefinitely prolonged, and pupation correspondingly delayed\*\*\*. It is this feature in the life history of the pest which has facilitated its carriage to many remote quarters of the earth. \*\*\* This longevity is one of the most important points in the life history of the insect\*\*\*"

It has been ascertained that the larvae may remain alive in stored seed as long as thirty-one months.

The summer life history briefly summarized appears to be about as follows:

Eggs hatch in from 4 to 12 days.

Larvae develop in from 20 to 30 days.

Pupal stage lasts 6 to 20 days.

Shortest time of development from egg to adult is about 30 days.

---

<sup>4</sup>Hunter, W. D., 1926. The Pink Boll Worm with Special Reference to Steps Taken by the Department of Agriculture to Prevent its Establishment in the United States. U. S. Dept. Agri. Bulletin, 1397, 30 pp.; 11 Figs. See this bulletin for late literature citations. From this bulletin figures 4, 5 and 6 were taken.

## METHODS OF DISSEMINATION

The pink boll worm is distributed mainly in cotton seed or seed cotton transported from place to place. Such cotton products not only afford good winter protection, but they also prevent the pest from being easily observed. Such infested material may either be carried in commercial quantities or in small quantities in sacks, bedding, or as packing material and in cracks of highway vehicles and railway cars.

The adult, i. e., the moth may create new infestations by flight and thus may be aided materially by wind.

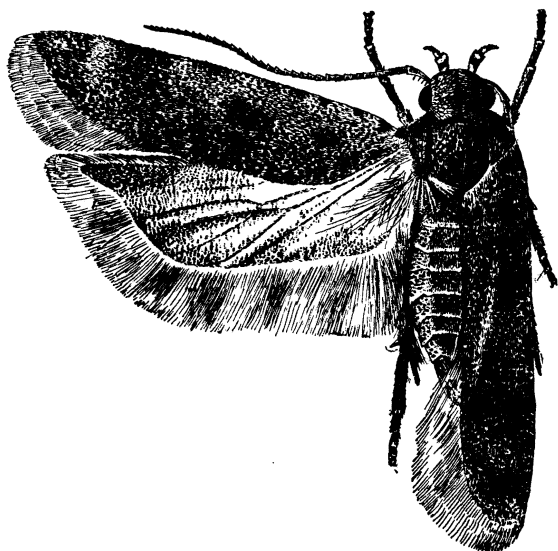


Fig. 1.—Pink Bollworm adult, enlarged. (Busck)<sup>5</sup>

The pink bollworm moth, (Fig. 1) resembles the clothes moth. From tip to tip of the extended wings it measures from three-fifths to four-fifths of an inch. It is of a dark-brown color, the forewings ending in a rather sharp point. The hind wings are somewhat broader than the fore wings and end in an even sharper point.

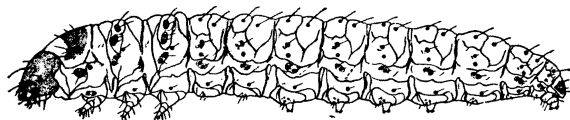


Fig. 2.—Pink Bollworm much enlarged. (Busck)<sup>5</sup>

The pink boll worm (larva) (Fig. 2) when first hatched, is glassy white with light-brown anterior markings. It grows rapidly, and when mature measures nearly a half inch in length. It is cylindrical, white, with dorsal sides strongly colored with pink. The majority of the hibernating forms found by us during February, 1928, were all strongly pink colored.

<sup>5</sup>Busck, August, 1917. The Pink Boll Worm, *Pectinophora gossypiella*, Jour. Agri. Res., Vol. 9, No. 10, p. 343-370, 7 Figs., pls. 7-12.

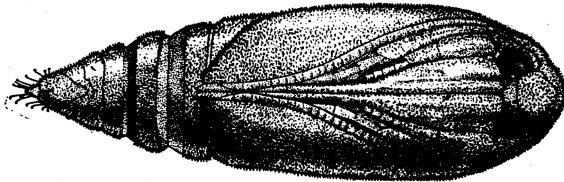


Fig. 3.—Pink Bollworm pupa, enlarged. (Busck)<sup>5</sup>

"The pupa (Fig. 3) is about two-fifths of an inch in length, reddish brown, the posterior end pointed and ending in an upturned hooklike process.

#### COTTON INSECTS EASILY MISTAKEN FOR PINK BOLLWORMS

"There are several insects found in bolls of cotton in the United States which may be mistaken for the pink bollworm. One of these is the so-called pink corn worm or scavenger boll worm, which frequently is found in decaying bolls, especially those which have been injured by disease. It has not been known to attack healthy bolls. It does not normally make its way into the seed, and this fact will help in distinguishing it from the pink boll worm."

Another insect which may most commonly be mistaken for the pink boll worm is the common large boll worm of cotton sometimes very destructive to cotton, corn and other plants in Oklahoma. During cold fall weather young boll worms sometimes attain a "pinkish" color, but the extra amount of frass and large entrance holes are generally sufficient for differentiating them in the pink boll worm.

The boll weevil, especially during its larval stage, may also be mistaken for the pink boll worm. The adult boll weevil is a snout beetle and not a moth like the pink boll worm adult. The young boll weevil or larva is a footless "c" shaped white colored grub and does not generally feed within cotton seed like the larva of the pink boll worm, which is a pinkish caterpillar that does not lie "c" shaped.



Fig. 4.—Cotton Seeds Injured by Pink Bollworms

Figure 4 shows individual seeds in the upper row infested by the pink boll worm. In the lower line are the "double seeds." The latter are frequently found as the result of the webbing together of two seeds by larvae of the later stages in order to obtain more room for pupation.

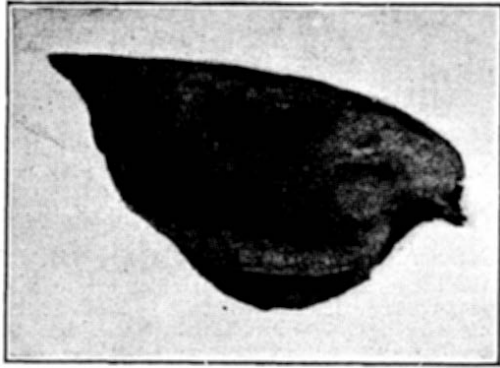


Fig. 5.—The Distinct Round Hole

“Figure 5 illustrates a full grown pink boll worm lying on the inside of a burr and the typical opening made by this insect when it crosses through the partition from one lock to another.

“Although these descriptions may help in enabling any one to determine whether the pink boll worm is present in a cotton field, it will always be best to send any specimens to an entomologist without delay.”

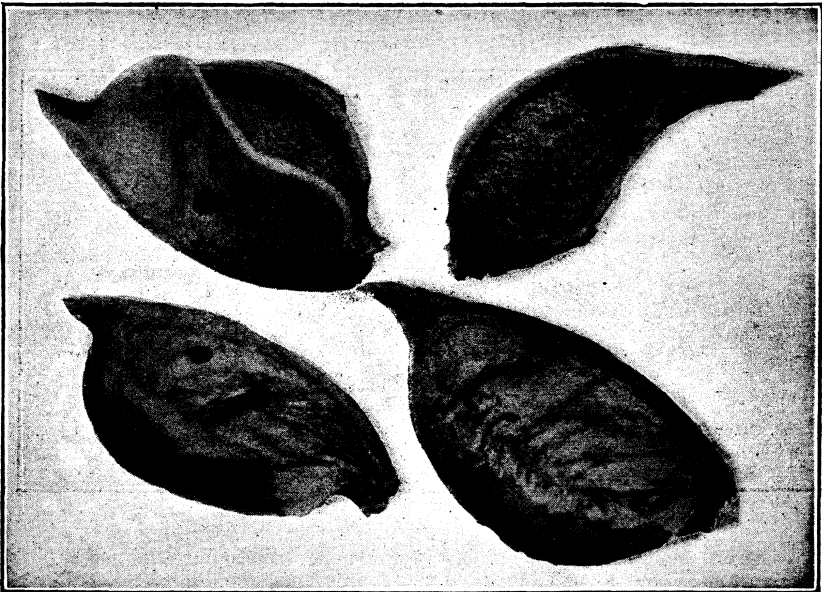


Fig. 6.—Typical holes made by pink bollworms through cotton-boll partitions or carpels

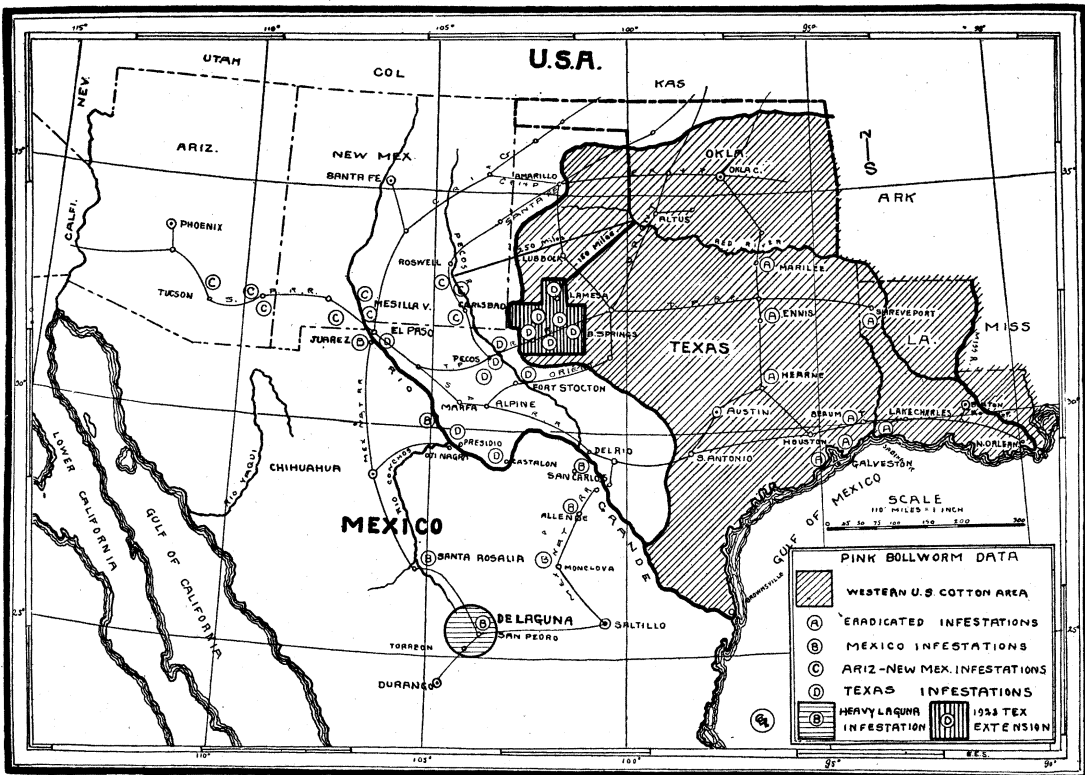


Fig. 7. See explanation on map for prevalent and eradicated infestations of the pink boll worm. Cross-hatched area shows principal contiguous cotton areas although cotton is grown in all localities where infestation is shown. Note particularly (d) the 1928 infestation, which is approximately 150 miles from the Oklahoma line.

Mr. Ernest E. Scholl found some wasp nests provisioned with pink boll worm larvae together with other larvae. This was on one of his trips of investigation into the Big Bend country of Texas, near Castolon, near Castolon, October, 1924.

## HOW TO DISTINGUISH THE PINK BOLL WORM IN THE FIELD, STORED SEED COTTON OR SEED

The moth (Fig. 1) can most easily be found in the cotton field at night by use of a light. The head light of an automobile or even a good flash light used as soon as darkness comes in the evening are good. The moths do not play around the light much, but usually light rather quickly on the glass of the headlight or on a nearby cotton plant, with their wings flat to the back, thus somewhat resembling an ordinary "sharpshooter", or "squirrel bug." When they are rather prevalent, some can be caught by means of a lighted lantern placed over an open vessel of water containing a film of oil.

If they are emerging from cotton seed or lint stored in dark rooms or bins with few windows, they will fly to the latter and attempt to escape during the evening at or a little after dusk. In nearly every instance after they alight they remain quiet instead of buzzing about like an ordinary candle moth. The moth that is most likely to be commonly mistaken for the pink boll worm moth in bins or granaries is the anguimois grain moth and common flour and meal moths.

The pink boll worm may be associated with a few other worms in the field. It is generally much the cleanest of any except the boll weevil larvae, however, in habit. Other moth larvae generally eat ragged edged holes into the squares and bolls, and also leave more or less frass or exudation at the entrance holes in the bolls. The entrance hole of the pink boll worm is not larger around than a sewing needle. The exit hole in the boll is nearly always round, clean cut, and not larger than the diameter of the lead in an ordinary pencil. It has the appearance of being drilled rather than having been gnawed. (See hole in upper right-hand quarter burr in Fig. 6). The same is true of the crossing holes in the partitions between the cotton locks. They may eat these holes through somewhat obliquely instead of straight through perpendicularly.

As previously mentioned a worm generally begins to develop by eating the seeds in a lock from the base toward the tip. They seem to prefer to remain continuously under protection, although we have found them sufficiently exposed in blossoms to be captured by wasps, as was proved also by finding them in wasp nests.<sup>9</sup>

No other larvae except a few scavenger larva are present in field bolls during the winter time. We have seen them so numerous in the Big Bend area of Texas during the month of February (1928) that from one to a dozen could be found in bolls lying on the ground on nearly any fifteen square feet space throughout a hundred acre field which had grown cotton during the preceding year.

The pink boll worm larva is practically the only worm that is ever found sealed up within stored cotton seed. Meal worms and others may crawl among cotton seeds, but they will not hermetically seal themselves within the seed hulls like the pink boll worm. The latter frequently attaches an adjacent seed by webbing it to and closing the opening of the one in which it is living. For illustration of infested cotton seed, see Fig. 4.

As was previously stated this insect is not yet known (April, 1928) to be in Oklahoma. Unfortunately cotton seed for both milling and planting purposes has been brought into Oklahoma from states known to be harboring infestation.

People chiefly interested in the introduction of such seed may be perfectly honest in assuming that it does not originate in a "known to be infested" locality. Yet they can be entirely erroneous. As a matter of fact, and as proven by a number of instances on record, shipments have originated from infested fields, although the fields were not known to be infested until late in the season after shipments had been made.