POST ERADICATION INSECT CONTROL: WAS IT WORTH IT?

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Abstract

Georgia began the boll weevil eradication program in 1987. Active eradication included wide spread use of malathion based on extensive trapping for the next four years. Since that time Georgia growers have benefitted greatly from the elimination of the boll weevil as an economic pests. Insect control costs and damage following eradication have been reduced by nearly $65 per acre compared with years prior to the BWEP. However, during the active phase of the program there were increased occurrences of secondary pests such as beet armyworm. Insect control costs (including BWEP assessment) and damage increased nearly $54 per acre during the active phase of the program compared with previous years.

Introduction

Cotton production in Georgia has increased dramatically since the elimination of the boll weevil as an economic pests. In 1983 Georgia harvested 115,000 acres of cotton compared with 1.43 million acres in 1997. The success of the Boll Weevil Eradication Program (BWEP) in Georgia is a primary factor which led to increased cotton plantings and production. Georgia cotton growers passed a referendum in November of 1986 to begin the BWEP in 1987. Georgia was in the active phase of the program for the next four years. Multiple applications of malathion based on extensive trapping in addition to cultural practices such as stalk destruction were the primary means used in the eradication process. During the active phase of the program multiple applications of malathion decimated predatory and parasitic insects. Reduced populations of natural enemies contributed to secondary pest problems such as beet armyworm. The program is currently ongoing in a maintenance phase to monitor for reinfestations and initiate insecticide treatments if necessary.

Wide spread use of malathion has not been needed since 1990. In the absence of boll weevil, insect control costs and damage have been significantly reduced. In addition to savings attributed to boll weevil, producers have also seen reductions in control costs and damage from other pest as well. Growers actively practice integrated pest management (IPM) and are able to use natural enemies as the first line of defense in insect management programs since early season boll weevil sprays are no longer needed.

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Methods

A summary of economic losses due to insect damage and cost of control in Georgia have been published annually by The University of Georgia as Experiment Station publications since 1971. Insect control costs and damage are summarized for years before, during, and after boll weevil eradication: 1971 to 1986 (Pre-BWEP), 1987 to 1990 (Active BWEP), and 1991 to 1997 (Post BWEP).

Results and Discussion

Cotton acreage has increased dramatically since the elimination of the boll weevil as an economic pests. The average acreage harvested since 1991 is greater than four-fold the acreage harvested prior to the initiation of the BWEP (Table 1). Yields have also increased following eradication of the boll weevil. In the absence of the boll weevil, growers are able to mature bolls late in the year which would not have been economical prior to the BWEP. Although several factors have contributed to these increases, elimination of the boll weevil is a primary factor.

The success of the BWEP has also decreased insect control costs and damage in Georgia cotton. Prior to the BWEP Georgia growers incurred losses in excess of 120 dollars per acre annually (Table 2). Control costs and damage increased during the active phase of the program and averaged $178.69 per acre. Control costs include grower assessments for the BWEP. From 1991 to 1997 insect control costs and damage have decreased to $59.97 per acre. Control costs for boll weevil prior to eradication averaged $17.27 per acre (Table 3). During the active phase of the BWEP costs averaged $38.26 per acre. The increased control costs during the active phase of the BWEP are contributed to in-season control cost during 1987 and annual grower assessments which averaged $29 per acre from 1987 to 1990. Control costs or grower assessments averaged $10.10 from 1991 to 1997. The BWEP grower assessment during 1997 was five dollars per acre. Damage or yield losses from boll weevil decreased during the active phase of the program compared to previous years and have been zero since 1991.

Control costs and damage for insect pests other than boll weevil increased more than $40 per acre during the active phase of the BWEP compared with previous years (Table 4). However, since 1991 insect losses have been less than fifty dollars per acre compared with $90.62 per acre prior to initiation of the BWEP. The increases in insect losses during the active phase of eradication are associated largely with aphids and beet armyworm (Tables 5 and 6). Decimation of natural enemies contributed in increased control costs and damage from these pests. Losses to beet armyworm totaled 8, 41, 42, and 73 dollars per acre from 1987 to 1990. During this time there were no insecticides which offered good control of beet armyworm. Since 1991 beet armyworm has been a spotty and sporadic pests, typically occurring during dry years. The fear of flaring this

devastating pests still drives many decisions which are made by growers today. Control costs and damage from aphids and beet armyworm since 1991 have averaged less than three dollars per acre. Prior to the BWEP growers incurred losses of $71.06 per acre from bollworm and tobacco budworm compared with $30.12 since 1991 (Table 7).

Since sprays are no longer needed for boll weevil control, producers are able to utilize a truly integrated approach to pest management. Georgia cotton producers have moved from an insecticide based system to a biological control based system for insect pest management. Natural enemies are the first line of defense. Prior to eradication multiple insecticide applications were needed as plants began fruiting for boll weevil control. These early sprays reduced beneficial populations and insecticides were the only means of insect control. Tobacco budworm and bollworm are currently the primary insect pests in Georgia. Typically three generations of budworms and two generations of bollworms will infest cotton. Conservation of beneficial insects will often keep first generation budworms below damaging levels and possibly delay the need to treat for second generation budworm. If early treatments are needed selective insecticides are used. Generally insecticides will be required for maximum yields but at a greatly reduced level compared with pre BWEP years. It was common for producers to make 10-12 insecticide sprays per acre prior to the BWEP. Since BWEP the number of sprays has averaged less than five per acre.

About one half of the Georgia acreage was planted in transgenic Bt varieties during 1998. Elimination of the boll weevil has allowed growers to maximize returns from this technology. Bt cotton has further reduced the number of insecticide applications required. Most insecticides applied to Bt cotton target bollworm, fall armyworm, or stink bugs. In boll weevil infested areas, multiple sprays would still be needed for boll weevil control.

Summary

The BWEP has been a success in Georgia and is a primary reason Georgia has increased acreage and production. Insect control costs and damage have been dramatically reduced in boll weevil free areas. During the active phase of the program there were some difficult years with secondary pests. Insect control costs (including BWEP assessment) and damage increased nearly $54 per acre during the active phase of the program compared with previous years. However, insect control costs and damage following eradication have been reduced by nearly $65 per acre compared with years prior to the BWEP. Was it worth it?

Table 1. Cotton acreage and yields in Georgia before, during, and after the boll weevil eradication program.

	Acres	Lint Yield (lbs/acre)
Pre BWEP (1971-1986)	228437	482
Active BWEP (1987-1990)	292500	603
Post BWEP (1991-1997)	946142	710

Table 2. Insect control costs and damage in Georgia before, during, and after the boll weevil eradication program.

	Dollars per Acre		
	Control Costs	Damage	Loss
Pre BWEP (1971-1986)	68.44	56.36	124.80
Active BWEP (1987-1990)	113.90	64.79	178.69
Post BWEP (1991-1997)	45.71	14.26	59.79

Table 3. Boll weevil control costs and damage in Georgia before, during, and after the boll weevil eradication program.

	Dollars per Acre		
	Control Costs	Damage	Loss
Pre BWEP (1971-1986)	17.27	16.90	34.17
Active BWEP (1987-1990)	38.26	8.40	46.66
Post BWEP (1991-1997)	10.10	0.0	10.10

Table 4. Control costs and damage of insects other than boll weevil in Georgia before, during, and after the boll weevil eradication program.

	Dollars per Acre		
	Control Costs	Damage	Loss
Pre BWEP (1971-1986)	51.17	39.45	90.62
Active BWEP (1987-1990)	75.64	56.39	132.03
Post BWEP (1991-1997)	35.61	14.26	49.87

Table 5. Cotton aphid control costs and damage in Georgia before, during, and after the boll weevil eradication program.

	Dollars per Acre		
	Control Costs	Damage	Loss
Pre BWEP (1971-1986)	0.55	2.94	3.49
Active BWEP (1987-1990)	7.10	10.93	18.03
Post BWEP (1991-1997)	0.64	0.25	0.90

Table 6. Beet armyworm control costs and damage in Georgia before, during, and after the boll weevil eradication program.

	Dollars per Acre		
	Control Costs	Damage	Loss
Pre BWEP (1971-1986)	2.20	2.92	5.12
Active BWEP (1987-1990)	25.56	15.87	41.43
Post BWEP (1991-1997)	1.33	0.73	2.06

Table 7. Bollworm and tobacco budworm control costs and damage in Georgia before, during, and after the boll weevil eradication program.

	Dollars per Acre		
	Control Costs	Damage	Loss
Pre BWEP (1971-1986)	43.66	27.40	71.06
Active BWEP (1987-1990)	31.18	17.95	49.13
Post BWEP (1991-1997)	21.13	8.99	30.12