TAKEN BY STORM: A REPORT OF THE TOBACCO BUDWORM PROBLEM IN MISSISSIPPI

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Abstract

The northeastern half of Mississippi sustained devastating populations of tobacco budworm during the summer of 1995. Second generation moths oviposited one to two eggs per plant per night in cotton fields beginning in mid-July and continued unabated through August 5. Third generation eggs and larvae were 5 to 10 times more numerous than were the second generation. Five factors are cited as probable causes for the outbreak and subsequent loss of control: near ideal climatic conditions for pest development, resistant insects, attractiveness of the crop, variety, and insecticide availability and use patterns.

Introduction

For a number of years North Mississippi farmers have struggled to find a crop that fits into their program allowing them to farm on a scale where they do most of the on farm work with one or two helpers. After 1994, which was a good year for many, there was a renewed optimism about growing cotton. Acreage increases were common in most North Mississippi counties for 1995 and anticipation for a good crop was up.

Discussion

Chronology

A mild winter ushered in an early spring and planting was accomplished in two fairly distinct periods. The early planting began in mid-April and lasted for about 3 weeks. The second planting period began around May 20 and went through the first week in June. Emergence was varied across the area, but generally was slower than usual. Many farmers, including those in the hills, entered 1995 with the attitude that we were not going to take damage from the tarnished plant bug. Thus, spray applications in addition to pinhead sprays were common in much of the cotton. Squaring was delayed in much of the North Mississippi crop and flowering began 5 to 10 days later than usual, especially in the late planted crop. First generation worms appeared shortly after June 15, but were not generally found by scouts until they started damaging squares. Most of the eggs from this generation of moths were placed down in the plants and missed by scouts. Many scouts had farmers spray the larvae, even though they were greater than 1/4" in length when they were found. About 65% of the acres in the North Mississippi region were treated an average of 1.3 times for bollworm /budworm in June (unpublished survey data). There is no general trend to early insecticide usage. Almost every pesticide available was used - pyrethroids, organophosphates, carbamates, and biologicals. The results were generally mediocre regardless of material used and in most cases the worms did not significantly damage the crop at this time. Surveys of entomologists who worked in this area agree that the pattern was mixed and there was little evidence that there were any indicators making 1995 different from past years. The only exception noted was that the June egg-lay, while not heavy, was more sustained. The moth ovipositional period persisted about 2 weeks.

Aphid populations began to build in many of the fields soon after emergence and insecticide applications most often included materials which were active against aphids. These populations remained in most North Mississippi fields until a fungus caused them to crash shortly after July 10. In some cases, the aphids may have made finding *Heliothis* eggs more difficult. Tarnished plant bugs were not generally a problem in North Mississippi cotton nor were boll weevils, early. Most farmers outside the eradication area applied two pinhead applications of Methyl Parathion as squaring began and eliminated weevils as a problem until the last week in July. Eradication area cotton fields remained weevil free.

Even though the North Mississippi crop was later than normal, it began to fruit heavily after July 10, setting squares and flowering as expected for full season. The second generation moth flight began in the Yazoo County area north of Jackson from July 10-14. The flight appeared in the Central and East Central counties (generally North of Highway 82 and South of Highway 8) during the weekend of July 15-16. By July 17th the flight had reached its full intensity and by July 21 had spread throughout the entire hill region generally east of the Mississippi hill/delta line. On the most heavily infested fields nightly oviposition of more than one egg per plant continued sustained until about August 5. Every egg seemed to hatch.! Initial applications of insecticides gave larval mortality of 65-85% as long as treatments were made to less than 4 day old worms, but when rains or other factors prevented the treatment on a 4 day interval, control was lost. In excess of 100% eggs per night for more than 20 nights simply could not be stopped. Insecticides held for 2 to 3 sprays, but then because of the overwhelming numbers larvae began to survive even the close interval sprays and by August 1 many farms were sustaining increases of 5 to 10% boll damage per scout. These numbers increased until many fields had in excess of 80% boll damage with larval numbers and size continuing to increase. Spray applications of pyrethroids (some at double rates) and in mixtures were used initially as a first line of defense. Curacron and Bolstar were soon added as materials of

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choice and later Larvin, Lannate, and Orthene were used. Most of these materials were used in mixtures with one another, with pyrethroids, with biologicals, at double rates, in oil applications, at higher volumes, in almost any conceivable manner which `might' help. NOTHING gave better than 70% control! Then materials began to be lost because of depletion of stocks. Many farmers spent as much as $60.00 to $100.00 per acre trying to control the second generation of worms.. Numerous farmers expended all their budgeted insecticide funds in that 20 day period and then overextended with never before imagined insecticide bills for the North Mississippi hill area. In an effort to keep some remedial type of treatment going, many turned to biological materials. Surprisingly, when used at 3 day intervals at fairly low, economical rates, they helped to keep larvae in the top of the plants and even seemed to increase efficacy of the `hard insecticides' with which they were mixed. As the second generation of moths began to decline, many farmers were forced to quit because of loss of yield potential and lack of funds.

Third generation tobacco budworm arrived on schedule on August 10-12 and as anticipated, egg numbers exceeded all expectations. Thirty to fifty eggs per plant per night were commonly seen in many fields for the next 10 to 12 nights. As is often seen in third generation, the small larvae were not as difficult to kill with insecticides. Many of them were weakened and diseases were much more prevalent. Eggs were not as viable as they were in the second generation. Much of the cotton was still green and able to support many worms and needs for control measures continued because of the high numbers. Those farmers who continued to fight them began looking for `cutout' and working to try to get that accomplished. Much of the crop was defoliated as quickly as possible. Numerous fields in the Central, East Central, North Central and Northeast areas of the state were never picked. Many of the fields which had pickers in them, harvested less than one bale per five acres. One anomaly noted by entomologists and farmers was that the ends of rows had harvestable crop, but 50 to 100 feet into the field there was nothing. Those farmers who persisted with spray operations generally picked 400 to 600 pounds of lint per acre at a cost of $150 to $175 per acre, almost all coming after July 15.

Factors

Why this disaster occurred when it did and where it occurred is open to widespread speculation. There is probably no one single factor which caused the over abundance of insects to develop. There are a number of factors which occurred which provided optimum conditions for its development.

1. Cotton production is more dependant upon weather conditions than any other factor. Yields vary from year to year depending upon timing and amount of rainfall, and upon temperatures and other climatic changes. Insect populations are also dependant upon weather. In general, climate which favors good plant growth also favors insects. Thus, weather is an important factor for us to study and understand. Since 1992, there have been reports of insect outbreaks in the midsouth area. The Mississippi delta region had heavy tobacco budworm populations during the summer of 1992. This was also the first year that resistant tobacco budworms caused losses in the hills of North Mississippi. This area escaped heavy TBW damage in 1993, but saw a few worm outbreaks in 1994. Reports from Alabama indicate that resistant TBW outbreaks occurred in South Alabama in 1993 and that Central Alabama had tremendous losses to TBW in 1994. Then in 1995 from the hill region of Mississippi up into Tennessee and covering most of Alabama, tobacco budworm populations exploded inflicting tremendous loss to the cotton crop. The weather is a factor in these losses! Figure 1 is a weather map of the midsouth area showing the March to June time frame for 1992. The area with heavy TBW outbreaks was warmer during that period. Figure 2 shows the same map for 1993, and Figure 3 shows 1994. The 200 DD area outlines the area of the Alabama outbreak. Figure 4 is the same area for 1995. It also is aligned with the area of the outbreak.

At Mississippi State, there have only been 3 days in the last three years where maximum temperatures did not exceed freezing. The winter of 1994 was the mildest on record. The first day of frost in the fall of 1994 was 12 days later than the average and the last day of frost was 12 days sooner in 1995. The rainfall was less, early in the year as well. All of these factors are highly fa-vorable to production of high numbers of overwintering TBW, high survival of pupae during the winter, and an increased abundance of spring hosts of TBW.

2. Resistance to insecticides by insects is a problem anytime it occurs and it is a major factor when insect population numbers are high. Flushing counts in fields in North Mississippi shortly after the initiation of the second generation egg lay revealed almost pure populations of tobacco budworm. Larvae collected from fields in North Mississippi were resistant to Pyrethroid insecticides (Luttrell, unpub data). Other chemicals also gave less than satisfactory results in the presence of the high population numbers. The loss of control, the lack of sufficient insecticides, and the inclement weather worked to overwhelm the management attempts in many of the fields.

3. Those fields which had the heaviest damage from tobacco budworm were the latest planted, most succulent, bottom land crop. The cotton fruited later and was more vegetative. Higher fertility also probably contributed to the higher incidence of budworms in those fields (unpub. survey data). The ridges and drouthy areas yielded better, simply because they were less attractive to moths for oviposition.

4. Some entomologists and farmers also think that there is a definite varietal difference in damage from TBW. In

general, earlier maturing varieties held up best in the presence of heavy pressure.

5. The boll weevil eradication program and its subsequent heavy use of Malathion has also been cited as a probable factor in causing the initial outbreak. Much of the affected area was not in the eradication zone and much of it was infested prior to or at the same time as the eradication area. Spray applications may have been a factor. The tendency to make multiple applications to fields in June often sets the crop up for pest Lepidoptera infestations later, because of the removal of beneficial insects. This was the scenario during the spring of 1995 because of the desire to control boll weevils, tarnished plant bugs and aphids. Many fields had 3 to 4 applications on a 5 to 7 day schedule beginning at 4th true leaf.

Conclusions

No single factor can be singled out as the cause of the devastation. The mild winters, coupled with a dry, early spring, and a later fruiting crop all synchro-nized with factors which favored the development of the tobacco budworm populations. Those same factors did not seem to favor the development of bollworms or tarnished plant bugs. Heavy insecticide usage can often release insect populations like aphids or at times bollworm/budworms and that may have been the case in 1995. Resistance to insecticides is also an integral piece of the puzzle, and perhaps it is the most dangerous part because it is the most difficult to manage and deal with. Because of the multiple factors involved, we can take hope that they will not again combine to give the same results in 1996.

Acknowledgements

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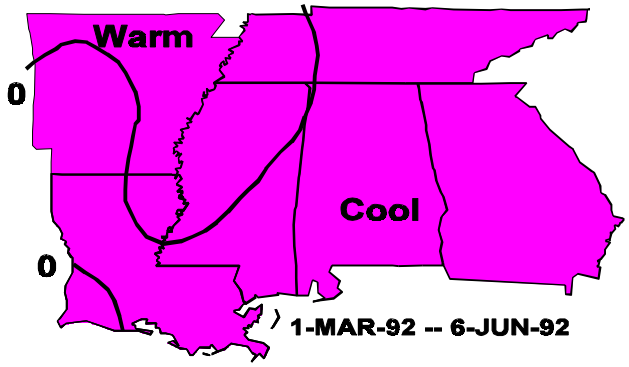

Figure 1. Areas of greater than 100 DD's over the midsouth - 1992.

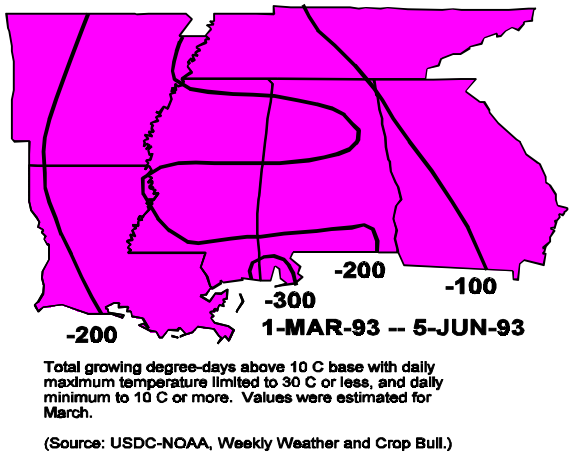

Figure 2. Areas of DD's over the midsouth area -1993

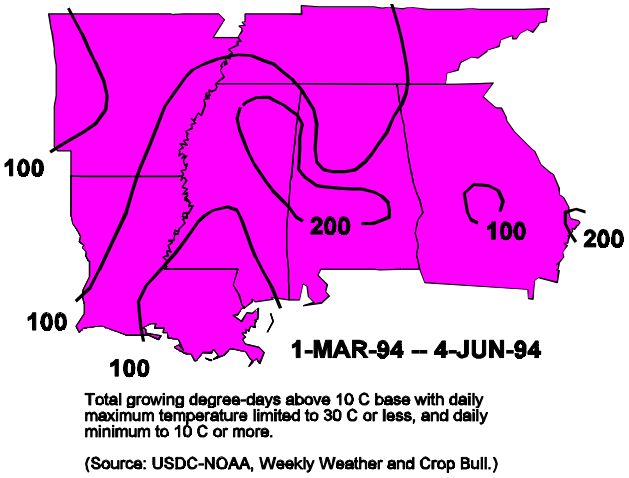

Figure 3. Areas of DD's over the midsouth area -1994

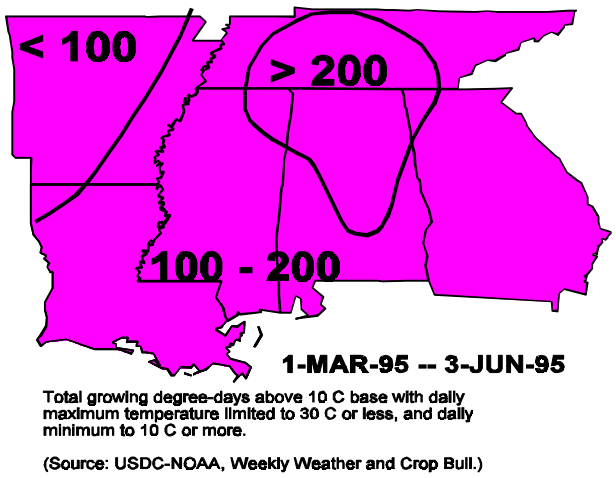

Figure 4. Areas of DD's over the midsouth area -1995.