INSECT MANAGEMENT IN MID-SOUTH ERADICATION ZONES: A PROGRESS REPORT

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Abstract

Active boll weevil eradication programs were in progress in five different regions of the Mid-South during 1998. Two of these regions, the Hill Region of Mississippi and the Red River Valley Region of Louisiana, were involved in the first full season of eradication following initiation in August of 1997. Excellent progress toward eradication was achieved in all regions. In the two regions involved in the first full season of eradication, no yield losses were attributed to boll weevils in 1998. Both of these areas experienced increased populations of secondary pests, especially aphids, whiteflies and, in fields not planted to transgenic Bt varieties, tobacco budworms. This flaring of secondary pests is attributed to the frequent applications of ULV malathion that are required during the early years of a boll weevil eradication effort and the effect of these treatments on beneficial insect populations. Fortunately growers had several new insect control tools available that help limit the damage potential of secondary pest outbreaks, and in most areas, the yield losses attributed to these increased secondary pest problems were offset, in whole or in part, by the reduction in yield losses caused by boll weevils. Flaring of secondary pests is expected to decline as the eradication program progresses and the number of applications of ULV malathion and the percent of fields requiring treatment declines.

Introduction

During the 1998 cotton production season, five active Boll Weevil Eradication Programs were underway in the three Mid-South states of Tennessee, Mississippi, and Louisiana. The location of these programs, approximate acreage in each program, and the approximate number of ULV malathion applications applied per acre during 1998 are summarized in Table 1.

Before discussing the progress of boll weevil eradication and its impact on secondary pest problems, it is appropriate to note that several recent developments have placed a greater burden for successful eradication of the boll weevil on the eradication programs. These developments are as follows: 1) a series of unusually mild winters, which means less winter mortality and consequently, higher survival of boll weevils into the following season, 2) the introduction and widespread adoption, especially in areas involved in boll weevil eradication, of transgenic Bt-cotton, which means fewer grower applied treatments targeting caterpillar pests and consequently less coincidental control of boll weevils, and 3) introduction of the caterpillar specific insecticide, spinosad (Tracer), which means less coincidental control of boll weevils by grower applied treatments targeted against caterpillar pests in non-Bt cotton.

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Discussion

Progress Toward Eradication

Despite these additional challenges, all five of the boll weevil programs currently active in the Mid-South appear to be making excellent progress toward successful eradication. The program in Middle Tennessee, which was in the 5th year of eradication in 1998, is the most advanced. This region was considered weevil free in the spring of 1998, but a total of eight weevils were captured on approximately 9,000 acres of cotton by the end of the growing season. These weevils are considered to represent a reinfestation due to migration of weevils from non-eradicated areas, possibly Mississippi. This reinfestation only involved four fields.

Although the program in southwest Tennessee (Region 1) was not initiated until August of 1998, pheromone trap capture results showed that the fall diapause treatments were successful in drastically reducing populations of overwintering boll weevils. An average of 43 weevils per trap were captured in Zone 1 during the week of October 2, compared to an average of 480 weevils per trap in Zones 2 and 3 which are located immediately north of Zone 1. This is a more significant reduction than numbers suggest because, historically, fall weevil populations are notably higher in the southern portion of West Tennessee (Zone 1).

Boll weevil populations were extremely low throughout the Hill region of Mississippi in 1998. Although pheromone trap captures indicated the presence of low numbers of weevils in most counties, field detection of boll weevils or boll weevil damaged fruit was extremely uncommon. Estimated yield losses to boll weevils in the Hill region of Mississippi were zero for the 1998 season, compared to estimates from past years which typically averaged four to five percent and reached 12.9% in 1989. Season long pheromone trap captures for boll weevil populations in the Hill region of the state averaged approximately 2.6 weevils/trap/week, compared to an average of 14.5 for the South Delta region, which initiated eradication efforts in August of 1998, and an average of 44.8 in the North Delta, which was not involved in eradication. Historically, boll weevil populations have been considerably higher in the Hill region than in the North Delta.

In the Red River Valley of Louisiana where eradication efforts were initiated in August of 1997, boll weevil

populations were reduced to an average of less than one weevil per acre for all trapping periods reported after July 1. During the week of September 23, for example, weevil populations in the Red River Valley Eradication area averaged 0.62 weevils per acre, compared to populations measured in the non-eradication parishes of Franklin and Tallulah of 52.0 and 188.1 weevils per acre, respectively. Yield losses to boll weevil in 1998 were estimated to be 0%. Historically the boll weevil was considered to be the primary insect pest in this area.

New Tools That Limit Risks of Secondary Pest Outbreaks

Because of the large number of applications of ULV malathion applied during the first and second full seasons of a boll weevil eradication program and the adverse impact these treatments have on beneficial insect populations, these early years of eradication are often associated with increased risks of secondary pest outbreaks. Some flaring of secondary pest populations also occurs during the fall diapause initiation. Fortunately, several relatively new tools are now available to producers to help minimize the risks of secondary pest outbreaks or to better control outbreaks that do occur.

The most significant of these tools is transgenic Bt-cotton which, because of its high level of activity against tobacco budworm and season long expression in the plant, essentially eliminates the risk of tobacco budworm outbreaks in fields planted to varieties containing the Bt gene. Consequently, producers in areas involved in the first or second full season of eradication are advised to plant most of their acreage to these varieties. Utilization of transgenic Bt-varieties was greater than 80% in both the Hill Region of Mississippi and the Red River Valley Region of Louisiana in 1998. On non-Bt acres the newly labeled foliar insecticide spinosad (Tracer from Dow Agrisciences) has proven to be highly effective against tobacco budworms, although multiple applications are required to control heavy or sustained infestations.

Beet armyworm is the caterpillar pest that is most often associated with boll weevil eradication efforts. Fortunately spinosad is also effective against beet armyworm, and two unlabeled products, chlorfenapyr (Pirate from American Cyanamid) and tebufenozid (Confirm from Rhom and Haas), were available under Section 18 Emergency Exemption in 1998 for use against beet armyworm. All three of these products are effective against beet armyworm and their availability greatly improved grower's ability to control this pest when treatment was necessary.

Populations of two sucking pests, aphids and whiteflies, also are often flared during the early years of boll weevil eradication. Because of high levels of insecticide resistance, cotton aphid is extremely difficult to control with currently labeled aphicides. Fortunately carbofuran (Furadan from FMC) was available in some states under Section 18 Emergency Exemption for use against cotton aphids in 1998.

Impact of Eradication on Secondary Pests

Tennessee: No region of Tennessee was involved in the first full season of eradication in 1998. However, some late season flaring of secondary pests was observed in Region 1, which initiated eradication efforts with a fall diapause program in August of 1998. Although beet armyworm was not a serious pest in Tennessee in 1998, populations were observed to be higher in the eradication program area than in adjacent non-eradication areas of the state. Likewise, late season tobacco budworm populations and number of insecticide treatments applied to control this pest were observed to be somewhat higher in the eradication program area.

Mississippi: Approximately 365,000 acres of Mississippi cotton were involved in the first year of eradication in 1998. Wide scale planting of transgenic Bt cotton served to minimize problems with tobacco budworm in this area, but many fields of non-Bt cotton suffered heavy tobacco budworm infestations. Some non-Bt fields suffered heavy damage as a result of these tobacco budworm infestations and, based on results of an end of season statewide survey, overall caterpillar induced boll damage in non-Bt cotton was significantly higher inside the eradication area, 6.2%, than in non-eradication areas, 2.6%. This same survey revealed evidence of an increased need to treat transgenic Bt-cotton for bollworms inside the eradication program area. During the 1998 season 83% of the Bt fields in the eradication area received at least one insecticide application to control bollworms, compared to only 15% of the Bt fields receiving treatment for bollworms in 1997.

The hot, dry conditions experienced through most of the season, combined with the frequent applications of ULV malathion, fostered great concern over the potential for an outbreak of beet armyworms, but no severe outbreak developed, and beet armyworm populations were observed to be only slightly more common inside the boll weevil eradication program area than outside. The new beet armyworm insecticides mentioned previously provided excellent control in those relatively few situations where treatment was required.

Both aphid and whitefly populations were clearly higher inside the Mississippi eradication program area than in non-eradication areas. In fact aphids and whiteflies were rated respectively as the second and third most damaging pests of Mississippi Hill cotton in 1998. In a season long survey of aphid populations involving seven fields located in non-eradication areas and nine fields located in that region of the state involved in the first full season of eradication, all of the fields located inside the eradication program area either exceeded 100 aphids per leaf or received an aphicide treatment before populations reached this level. Only one of the seven fields located in the non-eradication area

exceeded populations of 100 per leaf. Similar data are not available for whitefly populations, but heavy whitefly infestations were observed throughout the eradication program area while whitefly populations in the non-eradication area were low to non-existent. Populations of these two pests also were observed to be higher inside the eradication area during late summer and fall of 1997, as a result of the initial fall diapause applications.

It is noteworthy that this was the first year that boll weevil did not rank as one of the top three most damaging pests, in the Mississippi hills and even more noteworthy that no yield loss was attributed to boll weevils in this area in 1998. This reduction in losses to boll weevils more than offset the increased yield losses attributed to aphids and whiteflies.

Coincidental control of tarnished plant bug by ULV malathion treatments applied as part of the eradication effort also resulted in a reduction in yield losses attributed to this pest. However, this coincidental control of tarnished plant bug can be expected to decline in subsequent years of the eradication program as the number and frequency of ULV malathion treatments declines, and tarnished plant bug is expected to assume a more significant role as the key pest of cotton as the boll weevil is eradicated. Total costs of insect control for the Hill region of Mississippi, including fees for boll weevil eradication assessments and license fees for Bt-cotton, were estimated at $96.30 per acre, which is only slightly higher than the $88.29 per acre estimate for the previous year and lower than the $109.74 per acre estimate for the Delta region of the state in 1998.

Louisiana: Secondary pest problems experienced in the Red River Valley of Louisiana during 1998, the first full season of eradication in this area, were similar to those experienced in the Hill Region of Mississippi. Approximately 85% of the cotton acreage in this area was planted to Bt varieties and tobacco budworms were not a problem on these fields. However, compared to non-eradication areas of the state, higher numbers and damage from tobacco budworm were observed on many fields of non-Bt cotton. Beet armyworm populations, on the other hand, were observed to be slightly higher in the non-eradication program area. Aphid and whitefly populations also were significantly higher inside the boll weevil eradication program area. Tarnished plant bug populations were lower in the RRV area in 1998 due to reasons discussed above and hot/dry weather.

Summary

As of the end of the 1998 growing season, excellent progress toward eradicating the boll weevil was achieved in all of the active boll weevil eradication programs in the Mid-South. In the two areas involved in the first full season of eradication, the Hill Region of Mississippi and the Red River Valley of Louisiana, no yield losses were attributed to boll weevils. Although heavy use of ULV malathion caused noticeable flaring of several species of pests, the damage potential of these secondary pest outbreaks was limited by the availability of several new insect management tools. These new tools include transgenic Bt-cotton, which was in its third year of commercial use, and Tracer, which was labeled in 1997, along with the unlabeled insecticides: Pirate, Confirm, and Furadan, which were available under Section 18 Emergency Exemptions. Overall, yield losses due to secondary pest outbreaks were minimal and were largely offset by the reduction in yield losses due to boll weevils and tarnished plant bugs.

Table 1: Status of Mid-South Boll Weevil Eradication Programs in 1998

State & Zone	StartingDate [1]	Approx. 1998 Acres	Approx. No. Trts/Acre [2]
TN - Middle	1994	9,000	(8 weevils trapped)
TN - Zone 1 [3]	1998	113,000	11.0
MS - Hills	1997	365,000	13.4
MS - S. Delta	1998	126,000	8.7
LA - RRV [4]	1997	49,000	10.5

[1] All programs began in late summer with a series of treatments targeting the overwintering population.
[2] ULV Malathion was the primary material used for boll weevil eradication treatments.
[3] Tennessee Zone 1, is located in the extreme Southwest corner of the state.
[4]RRV = Red River Valley area.