# YEAR TWO OF BOLLGARD BEHIND BOLL WEEVIL ERADICATION--ALABAMA OBSERVATIONS

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## Abstract

Bollgard varieties planted in areas where the boll weevil has been eliminated as an economic pest have created a low insecticide use environment compared to historical standards. This shift in insecticide use patterns has caused significant changes in the cotton pest spectrum. This paper will focus on changes in pest status and field observations concerning the management of these pests.

## Introduction

The 1997 cotton growing season in Alabama was dominated, not by insects as in 1994 and 1995, but instead by adverse growing conditions. Approximately 20% of the 520,000 acres were plowed under about mid season (July) due to delayed maturity and the lack of potential profitable yields. There was no overall dominating insect damage with one exception. One localized multi-county area in extreme southeastern Alabama suffered heavy losses on conventional varieties to pyrethroid resistant tobacco budworms.

## Discussion

Approximately 60-65% of the states acreage was planted to Bollgard varieties. This was a reduction from the 75-77% planted the previous year. This change came about because some growers who planted the 96-4 refugia option in 1996 changed to the 80-20 option in 1997. Few additional growers planted Bollgard varieties due to the low tobacco budworm pressure in 1996.

The 1997 season began with one of the coolest springs on record while the rainfall situation fluctuated from one extreme to another several times during the growing season. Basically the spring, which lasted through June, was cool and wet. The effective fruiting season lasted from about July 1 to August 10. Available moisture during this period was in the form of scattered (localized) thunderstorms. After August 15, no rainfall occurred until October. Harvest season was then affected greatly by close interval weather fronts that pushed some harvesting into the 1998 calendar.

A review of the insect situation resulted in the following observations. Thrips numbers were moderate but the susceptible injury period was extended due to the slow development of the plants. Early season plant bug migration into cotton was moderate to heavy, and extended, due to lush conditions of the wild host plants on field borders. Early square set was poor due to plant bug injury, as well as the cool cloudy weather and waterlogged soils. Yellow striped armyworms were common on presquare cotton and populations persisted season long in fields with low insecticide usage. Their damage was primarily foliage feeding but some fruit feeding was reported and a few fields were treated.

Tobacco budworm (TBW) pressure was light during the early square stage in June but intensified with an early July generation. A second major generation occurred in early August. Control with pyrethroids and pyrethroid tank mixture was disappointing. Up to 100% fruit loss was experienced on conventional varieties in early July in the southeastern area of the state. This was primarily due to growers not recognizing the need to apply newer chemistry, such as Tracer, until the problem was too advanced. Tracer performed well where timing, coverage and appropriate rates were used. One other significant observation was made concerning TBW's in 1997. In multi county areas, where over 80% of the acreage was planted to Bollgard, two generations of budworms occurred in fields planted to conventional varieties. This somewhat disproved the theory that a high concentration of Bollgard would protect the remaining acreage from budworm infestations.

A bollworm generation (from corn) occurred about mid season on both Bollgard and conventional varieties. Escape larvae were not difficult to find on Bollgard varieties; however, less overspraying on Bt cotton was done in 1997 since bollworm numbers did not reach the economic level in most fields. Bollworm eggs, as in 1996, were again deposited lower in the canopy and associated with white or dried blooms. Pyrethroids gave excellent control of the bollworm species on conventional varieties. This egg deposition pattern of bollworms will in the future make it more difficult to collect eggs and/or larvae to utilize the Lepton Kit for species identification. The Lepton Kit, or other tools, are desperately needed to identify bollworms from budworms at a very early stage, since the choice of chemistry is very important on conventional varieties. Species identification is also important on Bollgard varieties to determine if the population is bollworm. This could prevent the need to use an egg threshold for high numbers of eggs if the population is primarily budworms.

Fall armyworm (FAW) populations developed early and were widespread in the Gulf Coast and Coastal Plain areas of the state in July. Detectable numbers occurred statewide for the second consecutive year from mid July until late August. As in 1996, the fruit damage did not reach the level expected, based on the number of larvae present. It does appear that the higher threshold for FAW, 2 X that of bollworms, is justified. Where insecticide controls were

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applied by growers for FAW's, limited results were obtained. Coverage continues to be a major limiting factor in controlling this pest due to the larval location on the plant in the early instar stage. Small FAW caterpillars are traditionally found between the boll bract and the boll in the lower areas of the plant.

The southern armyworm (SAW) was widespread in August in the southern areas of the state in low insecticide input fields. This caterpillar is somewhat like beet armyworms (BAW) in that they hatch from large egg masses and skeletonize the immediate and nearby leaves. The SAW is a slow feeder and consumes a rather small amount of leaf tissue per larvae. This damage was not thought to be economic but their presence was unnerving to growers who had previously experienced heavy BAW damage.

Heavy localized infestations of soybean loopers occurred in late season. This can be a very economically damaging species, even though they are a foliage feeder only. Up to 100% foliage loss may occur. Controls will be necessary in future years if populations occur before cotton is ready to defoliate. Beet armyworms did not occur at damaging levels in a single field, even though an extended drought occurred in the traditional BAW area of southeastern Alabama. This demonstrates again that a combination of dry conditions and intense phosphate insecticide use is required to set up disastrous BAW populations. A few fields in the extreme southern areas of the state had an infestation of the cotton leafworm (Alabama argillacea). This occurrence of exotic or migratory pests is expected to become more common in this lower spray environment in future years.

Stink bugs (SB) were observed in cotton as early as June. However, their numbers and damage did not increase until late July-early August. Populations were widespread in August and most fields were treated at least one time. Once controls were applied, it appeared to take about three weeks for SB numbers to rebound. The threshold of one SB per 6 row feet seemed to be on target and the drop cloth survey technique appeared satisfactory. Certain phosphate and pyrethroid insecticides gave adequate suppression of stink bugs.

Aphids were heavy (clustering on all plants) in many fields from late June to mid July. Few controls were applied and populations eventually crashed from the naturally occurring fungal disease (Neozyaites fresenii). Populations rebounded in numerous fields in September along with a buildup of whiteflies. Some sticky cotton was observed as the honeydew secreted by both pests fell on open bolls. Heavy populations of the silverleaf whitefly were identified in Mobile county (Gulf Coast) in September. Several fields were completely defoliated.

Beneficial insects were not as abundant in 1997 as 1996, even before any foliar insecticides were applied. This indicates that factors other than insecticide use patterns may also be regulating beneficial populations.

Boll weevils emerged in two rather confined areas in the spring of 1997, which correlated to where numbers were trapped the previous Fall. Eradication personnel concentrated on these areas (less than 5% of state) with foliar malathion sprays. Weevil numbers were non-detectable throughout most of the season in the majority of the state. However, in early September, weevils were captured in several counties for the first time all season. This may indicate that achieving final and complete eradication may be very difficult in communities that plant a high percent Bollgard cotton.

In general, Bollgard cotton was treated from 2 to 4 times in 1997, primarily for plant bugs, stink bugs, or fall armyworms. Conventional varieties were treated 6 to 8 times for budworms, bollworms, FAW and stink bugs. The greater difference between Bt and conventional varieties was not the number of applications, but the cost per application and the urgency of timing of applications. Budworm control on conventional varieties ranged from $10 to $15 per application, depending on the rates used or the choices of chemicals for the tank mixtures. In most instances, significant budworm damage occurred in addition to the control cost. Insecticides to control insects on Bt cotton generally range from $3 to 7 per acre per application.

After two years in this new and different cotton production system, combing the absence of boll weevils and the planting of Bollgard varieties, a few other general conditions appear to be surfacing. First of all, secondary pests have become more important and old established thresholds may not be appropriate. Subeconomic levels of several insects, occurring at the same time, may be doing economic damage in this new lower insecticide use environment.

Bollgard varieties have allowed growers to produce substantially higher yields, where adequate moisture is available, with minimal input for insect control. The attainable yield potential is now much higher. However, not all growers recognize this fact and are not taking advantage of this possibility. For example, a grower may be happy with harvesting 800 lbs. of lint per acre when 1000 lbs could have been reached by making a $3 spray for stink bugs.

Bollgard varieties gave a similar performance over a wide range of weather conditions and rainfall patterns. This is a distinct advantage when a new "moth flight" occurs during irrigation scheduling or inclement weather. Bollgard has eliminated the urgency of timing for bollworm/budworm sprays. The timing of applications for most of the remaining pests, such as plant bugs, stink bugs, aphids and fall armyworms are not as critical.

Pyrethroids did not perform well alone or in combination against high levels of tobacco budworms on conventional varieties in southeastern Alabama. The need to rotate to newer chemistry, such as Tracer, is advisable immediately when the population shift to budworms occurs. The precision by which this new chemistry must be used is much higher. The timing of applications, along with thorough coverage and appropriate rates are critical.

Field investigations for control of potentially economic insects of this new low insecticide use environment could be summarized as follows. Several phosphate insecticides (methyl parathion, Penncap-M and Bidrin) gave over 95% control of stink bugs. Pyrethroids (Karate and Decis) gave 80-90% suppression of the stink bug. Most newer chemistry (Tracer, Pirate, Intrepid and Strategy) had good to excellent fall armyworm activity. However, pyrethroids gave comparable effectiveness when all were being used "as needed" for bollworm/budworm control during the armyworm window. All insecticides recommended for plant bugs are effective on the immature stages. However, only the "hard" chemistry, that also suppresses beneficial insects, is effective on adult plant bugs.

Cotton monitoring for insects (scouting) is now a "special art." Inexperienced and unsupervised scouts are not doing an adequate job. Daily supervision of inexperienced scouts is a must since scouting techniques sometimes must be modified from one day to the next. Most growers cannot do an adequate job of scouting due to their knowledge base with new pests, the amount of time required, their patience and the eye sight necessary. For example, three to five minutes per plant may be necessary to find and quantify fall armyworm numbers and damage on cotton.

Cotton IPM (including scouting and insect management and control recommendations) is now both an art and a science. To be successful in this profession one must be both an artist and a scientist.