Excessive economic damage to cotton by the beet armyworm (BAW) has occurred in one or more areas of Alabama every year since 1984 (Figure 1). In recent seasons, yield losses have totaled into the millions of dollars, and unsuccessful control attempts have cost growers additional millions.

In 1993 much of Alabama's 435,000 acres of cotton were infested. The areas most heavily damaged were infested with BAW populations that exceeded 200 caterpillars per 3 row feet. Countywide yield losses were as high as 400 pounds of lint per acre, and up to 25 percent of the acres were destroyed by shredding prior to harvest.

The most extensive BAW damage has occurred where the greatest amounts of insecticide were applied to control boll weevils. Because insecticidal control to suppress weevils will be needed in central and western Alabama in 1994 and in the Tennessee Valley area in future years, another widespread disaster from the BAW is likely.

For this reason a committee representing Extension entomologists, county agents, consultants, chemical distributors, experiment station superintendents, commodity organizations, government agencies, and seed companies met in Prattville, Alabama in November 1993 to develop a plan to manage BAWs on cotton in Alabama. After thorough discussion, this committee concluded that the impact of the BAW may be lessened if cotton growers will implement the following practices and techniques. No single practice will provide a solution, but when all are used together in a management and production package, they should lessen the impact of the BAW.

Enhancing Early Maturity

Of all the things a cotton grower can do to reduce BAW damage, none are as important as using practices which help plants mature early. BAWs prefer late-maturing or late-planted cotton. Therefore, all practices that enhance earliness are valuable.

- Plant the crop on time when conditions favor quick emergence and rapid growth of the plants. Do not replant.
- Select varieties with early maturity dates.
- Thin plant stands. Stands that are too thick (more than 40,000 to 50,000 plants per acre) delay fruit-set and maturity.
- Time nitrogen applications so that all nitrogen is not applied preplant.

Controlling Early Season Insects

During the early weeks of squaring, heavy damage by thrips, plant bugs, early season bollworms, and tobacco budworms can easily cause a 2-week delay in maturity. If damaging levels of these insects occur, apply insecticides for control.

Apply Temik as a systemic insecticide to control thrips. Rates of approximately 3.5 to 5 pounds per acre will result in 1 to 2 weeks of earliness.

Malathion, applied as part of the eradication program for boll weevils, will control plant bugs as well as suppress beneficial insects. Therefore, expect bollworm-budworm peaks following pin head applications for overwintered boll weevils.
Use ovicides plus pyrethroids if high populations of bollworms and budworms occur. Apply a moderate to high rate of pyrethroid when the larvae are small to avoid cleanup treatments and prevent further fruit damage. While this recommendation is contrary to budworm resistant management plans, no documented resistance is present in most areas of Alabama. Furthermore, this recommendation is a short-term one to save growers during the next few seasons. Delaying budworm resistance will not matter if bankruptcies occur and cotton is forced out of an area.

Use selective chemicals for plant bug controls in areas outside the active eradication area. Lannate and Bolstar at 0.25 pound active ingredient (ai) per acre are two of the more selective materials on beneficial insects. Lorsban at 0.2 pound ai per acre is slightly less selective but gives good plant bug suppression. Methyl parathion at 0.33 pound ai per acre is a hard chemical on plant bugs and beneficials, but its short residual allows beneficials to rebound quickly, making it a popular choice with growers in recent years.

Although you may need to apply insecticides when early season insects are at damaging levels, avoid automatically spraying foliar insecticide sprays which disrupt beneficial populations. These unnecessary treatments suppress beneficial insects; such as the braconid wasp, Cotesia, at a time when they may provide the strongest line of defense against BAWs. Natural populations of beneficial insects will often hold BAWs in check through early and midseason if they are not decimated by hard insecticides targeted against other pests.

Selecting Less Susceptible Fields

Avoid planting cotton in fields adjacent to small grain. A continuous migration of thrips from small grains to cotton occurs as the grains mature. This results in excessive thrips injury and delay to cotton or the need to make multiple foliar applications to control thrips.

Rotate cotton away from fields which have a history of BAW problems.

Applying Preventive Treatments Of Dimilin

Since 1988 Dimilin has been used to suppress BAWs. An insect growth regulator, Dimilin has long residual when applied to cotton foliage and little effect upon beneficial insects. Apply Dimilin as a preventive before BAWs get out of control. Early in the season, use banded applications to cut costs.

In fields that have historically had BAW problems, start application at 2 ounces per acre prior to the first BAW appearance. If BAW egg masses are already present, use 4 ounces per acre on the initial application. Follow this application with multiple applications of 2 ounces each. You may need to apply a minimum of 6 to 8 ounces of Dimilin to achieve results.

Growers who have experienced the worst BAW damage now routinely apply 2 ounces of Dimilin every time a sprayer goes over the field, beginning with either the foliar thrips sprays or pin head square sprays for boll weevils. Some growers have applied as much as 16 to 24 total ounces in a season to prevent economic damage from the BAW.

Controlling BAW Larvae

Several currently registered insecticides give some control of BAW larvae (Figure 2). These include Lorsban, Larvin, Ovasyn, Curacon, Bolstar, and Lannate. However, when the crop is under heavy pressure over an extended period, all of these products allow escapes and damage. The problem has been that these insecticides have been applied too late and at too wide an interval. To lessen escapes and damage, try the following.

Begin control early before the situation gets out of hand. Target small larvae, less than ¼ inch. Ignore larger larvae, allowing them to cycle out.

Make at least two applications at a 3- to 5-day interval before evaluating an insecticide. Because BAW populations may peak every 15 to 20 days during the season, you may need three or

Figure 2. Full-size BAW caterpillar.
more applications at close intervals during the first 10 days of a cycle. During the next 10 days, you may not need to apply BAW controls. Expect each generation to be heavier than the previous one.

**Apply insecticides at moderate rates**, at close intervals (3 to 5 days), with high water volume per acre (10 to 20 gallons), under high pressure (80 to 100 psi), and with additives (crop oils or silicone surfactants).

Use Larvin at a rate of 0.125 to 0.25 pound ai per acre to reduce BAW populations. Apply Larvin as a preventive similar to the way Dimilin is applied.

Use the product Pirate™ from American Cyanamid if it is available. Full registration is not expected until the 1996 crop year. However, an emergency use request will be made for the 1994 crop season. If Pirate™ is available in 1994, the product will be limited in supply, expensive (greater than current standards of $15 per acre), and only labeled for use in ground equipment.

Based on research tests conducted under heavy BAW pressure, Pirate™ is effective where BAW populations thrive: in areas where chemical treatment for boll weevil eradication has occurred or where overwintered weevil numbers are high and the cotton crop is late. In Alabama tests, Pirate™ has given good crop protection.

A rate of 0.2 pound ai per acre will give high adult moth mortality. Pirate™ does have bollworm and budworm activity at higher rates, but it is not as effective as pyrethroids where resistance is not a factor.

When BAW pressure is heavy and control ineffective, apply adulticides to kill the moths. Methyl parathion at 0.3 pound ai and methomyl (Lannate) at 0.25 pound ai have the best reputation as adulticides.

**Evaluate control methods.** Count the number of larvae remaining on the plant prior to, and after, the second application using a drop or shake cloth. Don’t evaluate control methods by the presence or absence of dead larvae on the ground.

**Scouting**

Scouting for early infestations of BAWs is neither difficult nor time consuming. Use the scouting methods which best suit your management plan.

Use visual inspection to determine if BAWs are present. BAW moths generally select open canopy and stunted or stressed plants on which to deposit their first egg masses. These egg masses, referred to as **hits** after the tiny larvae begin feeding on the lower surface of the leaf, are usually found on plants at the ends of rows or on the borders of fields (Figure 3). When riding by a field border, you can often spot the first stages of an infestation. The top of the leaf will show a brown spot about the size of a thumbnail; this spot corresponds to early instar larval feeding on the lower surface. Later in the season, you can assess BAW infestations by walking through fields and recording the number of hits present per a given number of row feet.

After fields are more heavily infested with all sizes of larvae, use the shake or drop cloth (also used for soybean caterpillars) to evaluate control. The shake or drop cloth is the most effective method for determining BAW numbers. Spread the cloth between two rows and shake one or both rows over the cloth. Convert the numbers found to a row-foot basis.

To detect early BAW activity, use pheromone traps with BAW lure. In previous years, these traps have correlated with the first appearance of BAW in early spring and also peaked in July and August at the same time activity increased in nearby fields. Traps with lures could prove very valuable in timing preventive applications of Dimilin in early season. These are bucket-type traps that require an insecticide kill strip. A limited number of traps with lures will be available in each cotton-producing county. Check with your county Extension agent.

**Setting Action Thresholds**

The concept of thresholds varies with different cotton insects. Decisions on when to treat for some insects, such as the boll weevil, may be based on an economic threshold. However, with
an insect like the BAW, where adequate chemical controls are not available, using an action, egg, or preventive threshold may be more advisable. As with all thresholds, the time of the season, stage of the crop, weather conditions, and other factors are important in the decision-making process.

The time of the season and previous BAW history have much to do with BAW thresholds. Where BAW hits begin to appear and 20 to 60 days of the fruiting season remain, use the threshold of two hatching egg masses (hits) per 100 row feet. This preventive or egg threshold is the most commonly used in the Southeast.

Use higher thresholds when the crop begins cut out. In late season, when squares and blooms no longer have time to mature, use thresholds of 10 or more caterpillars per row foot (Figure 4). Accept some foliage, square, and bloom damage when the season is winding down. Foliage and immature fruit feeding from the BAW in late season is often not as damaging as it appears. BAWs are normally not heavy feeders on mature bolls unless they have consumed all other food sources.

Summary Of Chemical Control Tips

• Don’t give up too quickly on a chemical for control or the crop in general. Make two applications at 3- to 5-day intervals before evaluating an insecticide.

• Don’t panic over the sight of worms that escape controls. Cotton can produce respectable yields with some levels of BAWs present all season long. Yields may often be more than expected since foliage damage by BAWs is highly visible.

• Don’t evaluate for controls by the presence or absence of dead larvae on the ground. Count the number of larvae remaining on the plant prior to, and after, the second application using a drop or shake cloth.

Conclusion

Existing insecticides labeled for cotton are only slightly to moderately effective on the BAW. Consequently, the answer to preventing heavy losses to this pest lies in good management practices.

Additionally, the BAW is not looked upon as a long-term problem. When the need for weevil controls is eliminated in future years, beneficial insects will in all likelihood hold BAWs to non-damaging levels.

Figure 4. Late season BAW damage to boll.

Summary Of Chemical Control Tips

• Don’t give up too quickly on a chemical for control or the crop in general. Make two applications at 3- to 5-day intervals before evaluating an insecticide.

• Don’t panic over the sight of worms that escape controls. Cotton can produce respectable yields with some levels of BAWs present all season long. Yields may often be more than expected since foliage damage by BAWs is highly visible.

• Don’t evaluate for controls by the presence or absence of dead larvae on the ground. Count the number of larvae remaining on the plant prior to, and after, the second application using a drop or shake cloth.

Conclusion

Existing insecticides labeled for cotton are only slightly to moderately effective on the BAW. Consequently, the answer to preventing heavy losses to this pest lies in good management practices.

Additionally, the BAW is not looked upon as a long-term problem. When the need for weevil controls is eliminated in future years, beneficial insects will in all likelihood hold BAWs to non-damaging levels.