

THE BEET ARMYWORM IN TEXAS AND OKLAHOMA 1995

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Abstract

The beet armyworm (BAW), *Spodoptera exigua* (Hubner), has not historically been an annual, economically damaging pest in Texas. However, widespread outbreaks occurred in 1995; along with adverse dry weather, high aphid populations, cabbage looper and other insect damage. The amount of damage caused by the BAW varied widely from area to area. Over 3 million acres were infested to varying degrees. About 1.2 million acres were treated at a cost of over 31 million dollars. The general BAW situation and damage caused are reviewed for each of 7 cotton growing areas of Texas and Oklahoma. The worst infestations occurred in the Lower Rio Grande Valley and the Southern Rolling Plains. Basic biology of the BAW and general management guidelines for Texas are briefly reviewed.

Introduction

I know that most of you are familiar with the beet armyworm and many of you have had first hand experience with this insect. However, I thought it would be appropriate to first review some of the basic biology of the beet armyworm before I discuss the situation in Texas.

The beet armyworm is found worldwide and has a very large host range, feeding on many wild and cultivated plants. The adult is a greyish moth that lives about 4 days and is capable of migrating considerable distances. Females lay up to 600 eggs in masses of about 80 eggs each on the undersides of leaves. These eggs are covered by hairs and scales. This slide shows an uncovered egg mass. Upon hatching the small larvae feed in groups for several days, skeletonizing leaves. Hatching egg masses are called "hits". Larger larvae feed on foliage, squares and small bolls. Older larvae are smooth and green in color with a conspicuous black dot on each side of the second body segment behind the head. In Texas in 1995, the BAW fed primarily on squares and flowers, in addition to leaves.

The BAW can occur at any cotton growth stage, but the most damaging stage is during the squaring and blooming period. Mortality is high on seedling cotton and very little damage occurs to mature bolls. The BAW is a potentially very devastating pest to cotton given the right set of circumstances. Its status as a pest of cotton may be

changing for the worse according to several experts in the field.

Several key factors have been identified by Dr. Ron Smith and others as contributing to BAW outbreaks. These are mild winters, delayed crop maturity, heavy early season use of insecticides, prolonged hot dry weather and the fact that BAW are present early in a growing season. In addition, high risk situations include sandy and drought stricken soils; skippy, open canopies; and pigweed infestations.

The BAW has not historically been a serious pest in Texas. There have been occasional, regional outbreaks including one on the High Plains in 1980 and more recently in far West Texas in 1993. In 1995, however the BAW infested certain areas of Texas with a vengeance. Over 3 million acres were infested to various degrees. Approximately 1.2 million acres were sprayed 1 or more times at a cost of over 31 million dollars. Despite this, the amount of damage varied widely from area to area ranging from severe to sub-economic. Also, depending on the area, different stages of the crop were attacked and the efficacy of insecticides used apparently varied.

In the most hard hit areas, the Lower Rio Grande Valley and the Southern Rolling Plains, the boll weevil eradication program was in its first or second year and was blamed by some for causing the outbreaks. The facts were, however, that in those areas, all of the key outbreak factors I just mentioned were present. The boll weevil eradication program did not cause these outbreaks, but given all of the environmental conditions present may have contributed to the severity of the outbreaks in the eradication areas. The extent of the role of the eradication program in this respect is not precisely known. It should be noted that several significant changes have been made to the Texas boll weevil eradication program. These changes have been designed to somewhat reduce the impact of the area wide program on beneficial arthropods in the cotton agroecosystem.

Since Texas is such a large state, I would like to take you on a tour of the 1995 BAW situation in Texas area by area and in Oklahoma, and give you a brief summary of what happened in each cotton growing region.

Lower Rio Grande Valley

The Lower Rio Grande Valley is a subtropical area where cotton is planted in February. There are about 360,000 acres of cotton in the Valley, along with a significant amount of year round vegetable production, citrus and other crops, such as aloe. All 360,000 acres of cotton were infested with the BAW in 1995. Two hundred fifty thousand of these acres were treated. An estimated 205,000 acres were eventually harvested.

The BAW, along with numerous other factors, was extremely damaging to Valley cotton. At its peak, the BAW infestation was estimated at 1.1 million larvae per acre and an average of 3 insecticide applications per treated acre were made. The average yield was 80 pounds per acre which represents an average yield reduction over all acres of 50%.

The Valley experienced drought conditions early. Severe aphid and cabbage looper infestations caused extensive damage and numerous early insecticide applications. BAW populations were also present early as the Valley has a resident BAW population on vegetables. The highest cotton infestations occurred around Memorial Day; this was after aphids, loopers and drought had begun to take their toll. A considerable number of insecticide applications had already been made for aphids and loopers. The insect growth regulator, Confirm, became available through a section 18 label on June 5 in Texas.

There were 4 generations of the BAW in the Valley, 3 of which had about a 21 day cycle. Valley cotton continued to experience problems later with heavy whitefly infestations and tropical rains in August. There are currently BAW now present on vegetables in the Lower Rio Grande Valley and entomologists are worried about the prospects for BAW on cotton in 1996.

Coastal Bend

Moving up the state a bit we come to the Coastal Bend. This is also a subtropical area extending from near Kingsville and Corpus Christi almost to Houston. This area planted about 516 thousand acres of cotton in 1995. Two hundred eighty four thousand of these acres were infested with the BAW and about 125,000 were treated 1 or more times for the BAW.

At its peak the BAW infestation was much lower than the Valley at about 50,000 larvae per acre. There were an average of 1.5 control applications made per treated acre. Overall the average yield was over 700 pounds per acre, the highest dryland yield in the country, and the average yield loss to BAW was only 2%.

The Coastal Bend experienced 1 major BAW generation and by late June infestation numbers were very low. Most of the BAW damage occurred in the southern, dryer areas of the Coastal Bend where damage was heavy. The more northern areas experienced little or no damage, possibly related to rainfall. The Coastal Bend also experienced hot, dry conditions as well as early season aphid and looper damage in the southern areas. BAW appeared in early May and the Extension Service issued a BAW pest alert about 2 weeks prior to the major BAW outbreak.

In the southern Coastal Bend, some producers used multiple applications of Dimilin plus combinations of

Dimilin with high rates of certain organophosphates such as Larvin. Confirm was also used and appeared to give good results in 3-4 days on all larval sizes. In more northern areas of the Coastal Bend, BAW egg-lays did not amount to economic damage and insecticides were not eventually needed.

North/South Central

The North and South Central cotton growing regions of Texas are next on our statewide survey. This area planted about 259,000 acres of cotton, 19,000 of which were infested with the BAW in 1995. Of this only about 3600 acres were treated. At the worst in Central Texas, BAW infestations reached only 15,000 larvae per acre and required 1 application per treated acre. The average yield for this area was 395 pounds per acre with an estimated yield reduction of 0% due to the BAW. Parts of this area had quite a bit more rain than the rest of Texas this year and no economic infestations of BAW were reported.

Southern Rolling Plains

The Southern Rolling Plains, however, had quite a different experience. This area had 295,000 acres of cotton, all of which were infested with the BAW. One hundred eighty thousand acres were treated twice for the BAW and about 55,000 acres were lost to BAW infestations. At its worst, the BAW infestation was estimated to be almost 700,000 larvae per acre. The average yield over all acreage was 185 lbs., representing an average 30% reduction in yield due to the beet armyworm.

This area experienced a mild winter and a late cotton crop due to weather. BAW moths were caught in traps early in the year and seedling cotton was heavily infested. Mortality of BAW larvae on seedling cotton was high. Numerous insecticides on seedling cotton were used to advantage including insect growth regulators, organophosphates and *B. t.*'s. Some question remains, however, whether treatment of seedling cotton is always necessary given the high mortality of larvae at this cotton growth stage.

Later, in late July, a large moth migration and BAW egg-lay occurred. It has been theorized that this was a migration from South Texas borne on a hurricane front coming out of the Gulf of Mexico, resulting in a large moth "fall out" as the front stalled over the Southern Rolling Plains.

Resulting BAW infestations were simply overwhelming. Insect growth regulators were used, but worked more slowly than they had in Southern Texas due to cooler night temperatures in this area. Confirm, for example, took 7 days to show results. Conventional insecticides were used but were generally not adequate. The insecticide Pirate became available via a section 18 registration and a limited

amount was available by mid-August. This alleviated some of the BAW problem. However, by this time an estimated 50,000-100,000 acres had been abandoned due to a combination of heavy cabbage looper, bollworm, budworm, aphid and beet armyworm attack.

Northern Rolling Plains

We move on now to the Northern Rolling Plains of Texas. This area had about 545,000 acres of cotton. In 1995 about 224,000 acres of cotton were variably infested with the BAW, and about 87,000 acres were treated for the BAW. The maximum infestations in this area were about 7 hits per 100 row feet and an average of 2 applications per treated acre were made. The average yield here was 250 lbs. per acre, but only 1% yield reduction was attributed to the BAW.

The Northern Rolling Plains had a late crop due to weather and experienced heavy aphid and bollworm damage. Although the BAW was a threat through September in this area, naturally occurring predation helped keep infestations in check. Some Dimilin was used as a preventive, as other materials were not available.

Far West Texas

We move now to the far West Texas cotton growing region. This area had about 435,000 acres of cotton and did not experience serious BAW problems overall. About 135,000 acres were infested and, of these, 80,000 acres were treated about 1 time. The estimated maximum BAW infestations in this region were 150,000 larvae per acre. The average yield was 520 lbs. per acre, with a 4% yield reduction due to the BAW.

Far West Texas had very hot, dry conditions and seedling cotton was infested with the BAW, also with poor larval survival on seedling cotton. The maximum 150,000 larvae per acre infestations were received during peak bloom when Confirm and Pirate were mainly used.

High Plains

Finally we move to the Texas High Plains where 3.1 million acres of cotton was grown in 1995. In 1995, 1.65 million acres in the Texas High Plains are estimated to have been infested with the BAW and 450,000 acres treated for BAW control. Overall, however, infestations were moderate with maximum numbers estimated at 60,000 larvae per acre. The average yield was 420 lbs. per acre with only a 1% yield reduction due to the BAW.

Conditions in the Texas High Plains were variable, but generally wetter to the east. Confirm was used extensively and good results with organophosphates, when they were used with good spray coverage, were also reported.

Oklahoma

In Oklahoma there are about 400,000 acres of cotton grown in the southwestern areas. The BAW appeared late in Oklahoma and only about 25,000 acres were treated, mainly with Dimilin or Confirm. No major outbreaks occurred.

Cotton yields were low in Oklahoma mainly due to weather and heavy bollworm damage. The impact of beet armyworms in Oklahoma in 1995 was negligible.

Management

The beet armyworm is a difficult pest to control for several reasons. It is difficult to scout for, it is often spotty in the field, it can occur in huge numbers and it does tend to sneak up on producers and consultants. Populations can appear to “explode” into an unmanageable situation.

Management of the BAW includes early planting and maturity; preservation of beneficials when possible; early detection and thorough scouting; the use of treatment thresholds for all pests; and directing control measures toward small BAW larvae, before they have moved into the fruit.

The beneficial predator and parasite complex is very important in keeping the BAW in check as John Ruberson has just told us. The practical aspects of this are that certain insecticides are more toxic to BAW parasites than others. In general, here is a list of the relative toxicities of various groups of insecticides to beneficials, from more toxic to least toxic. Organophosphates top the list; followed by pyrethroids; carbamates, endosulfan, and pirate; fipronil and spinosad; the insect growth regulators; *B. t.*'s; and finally viruses. However, remember that pesticide toxicity to beneficials depends on the rate used and the exposure of the beneficials to the pesticide. Higher relative rates increase the toxicity to beneficials.

As far as the efficacy of various insecticides against the beet armyworm goes, there have been a number of excellent studies in Texas in 1995. I haven't had time to show you these, but generally the insect growth regulators and compounds such as pirate, spinosad and viruses gave better control than conventional insecticides. A paper on BAW insecticide efficacy trials in South Texas will be presented later this week by Dr. Stormy Sparks.

Economic thresholds are not well defined for the BAW, and because this insect can have spotty distribution in the field we recommend thorough scouting. Our thresholds during bloom are 2 hits per 100 row feet for insect growth regulators and 5 hits per 100 row feet or 20,000 larvae per acre for Pirate, should it become available. Texas expects section 18's for Confirm and Pirate by March of this year.

After cutout, thresholds are much higher and are placed at 15 or more hits per 100 row feet or 10 larvae per row foot.

Several BAW experts have suggested that the BAW is a changing pest. In other words, it may no longer follow the same biological or behavioral patterns we have expected it to follow in the past. For example, it appears that it may be infesting cotton earlier and possibly choosing cotton as one of its favored hosts. Also, it appears that it may be able to overwinter much further north than previously thought. Our management tactics may have to change accordingly.

In 1996, the Extension Service will be coordinating a statewide BAW pheromone trapping network in Texas. This will serve as both an early warning system and alert producers and consultants when to intensify scouting for BAW in cotton.

We will recommend in Texas that producers consider using soil insecticides when conditions appear conducive for BAW outbreaks to occur. This practice may help reduce early season foliar insecticide applications for aphids and thrips. We will also recommend that producers consider using the new *B.t.* cottons in areas where bollworm or budworm infestations are normally expected and especially in boll weevil eradication areas.

Finally, in many areas of Texas we will continue to reinforce our standard cultural practice which is the maintenance of a short season production system. The principles of a short season production system include early planting, use of rapidly fruiting varieties, protecting early fruit and optimizing fertilizer inputs.

The beet armyworm is potentially a serious threat to Texas cotton. We have many new tools with which to manage this pest. The future of integrated pest management is, in fact, very exciting not only for the BAW but for the management of many other pests. We have new insecticides, insect growth regulators, insect viruses, genetically engineered crops, pheromone technology, new application technology, information networks and most of all the dedication and knowledge of cotton growers and scientists. We expect that over time we will use these and other tools to successfully manage this newest threat to cotton.

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