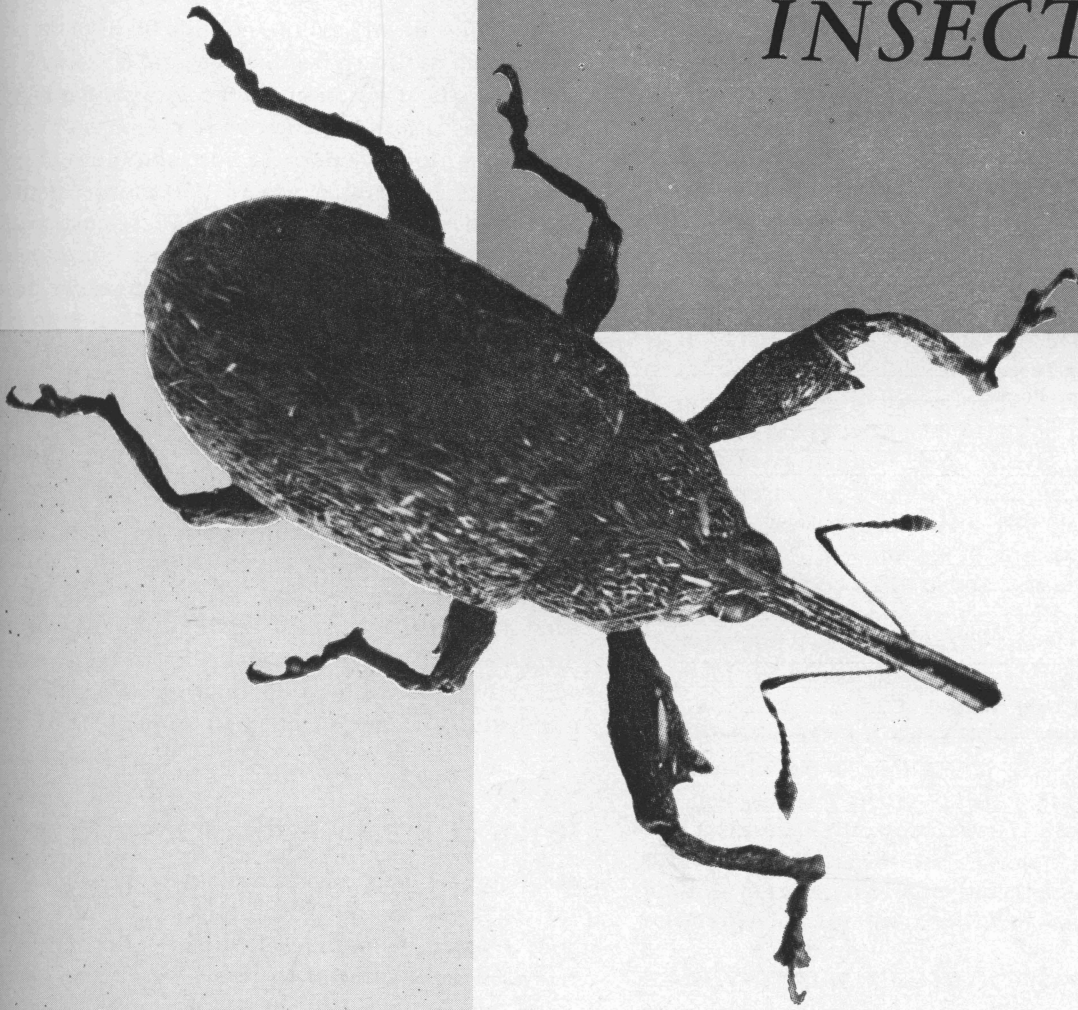


# COTTON INSECTS



TEXAS A&M UNIVERSITY  
TEXAS AGRICULTURAL EXTENSION SERVICE  
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# COTTON INSECTS

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COTTON INSECTS cause an estimated annual loss of over 70 million dollars to cotton growers in Texas. This tremendous crop loss emphasizes the importance of an adequate control program if the cotton grower is to realize a profit. No single step in the production of cotton is more important than the protection of the plants and fruit from insect damage. The increases in yield which have been made during recent years are due in no small measure to effective insect control programs. To carry on an incessant war against insect enemies of cotton, the planter should be able to recognize the most injurious pests, the nature of their damage and the principles involved in their control.

The cotton plant, with its many succulent leaves, nectaries and abundance of fruit, is attractive to many species of insects, both injurious and beneficial. While the boll weevil and bollworm are considered the most destructive, the pink bollworm is potentially more serious. Beneficial insects may aid in controlling injurious pests, but they alone cannot be relied upon to control the major pests.

## Principles of Cotton Insect Control

Results of research indicate that an adequate insect control program will, on the average, increase the crop yield by more than 40 percent. For every timely application of insecticide made when the infestation warrants control of injurious pests, a gain of at least 80 pounds or more of seed cotton per acre may be expected. The planter should net a profit, based on average increased yields of at least \$6 for every dollar invested in his insect control program. The decreases in crop yields are only a part of the losses caused by insects. Many insect pests that attack cotton and reduce yields also affect and lower the quality of lint under certain conditions. Often, insects have reduced the quality, resulting in a loss of as much as 10 cents per pound. In these instances the saving in quality loss alone would have paid for the control program.

## EARLY-SEASON CONTROL

The control of injurious insects on cotton early in the season has proved beneficial in most areas of the State. Early-season control insures early fruiting and earlier maturity in areas where thrips, aphids, fleahoppers or boll weevils alone or in combination cause damage every year. Usually two to four timely applications of insecticides, made at 7-day intervals, give effective control. The last of the early-season applications should be made at least 30 days before the bollworms usually appear. This period is desirable because it allows time for beneficial insects to develop in sufficient numbers to aid in reducing the bollworm population. This program reduces the number of boll weevils early in the season, which in turn normally minimizes the number of applications of insecticides necessary to control this insect. Since a comparatively low dosage of insecticides is needed to control insects early in the season, a larger number of beneficial insects can withstand exposure thereto and remain effective in reducing populations of injurious pests.

## LATE-SEASON CONTROL

Timely use of a proper insecticide will control the major insect pests. Leaflet 218, *Texas Guide for Controlling Cotton Insects*, revised and reprinted each year by the Texas Agricultural Extension Service, lists the insecticides and dosages recommended for the control of each insect.

## EARLY-STALK DESTRUCTION AND FARM CLEANUP

Early harvest, followed by prompt stalk destruction, reduces boll weevil and pink bollworm populations. Such practices prevent late-season development of weevils and pink bollworms, thus reducing the numbers to survive the winter. For more details, see Extension Leaflet 219, *Ways to Fight the Pink Bollworm in Texas*.

## Insects Resistant to Certain Insecticides

The term "resistant" as used here describes an insect population which consistently exhibits

greater survival from repeated exposures to a chemical insecticide than was observed when first used. The genetics of resistance is not well known and seems to differ in insects resistant to different insecticides. Several cotton insects have proved difficult to control with the chlorinated hydrocarbons in certain areas of Texas.

Boll weevil populations resistant to chlorinated hydrocarbons have been noticed in Brazos river bottom fields located in Grimes, Burleson, Brazos, Robertson, Falls and McLennan counties. Either calcium arsenate or a phosphorus insecticide should be relied upon to control weevils in this area.

The cotton bollworm has developed resistance to DDT in many areas and the tobacco budworm is resistant to several chlorinated hydrocarbon materials plus carbaryl.

Cotton fleahoppers resistant to the low dosages of chlorinated hydrocarbon insecticides have been found in Central Texas and certain nonirrigated fields in the Upper Rio Grande Valley. Mixtures of certain hydrocarbons with DDT, Sevin dust or phosphorus insecticides are necessary to control fleahoppers in these areas.

Control of thrips with low dosages of chlorinated hydrocarbon insecticides has been difficult on the High Plains.

Cotton leafworms are easier to control with phosphorus insecticides than with chlorinated hydrocarbons. The half-to-full-grown cabbage loopers are difficult to control with any known insecticide; however, the newly hatched larvae may be controlled with a number of the commonly used insecticides.

Growers should obtain information from local county agents as to the kind of insecticide to use for best control of specific pests.

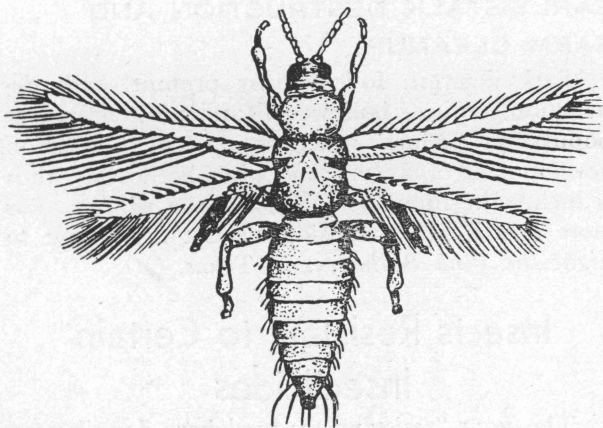


Figure 1. Adult thrips

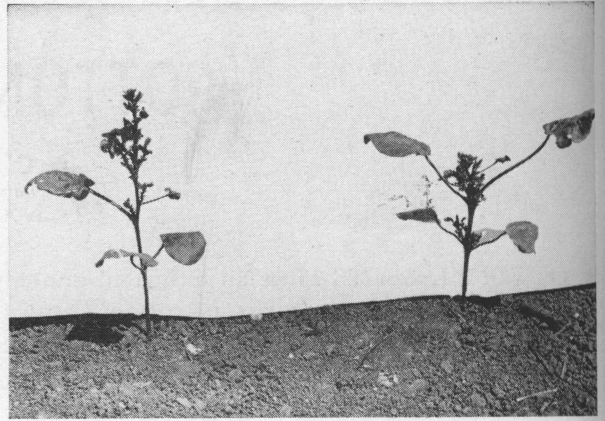


Figure 2. Cotton plants injured by thrips

## Insects of Major Importance

### THRIPS

As soon as cotton comes up to a stand in the spring, it is subject to attack by thrips. Several species<sup>1</sup> cause similar injury to cotton. One or more species of thrips attack cotton in all areas of the State.

*Description:* Adult thrips are minute, slender, yellowish insects, averaging about 1/15 inch in length, Figure 1. Their mouthparts are cone-shaped and adapted for rasping and sucking. The adults usually have two pairs of narrow wings fringed with long hairs, which assist in flight. Also they are capable of drifting long distances in wind currents.

*Life History:* Thrips appear on growing plants throughout the year in most areas of the State. Eggs are inserted into the plant tissue by means of the female's sharp ovipositor. The young hatch in about 6 days. The first two growth periods, known as larval stages, require about 6 days for completion. The next periods, known as prepupal and pupal stages, require an additional 4 days to maturity. Egg-to-adult development requires about 16 days. The average life span of a mated female is about 35 days, during which 50 eggs or more may be produced. Thrips can reproduce both sexually and without mating. Mated females produce both males and females while unmated females produce only males.

*Nature of Damage:* Thrips attack crops such as clover, alfalfa and oats as well as cotton. When certain crops that are hosts of thrips mature, the insects migrate to cotton in large numbers. Thrips

<sup>1</sup>*Frankliniella fusca* (Hinds)  
*Frankliniella tritici* (Fitch)  
*Frankliniella occidentalis* (Pergande)  
*Thrips tabaci* Lindeman

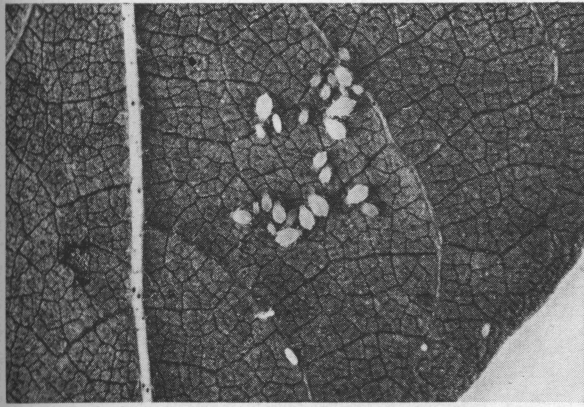


Figure 3. Cotton aphids

injure young cotton by causing the plants to be malformed and to shed the small squares. This results in delayed fruiting as well as loss of fruit, Figure 2. Damage from thrips usually occurs early in the season while in some areas this pest may blast squares during the entire season.

#### COTTON APHID

The cotton aphid<sup>2</sup> attacks cotton throughout Texas especially during cool, damp weather. This species of aphid attacks a wide variety of plants other than cotton, such as the cucurbits, beans, beets and many ornamentals.

*Description:* The cotton aphid is a minute insect with piercing sucking mouthparts varying in color from pale yellow to dark olive green with characteristic black markings. The insect may be wingless or possess two pairs of wings Figure 3.

*Life History:* All adults are females which live and produce young on growing plants during the winter. The male sex is not known to occur in this State. This aphid produces living young without mating. The young resemble the wingless adults. Aphids reproduce rapidly; one female may produce as many as 80 young females which mature within 8 to 10 days. Thus it is possible for aphids to have as many as 50 generations in a year in the southern part of the State.

*Nature of Injury:* Aphids commonly appear on the underside of leaves where they suck sap causing the leaves to curl and sometimes shed. They may cause malformed plants or sometimes even kill seedling plants. Infestations late in the season may cause premature defoliation and lowered yield. The honey dew secreted by the aphids affords an ideal medium for fungus growth which in turn may greatly reduce the quality of the lint.

#### COTTON FLEAHOPPER

The cotton fleahopper<sup>3</sup> attacks cotton early in the season, migrating from horsemint and other spring weed hosts to cotton. Late in the growing season when cotton has matured, the fleahopper transfers to croton and other weeds.

*Description:* The adult fleahopper is about  $\frac{1}{8}$  inch long and is pale green, Figure 4. The wings are marked with small dark spots and a pair of characteristic black marks near the tip of each. The adults and immature forms have piercing sucking mouthparts.

*Life History:* Adult female fleahoppers insert their eggs through the bark of various host plants



Figure 4. Adult cotton fleahopper

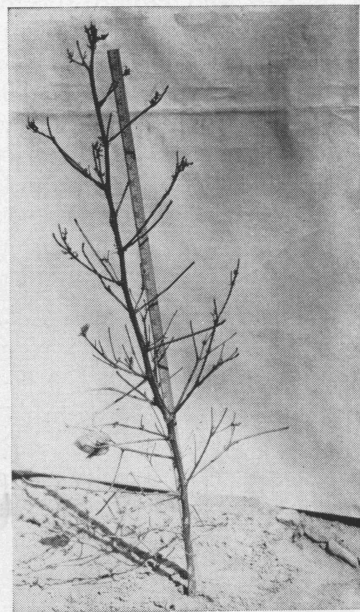


Figure 5. Cotton plant injured by cotton fleahopper

<sup>2</sup>*Aphis gossypii* (Glover)

<sup>3</sup>*Psallus seriatus* (Reuter)

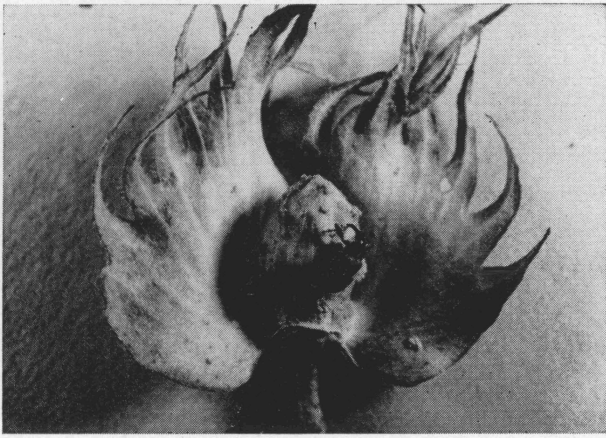


Figure 6. Boll weevil

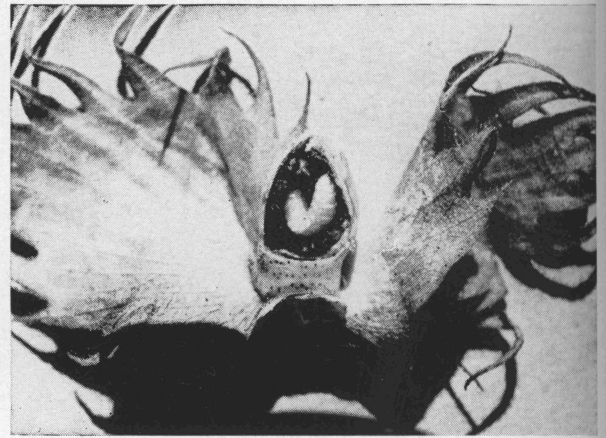


Figure 7. Boll weevil grub in square

including cotton. The eggs hatch in about 8 days. About 12 days are necessary for fleahoppers to attain full growth. The egg-to-adult stage requires 20 to 24 days depending on weather conditions. This insect overwinters in the egg stage, in croton weeds or other wild host plants as well as in cotton.

*Nature of Injury:* The adults and nymphs suck sap from the tender portions of the plant including the small squares. The injury may be characterized by excessive blasting and shedding of small squares and a reduction in the number of fruiting branches. This results in a tall whip-like growth of the main stem or an increased number of vegetative branches, Figure 5.

### BOLL WEEVIL

The boll weevil<sup>4</sup> crossed the Rio Grande at Brownsville in 1892 and rapidly spread over the entire Cotton Belt. The first specimens described were reared from bolls; thus it was given the present common name. It is believed that the "square weevil" would have been a better name since squares are attacked more readily than bolls. The weevil prefers cotton but will feed and breed on althea. The boll weevil is considered the most destructive pest of cotton in the eastern half of Texas and in the Lower Rio Grande Valley.

*Description:* The boll weevil egg is rarely seen because it is deposited in the square or boll. The white egg is elliptical with a soft smooth shell and measures about 1/30 inch in length. The immature weevil is a white legless grub and when full grown measures about 1/4 inch in length. The pupa is also white and is found within the square or boll. The mature weevil is about 1/4 inch long, grayish brown and has a prolonged snout which

bears the chewing mouthparts at its tip, Figure 6. The front femora have two spurs on the inner surfaces and the body is clothed with hair-like scales.

*Life History:* The boll weevil hibernates or passes the winter in woods trash, grass, cotton stalks, crop debris, fence rows, around houses and in Spanish moss. Early in the spring, the overwintered weevils leave their hibernation quarters in search of food. Soon after the first squares are one-third grown, egg laying begins. The female eats a cavity with her mouthparts in the square or boll and deposits an egg. She then seals the cavity by secreting a sticky substance. On the average, females lay about 100 eggs during their life period of about 30 days. The eggs hatch into larvae or grubs, Figure 7, in about 4 days and transforms into pupae within the squares or boll in 9 days. Six additional days are required for the adult to emerge. The pre-egg laying period requires about 8 days making it possible to have a generation of weevils in about 27 days.

*Nature of Damage:* Weevils puncture squares and bolls for feeding or for egg laying. Egg punctures can be distinguished from the feeding punctures by their wart-like appearance. Punctured squares flare open and usually fall to the ground within a week. Small punctured bolls may also drop to the ground but the larger bolls may remain on the plant. However, severely damaged bolls may fail to open or may open partially, with one or more locks ruined by the weevil.

### BOLLWORMS

Bollworms are serious pests of cotton throughout Texas, particularly in West Texas. Two species of bollworms attack cotton. However, the one commonly called bollworm is far more injurious.

<sup>4</sup>*Anthonomus grandis* (Boheman)

## Bollworm

The bollworm<sup>5</sup> is considered a pest of many crops other than cotton. It is known also as the corn earworm and the tomato fruitworm. It readily attacks legumes and many other crops. This insect overwinters in the pupal stage in the soil and the moth emerges early in the spring. The first brood of larvae feeds on legumes and corn or sorghum, while the second brood attacks corn and sorghum crops, then migrates to cotton fields and severely damages the more succulent cotton plants.

*Description:* The bollworm egg is scarcely as large as the head of a common pin. It is white when first laid, turning light brown just before hatching and spherical in shape with ridges along the sides. The eggs are laid singly and scattered over the cotton plant. The larvae vary in color, sometimes light green, pink or brownish to black with alternating light and dark stripes, Figure 8. They are about 1½ inches long when full-grown. The adults or moths vary from light brown with a greenish cast in the male to a deep reddish-brown in the female, Figure 9. They have a wing spread of about 1½ inches.

*Life History:* The eggs which are laid on the leaves hatch in 3 days and the young larvae feed on the tender leaf buds and small squares a few days before attacking larger squares and bolls. The young larvae hatched from eggs laid on the fruit usually crawl around feeding before entering the fruit. The larval period requires approximately 18 days and about 14 days are needed to complete transformation in the pupal stage. Thus the developmental stages from egg to adult total about 35 days.

*Nature of Damage:* The bollworm larvae feed on the fruit and the principal damage is the loss

<sup>5</sup>*Heliothis zea* (Boddie)



Figure 8. Bollworm in cotton bloom

of both squares and bolls. Newly hatched larvae feed on leaf buds and very small squares in the terminals later attacking the larger squares, making an entrance hole into each. The injured square flares and drops from the plant. The large larvae feed on bolls and on pollen in open flowers. They enter the boll and sometimes consume the entire contents of the boll. The larvae may "top" the plants by devouring the tender terminals when infestations are severe.

## Tobacco Budworm

The tobacco budworm<sup>6</sup> also injures cotton throughout Texas. This pest is difficult to distinguish from the bollworm in the larval stage. The host plants generally are the same for both the bollworm and tobacco budworm, except the tobacco budworm has not been observed attacking corn or sorghum.

*Description:* The egg of the tobacco budworm cannot be distinguished from the bollworm. Larvae of the two species are similar in appearance; the large worms can be identified by a distinctive process on the "jaws" of the tobacco budworm. Bollworm larvae do not have similar processes on their jaws. The tobacco budworm moth is smaller than the bollworm moth and the forewings of the tobacco budworm are greenish, with three oblique white lines.

*Life History:* The life history of the tobacco budworm is similar to that of the bollworm. A few days less are required for the tobacco budworm to complete the larval stage than are required for the bollworm. The time required for the other stages of growth is similar for the two species.

*Nature of Damage:* The tobacco budworm and the bollworm cause similar damage to the cotton.

<sup>6</sup>*Heliothis virescens* (Fabricius)

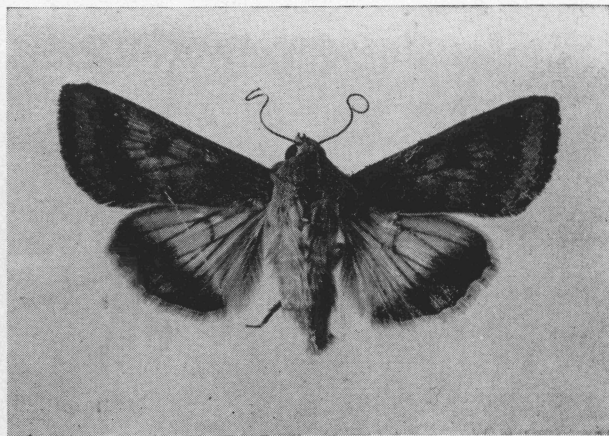


Figure 9. Bollworm moth



Figure 10. Pink bollworm in cotton boll

The tobacco budworm has become a serious pest of cotton in many areas of the State during the past few years.

### PINK BOLLWORM

The pink bollworm<sup>7</sup> is a world-wide pest of cotton and its feeding activities cause severe injury to the fruit. The original home of the pink bollworm is southern Asia from where it spread to Egypt to Brazil and to Mexico in cottonseed shipments. Since 1917, it has spread throughout Texas and into certain parts of New Mexico, Arizona, Louisiana, Oklahoma and Arkansas. Damage and spread have been reduced by Federal and State quarantines, which regulate the movement of seed cotton or cottonseed and by control measures practiced by governmental agencies and cotton growers. Certain cultural practices are mandatory in Texas. For detailed information on pink bollworm control see extension leaflet 219, Ways to Fight the Pink Bollworm in Texas.

During 1952, losses caused by the pink bollworm in a 38-county area in South Texas were estimated at more than 28 million dollars. This outbreak probably occurred because of the unfavorable weather which prevented planters from following the cultural control practice of destroying cotton stalks during the preceeding fall. Also unfavorable weather caused planters to plant the crop both early and late during the spring. Thus the different age cottons tended to furnish an ideal situation for the pink bollworm to develop to large numbers. In years when it is possible to destroy the stalks immediately after harvest and plant the crop early during a short period of time, injury to the crop from this pest is minimized.

Host plants of the pink bollworm other than cotton include okra and some other malvaceous plants.

*Description:* The female moth lays eggs promiscuously over the plant singly or in masses on the vegetative or fruiting parts of the cotton plant; however, the preferred oviposition site is at the base of the boll. The egg is white when first laid but turns reddish before hatching; it is oval and measures about 1/40 inch in diameter. The surface is finely netted with longitudinal ridges and irregular cross connections. Young worms are white while the larger larvae are pink and measure about 1/2 inch in length, Figure 10.

When a young pink bollworm larva eats its way into a square and feeds on the immature anthers, the square usually is not injured extensively but continues to develop. Often the resulting bloom is normal except that the unfolding petals are held together by strands of silk spun by the larva which at this time is almost fully developed. Such blooms are known as "rosetted" blooms. When the infested bloom is shed, the larva may continue to feed on the young boll or pupate in the fallen bloom. The pink bollworm moth is brownish with a wingspan of about 2/5 inch.

*Life History:* One moth may lay as many as 300 eggs. The average incubation period is about 5 days. The young larvae crawl over the boll before entering. Twelve to 14 days are required for the larvae to attain full growth. The larvae feed principally on the seeds, cut holes in the boll wall and drop to the ground to pupate or they may remain in the seeds to complete development. The larvae which remain in the boll may hibernate in a single seed or unite two hollowed-out seeds by spinning a cocoon within the two cavities. Seeds united in this way are called double seeds. The larvae may also hibernate in the field in the seed cotton remaining on the stalks or on the surface of the ground. Hibernating larvae may live for months before pupating. About 8 days are needed for the pupa to transform to a moth. Thus during the growing season, egg-to-adult development is completed in about 26 days. It is possible to have as many as six generations in a year.

*Nature of Damage:* Within the green bolls the larvae travel from one seed to another eating out the kernel of each. In going from one seed to another the immature lint is damaged, thus adding lint damage to the seed damage. The quality of the seed is reduced and the lint is stained, thus reducing its market value. In heavily infested fields, many bolls are so badly damaged

<sup>7</sup>*Pectinophora gossypiella* (Saunders)



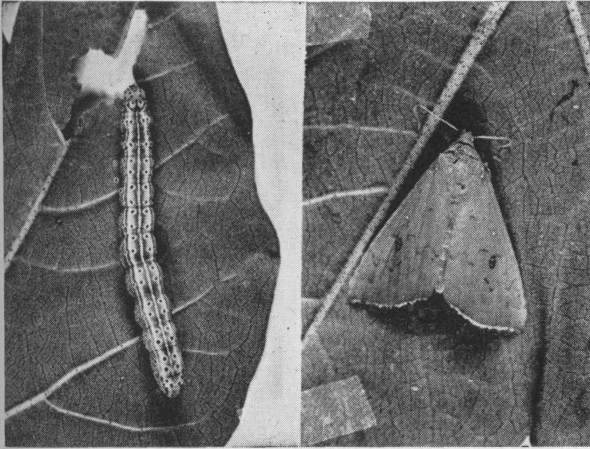


Figure 11. Cotton leafworm larva and moth

that they fail to open completely and are not picked. Thus yields are greatly reduced.

Good cultural practices are essential in controlling the pink bollworm. Certain insecticides are effective, but cannot be relied upon entirely for economical control.

## LEAFWORMS

### Cotton Leafworm

The Cotton Leafworm<sup>8</sup> is one of the earliest known pests of cotton; the first invasion of this insect was reported in 1793. It is not able to survive the winter in any part of the United States. Apparently infestations always originate from flights of moths from Central America. Nevertheless, the leafworm occurs in some section of the Cotton Belt almost every year. The conditions affecting the increase of this pest in its native habitat and the weather conditions at the time the moths appear are the main factors governing its development.

*Description:* The flattened circular-shaped eggs, laid singly on the underside of the leaves, are bluish-green when first laid and hardly as large as the head of a common pin. The egg with a ribbed shell differs from the bollworm egg in shape, color and place of attachment to the leaves.

The slender larvae when full grown measure about 1½ inches long, Figure 11. They vary from light to dark yellowish-green and are marked with three narrow white stripes down the back and one similar stripe along each side. Also black spots arranged in rows may be found on their back, each set with a black spine surrounded with a white ring. The head of the larger worms bear 30 characteristic black spots. They are semi-loop-

ers because the first pair of prolegs is reduced and seldom used.

The larvae "web up" by forming flimsy cocoons for protection within a fold or roll of leaves to pupate. The pupal or resting stage is dark brown and is provided with hooks at the posterior end of the abdomen.

Wings of the moth are light brown tinged with olive green, measuring about 1½ inches from tip to tip. The characters that distinguish the leafworm moths are the undulating reddish lines across the front wings and the oval dark spot near the center of each forewing, Figure 11.

*Life History:* Within 3 days after the eggs are laid in midsummer, the young larvae eat their way through the egg shell. The time elapsing in the egg stage varies with the temperature; a much longer time is required in the early fall than in midsummer. Eggs can not survive frost.

The larvae pass through six growth stages requiring about a week in midsummer, while in early fall the time may be greatly extended. The pupa or resting stage requires about a week. Egg-to-adult development requires about 17 days in midsummer. The newly emerged adult is capable of laying eggs within 2 to 4 days.

*Nature of Damage:* The leafworm reproduces only on cotton. The insect is essentially a leaf feeder. However, when all foliage has been consumed, the worms may attack the squares. The tip of the proboscis of the moth is armed with spinose bristles, by means of which they are able to lacerate the skin of fruits and feed upon the juices at the puncture. The moths may cause considerable damage to figs and peaches. Leafworms have not caused serious injury to cotton during the last

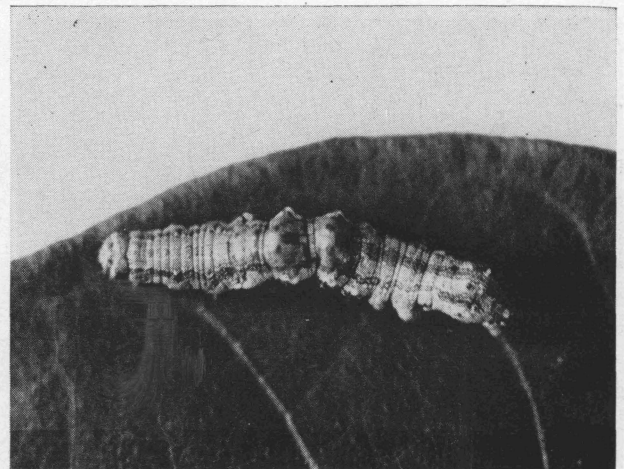


Figure 12. Brown cotton leafworm

<sup>8</sup>Alabama *argillacea* (Hubner)

few years. This perhaps is due to the thorough dusting and spraying programs which have been followed generally throughout South Texas.

### Brown Cotton Leafworm

The brown cotton leafworm<sup>9</sup> was first observed attacking cotton in South Central Texas during 1953. Since this date, outbreaks have occurred in at least 20 Central Texas counties.

*Description:* The brown cotton leafworm egg is subconical in shape, bluish-green and about equal to the size of the bollworm egg. However, it can be distinguished from the bollworm egg by the semitransparent ribs of varying lengths crested with a distinctive semitransparent flange. The eggs are laid singly on the terminal buds, leaves, stems and leaf petioles. The larva is reddish-brown mottled with white, about 1¼ inches long when full grown, Figure 12.

The pupa or resting stage is dark brown, about ½ inch in length. The insect normally pupates on the surface or no deeper than ¼ inch in the soil. The capsule-like cocoon is formed about the pupa by incorporating soil particles and debris with the silken fibers spun by the larva.

Male moths can be distinguished from females by the color pattern of the forewings. The forewing of the female is grayish at the base bordered by an irregular dark band and terminated with an oblique white line. Each wing has a conspicuous reddish brown spot near the anal area. The forewing of the male is pale gray on the basal area which is bordered by an evenly curved white line extending obliquely across the wing. Here it joins a similar transverse line which separates the black tip from the light-colored area. The average wing span is about 1 inch.

<sup>9</sup>*Acontia dacia* (Druce)

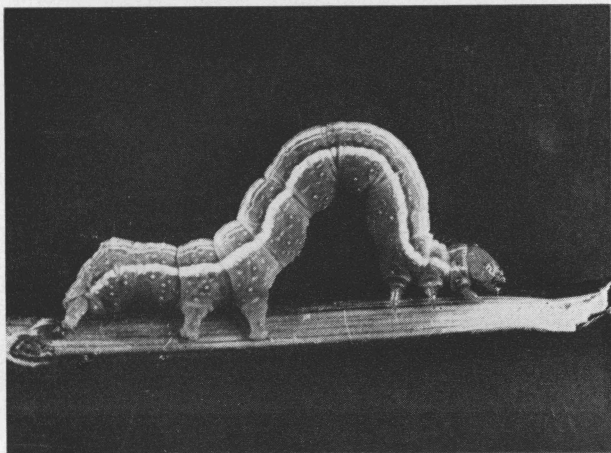


Figure 13. Cabbage looper

*Life History:* The duration of the egg stage averages about 3 days; the larva, about 12 days; the prepupa and pupa, about 15 days. Egg-to-adult development requires about 30 days. Newly emerged moths are capable of laying eggs in 3 or 4 days.

*Nature of Damage:* The larvae feed on the foliage of the cotton plant. The damage resulting from the early stages of an infestation is characterized by "buckshot" holes in the leaves. Later the plants may be defoliated completely.

### Cabbage Looper

The cabbage looper<sup>10</sup> attacks cotton throughout Texas. In recent years it has become destructive, particularly in West Texas. Also, it is considered a pest of cabbage, lettuce, beets, potato, tomato and many other species.

*Description:* The eggs are greenish-white, laid singly on the upper surface of leaves and on tender portions of the plant. Cabbage looper eggs resemble bollworm eggs in size, color and place of attachment.

The larva is greenish and tapers toward the head, Figure 13. A conspicuous white line extends along each side of the body and two other white longitudinal lines are near the middle of the back. The middle region of the body is generally "humped up" when the insect rests or moves. This action suggests the name "looper" for the insect.

The cabbage looper overwinters in the pupal stage. The latter is greenish to brown and about ¾ inch long. The pupa is encased in a delicate cocoon of silken threads spun by the larva and remains attached to the leaves upon which it fed.

The moth is grayish-brown mottled with gray; it has a wing spread of about 1½ inches. The mottled brownish front wings have a small, silvery eight-shaped spot near the middle.

*Life History:* The incubation period of the egg stage lasts about 6 days. Shortly after hatching the young worms begin feeding on the leaves. The larvae feed about 14 days before spinning the cocoon. They transform to a moth in 10 days. Egg-to-adult development requires about 30 days. Three or more generations during the season may attack cotton. The population of worms increases with the development of each generation.

*Nature of Damage:* The looper is principally a leaf feeder. The damage resulting from an infestation is also characterized by the "buckshot"

<sup>10</sup>*Trichoplusia ni* (Hubner)

holes in the leaves. Heavy infestations may defoliate the plants.

### HEMIPTEROUS INSECTS (PLANT BUGS)

A number of species of hemipterous insects, or true bugs, other than the cotton fleahopper, attack cotton, especially in West Texas. In general, they attack the squares and bolls, causing them to shed. The plant bugs have piercing, sucking mouthparts. They feed by inserting their beaks into the plant tissue and sucking the plant juices.

#### Lygus Bugs

Several species<sup>11</sup> of this genus attack cotton. Also, the rapid plant bug<sup>12</sup> causes similar injury. These insects usually feed on the squares and small bolls.

Usually the eggs of these species are in the buds, flowers and stems of the host plants. The immature forms are similar to the adults except they are wingless. It requires about a month for the development of a complete generation. The adults vary in color from greenish to dark brown and are about 1/4 inch long, Figure 14. They can be recognized readily by the presence of a beak which is adapted for sucking sap.

The small-sized plant bugs, except fleahoppers, seldom breed excessively in cotton. They prefer other species of plants, especially legumes. The bugs usually develop on crops such as alfalfa and migrate to cotton after the alfalfa matures and no longer is attractive as a source of food. *Lygus* populations usually are not large in alfalfa or other legumes grown for hay. When these crops are

<sup>11</sup>*Lygus oblineatus* (Say)  
*Lygus hesperus* (Knight)  
*Lygus elisus* (Van Duzee)  
*Lygus apicalis* (Fieber)  
<sup>12</sup>*Adelphocoris rapidius* (Say)



Figure 14. *Lygus* bug in vetch bloom

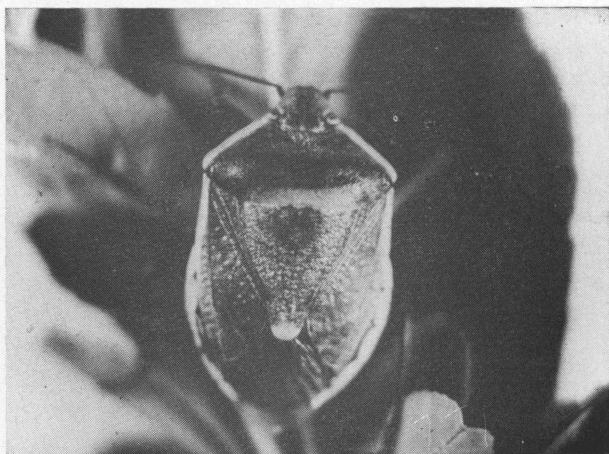


Figure 15. *Conchuela* stink bug

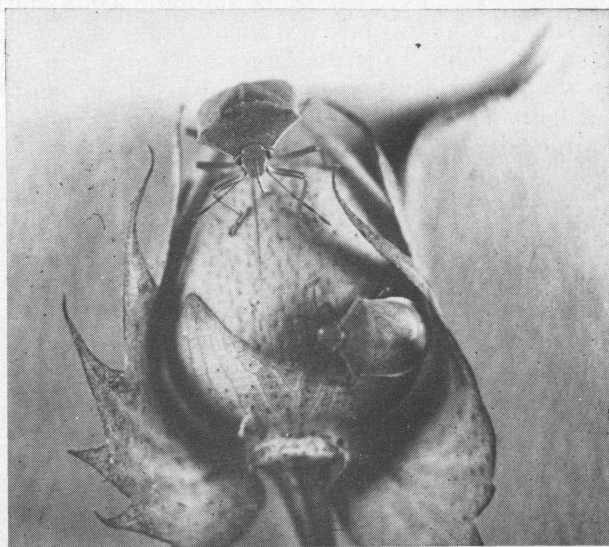


Figure 16. *Green* stink bug on cotton boll

grown for seed the populations sometimes reach sizable proportions and when they migrate to cotton they may completely destroy the fruit.

The plant bugs overwinter in the adult stage in the southern areas or perhaps in the egg stage in North Texas.

#### Stink Bugs

Several species of stink bugs attack cotton; the conchuela and the green stink bug are perhaps the most common. Stink bugs, like the smaller plant bugs, have piercing, sucking mouthparts adapted for sucking the plant juices.

The adult stink bugs have shield-shaped, flattened bodies and are at least two-thirds broad as long. The conchuela<sup>13</sup> is dark brown with a narrow border of red around the body, Figure 15.

<sup>13</sup>*Chlorochroa ligata* (Say)

The green stink bug<sup>14</sup> is uniformly green, Figure 16. The say stink bug<sup>15</sup> is usually dark green and marked with three prominent light spots in the triangular area between the wings. All of these species measure about 1/2 inch in length.

The life histories of these species follow somewhat the same pattern. The eggs are barrel-shaped, usually laid in clusters on the stems and leaves of the host plants. The immature forms resemble the adults except they are wingless. When climatic and food conditions are favorable, a generation of these insects may be completed in about 6 weeks. Stink bugs seldom develop to large numbers on cotton. Like the smaller plant bugs they develop on other crops and migrate to cotton. The stink bugs are injurious to the bolls. They feed by inserting their long beaks into the bolls and sucking the plant juices. Small bolls may fall from the plants while the larger bolls may remain on the plant. Feeding injury may result in hardened dry locks which cannot be harvested. Lint of the damaged bolls may be stained, reducing the grade. Boll rot fungi may be associated with the feeding of these bugs.

### Spider Mites

Several species of spider mites injure cotton throughout the State. These pests attack the underside of leaves and suck the plant juices causing the leaves to discolor. Under conditions of a severe infestation, the plants may be defoliated.

The most injurious species include the desert spider mite,<sup>16</sup> the two spotted mite,<sup>17</sup> carmine

<sup>14</sup>*Nezara viridula* (Linn.)

<sup>15</sup>*Chlorochroa sayi* (Stal.)

<sup>16</sup>*Tetranychus desertorum* (Banks)

<sup>17</sup>*Tetranychus telarius* (L.)



Figure 17. Spider mites

spider mite<sup>18</sup> and the tumid spider mite<sup>19</sup>. Species of mites are difficult to separate in the fields.

The life histories of the common species of spider mites follow a similar pattern. Both male and female mites may feed on the leaves, Figure 17. The different species vary from green to red. The mites overwinter as mature females. During periods of mild weather in the winter season the females may lay eggs and the young mites will develop. The almost transparent, spherical eggs hatch in about 4 days and the small six-legged form known as the larva feeds for about 2 or 3 days, then sheds its skin and develops into an eight-legged nymph. The nymphal stage requires about 5 or 6 days to become an adult. Thus, under favorable conditions a generation may be completed in about 11 days. A thin web is spun over the surface on which the mites feed, serving as a protection for the eggs and immature forms. Spider mites usually overwinter on growing plants and migrate to cotton early in the season.

Mite infestations on cotton cause the leaves to discolor; in the early stages of feeding, yellow spots form and later the leaves may turn red. Thus the planter may notice an infestation before serious damage occurs.

### Insects of Minor Importance

A number of species of insects cause what is considered minor damage to cotton each year. However, it is possible for a species listed under this category to develop to outbreak proportions any year and cause considerable damage.

<sup>18</sup>*Tetranychus cinnabarinus* (Boisduval)

<sup>19</sup>*Tetranychus tumidus* (Banks)

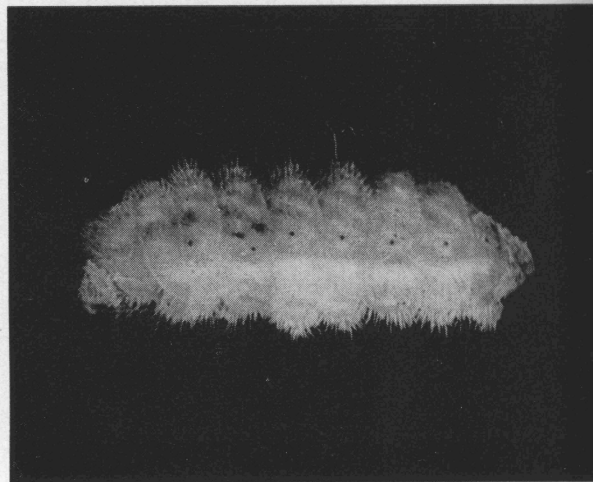


Figure 18. Square borer larva

## COTTON SQUARE BORER

The cotton square borer<sup>20</sup> is found in cotton fields, but is not a major pest of cotton. The small bluish-gray, hair-streak butterfly lays small pale-green eggs singly scattered over the plant. The larvae hatch in about 6 days and become full grown in 20 days. The full grown larva is usually bright-green and tapers at both ends, Figure 18. The entire body is densely covered with hairs which gives them a velvety appearance in the field. The full-grown larvae average about  $\frac{3}{5}$  inch in length. Pupation occurs in the open, usually upon the food plant. About 10 days are required for pupal development. The larvae bore into the squares causing an injury similar to that by the bollworm.

## SALT-MARSH CATERPILLAR

The salt-marsh caterpillar<sup>21</sup> may injure cotton leaves considerably especially early in the growing season. Reports indicate that the larvae often migrate from wild host plants to young cotton. The forewings of the moths are white with black dots and their bodies are orange. They measure about  $1\frac{3}{4}$  inches from wing tip to wing tip. The eggs are laid in masses, usually on the underside of the leaves. The mature larva is about 2 inches long, mottled yellow and black, covered with dense, long, buff to black hairs. The larvae hide in debris on the ground to pupate. From egg-to-adult requires about 6 weeks under favorable weather conditions.

## GARDEN WEBWORM

The garden webworm<sup>22</sup> may attack cotton leaves, even though it is primarily a pest of many

<sup>20</sup>*Strymon melinus* (Hubner)

<sup>21</sup>*Estigmene acrea* (Drury)

<sup>22</sup>*Loxostege similalis* (Guenee)

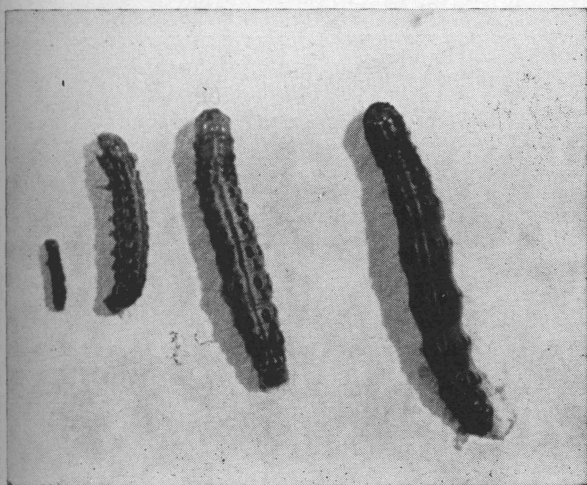


Figure 19. Garden webworm

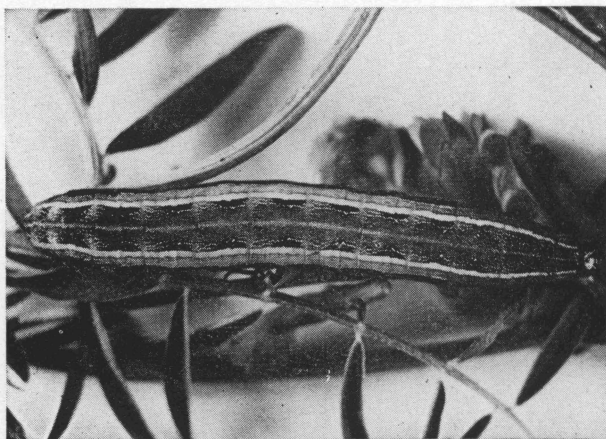


Figure 20. Yellow-striped armyworm

plants other than cotton. The moths often are observed in cotton fields in large numbers, perhaps feeding on nectar. They are small, buff-colored moths with a wing span of about  $\frac{3}{4}$  inch. The eggs are laid in masses on the leaves. The larvae vary from pale greenish-yellow to dark yellow and are marked with numerous black tubercles, Figure 19. The mature larva averages about 1 inch in length and pupates in the soil. Egg-to-adult development requires 4 to 5 weeks.

## YELLOW-STRIPED ARMYWORM

The yellow-striped armyworm<sup>23</sup> feeds on the leaves of cotton early in the season and later it may attack the fruit. The gray-brown moths have a wing span of about  $1\frac{1}{2}$  inches. The eggs are laid in masses on the leaves and are covered with scales from the body of the female moth. The larvae are velvety black with a bright yellow stripe on each side, Figure 20; they pupate in the soil. The developmental stages average 6 days for the egg, 20 days for the larva and 14 days for the pupa. From egg-to-adult requires about 40 days.

## FALL ARMYWORM

The fall armyworm<sup>24</sup> causes injury to cotton by feeding on the leaves and fruit. The forewings of the moths are dark gray while the hindwings are grayish-white. The wingspan measures about  $1\frac{1}{2}$  inches. Eggs are deposited in masses on or near the host plants. The larvae vary from light to dark brown or black. When full grown they average  $1\frac{1}{3}$  inches in length. A prominent white inverted Y is on the head and the three yellowish-white lines are down the back. The fullgrown larvae pupate in the soil. A generation of the fall armyworm may be completed in about a month.

<sup>23</sup>*Prodenia ornithogalli* (Guenee)

<sup>24</sup>*Laphygma frugiperda* (Smith)

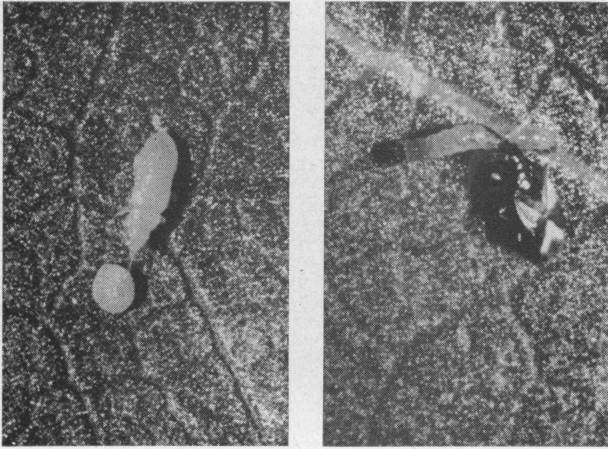


Figure 21. Flower bug or pirate bug. Left, immature stage feeding on bollworm egg; Right, adult feeding on bollworm larva

### GRASSHOPPERS

Grasshoppers are among the most injurious pests of all crops. They sometimes invade cotton fields and cause considerable damage. Many species occur in Texas. Several of these species are illustrated and discussed in Extension Leaflet 429, *Grasshoppers Common to Texas*.

### OTHER MINOR INSECTS

A number of species of leafhoppers, leaf miners, cutworms, whiteflies, cotton stainers, wireworms and a species of collembola, *Entomobrya unostriata* Stach. often are found in cotton fields but rarely in sufficient numbers to warrant control measures.

## Beneficial Insects

Many insects in the cottonfield are considered beneficial; that is, they destroy populations of injurious insects. Some are predators while others

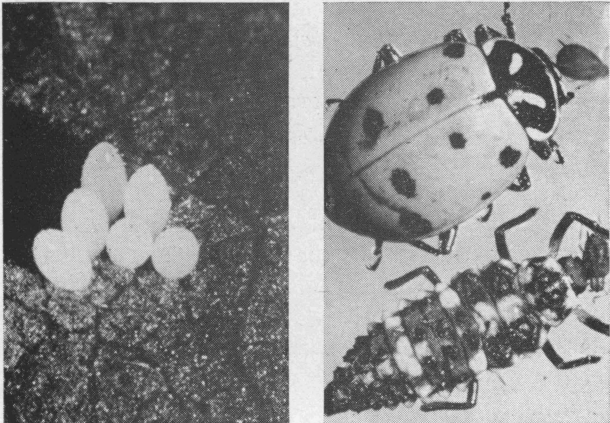


Figure 22. Lady Beetle. Left, eggs; Right, adult and larva feeding on aphid

are parasites. Beneficial insects cannot be relied upon to control infestations of injurious insects but an effort should be made to protect them so that the planter may benefit from their presence as much as possible. Results of experiments show that the release of large numbers of bollworm egg parasites or lady beetles into cotton fields have not proved effective in controlling damaging infestations of bollworms.

### FLOWER BUG

The flower bug<sup>25</sup> or pirate bug is considered perhaps the most beneficial of all insect predators, Figure 21. Both the nymph or immature stage and adult are active feeders on the eggs and larvae of bollworms, leafworms, armyworms, nymphs of plant bugs, red spiders, aphids and thrips. The adults are about 1/16 inch long, somewhat oval and flat in body form. The immature bugs are amber while the adults are dark or blackish.

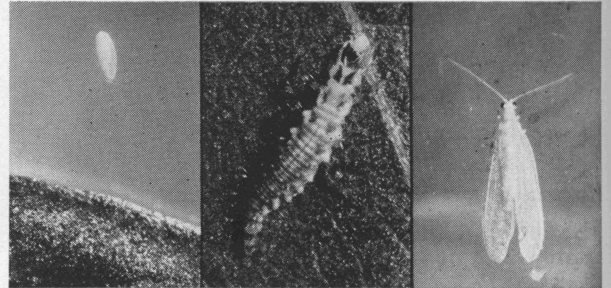


Figure 23. Lace-wing fly. Left, egg suspended on silken stalk above surface of leaf; middle, larva; right, adult

### LADY BEETLES

Lady beetles are perhaps the best known beneficial insects which may be observed in the cotton field. Several species are predatory on aphids,

<sup>25</sup>*Orius insidiosus* (Say)

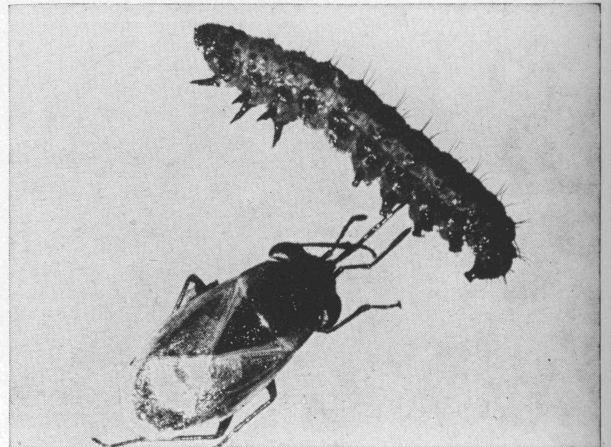


Figure 24. Big eyed bug feeding on bollworm larva

spider mites and other soft-bodied insects. The females deposit their yellow eggs in groups on the cotton plants. The larvae are black marked with orange and white. The pupa is attached to the leaves. The adults in general are hemispherical and are usually conspicuously marked. The convergent lady beetle<sup>26</sup> is more elongate, reddish with variable black spots and converging light lines on the thorax, Figure 22; *Olla abdominalis* (Say) is gray with variable black spots; *Cycloneda sanguinea* (Linn.) is shiny yellowish brown without spots. Both the larvae and adults are predacious on aphids, mites and other soft-bodied cotton insects.

#### LACE-WINGED FLY OR APHID LION

Lace-winged fly or aphid lion<sup>27</sup> is another important predator of aphids and other soft-bodied insects, Figure 23. There are several species of aphid lions, some green while others are brown. The adults have two pairs of net-veined wings which are held roof-like over the body. The eggs are suspended about 1/2 inch above the leaf surface by a fine silken stalk. The predacious larva is 1/2 inch long, flattened and tapers at both extremities. It ranges from cream to yellow, mottled with brown. Each larva has a pair of conspicuous sickle-shaped jaws used for consuming prey.

#### BIG-EYED BUGS

The big-eyed bugs<sup>28</sup> are often found in large numbers and may be mistaken for injurious species, Figure 24. The adults are about 1/8 inch long, tan to brown and have dark protuding eyes. The clear portion of their wings form a silver triangle over their back. The immature forms are greenish-gray resembling the adults in shape. Both the immature and adults prey upon young bollworms and leafworm larvae and on young plant bugs. They sometimes develop to large numbers

<sup>26</sup>*Hippodamia convergens* (Guer.)

<sup>27</sup>*Chrysopa rufilabris* (Burmeister)

*Chrysopa plorabunda* (Fitch)

<sup>28</sup>*Geocoris* spp.

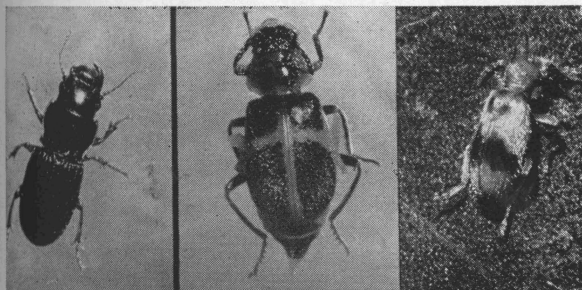


Figure 25. Left, ground beetle; Middle, soft-winged flower beetle; Right, hooded beetle

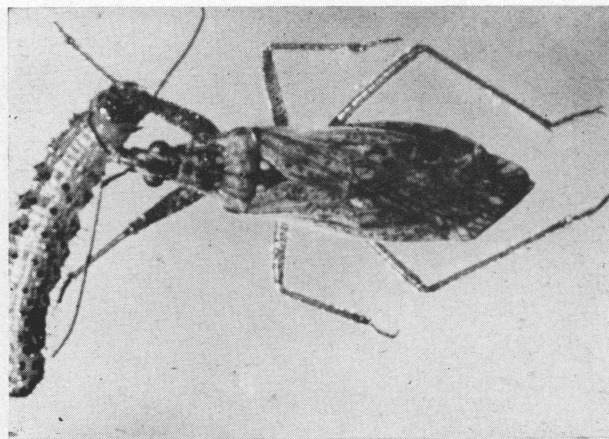


Figure 26. Damsel bug feeding on bollworm larva

in alfalfa and migrate to cotton after the alfalfa is cut or matures.

#### HOODED BEETLE

The hooded beetle<sup>29</sup> is an important predator, especially in West Texas, Figure 25. The adult can be distinguished by the roof-like hood projecting over the head. It measures about 1/4 inch long and is grayish-brown marked with a dark band across the wings. The hooded beetle preys upon the eggs, nymphs and larvae of injurious insects including thrips, aphids, fleahoppers and small bollworms.

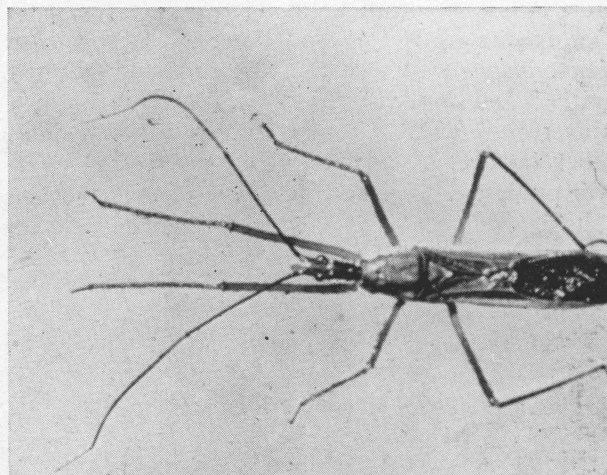


Figure 27. Assassin bug

#### SOFT-WINGED FLOWER BEETLE

The soft-winged flower beetle sometimes incorrectly called the checkered beetle<sup>30</sup> is commonly seen in cotton fields, Figure 25. It is known to feed on aphids and small lepidopterous larvae. The adults are metallic blue with red markings

<sup>29</sup>*Notoxus monodon* (Fabr.)

<sup>30</sup>*Collops vitatus* (Say)

*Collops balteatus* (Lec.)

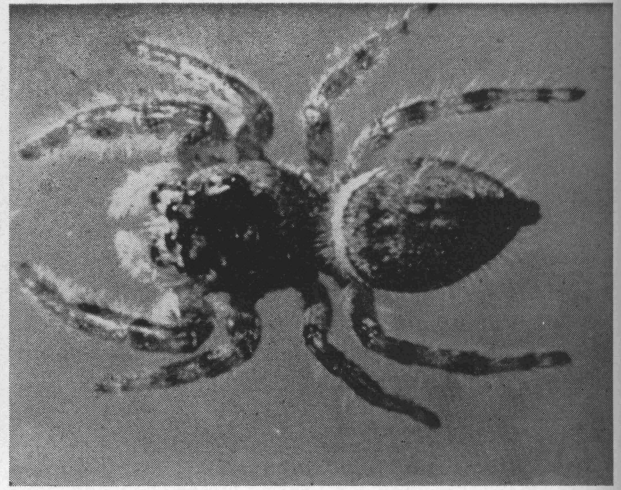


Figure 28. Spiders

resembling a cross. They are oval and measure about 1/5 inch long.

#### GROUND BEETLES

Ground beetles are common in cotton fields, Figure 25. The adults of most species are rather large, long-legged, swift runners and strongly built, thus capable of preying upon many injurious insects.

#### ASSASSIN BUGS

Assassin bugs<sup>31</sup> include several species of predators found in cotton fields, Figure 27. The common species are 1/2 to 3/4 inch long and light brown. These insects walk over the plants in a slow clumsy gait. Their forelegs which are usually held in a prayerful repose, are used to capture and hold other insects. Assassin bugs are considered effective predators on immature forms of injurious insects.

<sup>31</sup>*Zelus renardii* (Kol.)

*Sinea diadema* (Fabr.)

<sup>32</sup>*Nabis ferus* (Linn.)

#### NABID OR DAMSEL BUG

Nabids or damsel bugs<sup>32</sup> resemble the assassin bugs, Figure 26. They are pale gray, about 3/8 inch long. Like the assassin bugs, their forelegs remain in a prayer-like manner and are used also for capturing prey. These predators are reported to prey on aphids, fleahoppers and small larvae.

#### SPIDERS

Spiders of many species are encountered in cotton fields, Figure 28. Most are harmless to man but they prey on many species of injurious insects.

Other predators found in cotton fields include robber flies, syrphid flies, ants and wasps.

#### PARASITES

Parasites appear in most fields. This group includes many species of flies and tiny wasps. Attempts have been made to release large numbers of egg parasites in cotton fields to control the bollworm, but they did not prove successful.