FIELD CHECK BOOK

For Cotton

Checking for Insects

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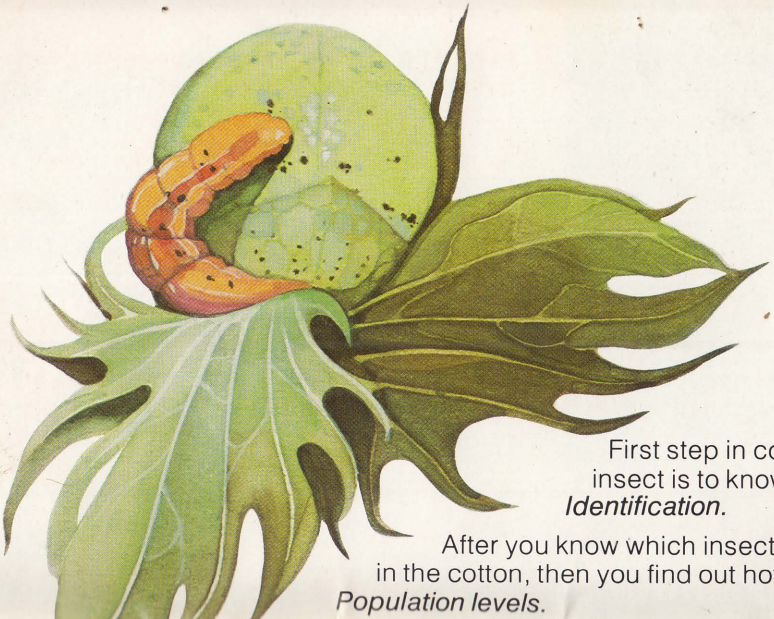


First step in controlling a damaging insect is to know which insect is there. *Identification.*

After you know which insect or insects are in the cotton, then you find out how many. *Population levels.*

When you know "how many," you can judge whether or not the *economic threshold* has been reached.

What's the economic threshold? Just that point at which the insect numbers have risen to where they are causing damage which results in a grower losing profit.

At this point, control by insecticides, supplemental to control by beneficial insects, should be put into practice.

Why this cotton insect guide?

Because we feel the grower, scout and consultant need a reference to help them identify the most common cotton pests and beneficial insects.

Another purpose of this guide is to describe some techniques now being used in sampling for cotton insects that might be of use to those not familiar with these particular techniques.

You'll find them following the insect identification pages.

Cotton Fleahopper

Pseudatomoscelis seriatus

The fleahopper normally infests cotton in the early season before squaring, and may remain on the plants as long as there is new growth. The fleahopper has three stages of development — egg, nymph and adult.

Sampling should be concentrated in the terminals of the cotton plant.

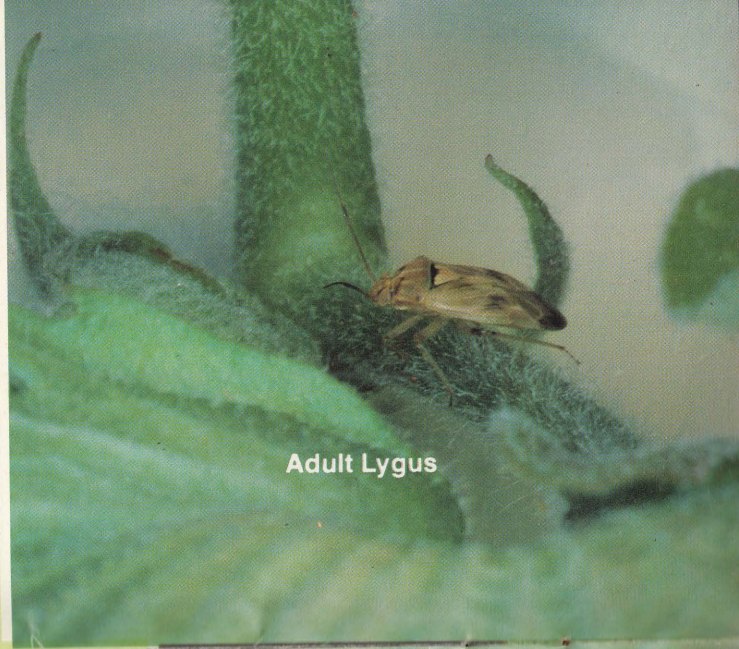
Damage: The cotton fleahopper feeds by sucking fluid from the cotton plant. Injury may occur to the leaves or squares. Premature square shed caused by fleahopper feeding may result in excessive or abnormal vegetative growth and late crop maturity.

Lygus Bugs

Lygus hesperus
Western Cotton Areas

Lygus lineolaris
Southern Cotton Areas

The lygus bug is more of a problem in cotton in the Western United States than in the Mid-South and Southeastern parts of the country. Both species damage the cotton plant by sucking fluid from the young tissues. Fruit (squares, bolls) shedding occurs after lygus bug feeding. Three stages of development, egg, nymph,



Adult Lygus

and adult, may be found on the cotton plant throughout the growing season.

Sampling for lygus bugs should be concentrated in the terminals of the cotton plant.

Damage from the lygus bug is more prevalent during the first six weeks of growth. Excessive or abnormal vegetative growth and delayed maturity can result from lygus bug feeding.

Lygus hesperus

Lygus damage
Pinhead squares

Boll Weevil

Anthonomus grandis

The boll weevil infests cotton from the pre-squaring stage until the crop is harvested. The adult boll weevil prefers to feed and lay eggs in the squares but will oviposit in bolls later in the season. Eggs laid in the squares hatch into larvae. The larva molting from the second to third instar causes the square to drop from the plant. The boll weevil pupates inside the fallen square.

Scouting for the boll weevil should include thorough, whole plant sampling of the fruit for damage (feeding and oviposition punctures).

The boll weevil has the potential of destroying a cotton planting. Several generations per growing season result in heavy populations by August and September in the Southern areas.

Pink Bollworm

Pectinophora gossypiella

The pink bollworm is primarily a pest of cotton in the Western United States, although it occurs in Texas and Arkansas.

The adult moth lays eggs primarily on the squares and bolls. The hatching larvae enter the fruit immediately.

Survey for the pink bollworm may involve adult trapping and sampling for larvae in blooms in the

early season. However, after bolls are on the plants, sampling involves collecting green bolls and opening them for larval inspection. Heavy populations can destroy a cotton planting.

Damage to the cotton plant results from the larvae feeding in the squares and bolls. Of the two, boll damage is much greater and more injurious to the crop than square damage.

Heliothis Complex

Heliothis zea
Cotton Bollworm

Heliothis virescens
Tobacco Budworm

Both species have essentially the same life cycle and damage potential to the cotton plant. The tobacco budworm has a history of being more resistant to insecticides than the cotton bollworm. In some areas of the Cotton Belt, the tobacco budworm does not infest the crop as early as the cotton bollworm.

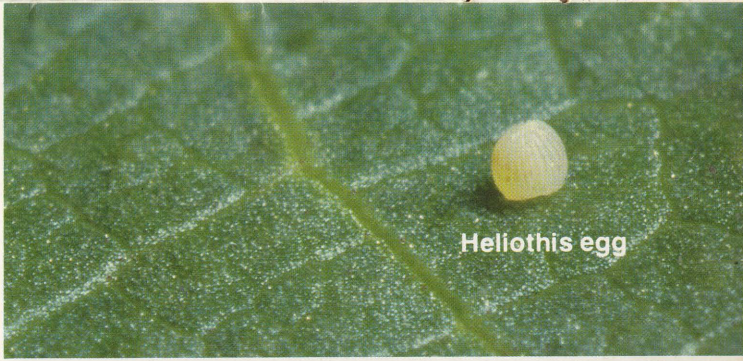
The adult moth lays eggs singly on the leaves, stems and fruit of the

Heliothis larvae

Heliothis larvae damage

cotton plant. The larvae hatch and feed in the squares and bolls as they move down the plant. Five larval instars are spent on the plant before they pupate below the soil surface. It is difficult to distinguish the two species apart as larvae. One quick way is to inspect the jaws — the tobacco budworm larva has a distinguishing raised area on its jaws.

Sampling for *Heliothis* infestations should involve whole plant inspections for eggs, larvae and/or larval damage to squares and bolls. Heavy infestations can destroy a cotton planting.



Armyworm Complex

Spodoptera exigua
Beet Armyworm

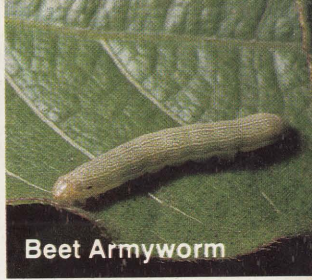
Spodoptera frugiperda
Fall Armyworm

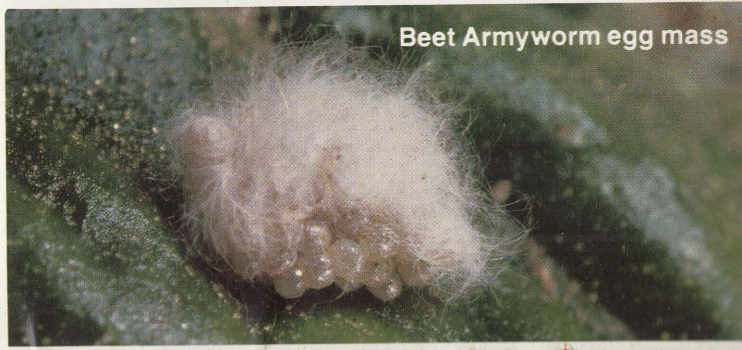
Spodoptera ornithogalli
Yellowstriped Armyworm

Spodoptera praefica
Western Yellowstriped Armyworm

Although the beet armyworm appears in recent years to have established itself as an annual cotton pest, the armyworm complex represents insects that are occasional pests in


Full-grown
Beet Armyworm


Beet Armyworm


Beet Armyworm egg mass

cotton. Heavy infestations of any of these pests can result in yield loss to the cotton planting.

Sampling for these insects should include whole plant inspection for eggs and larvae. These insects or their damage are often mistaken for *Heliothis* infestations.

Damage: The moths of these insects lay egg masses on the cotton plant. The hatching larvae feed on leaves, blooms and fruit of the cotton plant.

Cabbage Looper

Trichoplusia ni

The larvae of this insect is occasionally a pest of cotton. It is a leaf feeder with three pairs of prolegs and a body which tapers toward the head. These physical characteristics make the cabbage looper readily distinguishable from the *Heliothis* and armyworm larvae.

Infestations of this insect are observed mainly in the latter portion of the cotton-growing season.


Cabbage Looper


Looper moth

Sampling for the cabbage looper should be concentrated on leaf inspection for eggs and larvae. A natural occurring nuclear polyhedrosis virus (NPV) usually controls the cabbage looper each season.

Cotton Leafperforator

Bucculatrix thurberiella

The cotton leafperforator is a pest of cotton in the hot, dry cotton-growing areas of the United States (mainly Arizona and California).

Sampling for the cotton leafperforator should involve inspection of the leaves to determine the stage of development as well as percent infestation.

Spider mite damage to cotton leaves is often more evident than the eggs, larvae, nymphs and adults that occur on the underside of the leaves. Feeding by spider mites cause the leaves to become discolored and stippled. Heavy feeding can cause premature defoliation.

Thrips

There are several species of thrips that infest cotton. They feed by rasping the leaf and sucking the plant's fluid. Thrips have four stages of development — egg, larva, pupa and adult. They are found on cotton seedlings early in the season.

Sampling for thrips should include visual observation of the plants for damage. Thrips counts should be made also. These tiny insects can be seen with

the naked eye and counting can be aided by shaking the thrips from the plants onto a white cloth or paper surface.

Damage: Their feeding may cause the leaves to become ragged and curled upward. Unless a heavy thrips infestation kills them, cotton plants can outgrow this distorted appearance and develop to maturity.

Aphids

Various species of aphids can infest cotton plants, although they have not been a problem in the U.S. in recent years.

Winged and non-winged forms can be found in colonies on the plant surface. When aphids feed, they exude honeydew which can give rise to fungal infections. Late season infestations can lead to some lint stain from the honeydew called sooty mold.

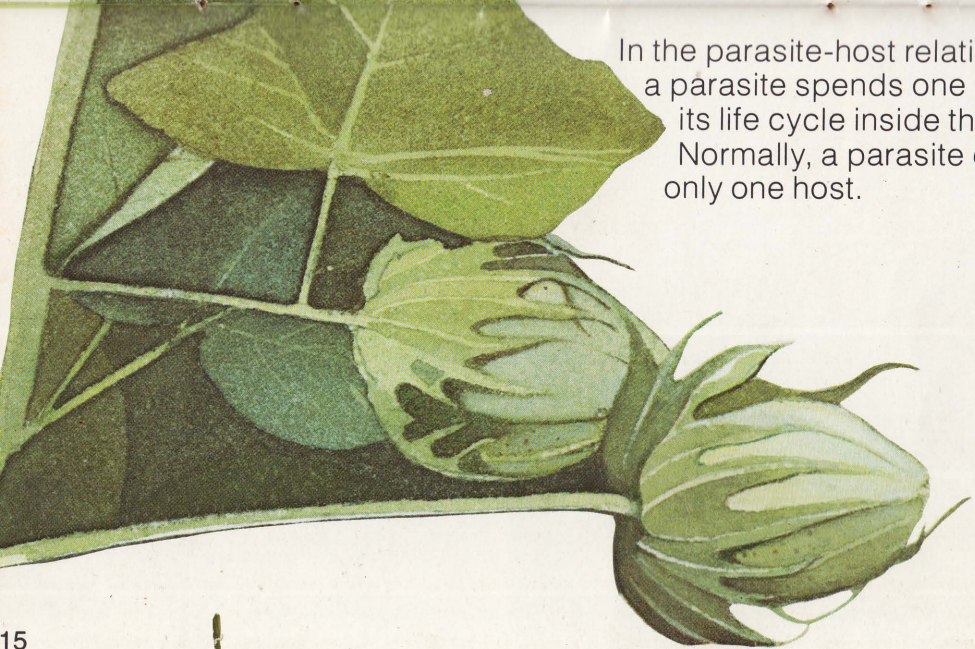
Sampling for aphids should involve whole plant inspections looking for active colonies.

Damage: Feeding by aphids will cause the leaves to curl and die.

Beneficial Arthropods

Beneficial arthropods are grouped into two categories, predators and parasites. Many hundreds of these arthropods have been identified in cotton fields.

In the predator-prey relationships, a predator captures the prey and either eats it completely or sucks its body fluids. One predator may destroy many prey.



In the parasite-host relationship, a parasite spends one part of its life cycle inside the host. Normally, a parasite destroys only one host.

Lady Beetles

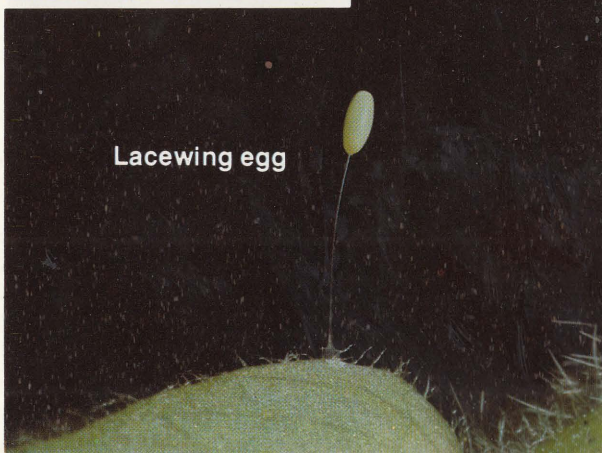
Lady beetles are conspicuous on the cotton plant from their bright orange egg masses, alligator shaped-larvae and distinctly marked adults. Two of the most common lady beetles found on the cotton plant are the convergent lady beetle, *Hippodamia convergens,* and the spotted lady beetle, *Coleomegilla maculata.*

Lady beetles feed as adults and larvae on aphids; spider mites; and the eggs and larvae of the budworm, bollworm; and the cabbage looper.

Green Lacewings

Chrysopa spp.

The green lacewing is a common predator found in cotton fields. The larvae feed on aphids, spider mites, budworm and bollworm larvae and insect eggs. The larvae have an alligator shaped body and long, sickle-shaped mandibles. The adults are green with netted wings. The female deposits eggs at random over the cotton plant. These are very characteristic, since they are deposited singly on a thread-like stalk.



Big-Eyed Bugs

Geocoris spp.

Both the adult and nymph of big-eyed bugs feed on insect eggs, small budworm and bollworm larvae, plant bugs, and aphids. Their numbers are usually high in the early portion of the cotton-growing season. When sampling cotton for beneficial species, the big-eyed bug is usually the main species collected.

Minute Pirate Bug, (Insidious Flower Bug), *Orius insidiosus*

Both the adult and nymphal stages of this small bug feed on insect eggs, aphids, thrips, spider mites, and young budworm and bollworm larvae. Adults and nymphs are found most often in the terminals and flowers of the cotton plant.

Damsel Bugs, *Nabis spp.*

These slender bugs feed on plant bugs, spider mites, aphids, and budworm and bollworm eggs and larvae.

Assassin Bugs, *Zelus spp.*

Although they resemble damsel bugs; assassin bugs are larger. They will feed on budworm, bollworm and cabbage looper larvae. They are not as abundant in cotton as damsel bugs.


Damsel Bug


Assassin Bug

Spiders

Several species of spiders may be found on the cotton plant. Because of their general feeding habits, they prey upon both harmful and beneficial insects. However, most experts consider them beneficial.

Egg Parasites

The most famous egg parasite in cotton is *Trichogramma spp.*, a parasite of budworm, bollworm, beet armyworm, and cabbage looper eggs.

Larval Parasites

Some of the common larval parasites are Hymenopterans. The adult lays eggs into larvae and the parasite completes its larval development inside the host. After the host is consumed, the parasite pupates. The characteristic cocoon of the parasite often can be found on the plant surface.

Sampling

When to Begin

Sampling can begin early, when cotton is in the 2-4 true-leaf stage. Most programs are started, however, when the first flower buds (squares) develop.

Squares normally begin to develop on the 6-7 node. If a plant fails to set squares by the 9th node, this could mean insect damage, fertilization imbalance, or weather factors.

Close observation is vital in this period because a good crop starts with a vigorously growing stand.

Monitoring the Fruit

Close monitoring of the square load, and later, the boll load, should be

practiced throughout the growing season.

Why? Because the most damaging insects feed on the fruit. And treatment decisions should be made on the number of insects on, or damage to, these fruiting forms of the plant.

Cotton plants produce more fruit than is harvested; fruit shedding is natural through the season; however, the fruit that is set on the plant during the first 6 weeks of bloom accounts for 90% of the yield.

Obviously, it is good cotton-growing practice to be strict about control of the insects that threaten to reduce this important fruit set.

How to Sample

Good sampling includes whole-plant inspection (terminals, and fruit) to get the most complete evaluation of a field's condition.

The amount of time that should be spent in sampling any field depends on your good judgment. Relate the amount of time it takes to do a proper job of sampling to the investment you can profitably expend on that field's cotton.

Sampling Methods

Several are being used. Since sampling involves an estimate based on a small portion of a total population of insects, care should be taken that the sample is

representative,
unbiased,
and random.

Random Sampling

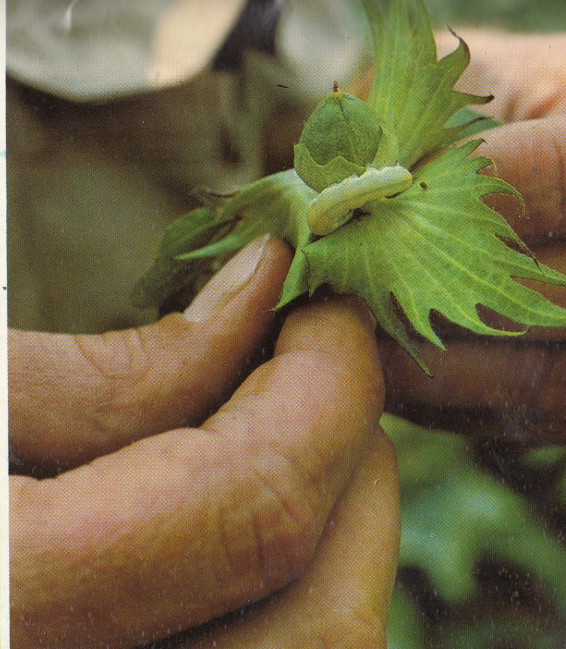
In this one, the scout moves through the field inspecting terminals and the fruit.

Usually, squares are pulled from the tops, middles and bottoms of the plants. These are inspected for insects and damage. The scout moves in a circular or semi-circular pattern; or he may move across the field in an X shaped pattern.

The number of squares he collects depends on the size of the field. Percent infestation is based on the number of squares infested.

Sequential Sampling

This is a modification of the Random Method. It allows "treatment" or "no-treatment" decisions to be made while the sampling is in progress.



Sequential sampling requires background knowledge of the distribution of the target insect.

From this knowledge of insect distribution, and other beforehand information, guidelines are set — which allow the scout to decide on treatment or no treatment as he continues to take samples across a cotton field.

Results from this method have shown that sampling time can be reduced with no loss in accuracy.

Point Method of Sampling

Several "points" are selected at random in the field. At each of these sampling points, the starting place is marked on the row.

All squares ¼" in diameter are inspected until 50 squares have been sampled. Insect-damaged squares have been removed and recorded.

The place where the 50-square sample ended is marked on the row, and the length of sampled sections is measured.

After making 4 to 8 such samples in a field, insect infestation and/or damage, and the fruiting level of the crop can be figured.

It is advisable that the scout also inspect 25 to 100 plant terminals as he moves along his row sections. This will allow evaluation of infestation in this part of the cotton plant.

Sampling Intervals

The interval between field inspections will depend on many factors. Most states in the Cotton Belt recommend that samples be taken twice a week during periods when heavy insect activity is expected.

For further information or further descriptions, economic thresholds, or treatment recommendations, the users of this guide should refer to the guidelines published by the Cooperative Extension Service in their state.

Growing nature's fibre — Cotton with crop protectants from CIBA–GEIGY

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