

# **SELECTION OF SUPPLEMENTAL INSECTICIDES FOR PEST CONTROL IN BT COTTON AND NON-BT COTTON**

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## **Abstract**

Thirty consultant demonstrations were conducted across the mid-south and southeastern cotton growing regions. Thirteen demonstrations were conducted on Bollgard™ cotton and seventeen demonstrations were conducted on non-*B.t.* cotton. Consultants selected Bayer insecticides which they considered effective on specific pest situations and compared them to competitive standards in the same field. Consultant reports indicated Baythroid was the most commonly recommended Bayer product and was used at least once in each of the non-*B.t.* cotton trials and in 10 of the Bollgard™ demonstrations. Guthion was also heavily recommended for weevil control and Provado was used extensively for plant bug and aphid control. Consultants were able to control all cotton pests encountered on either cotton type utilizing Bayer products. Both Bayer products and competitive standards provided good insect control. Data from consultant demonstrations indicated a positive yield response when Bayer cotton insecticides were used in either Bollgard™ or non-*B.t.* cotton compared to competitive standards.

## **Introduction**

Bayer is a major supplier of quality crop protection products for cotton. Bayer insecticides for cotton include Admire, Nemacur, Di-Syston, Monitor, Baythroid, Guthion, and Provado. These products may be used to control various cotton pests throughout the growing season.

The importance of insecticidal sprays has been widely accepted as a means to control insect pests on cotton and maximize cotton yields. Consultant recommendations play an important role in the selection of insecticides. Whether the cotton contains Bollgard™ (Monsanto Agric. Co., St. Louis, MO) or is non-*B.t.* cotton, the consultant and grower

must determine the most effective treatment for insect control.

In 1996, trials conducted at the Bayer Research Farm in Tifton, GA indicated a substantial yield increase following three applications of Baythroid on Bollgard™ cotton and non-*B.t.* cotton. A similar trend was also observed at the Agricenter International in Memphis (Table 1). Others (Lambert et al. 1997, Mink et al. 1997) have reported increased cotton yields where pyrethroid insecticides were used as supplemental sprays on BollgardJ cotton compared to Bollgard™ cotton without supplemental sprays.

In 1997, Bayer sales and field development representatives asked selected consultants to cooperate in a project to demonstrate Bayer cotton insecticides under grower conditions across the mid-south and southeastern cotton-growing regions of the U. S.

## **Materials and Methods**

Consultants in Arkansas, Alabama, Georgia, Louisiana, Missouri, Mississippi, and Tennessee cooperated in the project known as "AGrow Cotton With Bayer" (Table 2). Consultants were asked to divide fields into two parts, each consisting of 30 to 50 acres. On one part they were to recommend only Bayer products to control pests based upon scouting. On the other part they were to recommend any other competitive products for the same pests. In a few instances, consultants chose Bayer products on both parts of the field due to the consultant's confidence in Bayer products.

Because consultants had the freedom to choose any products they deemed necessary, Bayer products selected and competitive comparisons varied greatly among the demonstrations.

Consultants reported results to Bayer representatives. Consultant reports included scouting records, treatments selected, observation of beneficial arthropods and yield. Some consultants also provided plant-mapping data. However, plant mapping data are not included in this writing. Results were summarized across locations and are presented in tables.

## **Results**

### **Bollgard™ Cotton Demonstrations**

Of the thirteen demonstrations conducted on Bollgard™ cotton, only one required no supplemental insecticide sprays. Other demonstrations received from one application targeting primarily plant bug to 11 applications targeting boll weevil, bollworm, tobacco budworm, plant bug and aphid. Baythroid was the most popular choice for most consultants because of its activity against a broad spectrum of insect pests. Baythroid was utilized in 10 of the 12 demonstrations which required insecticide sprays. Provado

and Guthion were also used extensively in Bollgard™ cotton (8 of 12 demonstrations). Bayer treatments and competitive comparisons are listed in table 3.

Since insect pressure varied greatly between locations, a comparison between locations is not appropriate. However, it is interesting to note which insecticides were selected by consultants to control specific insect pests on Bollgard™ cotton. Where boll weevil was the only target pest, consultants chose Guthion for 12 applications and Baythroid for 3 applications. Baythroid was recommended 3 times specifically for bollworm control, 6 times for bollworm in complex with boll weevil and twice for bollworm in complex with plant bug. When treatment was needed for boll weevil, bollworm and plant bug, Baythroid or a Baythroid tank mix was selected for 9 of 10 applications. For plant bug control, Provado was recommended 8 times and Monitor was recommended 4 times (Table 4).

Consultants provided yield data from 12 of the 13 Bollgard™ demonstrations. Yield ranged from 534 lb. lint/A to 1158 lb. lint/A. Bayer products provided higher lint yield in 9 of 11 trials where differences were observed. Bayer products provided an average yield of 930.5 lb. lint/A while yield from competitive standards averaged 859 lb. lint/A (Table 5).

#### **Non-B.t. Cotton Demonstrations**

All seventeen demonstrations conducted in non-*B.t.* cotton required insecticide treatment. At least two applications were required at each location. Some locations required as many as 14 applications. As observed on Bollgard™ cotton, Baythroid was also the most widely recommended Bayer product on non-*B.t.* cotton. In areas outside the boll weevil eradication zone, Guthion and Guthion tank mixes were used extensively. For plant bug control, Provado was used alone or in tank mix with Guthion or Baythroid. Guthion tank mixes were used where boll weevil was a concern in complex with other pests. Baythroid tank mixes were used where bollworm was a major concern in complex with other pests. Non-Bayer products were tank mixed in some instances, especially for tobacco budworm control. In some cases, products such as Larvin, Curacron, Pirate and Tracer were used as tank mix components for tobacco budworm control even though Bolstar was an effective tank mix component for the same pest complex in other demonstrations (Table 6).

As indicated for Bollgard™ cotton, a direct comparison between locations is not appropriate since insect pressure varied greatly between locations. However, a review of consultant recommendations revealed extensive use of Baythroid for a broad spectrum of insect pests (Table 7). In contrast to Bollgard™ demonstrations, Guthion was used much less frequently and Baythroid was used much more frequently. However, Guthion tank mixes (primarily

Guthion + Provado or Guthion + Monitor) were found especially useful for boll weevil in complex with plant bug.

Consultants provided yield data from 15 of the 17 non-*B.t.* demonstrations. Yield ranged from 571 lb. lint/A to 1530 lb. lint/A. Bayer products provided higher lint yield in 10 of 14 trials where differences were observed. Bayer products provided an average yield of 953.3 lb. lint/A while yield from competitive standards averaged 875.1 lb. lint/A (Table 8).

#### **Bollgard™ Comparison to Non-B.t. Cotton**

A legitimate comparison between Bollgard™ demonstrations and non-*B.t.* demonstrations can only be made where both cotton types were compared under similar conditions. At eight locations in Alabama, Louisiana and Mississippi, Bollgard™ and non-*B.t.* cotton was compared in adjacent fields where similar insect populations and yield potential existed.

Bollgard™ cotton required slightly more insecticide applications for weevil, plant bug, and bollworm/weevil in complex. Bollgard™ cotton required about the same number of applications targeting aphid, plant bug/weevil complex, or plant bug/weevil/bollworm complex. Fewer applications on Bollgard™ cotton targeted bollworm, tobacco budworm/bollworm complex or bollworm/plant bug complex (Table 9).

Yield data from Bollgard™ and non-*B.t.* comparisons indicate slightly higher yields on non-*B.t.* cotton, especially where Bayer insecticides were used. Bayer products provided higher yields in 5 of 7 Bollgard™ trials where differences were observed. In 5 of 8 non-*B.t.* demonstrations, Bayer products provided higher yields than standard comparisons. Bayer products provided average yields of 916.5 and 972.6 pounds lint/A in Bollgard™ and non-*B.t.* demonstrations, respectively (Table 10). Yields were 8% higher on Bollgard™ cotton and 11.6% higher on non-*B.t.* cotton compared to competitive standards.

#### **Summary**

Consultants recommended supplemental insecticide sprays in 12 of 13 demonstrations on Bollgard™ cotton and recommended insecticide sprays in all 17 non-*B.t.* demonstrations. Baythroid and Baythroid tank mixes were the most popular Bayer treatments for both cotton types. Baythroid was used in 10 of 13 Bollgard™ demonstrations and was recommended at least once in all non-*B.t.* demonstrations. Although Baythroid was used extensively, it was only used three times in early season (once for thrips and twice for cutworm). Bayer products provided comparable insect control compared to competitive standards. Consultants were able to control all pests encountered utilizing Bayer products. In a few instances, non-Bayer products were used as a tank mix for tobacco budworm control because Bolstar was not readily available.

However, good control was obtained where Bolstar was used as a tank mix for tobacco budworm control. Bayer products provided higher yields when compared to competitive standards on Bollgard™ or non-*B.t.* cotton.

### References

Lambert, A.L. J.R. Bradley, Jr., and J.W. Van Duyn. 1997. Interactions of *Helioverpa zea* and BT cotton in North Carolina. pp. 870-873. In, Proc. Beltwide Cotton Prod. Res. Conf., National Cotton Council, Memphis, TN.

Mink, J., S. Harrison, and S. Martin. 1997. Performance and benefits of Karate® Insecticide on Bollgard® Cotton. pp. 898-899. In, Proc. Beltwide Cotton Prod. Res. Conf., National Cotton Council, Memphis, TN.

Table 1. Percent yield response to Baythroid in *B.t.* and non-*B.t.* cotton.

Location	Treatment	NuCotn 33B	DPL 5415
		-----Yield (lb lint/A)-----	
Bayer Research Farm, 1996	3 appl. Baythroid	1267	1434
	No pyrethroid	1065	898
Agricenter International, 1996	3 appl. Baythroid	1150	-
	No pyrethroid	1053	-

Table 2. Cooperating consultants, locations and cotton varieties.

Consultant	Location	Cotton Variety	Bollgard™
John Atwill	Bragg City, MO	STV BXN 47	No
Billy Beegle	Dyersburg, TN	Paymaster 1215	Yes
Danny Bennett	Pulaski Co., GA	NuCotn 33B	Yes
Danny Bennett	Bleckley Co., GA	DP5690	No
Danny Bennett	Bleckley Co., GA	DP5690	No
Roger Carter	Monterey, LA	NuCotn 33B	Yes
Roger Carter	Monterey, LA	DP5415	No
Richard Davis	Shorter, AL	NuCotn 33B	Yes
Richard Davis	Shorter, AL	S. Grow 125	No
Gerald Dean	Watson, AR	DP5415	No
David Hydrick	Etowah, AR	Stoneville 474	No
Bill Harris	Memphis, TN	DP5409	No
Jack Joyner	Alamo, TN	Paymaster 1215	Yes
Ed Kowalski	Hornersville, MO	S. Grow 125	No
Rob Lewis, Jr.	Clarksdale, MS	Paymaster 1215	Yes
Rob Lewis, Jr.	Clarksdale, MS	STV BXN 47	No
Renold Minsky	Lake Providence, LA	NuCotn 33B	Yes
Renold Minsky	Lake Providence, LA	Stoneville 474	No
Cecil Parker	Vidalia, LA	NuCotn 33B	Yes
Cecil Parker	Vidalia, LA	Stoneville 474	No
Jessie Rice	Gould, AR	NuCotn 33B	Yes
Tim Roberts	Dyersburg, TN	DP5409	No
Bob Sammons	Somerville, TN	NuCotn 33B	Yes
Mike Sartor	Bolton, MS	NuCotn 33B	Yes
Mike Sartor	Bolton, MS	S. Grow 125	No
David Smith	Morgan City, MS	NuCotn 33B	Yes
David Smith	Morgan City, MS	Stoneville 474	No
Ron Smith	Tallassee, AL	NuCotn 33B	Yes
Ron Smith	Tallassee, AL	DP45409	No
Jan Streeter	Crawfordsville, AR	DP51	No

Table 3. Bayer treatments and competitive comparisons in Bollgard™ cotton.

Bayer Treatment	Competitive Comparisons
Guthion	Methyl parathion, Bidrin, Vydate, Methyl parathion + Orthene, Phaser, Karate
Guthion + Monitor	Vydate
Guthion + Orthene*	Bidrin + Orthene
Guthion + Provado	Methyl parathion + Orthene, Malathion
Monitor	Orthene, Dimethoate
Provado	Dimethoate, Bidrin
Baythroid	Methyl parathion, Vydate, Decis, Fury + methyl parathion, Karate, Asana
Baythroid + Monitor	Karate + Larvin, Asana + Monitor, Fury + Orthene
Baythroid + Provado	Karate + Provado
Baythroid + Larvin*	Karate, Karate + Larvin
Baythroid + Tracer	Tracer

\*Although these treatments were used as tank mix components on the Bayer portion of the field, Orthene is a product of Valent USA, Larvin is a product of Rhone Poulenc Ag. Co. (Sedagri), and Tracer is a product of Dow AgroSciences.

Table 4. Number of Bayer insecticide applications recommended and number of locations where treatment was used in Bollgard™ cotton.

	Guthion	Guthion Tankmix	Monitor	Provado	Baythroid	Bayth. T.mix
Boll weevil	12(6)*				3(3)	
Boll-worm					3(3)	
Plant bug			4(1)	8(6)		
Weevil /p. bug		6(4)			1(1)	
b.worm /p. bug	1(1)				2(2)	
b.worm/weevil	7(3)				4(2)	2(2)
Weevil /b.worm/p. bug		1(1)			5(4)	4(2)
b.worm /aphid						1(1)
TBW/b.worm						2(1)

\*number in parenthesis indicates the number of locations where the treatment was used.

Table 5. Yield response to Bayer products compared to competitive standards in Bollgard™ cotton.

Location	Treatment	Yield (lb lint/A)*
Dyersburg, TN	Bayer	820
	Competitive	738
Monterey, LA	Bayer	761
	Competitive	738
Shorter, AL	Bayer	534
	Competitive	534
Alamo, TN	Bayer	1022
	Competitive	953
Clarksdale, MS	Bayer	976
	Competitive	983
Lake Providence, LA	Bayer	1158
	Competitive	863
Vidalia, LA	Bayer	1062
	Competitive	1007
Gould, AR	Bayer	1089
	Competitive	1062
Somerville, TN	Bayer	903
	Competitive	810
Bolton, MS	Bayer	1115
	Competitive	879
Morgan City, MS	Bayer	829
	Competitive	792
Tallasse, AL	Bayer	897
	Competitive	949

- Bayer products average: 930.5 pounds lint/A
- Competitive products average: 859.0 lb lint/A

Table 6. Bayer treatments and competitive comparisons in non-*B.t.* cotton.

Bayer Treatment	Competitive Comparisons
Guthion	Methyl parathion
Guthion + Monitor	Vydate, Methyl parathion
Guthion + Monitor + Baythroid	Karate + Orthene + Methyl parathion
Guthion + Provado	Vydate, Methyl parathion + Orthene, Malathion
Guthion + Curacron + Pirate*	Methyl parathion + Curacron + Pirate
Monitor	Orthene + Karate
Provado	Dimethoate, Thiodan & Methyl parathion, Bidrin
Baythroid	Karate, Methyl parathion, Asana XL, Fury, Orthene, Asana XL+Orthene, Decis, Scout X-tra,
Baythroid + Monitor	Karate + Orthene, Asana XL + Monitor + Methyl parathion
Baythroid + Provado	Karate + Provado, MPV + Methyl parathion, Tracer + Vydate, Karate + Bidrin
Baythroid + Monitor + Larvin*	Karate + Larvin + Dimethoate, Karate + Larvin
Baythroid + Bolstar	Karate + Orthene, Karate + Pirate, Karate + Curacron,
Baythroid + Curacron*	Karate + Curacron
Baythroid + Larvin*	Karate, Karate + Larvin
Baythroid + Pirate*	Curacron + Pirate
Baythroid + Tracer*	Asana XL + Tracer

\*Although these treatments were used as tank mix components on the Bayer portion of the field, Larvin is a product of Rhone Poulenc Ag. Co. (Sedagri). Curacron is a product of Novartis Crop Protection, Pirate is a product of American Cyanamid and Tracer is a product of Dow AgroSciences.

Table 7. Number of Bayer insecticide applications recommended and number of locations where treatment was used in non-*B.t.* cotton.

	Guthion	Guthion Tankmix	Monitor	Provado	Baythroid	Bayth. T.mix
Boll weevil	4(4)				8(4)	
Boll-worm					23(8)	
Plant bug			3(2)	4(3)	1(1)	
Weevil /p. bug		8(5)			1(1)	
b.worm /p. bug					8(4)	1(1)
b.worm/ weevil					4(4)	2(1)
Weevil /bworm/ p. bug					4(3)	9(3)
b.worm /aphid						1(1)
TBW/ b.worm						11(4)
TBW/ weevil		1(1)				

\*Number in parenthesis indicates the number of locations where the treatment was used.

Table 8. Yield response to Bayer products compared to competitive standards in non-*B.t.* cotton.

Location	Treatment	Yield (lb lint/A)*
Bragg City, MO	Bayer	789
	Competitive	717
Monterey, LA	Bayer	807
	Competitive	854
Shorter, AL	Bayer	571
	Competitive	580
Watson, AR	Bayer	1125
	Competitive	1125
Memphis, TN	Bayer	1096
	Competitive	1008
Etowah, AR	Bayer	866
	Competitive	844
Hornersville, MO	Bayer	1001
	Competitive	928
Clarksdale, MS	Bayer	1077
	Competitive	1048
Lake Providence, LA	Bayer	963
	Competitive	868
Vidalia, LA	Bayer	1530
	Competitive	992
Dyersburg, TN	Bayer	991
	Competitive	903
Bolton MS	Bayer	784
	Competitive	797
Morgan City, MS	Bayer	1316
	Competitive	1039
Tallasse, AL	Bayer	733
	Competitive	696
Crawfordsville, AR	Bayer	650
	Competitive	727

- Bayer products average: 953.3 pounds lint/A
- Competitive products average: 875.1 pounds lint/A

Table 9. Number of Bayer insecticide applications recommended for specific pests at specific locations in Bollgard™ and non-*B.t.* cotton.

		AL1	AL2	LA1	LA2	LA3	MS1	MS2	MS3
Boll weevil	BT			0	2	4		3	
	NBT			1	0	1		1	
Plant bug (PB)	BT		1		5	2			1
	NBT		0		3	2			0
Weevil/bollworm	BT			5		4		2	
	NBT			3		1		0	
Cotton aphid	BT						1		
	NBT						1		
Weevil/plant bug	BT			3		1	1	1	0
	NBT			3		2	1	0	1
Weevil/PB/bollworm	BT			1	4	1	2	1	0
	NBT			0	7	2	0	0	1
Bollworm	BT	0	0					1	0
	NBT	2	2					3	2
Bollworm/plant bug	BT					0	0	1	0
	NBT					2	3	2	1
Bollworm/t.budworm	BT		0	2		0		0	0
	NBT		1	2		2		4	4

Table 10. Yield response to Bayer products compared to competitive standards in Bollgard™ and non-*B.t.* cotton.

Location	Bollgard™ Cotton		Non- <i>B.t.</i> Cotton	
	Bayer products	Competitive comparison	Bayer products	Competitive comparison
	-----Yield (pounds lint/A)-----			
AL1	534	534	571	580
AL2	897	949	733	696
LA1	761	738	807	854
LA2	1158	863	963	868
LA3	1062	1007	1530	992
MS1	976	983	1077	1048
MS2	1115	879	784	797
MS3	829	792	1316	1039
Average	916.5	843.1	972.6	859.3