



2000 Florida Cotton Production Guidelines: Insect Management in Cotton¹

Richard K. Sprenkel²

1. Effective and economical cotton insect control involves the integration of many control techniques. These techniques include using beneficial insects and diseases and cultural control practices to the fullest extent possible. Chemical insecticides are important suppression tools but, they should be used selectively and at the proper rate and time. Use the insecticides listed below as a guide in selecting appropriate controls.

How to Scout Cotton

Insecticide treatments should be based on thorough inspections or scouting of the field. To make control decisions you should take random samples throughout the field on a regular, twice-a-week, basis.

To take a sample in conventional cotton varieties, carefully examine the top 6-10 inches of the main stem terminal, including the small squares, for worm eggs (see note below on sampling Bt-cottons), small worms and whiteflies. Normally 10 plants should be examined per 5 acres of field. A minimum of 50 plants should be examined in each field.

Beginning around August 1 or when terminal growth has ceased, whole-plant inspections should include every square, bloom and boll from the terminal to the ground. A minimum of 25 plants should be examined at this time over the entire field.

Aphid and spider mite infestations can be determined by examining 1 leaf from each plant inspected. Examine leaves that are at least 2-3 inches in width. Record the degree of infestation according to the average number of aphids and spider mites estimated on each leaf.

None-----0

Light-----1-10

Medium-----11-25

Heavy-----26 or more

Sampling Bollgard Transgenic Cotton

Bollgard cotton was first planted in Florida in 1996. Since then, up to 60% of Florida's cotton acreage has contained the Bollgard gene. This gene from the bacterium, *Bacillus thuringiensis*, is

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expressed in the cotton plant as a protein that is toxic to the tobacco budworm and cotton bollworm.

Although the Bt-cottons provide nearly complete control of the tobacco budworm, observations in Florida and elsewhere indicate that economic populations of the cotton bollworm may be present on the transgenic cotton varieties. For this reason, it is necessary to monitor the Bt-cotton varieties for these "escapes". Studies have indicated that cotton bollworm larvae were most frequently found associated with white blooms, red blooms or bloom tags (dried blooms). Although research on sampling technique is very limited, experiences in 1996 and 1997 suggest that sampling efforts be directed toward the blooms (1 white, red and 2-3 brown blooms on each of 50 plants per field). The terminal portion of each plant should also be examined. Larvae 1/4 inch or larger should be counted and populations per 100 plants calculated.

Since the toxin in Bt-cottons is not effective on the true bugs, sampling the plant bug and stink bug will become more demanding. This is because in the past these pests were frequently controlled with the pyrethroid treatments for the budworm/bollworm. To avoid unnecessary treatments which could lead to secondary pest outbreaks (beet armyworm, fall armyworm, looper, etc.), plant bug and stink bug populations will need to be estimated as accurately as possible through sampling. This will probably mean more time in the field surveying for these and other pests not controlled by the Bollgard gene.

Sources of Supplies for Monitoring Insects

From time to time, I have been asked about obtaining various supplies used in monitoring insects on cotton. Great Lakes IPM has an assortment of professional-quality sweep nets, traps, pheromones and other supplies. You can reach them at:

Great Lakes IPM

10220 Church Road NE

Vestaburg, Michigan 48891

517/268-5693

Some of the items offered are:

* 15 inch heavy-duty sweep net (\$25.00) for monitoring plant bugs.

* Universal Moth Trap (\$8.95) for monitoring the beet armyworm and fall armyworm.

* Heliothis trap (\$45.00) for monitoring the cotton bollworm and tobacco budworm.

* Pheromone lures (\$1.90-4.00, each) for baiting the traps.

* 10X hand lens (\$5.50-10.00)

Pyrethroid Resistance Management

In 1987, a pyrethroid-resistant population of tobacco budworms was documented in Brazos County, Texas. Since then, resistant tobacco budworms have been identified in Arkansas, Louisiana, Mississippi, the Tennessee Valley of Alabama and southwestern Georgia. Because of field control failures and an increase in the levels of resistance, several states have implemented a Pyrethroid Resistance Management Plan.

For a number of years, tobacco budworms at NFREC Quincy Florida have been screened for resistance using the 'vial test' developed at Texas A&M University. This test uses glass vials that are uniformly coated on the inside with a 10 microgram dose of cypermethrin (the active ingredient of Baythroid 2E). This rate was determined through several studies to be a 'discriminating dose' that killed nearly 100% of susceptible tobacco budworm moths but allowed pyrethroid-resistant moths to survive a 24 hour exposure. From 1988 through 1992, survival of the tobacco budworm moths exposed to the 10 microgram dose was rare at Quincy indicating no resistance. In 1993, low levels of survival at the 10 microgram rate were common. Testing in 1994 indicated that the population was

susceptible to the discriminating dose with very low levels of survival of the moths tested. In 1995, field populations of tobacco budworms in the western panhandle of Florida could not be controlled with the maximum labeled rates of registered pyrethroids. Although not documented by laboratory tests, it is believed that these control failures in 1995 and similar field control failures in northeastern Jackson County in 1996 and 1997 indicate pyrethroid resistance in the tobacco budworm in Florida.

Because of the demonstrated tobacco budworm resistance in several Florida cotton production areas a Pyrethroid Resistance Management Plan was recommended, beginning in 1996 for all cotton farmers in Florida not planting *Bacillus thuringiensis* transgenic cotton (Bollgard).

1. Manage crop for earliness
2. From planting to first bloom:
 - a. Do not use pyrethroids.*
 - b. Scout cotton and treat only on an as-needed basis.
3. From first bloom through the following 6 weeks:
 - a. Scout cotton twice weekly.
 - b. Treat on basis of bollworm/budworm eggs and small larvae.
 - c. Use pyrethroid at mid-range rates in combination with *Bacillus thuringiensis* (B.t.) or non-pyrethroid ovicide.
 - d. If control of a tobacco budworm generation using a pyrethroid plus B.t. or an ovicide is not satisfactory, use larvicidal rates of a carbamate or organophosphate insecticide for the next treatment of that generation.
4. During late season:
 - a. Do not use pyrethroids.*
 - b. Use larvicidal rates of an organophosphate or carbamate for tobacco budworm control if treatment is justified.

c. Terminate all insecticides as soon as possible.

*Plant bugs may be controlled using a carbamate or organophosphate insecticide. In field trials conducted for several years in Jackson and Santa Rosa Counties, bollworms and budworms have been successfully controlled using a Bt product plus a non-pyrethroid ovicide as a foliar spray.

Florida Cotton Pest Hotline

Like the weather, cotton insect pest problems cannot be accurately predicted more than a few days to a week in the future. For this reason, cotton farmers in Florida need to keep up to date with current pest conditions throughout the panhandle and with management practices that are economical and effective. To assist Florida cotton farmers, the Cotton Foundation is funding the Florida Cotton Pest Hotline. The Hotline is a two-minute tape that is updated twice weekly from mid-May through the end of September. It is available toll-free to anyone in Florida and has information on pheromone trap catches, insect pest field reports, pest problems in southeastern states, updates on boll weevil eradication progress, new chemical registrations/cancellations, upcoming cotton meetings, etc. To call the Cotton Pest Hotline, dial:

1 - 800 - 654 - 8488

Table 1. Insect control in cotton.

Insecticide	Ibs. AI/Acre	Formulation	Acres Covered/Gal.or Lb.
BEE T ARMYWORMS			
Bolstar 6E (sulprofos)	0.75-1.5	1-2 pts	8-4
Curacron 6E (profenofos)	0.5-1.0	2/3-1 1/3 pts	12-6
Dimilin 4L (diflubenzuron)	0.0625-0.125	4-8 ozs	32-16
Larvin 3.2F (thiodicarb)	0.6-0.9	1 1/2-2 1/4 pts	5.3-3.5
Lannate 2.4 LV (methomyl)	0.45-0.675	1 1/2-2 1/4 pts	5.3-3.5
Lorsban 4E (chlorpyrifos)	0.75-1.0	1 1/2-2 pts	5.3-4
Tracer (spinosad)	0.067-0.089	2.14-2.9 ozs	60-45
BOLLWORMS, TOBACCO BUDWORMS			
Ammo 2.5E (cypermethrin)	0.04-0.08	2-4 ozs	62.5-31.3
Asana XL 0.99E (esfenvalerate)	0.02-0.05	3.9-9.7 ozs	33-13.2
Baythroid 2E (cyfluthrin)	0.025-0.05	1.6-3.2 ozs	80-40
<i>Bacillus thuringiensis</i> **	See individual labels for rate.		
Bolstar 6E (sulprofos)	0.75-1.5	1-2 pts	8-4
Capture (bifenthrin)	0.04-0.1	2.6-6.4 ozs	50-20
Curacron 6E ((profenofos)	0.75-1.0	1-1 1/3 pts	8-6
Cymbush 3E (cypermethrin)	0.04-0.08	1.7-3.4 ozs	75-37.5
Danitol (fenpropathrin)	0.2-0.3	10 2/3-16 ozs	12-8
Fury 1.5EC (zetamethrin)	0.033-0.045	2.82-3.83 ozs	45.5-33.3
Karate 2.08 Z (cyhalothrin)	0.025-0.04	1.6-2.56 ozs	80-50
Lannate 2.4 L (Methomyl)*	0.113-0.45	3/8-1 1/2 pt	21-5.3

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Insecticide	lbs. AI/Acre	Formulation	Acres Covered/Gal.or Lb.
Larvin 3.2F (thiodicarb)	0.6-0.9	24-36 ozs	5.3-3.6
Lorsban 4E (chlorpyrifos)	0.75-1.0	1 1/2-2 pts	5.3-4
Orthene 90S (acephate)	1	1.1 lbs	0.9
Scout X-TRA 0.9E (tralomethrin)	0.018-0.024	2.5-3.4 ozs	50-37.5
Tracer 4 SC (spinosad)	0.045-0.089	1.4-2.9 ozs	90-45
COTTON APHIDS			
Bidrin 8E (dicrotophos)	0.2	3.2 ozs	40
Capture 2EC (bifenthrin)	0.04-0.1	2.6-6.4 ozs	50-20
Cygon 4E (dimethoate)	0.2	2/5 pt	20
Lorsban 4E (chlorpyrifos)	0.5-1.25	1/2-1 pt	8-3.2
Malathion 5E (malathion)	0.5-1.25	4/5-2 pts	10-4
Phaser 3EC (endosulfan)	0.375-0.75	1/2-1 qt	8-4
Provado 1.6F (imidacloprid)	0.047	3.75 oz	34
Thiodan 3EC (endosulfan)	0.375-0.75	1/2-1 qt	8-4
CUTWORMS			
Ammo 2.5E (cypermethrin)	0.04-0.10	2.0-5.0 ozs	62.5-25
Asana XL 0.66 (esfenvalerate)	0.02-0.05	3.9-9.7 ozs	33-13.2
Cymbush 3E (cypermethrin)	0.06-0.10	2.56-4.27 ozs	50-30
Lorsban 4E (chlorpyrifos)	1	2 pts	4
FALL ARMYWORMS			
Bolstar 6E (sulprofos)	0.75-1.5	1-2 pts	8-4
Curacron 6E (profenofos)	0.75-1.0	1-1 1/3 pts	8-6

Table 1. Insect control in cotton.

Insecticide	lbs. AI/Acre	Formulation	Acres Covered/Gal.or Lb.
Lannate 2.4LV (methomyl)*	0.45	1 1/2 pts	5.3
Larvin 3.2F (thiodicarb)	0.6-0.9	1 1/2-2 1/4 pts	5.3-3.5
Lorsban 4E (chlorpyrifos)	0.7-1.0	1 2/5-2 pts	5.3-4
Orthene 90S (acephate)	1	1.1 lbs	0.9
Tracer 4SC (spinosad)	0.067-0.089	2.14-2.9 ozs	60-45
FLEAHOPPERS, PLANT BUGS			
Bidrin 8E (dicrotophos)	0.1-0.2	1/6-3.2 ozs	80-40
Cygon 4E (dimethoate)	0.125-0.25	1/4-1/2 pt	32-16
Dylox 80SP (trichlorfon)	1.0-1.5	20-30 ozs	6.4-4.3
(fleahoppers)			
Dylox 80SP (trichlorfon)	0.25-1.0	5-20 ozs	25.6-6.4
(plant bugs)			
Lorsban 4E (chlorpyrifos)	0.2-0.5	2/5-1 pt	20-8
Orthene 90S (acephate)	0.37	0.4 lb	2.5
LOOPERS			
Ambush 2E (permethrin)	0.1-0.2	0.4-0.8 pt	20-10
<i>Bacillus thuringiensis</i> **	See individual labels for rate.		
Larvin 3.2F (thiodicarb)	0.6-0.9	1 1/2-2 1/4 pts	5.3-3.6
Monitor 4E (methamidophos)	0.5-1.0	1-2 pts	8-4
Orthene 90S (acephate)	1	1.1 lbs	0.9
Pounce 3.2E (permethrin)	0.1-0.2	4-8 ozs	32-16
Scout X-TRA .9E (tralomethrin)	0.018-0.024	2.56-3.33 ozs	50-37.5

Table 1. Insect control in cotton.

Insecticide	lbs. AI/Acre	Formulation	Acres Covered/Gal.or Lb.
Tracer 4SC (spinosad)	0.067-0.089	2.14-2.9 ozs	60-45
SPIDER MITES			
Capture 2EC (bifenthrin)	0.06-0.1	3.8-6.4 ozs	33.3-20
Comite 6.5E (propargite)	1.0-1.6	1 1/5-2 pts	6.5-4.1
Curacron 6E (profenophos)	0.5-0.75	2/3-1 pt	12-8
Di-Syston 15G (disulfoton)	0.6-0.75	4-5 lbs	0.25-0.2
Kelthane MF 4E (dicofol)	1.0-1.5	2-3 pts	4-2.7
Lorsban 4E (chlorpyrifos)	0.5-1.0	1-2 pts	8-4
Monitor 4E (methamidophos)	0.5-1.0	1-2 pts	8-4
Supracide 2E (methidathion)	1	2 qts	2
Temik 15G (aldicarb)	0.6	4 lbs	0.25
Thimet 20G (phorate)	0.5-0.75	2 1/2-3 3/4 lbs	0.4-0.27
STINK BUGS			
Bidrin 8E (dicrotophos)	0.25-0.5	4-8 ozs	32-16
Declare 4E (methyl parathion)	0.5	1	8
Orthene 90S (acephate)	0.72	0.8 lb	1.25
THRIPS			
Bidrin 8E (dicrotophos)	0.2	1/5 pt	40
Cygaon 4E (dimethoate)	0.2	2/5 pt	20
Di-Syston 15G (disulfoton)	0.6-0.75	4-5 lbs	0.25-.02
Guthion 2L (azinphos-methyl)	0.25	1 pt	8
Orthene 90S (acephate) Foliar	0.1875	0.2 lb	5

Table 1. Insect control in cotton.

Insecticide	lbs. AI/Acre	Formulation	Acres Covered/Gal.or Lb.
Orthene 90S (acephate) Planter box	0.14-0.18	2.5-3.25 oz	6.4-5.9
Payload 15G (acephate)	0.75-1.0	5-6.7 lbs	0.2-0.15
Temik 15G (aldicarb)	0.525-0.75	3 1/2-5 lbs	0.29-0.2
Thimet 20G (phorate)	0.5-0.75	2 1/2-3 3/4 lbs	0.4-0.27
WHITEFLIES			
Danitol 2.4 EC (fenprothrin) plus	0.2-0.3 plus	10.7-16 ozs plus	12-8
Orthene 90 S (acephate)	0.625	9 oz	1.78
Monitor 4E (methamidophos)	0.25-0.5	1/2-1 pt	16-8
Orthene 90 S (acephate)	0.5-1.0	0.55-1.1 lbs	1.8-0.9
Supracide 2E (methidathion)	0.25-0.5	1-2 pts	8-4
<p>*CAUTION: Methomyl (lannate) may be phytotoxic to cotton under stress. Use in late season and do not exceed 3 applications, applied a minimum of 10 days apart. E=Emulsifiable concentrate, F=Flowable, G=Granules, L=Liquid, SP= Soluble Powder. For cost per acre, divide your cost per gallon or pound of material by acres covered.</p> <p>**Several products containing <i>Bacillusthuringiensis</i> are registered for use on cotton.</p>			