W128

Scouting Insects in Cotton

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Insect populations vary from year to year and field to field during the growing season. All fields should be monitored for insect pests and beneficial populations at least weekly during the season, preferably twice weekly after blooming has begun. In areas of high insect pressure or increasing populations, twice-a-week scouting is recommended. Monitoring plant growth and development is an important aspect of crop management, maximizing yield potential and managing insects.

The economic threshold (ET) is defined as the pest population level at which control should be initiated to keep the pest population from reaching economically damaging numbers. Insecticide applications are generally unnecessary until one or more pests exceed the ET. Although economic thresholds have been established for specific insect pests, multiple pest thresholds are not well established. When losses from multiple pests are occurring, fixed individual pest thresholds may become dynamic or change. Monitor fruit retention and damage levels weekly, along with insects.

A cotton scouting form (F629), developed by the University of Tennessee, is available from county Extension offices. Decisions to apply controls should be based on thorough scouting and identification of pests, cost of insecticide, the price of cotton, yield potential, and fruit retention goals. Scheduled insecticide sprays should generally be avoided. Applications of insecticides on an as-needed basis will preserve beneficial insects and reduce the likelihood of secondary pest outbreaks.

Communication and safety are important considerations for avoiding accidental insecticide poisoning, heat stroke and misunderstandings that may lead to ineffective or poorly timed insecticide applications. Scouts should be familiar with commonly used insecticides.

The table below is intended to give general guidelines for when pests normally occur in the field. Scouting intensity and methods should be selected to suit the pests most likely to occur during a given stage of crop development. For some pests, the best scouting method (e.g., sweep net, drop cloth, vs. visual sampling) may change as the crop develops. For example, the sweep net is less valuable for sampling plant bugs in cotton once boll development begins because cotton of this size is difficult to sweep. Also, the sweep net is less efficient than the drop cloth in monitoring immature plant bugs.

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Stage of Plant Development	Major Pests	Occasional Pests
Emergence to first square	Thrips	Aphids, Spider mites, Cutworms
First square to first bloom	Plants bugs	Aphids, Bollworm, Tobacco budworm, Spider mites
After first bloom	Bollworm, Tobacco budworm, Stink bugs, Tarnished and clouded plant bugs	Aphids, Loopers, Fall and Beet Armyworms, Spider Mites, Whiteflies

Sweep Net Sampling

The standard sweep net used in insect sampling has an opening of 15 inches in diameter and is about three feet long. The following directions should improve the consistency and accuracy of your sweep net samples. In cotton, the sweep net is most commonly used to sample plant bugs.

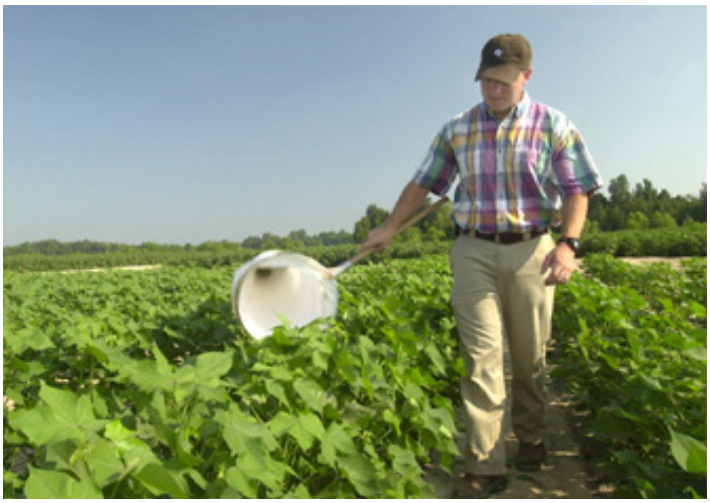
Using the Net

1. The net should be held in front of the sampler and angled downward at about 45 degrees (this angle will vary depending upon the height of the vegetation).
2. Swing the net from side to side in about a 120 – 180 degree arc and take one stroke per step as you walk through the field or down the row. Tilt the net opening so the lower edge of the rim is slightly ahead of the upper rim.
3. The net should be swung briskly enough that some plant debris (leaves, etc.) are dislodged into the net.
4. Space successive strokes by 2 to 3 feet so they do not overlap.
5. In taller vegetation, sweep just deep enough to keep the top edge of the sweep net even with the top of the plants.
6. Each swing of the net through the canopy is a sweep. The same sweeping motion should be made regardless of row spacing, and the normal path of the net should be continued through any adjacent rows. For rows spaced more than 36 inches apart, the path should not pass through adjacent rows.

Taking a Sample

Many treatment thresholds are expressed in numbers of insects per 25 or 100 sweeps. It is generally recommended to make a minimum of 100 sweeps in a field (e.g., four subsamples of 25 sweeps), but this number may vary depending on the size of the field and other factors. It is not usually advisable to make more than 25 sweeps in a single subsample, and subsamples should be distributed across representative areas of a field.

The Efficiency of a Sweep Net



Different weather conditions may affect the number of insects in the field. Wet vegetation can make swinging a sweep net cumbersome and ineffective. Some insects may be more or less active at certain times of the day. Plant height and different styles of sweeping will also influence results. In cotton, the sweep net is usually used from the early squaring stage of crop development to early bloom. Once bolls begin to develop, drop cloth or visual sampling methods are generally preferred. Keep in mind that the sweep net is not intended for sampling all kinds of insects. When used correctly and for the insects intended, the sweep net can give a quick and reliable indication of some pest and beneficial insect populations in a field.

Drop Cloth (or Shake Sheet) Sampling

A white- or black-colored drop cloth is sometimes used for sampling various insects in row-planted crops. The drop cloth is made of heavy cloth with 1/2-inch or larger dowels (42 inches long) attached to each side. The width of the cloth varies with the row spacing to be sampled, but the drop cloth is usually used only in rows spaced

30 inches or wider. The standard drop cloth length is three feet long, but drop cloths of different sizes are also available. Plant bug and stink bug populations are often monitored using a drop cloth.

Using a Drop Cloth

Take samples by extending the cloth with the dowels parallel to each row and slide it forward on the ground under the plants. Take care not to disturb the plants. While kneeling between two rows, extend each arm forward parallel with the row on either side and bend the plants over the cloth. The plants are then vigorously shaken to dislodge the insects, which are quickly counted on the cloth. If using a three-foot-long drop cloth, sampling both rows renders a six-foot subsample. If preferred, a single row can be sampled.

Taking a Sample

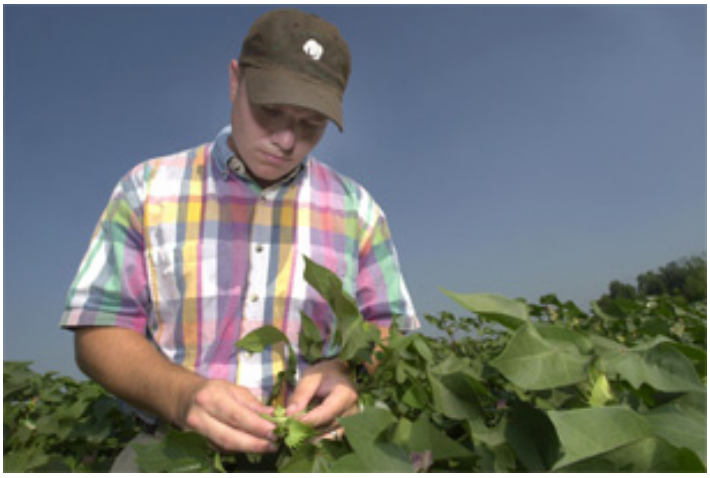
Select sampling sites to give adequate field coverage. A minimum of four subsamples should be taken per field. Additional subsamples may be necessary for larger fields but normally do not exceed eight sites per field. Many thresholds are expressed in the numbers of insects per foot of row (or per six feet of row).

The Efficiency of a Drop Cloth

The efficiency of the drop cloth is influenced by the size of the crop, row spacing and weather conditions as well as how a person takes the sample. As with the sweep net, the drop cloth is not intended for all kinds of insects. Typically, the drop cloth is a better sampling tool than the sweep net when plants are relatively tall or when monitoring for some immature insects (such as plant bugs).

Visual Scouting Techniques

Visual scouting refers to the examination of plants to determine the presence of pests or their damage. In cotton, this may include the examination of plant terminals, whole-plant examination or some modification of these approaches. The method and intent of this sampling will vary with the developmental stage of the crop and whether or not it is genetically modified to express Bt toxins (i.e., Bt cotton). The number of plants examined varies with field size but will generally range from 50 to 100 plants. However, fewer plants can sometimes be sampled if pest densities are well above treatment threshold. A preferred method of sampling is to visually examine five consecutive plants in 10 to 20 representative locations within a field. Counts are typically expressed in insect numbers (or percent) per 100 plants.



Emergence to First Square

Prior to squaring, the scout's primary responsibility is to monitor general crop health in a field. This includes determining whether an adequate stand has been established. Environmental conditions, such as excessive rainfall and cold weather, can reduce cotton emergence and increase the incidence of seed and seedling diseases. Replanting may be necessary for parts or all of some fields. You may need to make a "stand count" in areas where low plant populations exist. Stand counts are normally done by counting the number of living plants in a certain length of row at several locations within the affected area. Depending on row spacing, the average number of plants per acre can then be calculated. An average of two to four healthy plants per foot of row is sufficient to produce optimal cotton yields at typical row spacings (i.e., 30 – 40 inch rows). However, replanting may not be justified even when populations fall below this level depending on the size of the affected area, the uniformity of the existing stand and other factors. More detailed replant recommendations are presented in *Making Replant Decisions in Cotton* (Publication W073).

The primary insect pests that threaten seedling cotton plants are thrips and cutworms. Thrips are a common pest of seedling cotton. Severe thrips infestations can kill seedling plants or delay crop maturity and reduce yields. The severity of thrips injury should be determined at several locations within a field. The

numbers of thrips per plant should also be recorded. One method of counting thrips is to make a bouquet of two to three seedling cotton plants, and while holding them by their base, shake the tops vigorously over an empty cigar box covered with hardware cloth or a Cool Whip container. Thrips will be visible on the white surface.

Cutworms may be present in only parts of a field, such as low, wet or weedy areas. They are normally found underground, near freshly cut plants, during the day. Scouts should walk through representative areas of a field. If "cut" plants are found, the number of cut plants per 100 consecutive plants in a row should be counted at several locations. The presence of other pests or damage that may threaten plant stands should also be recorded.

First Square to First Bloom

When sampling a plant, first examine the terminal for the presence of tarnished plant bugs, particularly adults. Monitoring populations of bollworm and tobacco budworm eggs and small larvae involves thorough examination of the upper three to four nodes, known as a "terminal" sample. Check for eggs on leaves, bracts and stems. Thumb through the terminal and open the bracts of larger squares in search of larvae. If damage is found in the terminal, extra time should be taken to track down the offending larvae and determine its size. Timing of insecticide applications is very important because smaller larvae (1 to 3 days old) in the top of terminals are much easier to control. Also, note what moths (bollworm vs. budworm) are being seen in the field. Species and larval size are two critical components in the choice of an insecticide and the rate of application.

Square retention should be monitored on the same plants. This is done by examining first position fruiting sites in the terminal of the plant and recording the number of missing squares, being sure to count any injured squares that dislodge when touched (above). Percent square retention is calculated by dividing the number of missing squares by the total number of fruiting sites examined and multiplying by 100. Normally, a sample would consist of first-position square retention on the top five fruiting nodes for a minimum of 20 plants per field. When they have fewer than five fruiting nodes, more plants must be examined.

Significant aphid infestations will normally be detected during standard scouting efforts. Aphid populations are characterized as low, medium or high, which corresponds to an average of <10, 10 – 50, and >50 aphids per leaf, respectively (usually the first fully expanded leaf in the terminal). High populations typically result in many plants with an accumulation of honeydew as well as leaves with the edges curled downward (*pictured below*).

Bt cotton: economically damaging infestations of tobacco budworm and bollworm are rare prior to bloom in Bt cotton. Thus, scouting efforts should concentrate on monitoring more

likely pest problems such as plant bugs. A shift in emphasis toward monitoring square retention will normally help in detecting any injury caused by caterpillar pests.

Non-Bt cotton: Greater emphasis on monitoring bollworm and tobacco budworm populations is required in non-Bt cotton. Scouting for bollworm and tobacco budworm in non-Bt cotton also provides information about what "pressure" the Bt cotton may be experiencing. Significant larval infestations in Bt cotton fields are unlikely if surrounding non-Bt fields have low infestations, assuming fields are in a similar developmental stage.

After First Bloom

Cotton is more tolerant of bollworm and budworm damage prior to bloom. After bloom, greater effort should be made to monitor caterpillars, primarily bollworm and tobacco budworm, and stink bug infestations. Increased reliance on visual scouting occurs once cotton has begun to bloom, and modified "whole-plant" samples are preferred over terminal counts. The intent of a whole-plant count is to find pests that may be occurring relatively low in the canopy in addition to those in the terminal. This includes detecting 1) bollworm, budworm or fall armyworm or their damage in blooms and small bolls; 2) plant bugs (particularly nymphs) that are often found feeding in blooms and behind the bracts of large squares or small bolls; and 3) stink bugs and their damage. In Bt cotton, initial bollworm infestations are often first associated with white and pink blooms. Eggs are often found on bracts and stuck bloom tags. Bollworm and armyworm larvae may be in blooms and under bloom tags.

A whole-plant count starts with checking the terminal of the plant as previously described. In addition, the scout should also examine behind the bracts of larger squares and small bolls, inside white and pink blooms, and under bloom tags for the presence of plant bugs, stink bugs, caterpillars and their damage. It is not necessary to sample every square, bloom or boll on a plant. Besides the terminal, examine at least one medium sized square, one white or pink bloom (bloom tag), and one small- to medium-sized boll per plant. Bolls should be examined for the presence of or injury from caterpillar pests or stink bugs. Counts are expressed in terms of numbers (or percent) per 100 plants or plant parts. For example, three bollworm

Stink bug damage

larvae per 100 plants or 25 percent of bolls with internal signs of stink bug injury.

In Bt cotton, especially Bollgard II and WideStrike varieties, greater emphasis can be placed on sampling non-lepidopteran pests, such as stink bugs and plant bugs. This is especially true at times when little bollworm and tobacco budworm activity is being detected in surrounding fields.

Communication and Safety

Communicate

Talk frequently with growers, co-workers and bosses. Know when and what insecticide applications have been made to a field. Immediately report any significant insect infestations to the person responsible for making insect control recommendations. If you are not the person responsible for making insect control recommendations for a field you are scouting, then don't make them. Be positive and courteous with growers.

Someone should know your approximate whereabouts and schedule in case of accident or emergency. This may include family, co-workers or your employer. Cell phones or two-way radios are suggested as a means of emergency communication.

Pesticides

Pesticides, and insecticides in particular, vary widely in their toxicity to people. Direct exposure to undiluted insecticides, especially liquid formulations, is most serious. Scouts are usually exposed indirectly

through contact with treated plants. Never enter a field immediately after an insecticide application. This is especially dangerous for highly toxic insecticides. Minimum re-entry intervals following an insecticide application and other information are provided on the insecticide label (and at the back of the Tennessee Cotton Insect Control Guide, Publication 387).

Know Your Insecticides

The table below provides a relative index of insecticide toxicity. This is primarily for dermal (skin) exposure. Many relatively non-toxic insecticides can be very dangerous if ingested because they are often mixed with solvents or other potentially harmful chemicals. Always seek immediate medical attention if any insecticide is swallowed.

Relative Toxicity of Commonly Used Insecticide

Insecticide (common name)	Risk level*	Insecticide (common name)	Risk level*
Ammo, Up-Cyde (cypermethrin)	L-M	Karate (cyhalothrin)	L-M
Asana (esfenvalerate)	L-M	Kelthane (dicofol)	M
Baythroid (cyfluthrin)	L-M	Lannate (methomyl)	**H**
Bidrin (dicrotophos)	**H**	Larvin (thiodicarb)	M
Capture (bifenthrin)	L-M	Lorsban (chlorpyrifos)	M
Centric or Cruiser (thiamethoxam)	L	malathion	L
Comite (propargite)	M	methyl parathion (Declare, etc.)	**H**
Curacron (profenofos)	**H**	Monitor (methamidophos)	M
Decis (deltamethrin)	L-M	Orthene (acephate)	L-M
Denim (emamectin benzoate)	L	Trimax or Gaucho (imidacloprid)	L
dimethoate	M	Steward (indoxacarb)	L
Fury (zeta-cypermethrin)	L-M	Temik (aldicarb)	**H**
Intrepid (methoxyfenozide)	L	Tracer (spinosad)	L
Intruder (acetamiprid)	L	Vydate (oxamyl)	**H**

* L = Low, M = Moderate, H = High

Insecticide Poisoning

As a rule of thumb, organophosphate (e.g., Bidrin, methyl parathion, Lannate, Vydate) and some carbamate (e.g., Temik) insecticides pose the greatest risks to scouts. Symptoms of poisoning last hours to days after exposure to carbamate insecticides but can last for weeks after exposure to organophosphate insecticides. These symptoms may include eye tearing, blurred vision, salivation, unusual sweating, coughing, vomiting, and frequent bowel movements and urination. Breathing may become difficult, and muscles may twitch and become weak. It is rare, but death can occur. Pyrethroid insecticides can cause sneezing, eye tearing, coughing, and occasional difficulty breathing. Serious symptoms rarely develop. Suspected insecticide poisoning should be treated immediately. Insecticide labels contain treatment instructions for physicians. Remove clothing and wash any skin that was exposed to insecticide.

Other Safety Considerations

More common than pesticide poisoning, scouts may suffer from heat stroke. Symptoms of heat stroke include weakness, dizziness, rapid pulse, reddish tinge to skin, nausea and/or vomiting, unconsciousness, and high body temperature.

Safety Tips

1. To avoid heat stroke, drink plenty of water, wear a wide-brim hat and take breaks in the shade.
2. Scouts should also wear a wide-brim hat and sunscreen to avoid sunburn and help prevent skin cancer.
3. Pants, rather than shorts, are recommended to reduce wear and tear on your legs. They also keep your skin from contacting any insecticide residue on plants.
4. Bring a change of clothes, particularly later in the year when early morning dew will soak your clothing. You will not only be more comfortable, but dry clothes are also a better barrier to any insecticide residue present on plants.
5. Wash your hands before eating or drinking.
6. If possible, schedule your hardest work during cooler times of the day.
7. You are more likely to get in an automobile or four-wheeler accident than poisoned by pesticides, so drive carefully!

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time.
The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

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