soften or weaken a crust and accomplish the same objective. Timing this operation is critical. If a hard crust is evident when the seed root is 0.6 to 0.75 inches long, it should be broken immediately, being careful not to completely uproot more than 20 to 25 percent of the seedlings. Soil crust strength can be measured with a small pocket penetrometer. Emergence decreases rapidly at soil strengths above 10 psi especially when cotton is planted deeper than 1 inch.

INSECT MANAGEMENT

Cotton insect management has changed dramatically since the successful elimination of the boll weevil as an economic pest and the commercialization of Bt transgenic cotton. Prior to elimination of the boll weevil, Georgia producers annually applied 10 to 20 insecticide treatments each season for control of boll weevils and other pests. Upon elimination of the boll weevil as an economic pest, the number of insecticide applications was reduced to four or five during 1992 to 1995. Utilization of Bt cotton, commercialized in 1996, has further reduced the need for insecticides by eliminating the need to treat tobacco budworm and significantly reducing the need to treat for corn earworm. Producers in Georgia continue to fully utilize an integrated approach to pest management (IPM) utilizing a variety of control tactics rather than relying solely on one method of control such as insecticide use. Cultural practices, variety selection, biological control, and insecticides used on an as-needed basis are the building blocks of an IPM program. Pests are managed so that economic damage and harmful environmental side effects are minimized while maximizing profits. In most IPM programs insecticide use decreases resulting in lower production costs, delayed resistance problems, and improved competitiveness and profitability. A successful and economical cotton pest management program mandates the use of this multi-tactical or IPM approach to insect control.

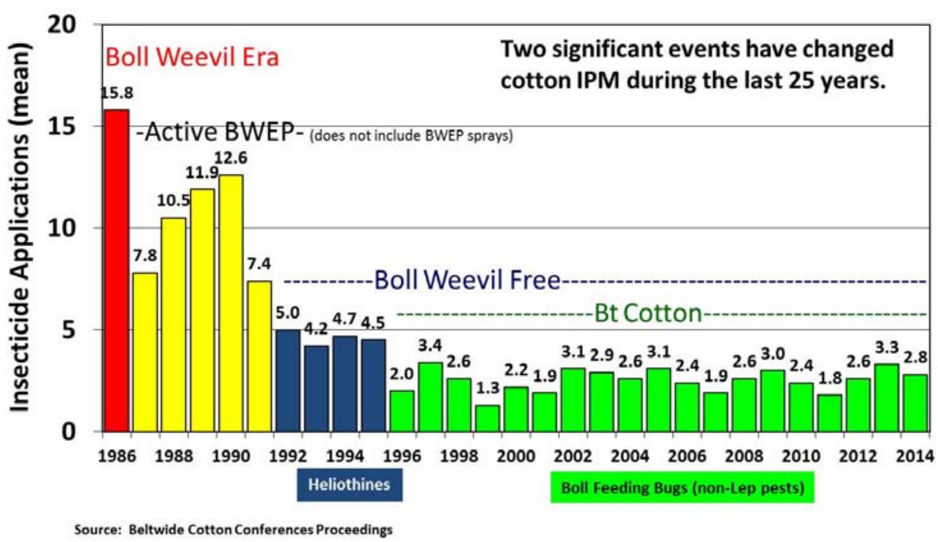

Figure 1. Mean insecticide applications applied on Georgia cotton, 1986-2014. The Boll weevil Eradication Program was initiated during the fall of 1986.

Scouting
Insect scouting is a **necessity**. All fields, both Bt and non-Bt cotton, should be scouted on a regular basis. Insect populations vary from year to year and even from field to field during the year. Fields should be scouted at least every five days, some scouts monitor fields twice per week. Although not recommended, once a week scouting may be acceptable on Bt cotton but there is associated risk with this reduction in field visits. **Once a week scouting on non-Bt cotton is unacceptable**. Management decisions should be made independently for each field based on the pest(s) situation. Accurate monitoring of fields will allow growers to make timely applications of the correct insecticide(s) and rates to prevent damage from reaching economic levels. (See ***Cotton Scout Handbook*** for a detailed discussion of insects and scouting techniques and the Cotton Insect Control tables below for insecticides, rates, and thresholds.)

Beneficial Insects
Several species of predatory and parasitic insects are present in Georgia cotton. These natural controls are our most economical pest management tools and conservation of beneficial populations should be considered especially during early season. Big-eyed bugs, minute pirate bugs, fire ants, and *Cotesia* wasps are four important beneficial insects. The presence of these natural controls may delay the need to treat for some insect pests. The use of natural controls should be maximized in attempts to reduce production costs.

Thresholds
Action or economic thresholds have been established for major cotton insect pests and are defined as the pest density at which action must be taken to prevent economic damage. The decision to apply an insecticide should be based on scouting and the use of thresholds. Thresholds for major cotton insects found in the Cotton Insect Control tables below should serve as a guide for decision making. **Scheduled or automatic applications of insecticides should be avoided**. An unnecessary application can be more costly than just the cost of the insecticide due to the destruction of beneficial insects. In the absence of beneficial insects, the risk of economic infestations for many pests increases. Application of insecticides on an as-needed basis allows beneficial insects to be preserved and reduces the likelihood of secondary pest outbreaks such as beet armyworm and spider mites.

Resistance Management
In a population of insects, insecticide resistance levels to a particular class of insecticide increase each time that class of insecticide is used. Once an insecticide is used, its level of effectiveness will likely be reduced against subsequent generations within the season. Therefore **alternating the use of insecticide classes on different generations** of insects during the season is a recommended resistance management tactic. Since most cotton insect pests are highly mobile, such a strategy will be most effective if adopted by all producers in a large geographic area.

Thrips Management
Thrips are consistent and predictable pests of seedling cotton that infest cotton at emergence. Thrips initially feed on the lower surface of cotyledons and then in the terminal bud of developing seedlings. Excessive feeding results in crinkled malformed true leaves, stunted plants, delayed maturity, reduced yield potential, and in severe cases reduced stands.

At-plant systemic insecticides provide consistent yield responses and are used by most growers for early season thrips control. In-furrow applications or seed applied systemic insecticides are taken up by the plant as it germinates and develops providing protection during early growth stages. Commonly used at plant thrips insecticides include the neonicotinoid seed treatments imidacloprid (Gaucho, and Aeris Seed Applied System) and thiamethoxam (Cruiser and Avicta Complete Cotton). Infurrow spray applications of imidacloprid or acephate at planting are also options for early season control of thrips.

Supplemental foliar sprays may be needed if environmental conditions are not conducive for uptake of at-planting systemic insecticides or if heavy thrips infestations occur. Systemic foliar insecticides should be applied to cotton which had an at-plant systemic insecticide when 2-3 thrips per plant are counted and immatures are present. The presence of numerous immatures suggests that the at-plant systemic insecticide is no longer active. If no at-plant thrips insecticide is used, multiple well timed foliar applications will be needed.

The following factors related to thrips biology and ecology should be considered when planning thrips management programs:

- Thrips infestations are generally higher on April and early May planted cotton compared with later planting dates.
- Thrips infestations are lower in reduced tillage systems compared with conventionally tilled systems (winter cover crops should be killed at least 3 weeks prior to planting and no green vegetation should be present at planting).
- Seedling injury and potential yield impacts from thrips feeding are compounded by slow seedling growth due to cool temperatures or other plant stresses (i.e. PRE herbicide injury).
- A rapidly growing seedling can better tolerate thrips feeding.
- Seedlings become more tolerant of thrips feeding as they develop; small seedlings (<2-leaf) are more sensitive to thrips injury in terms of yield loss compared with 3-4 leaf seedlings.
- Slow growing seedlings will remain in the thrips "susceptible window" for a more extended time compared with a rapidly growing seedling; it is unlikely that seedlings which have reached the 4-leaf stage and are growing rapidly will benefit from supplemental foliar sprays.

Neonicotinoid seed treatments including imidacloprid or thiamethoxam provide similar levels of thrips control and are active on thrips for 14-21 days after planting. Research and observation have shown that a supplemental foliar spray is often needed in addition to a neonicotinoid seed treatment when thrips infestations are high. We typically expect to see higher thrips infestations on early planted cotton in conventional tillage systems. Unless thorough scouting reveals thrips populations are below established thresholds, **a foliar thrips systemic insecticide should be applied at the 1-leaf stage in conventional tilled fields planted prior to May 10 when a noenicotinoid seed treatment is used**. In most situations this program will provide good thrips control, but the fields should be scouted regularly for thrips and injury following the foliar spray. In fields planted after May 10 or where reduced tillage is used, the risk of high thrips infestations is lower and an automatic foliar spray should not be applied; scout and treat when thresholds are exceeded.

Thrips populations in some areas of the US have shown reduced susceptibility to neonicotinoid seed treatments. However, thrips feeding on seedlings from thiamethoxam-treated seed appears to be more severe than imidacloprid-treated seed in these areas. Surveys of tobacco thrips poulations in Georgia during 2014 indicated that susceptibility to neonicotinoids was variable meaning that some populations may not be as easily controlled as others. This is a potential problem we will continue to monitor closely.

Aphid Management

Cotton aphid is a consistent and predictable pest of cotton in Georgia. Aphids will typically build to moderate to high numbers and eventually crash due to a naturally occurring fungus. This fungal epizootic typically occurs in late June or early July depending on location. Once the aphid fungus is detected in a field (gray fuzzy aphid cadavers) we would expect the aphid population to crash within a week.

Aphids feed on plant juices and secrete large amounts of "honeydew", a sugary liquid. The loss of moisture and nutrients by the plants has an adverse effect on growth and development. This stress factor can be reduced with the use of an aphid insecticide. However, research conducted in Georgia fails to consistently demonstrate a positive yield response to controlling aphids. Invariably, some fields probably would benefit from controlling aphids during some years. Prior to treatment, be sure there is no indication of the naturally occurring fungus in the field or immediate vicinity. Also consider the levels of stress plants are under, vigorous and healthy plants appear to tolerate more aphid damage than stressed plants.

Tobacco Budworm / Corn Earworm Management

Tobacco budworm and corn earworm comprise the Heliothine complex. Although these two species appear very similar in the egg and larval stages and cause similar damage, they are different insects and their susceptibility to specific insecticides differ. Three generations of tobacco budworm infest cotton each year. The first generation usually occurs in early June, the second in early July, and the last during August. These time periods vary from year to year and locality within the state but generally occur on a four-week cycle. Two generations of corn earworm infest cotton. The first corn earworm infestation is typically observed during mid-July when corn begins to dry down and a second generation occurs approximately four weeks later. Late in the season overlapping generations of both species are often observed.

It is important that we accurately distinguish between these two species. The adult or moth stage of tobacco budworm and corn earworm can be easily distinguished (See ***Cotton Scout Handbook*** for a detailed discussion of insects and scouting techniques). Observation of "flushing" moths during scouting and other field activities provides an opportunity to recognize which is the predominant species. Tobacco budworm and corn earworm larvae can be distinguished upon careful examination with a hand lens or use of a dissecting microscope (see http://www.gaipm.org/cotton/larvaid.html for identification procedures). Populations of tobacco budworm infesting Georgia cotton are resistant to the pyrethroid class of insecticides and therefore **non-pyrethroid insecticides should be used to control tobacco budworm**.

On non-Bt cotton insecticide applications should target larvae 1/4 inch in length or less (less than 3 days of age). Coverage and penetration of the canopy with insecticide sprays are important. These basic principles of insect control are especially important if high populations or difficult to control larvae are present.

Distinguishing tobacco budworm and corn earworm is also important in Bt cotton. Corn earworm is less susceptible to the Bt toxin compared with tobacco budworm. Supplemental insecticide treatments may be needed for corn earworm control on Bt cotton whereas Bt cottons provide excellent control of tobacco budworm.

Pyrethroid Resistant Tobacco Budworm

Tobacco budworm populations in Georgia exhibit moderate to high levels of pyrethroid resistance. Erratic and often unacceptable control would be expected if pyrethroids were used for control of tobacco budworm. In areas where tobacco budworm commonly infests cotton, producers should utilize Bt cotton which has provided excellent control. On non-Bt cotton, pyrethroid insecticides should **not** be used for control of tobacco budworm. Non-pyrethroid insecticides should be used in a timely basis for control of tobacco budworm on non-Bt cotton.

Difficult to Control Corn Earworm

Susceptibility of corn earworm to pyrethroid insecticides has declined in some areas of the US during recent years. Elevated LD50s (the lethal dose to kill 50 percent of a population) of some corn earworm collections have been observed in LA, VA, and TX, as well as Georgia. During recent years, corn earworm susceptibility to pyrethroids has been monitored using cypermethrin (pyrethroid) treated glass vials. To conduct Adult Vial Tests, moths are collected from pheromone traps and placed in pyrethroid treated vials and mortality is evaluated 24 hours later. Since 2000 we have observed a trend for increased survival in pyrethroid treated vials; but this trend is variable. Increased survival suggests that populations will be more difficult to control with a field application of a pyrethroid insecticide. Results of Adult Vial Tests will be reported in the UGA Cotton News (found online at http://ugacotton.com) as needed which is published regularly during the growing season.

Recommendations for control of corn earworm include the use of medium to high rates of pyrethroids for low to moderate infestations. Under heavy pressure, consider adding an ovicide or another larvacide with the pyrethroid. Efficacy of pyrethroid sprays should be evaluated three days after application. If poor control of corn earworm is observed and other factors of poor control (coverage, rate, and timing of application) can be ruled out, a non-pyrethroid insecticide should be used. We cannot predict if this problem will develop further or if, when, or where it may occur.

Bt Cotton Management

Commercially available Bt cotton technologies include Bollgard II , WideStrike, and WideStrike III. Bt cottons are not immune from economic damage from caterpillar pests and have no activity on "bug" pests such as plant bugs and stink bugs. Thus, scouting for insect pests in Bt cotton (both caterpillar and bug pests) continues to be important.

Bollgard II is a two-gene Bt cotton that contains the Cry1Ac and Cry2Ab toxins and WideStrike is a two-gene Bt cotton that contains the Cry1Ac and Cry1F toxins. WideStrike III is a three-gene Bt cotton that contains the Cry1Ac, Cry1F, and Vip3A toxins. Currently available Bt cottons provide excellent control of tobacco budworm and good control of most caterpillar pests. However, supplemental insecticides may be needed for pest such as corn earworm and fall and beet armyworms. Be sure to monitor these cottons for early signs of infestation as the presence of numerous moths, eggs, or small larvae should influence insecticide selection when applications are made for other pests such as stink bugs.

Bt Cotton Resistance Management

Since Bt cotton provides continuous season long activity against tobacco budworm and corn earworm, there is a high potential for one or both of these pests to quickly develop resistance if an effective resistance management plan is not implemented. Resistance management in Bt cotton uses the refuge approach to maintain a pool of susceptible moths to mate with any resistant moths that may survive on Bt cotton. Producers should maintain full knowledge of the details and follow resistance management requirements of use agreements with suppliers of transgenic seed or technology**.** Weedy host plants and non-cotton agronomic crops currently serve as a natural refuge for Bollgard II and WideStrike cottons.

Stink Bug Management

The pest status of stink bugs in Georgia cotton and other areas of the Southeast have been elevated in recent years due to the reduction of broad spectrum insecticide use. Eradication of the boll weevil, greater utilization of natural controls, commercialization of Bt transgenic cotton, and development of caterpillar specific insecticides have all contributed to the reduced use of broad spectrum insecticides. Routine use of broad spectrum insecticides, such as pyrethroids to control other pests in years past suppressed stink bugs below economic levels. In the absence of coincidental control of stink bugs, populations can build to damaging levels.

The most important species of stink bugs that we observe in Georgia are the southern green and brown stink bugs. Southern green is generally the most common. Organophosphate insecticides such as Bidrin provide excellent control of southern green and brown stink bugs. Pyrethroids provide good control of southern green stink bugs and are useful when populations of both caterpillar pests and stink bugs infest the same field. Research indicates that the brown stink bug is less susceptible to pyrethroids compared with southern green stink bug (control of brown stink bugs with pyrethroids increases when high rates are used). If brown stink bugs are present at economic levels an organophosphate insecticide should be used. However, the key to successful management of stink bugs in cotton is to know when and if an insecticide application is needed.

Stink bugs have piercing sucking mouthparts and damage cotton by feeding on the seeds of developing bolls. Stink bugs feed by piercing the boll wall with their beak and injecting a digestive enzyme into the boll in or near the seed to soften or dissolve plant tissues so the bug can remove them. In addition to physical damage, this process allows for entry of rot organisms that contributes to degradation of bolls reducing yield and quality. Bolls damaged by stink bugs may show sunken, purple spots on the outside boll wall; however this is not a reliable indicator of stink bug damage. Internal symptoms of injury are a much better indicator of stink bug feeding and include stained or yellowish lint and/or callous growths or warts on the inner surface of the boll wall where the stink bug penetrated the boll. The wart or callous growth on the inner surface of the boll wall will form within 48 hrs on developing bolls. As bolls mature and open, damage often appears as matted or tight locks with localized discoloration that will not fluff. Severely damaged bolls may not open at all.

Scouting for stink bugs should be a priority as plants begin to set bolls. In addition to being observant for nymphs and adult stink bugs, scouts should assess stink bug populations by quantifying the percentage of bolls with internal damage. Estimating boll injury has proven to be a reliable technique for timing insecticide applications when needed. Bolls are considered injured if stained lint is observed or a warty growth is present on the inner surface of the boll wall. Bolls approximately the diameter of a quarter should be examined. Bolls of this age are preferred feeding sites for stink bugs can be easily squashed between your thumb and forefinger. It is important that bolls of this size (soft) are selected. If bolls which are the diameter of a quarter are not present, i.e. the first or second week of bloom, sample the largest bolls present. Monitor boll retention during the first week of bloom; if small bolls are damaged by stink bugs they will often be aborted (small bolls which are damaged by stink bugs will often have “jelly-like” contents in some locules). In addition to stink bugs, other bug species such as tarnished plant bug and leaf-footed bugs may injure developing bolls.

The number of bolls per plant which are susceptible to stink bugs is not constant and varies during the year. The greatest number of susceptible bolls per plant generally occurs during weeks 3-5 of bloom. During early bloom there are relatively few bolls present. During late bloom, many bolls are present but only a limited number may be susceptible to stink bug damage (individual bolls are susceptible to stink bugs in terms of yield loss until approximately 25 days of age). A **dynamic threshold** which varies by the number of stink bug susceptible bolls present is recommended for determining when insecticide applications should be applied for boll feeding bugs.

The boll injury threshold for stink bugs should be adjusted up or down based on the number of susceptible bolls present. Use a 10-15% boll injury threshold during weeks 3-5 of bloom (numerous susceptible bolls present), 20% during weeks 2 and 6, and 30%(+) during weeks 7(+) of bloom (fewer susceptible bolls present). Environmental factors such as drought and/or other plant stresses may cause susceptible boll distribution to vary when normal crop growth and development is impacted; thresholds should be adjusted accordingly. Detection of 1 stink bug per 6 feet of row would also justify treatment.

Week of bloom	Stink Bug Threshold (% Damage)
1	Retention
2	20
3	10-15
4	10-15
5	10-15
6	20
7+	30+

Research suggests that in addition to yield loss, excessive stink bug damage can reduce fiber quality characteristics. Fiber characteristics associated with length, maturity, and color are reduced when excessive stink bug damage is present.

Stink bugs are a primary pest of Georgia cotton and require management. Not all fields will require treatment, but for profit maximization scouting and treating on an as-needed basis is required. Fields at highest risk for stink bug infestations are those that have not received a broad spectrum insecticide during the past two weeks. Stink bug infestations are often first observed near field edges (especially near a peanut planting). Some innovative growers have chosen to scout and treat cotton near field edges independent of the entire field.

Boll Weevil Eradication Program

The BWEP is in the containment phase. Activities include reduced trapping but active spraying in areas where boll weevils are detected. Boll weevils are the responsibility of the program, so growers with suspected boll weevil problems should notify their local field supervisors. Everyone growing cotton is required to pay a per bale assessment for the BWEP. Boll weevil traps will be placed in fields by late July and monitored every three weeks for reinfestation. It is vitally important that traps are standing and functional. If a trap is accidentally knocked down or destroyed, stand it back up or contact your local field supervisor. All attempts to prevent reinfestations should be taken. A common means for boll weevils to reenter Georgia is on used farm machinery such as pickers and module trucks. If you plan to acquire machinery from a non-eradicated area, be sure it is boll weevil free. Contact the BWEP for more details.

COTTON: *COTTON INSECT CONTROL*

PEST	INSECTICIDE	IRAC GROUP	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI*/PHI* Hours (H) or Days(D)	REMARKS
Aphid (Cotton)	*acetamiprid* Assail 30SG	4A	1.5-2.5 ozs	0.028-0.047	12(H) / 28(D)	Apply when aphids are abundant and seedling leaves are severely curled, or when "honeydew" is present in older cotton. A naturally occurring fungal disease often eliminates the need for sprays, but this epidemic occurs only after aphid populations reach high levels and tends to be less effective late in the season.
	dicrotophos Bidrin 8	1B	4.0-8.0 ozs	0.25-0.50	6(D) / 30(D)	
	flonicamid Carbine 50WG	9C	1.4-2.8 ozs	0.044-0.088	12(H) / 30(D)	
	imidacloprid Admire Pro 4.6	4A	0.9-1.7 ozs	0.032-0.061	12(H) / 14(D)	
	sulfoxaflor Transform 50 WG	4C	0.75-1.0 oz	0.023-0.031	24(H) / 14(D)	
	thiamethoxam Centric 40 WG	4A	1.25-2.0 ozs	0.031-0.05	12(H) / 21(D)	
Beet Armyworm	*emamectin benzoate* Denim 0.16	6	6-8 ozs	0.0075-0.01	12(H) / 21(D)	Apply when 10% of squares, or terminals are damaged, 10% of blooms are damaged and/or infested, or when 10 active "hits" are observed per 300 row feet. Beet armyworms may infest Palmer amaranth and move to cotton as larvae develop; Bt cottons will not control large beet armyworms moving from Palmer amaranth.
	diflubenzuron Dimilin 2L	15	4-8 ozs	0.0625-0.125	12(H) / 14(D)	
	flubendiamide Belt 4SC	28	2-3 ozs	0.0625-0.094	12(H) / 28(D)	
	indoxacarb Steward 1.25EC	22	9.2-11.3 ozs	0.09-0.11	12(H) / 14(D)	
	methoxyfenozide Intrepid 2F	18	4 ozs	0.0625	4(H) / 14(D)	
	novaluron Diamond 0.83EC	15	6-12 ozs	0.039-0.077	12(H) / 30(D)	
	chlorantraniliprole Prevathon 0.43	28	14-27 ozs	0.047-0.09	4(H) / 21(D)	
	spinosad Blackhawk	5	2.4-3.2 ozs	0.054-0.072	4(H) / 28(D)	
Bollworm/ Tobacco Budworm	**NON-PYRETHROIDS**					On non-Bt cotton apply when 8 small larvae are found per 100 terminals prior to first insecticide treatment, or when 5 larvae are found after first spray. Due to the threat of pyrethroid resistance, non-pyrethroid insecticides are recommended for control of tobacco budworm. Resistance management: Do not treat successive generations with insecticides that have the same mode of action. Bt Cotton containing the Bollgard II or WideStrike Bt genes are effective tools for use in bollworm and tobacco budworm management programs. Apply insecticide on Bt cotton when 8 larvae (1/4 inch or greater in length) are found per 100 plants.
	emamectin benzoate Denim 0.16	6	8-12 ozs	0.01-0.015	12(H) / 21(D)	
	flubendiamide Belt 4SC	28	2-3 ozs	0.063-0.094	12(H) / 28(D)	
	indoxacarb Steward 1.25EC	22	11.3 ozs	0.11	12(H) / 14(D)	
	methomyl Lannate LV 2.4	1A	1.5-2 pts	0.45-0.6	72(H) / 15(D)	
	profenofos Curacron 8E	1B	0.75-1 pt	0.75-1.0	48(H) / 30(D)	

COTTON INSECT CONTROL

PEST	INSECTICIDE	IRAC GROUP	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI*/PHI* Hours (H) or Days(D)	REMARKS
Bollworm/ Tobacco Budworm (continued)	**NON-PYRETHROIDS**					
	chlorantraniliprole Prevathon 0.43	28	14-27 ozs	0.047-0.09	4(H) / 21(D)	
	spinosad Blackhawk	5	2.4-3.2 ozs	0.054-0.072	4(H) / 28(D)	
	PYRETHROIDS					Tobacco budworm is resistant to pyrethroid insecticides. Pyrethroids should not be used for control of tobacco budworm.
	alpha-cypermethrin Fastac 0.83	3A	2.6-3.6 ozs	0.017-0.023	12(H) / 14(D)	
	beta-cyfluthrin Baythroid XL 1	3A	1.6-2.6 ozs	0.0125-0.02	12(H) / 0(D)	
	bifenthrin Brigade 2EC Discipline 2EC Fanfare 2EC	3A	2.6-6.4 ozs 2.6-6.4 ozs 2.6-6.4 ozs	0.04-0.1 0.04-0.1 0.04-0.1	12(H) / 14(D)	
	cypermethrin Ammo 2.5EC Up-Cyde 2.5EC	3A	2-5 ozs 2-5 ozs	0.04-0.1 0.04-0.1	12(H) / 14(D)	
	esfenvalerate Asana XL 0.66	3A	5.8-9.6 ozs	0.03-0.0495	12(H) / 21(D)	
	gamma-cyhalothrin Prolex 1.25 Declare 1.25	3A	1.28-2.05 ozs 1.28-2.05 ozs	0.0125-0.02 0.0125-0.02	24(H) / 21(D)	
	lambda-cyhalothrin Karate w/ Zeon 2.08 Karate EC 1 Silencer 1	3A	1.6-2.56 ozs 3.2-5.12 ozs 3.2-5.12 ozs	0.025-0.04 0.025-0.04 0.025-0.04	24(H) / 21(D)	
	zeta-cypermethrin Mustang Max 0.8	3A	2.64-3.6 ozs	0.0165-0.0225	12(H) / 14(D)	
Bollworm/Tobacco Budworm (ovicides)	*methomyl* Lannate LV 2.4	1A	0.4-0.75 pt	0.12-0.22	72(H) / 15(D)	Apply in a tank-mix with a larvacide when large numbers of eggs are present.
	profenofos Curacron 8E	1B	0.125-0.25 pt	0.125-0.25	48(H) / 30(D)	
Cutworm (seedling cotton)	*acephate* Orthene 97 Orthene 90S Acephate 97 Acephate 90	1B	0.75 lb 0.80 lb 0.75 lb 0.80 lb	0.72 0.72 0.72 0.72	24(H) / 21(D)	Apply when stand is threatened. Spot treatment is often adequate. Pyrethroids provide good control of cutworms at low rates. See insecticide label for use rate.
	chlorpyrifos Lorsban 4E Chlorpyrifos 4E	1B	1.5-2 pts 1.5-2 pts	0.75-1.0 0.75-1.0	24(H) / 14(D)	
	Pyrethroids	3A	see remarks			

COTTON INSECT CONTROL

PEST	INSECTICIDE	IRAC GROUP	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI*/PHI* Hours (H) or Days(D)	REMARKS
Fall Armyworm	*chlorantraniliprole* Prevathon 0.43	28	14-27 ozs	0.047-0.09	4(H) / 21(D)	Apply when 15 larvae are found per 100 plants. Control of large larvae (›½ inch in length) is difficult; higher rates should be used.
	diflubenzuron Dimilin 2L	15	4-8 ozs	0.0625-0.125	12(H) / 14(D)	
	emamectin benzoate Denim 0.16	6	8-12 ozs	0.01-0.015	12(H) / 21(D)	
	flubendiamide Belt 4SC	28	2-3 ozs	0.0625-0.094	12(H) / 28(D)	
	indoxacarb Steward 1.25EC	22	9.2-11.3 ozs	0.09-0.11	12(H) / 14(D)	
	methomyl Lannate LV 2.4	1A	1.5-2 pts	0.45-0.6	72(H) / 15(D)	
	methoxyfenozide Intrepid 2F	18	4-10 ozs	0.0625-0.156	4(H) / 14(D)	
	novaluron Diamond 0.83EC	15	6-12 ozs	0.039-0.077	12(H) / 30(D)	
	profenofos Curacron 8E	1B	0.75-1.0 pt	0.75-1.0	48(H) / 30(D)	
	Pyrethroid	3A	See remark			Pyrethroids at high rates provide good suppression of larvae less than 1/8 inch in length.
	spinosad Blackhawk	5	2.4-3.2 ozs	0.054-0.072	4(H) / 28(D)	
Plant Bugs and Fleahoppers	*acephate* Orthene 97 Orthene 90S Acephate 97 Acephate 90	1B	 0.25-0.50 lb 0.25-0.50 lb 0.25-0.50 lb 0.25-0.50 lb	 0.24-0.49 0.225-0.45 0.24-0.49 0.225-0.45	24(H) / 21(D)	Apply insecticide when plants are retaining less than 80% of pinhead squares and numerous plant bugs are observed. Sweep nets and drop cloths may also be used to monitor plant bugs. Sweep nets (15 inch in diameter) are an effective tool for monitoring adult plant bug populations. Drop cloths are more effective for monitoring immatures. Thresholds: First 2 weeks of squaring: Sweep Net: 8 plant bugs per 100 sweeps. Drop Cloth: 1 plant bug per 6 row feet. Third week of squaring through bloom: Sweep Net: 8 plant bugs per 100 sweeps. Drop Cloth: 1 plant bug per 6 row feet. Diamond is an insect growth regulator and will not control adults.
	dicrotophos Bidrin 8	1B	4-8 ozs	0.25-0.5	6(D) / 30(D)	
	imidacloprid Admire Pro 4.6	4A	0.9-1.7 ozs	0.032-0.061	12(H) / 14(D)	
	novaluron Diamond 0.83EC	15	9-12 ozs	0.058-0.077	12(H) / 30(D)	
	oxamyl Vydate C-LV 3.77	1A	8.5-17 ozs	0.25-0.50	48(H) / 14(D)	
	sulfoxaflor Transform 50 WG	4C	1.5-2.25 ozs	0.047-0.071	24(H) / 14(D)	
	thiamethoxam Centric 40 WG	4A	2 ozs	0.05	12(H) / 21(D)	

COTTON INSECT CONTROL

PEST	INSECTICIDE	IRAC GROUP	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI*/PHI* Hours (H) or Days(D)	REMARKS
Soybean Looper	*emamectin benzoate* Denim 0.16	6	8-12 ozs	0.01-0.015	12(H) / 21(D)	Treatment is necessary when soybean loopers threaten to defoliate cotton with immature bolls.
	flubendiamide Belt 4SC	28	2-3 ozs	0.0625-0.094	12(H) / 28(D)	
	indoxacarb Steward 1.25EC	22	6.7-9.2 ozs	0.065-0.09	12(H) / 14(D)	
	methoxyfenozide Intrepid 2F	18	4-10 ozs	0.0625-0.156	4(H) / 14(D)	
	novaluron Diamond 0.83EC	15	6-12 ozs	0.039-0.077	12(H) / 30(D)	
	spinosad Blackhawk	5	2.4-3.2 ozs	0.054-0.072	4(H) / 28(D)	
Spider Mites	*abamectin* Agri-Mek 0.15	6	8-16 ozs	0.009-0.018	12(H) / 20(D)	Apply when mites are spreading. Spot treatment may be adequate. Thorough coverage is essential; a second application may be necessary. In fields where mites are observed, conservation of beneficial insects should be a priority; insecticides prone to flare mites should be avoided when targeting other pests. *Bifenthrin only provides suppression of mites.
	*bifenthrin** Brigade 2EC Discipline 2EC Fanfare 2EC	3A	 6.4 ozs 6.4 ozs 6.4 ozs	 0.1 0.1 0.1	12(H) / 14(D)	
	etoxazole Zeal 72 WSP	10B	0.66-1.0 oz	0.03-0.045	12(H) / 28(D)	
	fepyroximate Portal 0.4	21A	16-32 ozs	0.05-0.1	12(H) / 14(D)	
	propargite Comite II 6	12C	1.25-2.25 pts	0.937-1.687	6(D) / 50(D)	
	profenofos Curacron 8E	1B	0.5-0.75 pt	0.5-0.75	48(H) / 30(D)	
	spiromesifen Oberon 2SC	23	8-16 ozs	0.125-0.25	12(H) / 30(D)	
Stink Bugs	**ORGANOPHOSPHATES**					The boll injury threshold should be adjusted up or down based on the number of susceptible bolls present. Use a 10-15% boll injury threshold during weeks 3-5 of bloom (numerous susceptible bolls present), 20% during weeks 2 and 6, and 30%(+) during weeks 7(+) of bloom (fewer susceptible bolls present). Detection of 1 stink bug per 6 row feet would also justify treatment. Higher stink bug populations are typically observed on late planted cotton compared with early planted cotton. Organophosphates should be used for control of brown stink bugs.
	acephate Orthene 97 Orthene 90S Acephate 97 Acephate 90	1B	 0.75 lb 0.8 lb 0.75 lb 0.8 lb	 0.72 0.72 0.72 0.72	24(H) / 21(D)	
	dicrotophos Bidrin 8	1B	4-8 ozs	0.25-0.5	6(D) / 30(D)	
	PYRETHROIDS					
	alpha-cypermethrin Fastac 0.83	3A	2.6-3.6 ozs	0.017-0.023	12(H) / 14(D)	

COTTON INSECT CONTROL

PEST	INSECTICIDE	IRAC GROUP	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI*/PHI* Hours (H) or Days(D)	REMARKS
Stink Bugs (continued)	**PYRETHROIDS**					
	beta-cyfluthrin Baythroid XL 1	3A	1.6-2.6 ozs	0.0125-0.0205	12(H) / 0(D)	
	bifenthrin Brigade 2EC	3A	2.6-6.4 ozs	0.04-0.1	12(H) / 14(D)	
	Discipline 2EC		2.6-6.4 ozs	0.04-0.1		
	Fanfare 2EC		2.6-6.4 ozs	0.04-0.1		
	esfenvalerate Asana XL 0.66	3A	5.8-9.6 ozs	0.03-0.0495	12(H) / 21(D)	
	gamma-cyhalothrin Prolex 1.25	3A	1.28-2.05 ozs	0.0125-0.02	24(H) / 21(D)	
	Declare 1.25		1.28-2.05 ozs	0.0125-0.02		
	lambda-cyhalothrin Karate w/ Zeon 2.08	3A	1.6-2.56 ozs	0.025-0.04	24(H) / 21(D)	
	Karate EC 1		3.2-5.12 ozs	0.025-0.04		
	Silencer 1		3.2-5.12 ozs	0.025-0.04		
	zeta-cypermethrin Mustang Max 0.8	3A	2.64-3.6 ozs	0.0165-0.0225	12(H) / 14(D)	
Thrips (seedling cotton), At-Plant Treatments	*acephate* Orthene 97ST	1B	Commercial seed	treatment	24(H) / 21(D)	
	Orthene 97		1.0 lb	0.97		
	Orthene 90S		1.1 lb	1.0		
	Acephate 97		1.0 lb	0.97		Apply acephate as an in-furrow spray during planting.
	Acephate 90		1.1 lb	1.0		
	imidacloprid Admire Pro4.6	4A	9.2 ozs	0.33	12(H) / 14(D)	Apply Admire Pro as an in-furrow spray during planting directed on or below seed.
	thiamethoxam Cruiser	4A	Commercial seed	treatment	12(H) / na	Thrips populations in some areas of the US have shown reduced susceptibility to neonicotinoid seed treatments (IRAC Group 4A). Neonicotinoid seed treatments are active for 14-21 days but may need a supplemental foliar insecticide application if thrips populations are high.
	imidacloprid Gaucho 600	4A	Commercial seed	treatment	12(H) / na	
Thrips (seedling cotton), Foliar Spray	*acephate* Orthene 97	1B	3.0 ozs	0.18	24(H) / 21(D)	Apply insecticide when 2-3 thrips per plant are counted and immatures are present. Expect higher thrips populations on early planted cotton.
	Orthene 90S		3.2 ozs	0.18		Thrips injury is more severe when seedlings are not growing rapidly (i.e. stress from cool temperatures or PRE herbicides). Rapidly growing seedlings can better tolerate thrips feeding.
	Acephate 97		3.0 ozs	0.18		
	Acephate 90		3.2 ozs	0.18		
	dicrotophos Bidrin 8	1B	1.6-3.2 ozs	0.1-0.2	6(D) / 30(D)	Treatment is rarely necessary after plants have 4 true leaves and are growing vigorously.

PEST	INSECTICIDE	IRAC GROUP	FORMULATION PER ACRE	LBS. ACTIVE PER ACRE	REI*/PHI* Hours (H) or Days(D)	REMARKS
Thrips (seedling cotton), Foliar Spray (continued)	*dimethoate* Dimethoate 4	1B	0.25-0.5 pt	0.125-0.25	48(H) / 14(D)	
Whitefly (banded winged)	*acephate* Orthene 97	1B	0.5-1.0 lb	0.49-0.97	24(H) / 21(D)	Apply when 50% of terminals in rapidly growing cotton are infested, or when honeydew is found on foliage or lint of older cotton with open bolls.
	Orthene 90S		0.5-1.0 lb	0.45-0.90		
	Acephate 97		0.5-1.0 lb	0.49-0.97		
	Acephate 90		0.5-1.0 lb	0.45-0.90		
	thiamethoxam Centric 40 WG	4A	2 ozs	0.05	12(H) / 21(D)	
Whitefly (silverleaf)	*acetamiprid* Assail 30 SG	4A	4.0-5.3 ozs	0.075-0.1	12(H) / 28(D)	Silverleaf whitefly is difficult to control with insecticides. Early detection and conservation of natural controls are important. Hairy leaf cottons are preferred by silverleaf whiteflies compared with smooth leaf varieties. Silverleaf whitefly infestations are typically higher on late planted cotton.
	dinotefuron Venom 70WDG	4A	1-3 ozs	0.045-0.134	12(H) / 14(D)	
	pyriproxyfen Knack 0.86	7D	8 ozs 5 ozs fb 5 ozs	0.05375 0.033 fb 0.033	12(H) / 28(D)	Vegetative cotton; 5 ozs. followed by 5 ozs.. See Label.
	spiromesifin Oberon 2	23	8-16 ozs	0.125-0.25	12(H) / 30(D)	Bifenthrin applied at high rates will suppress adults; tank-mixing with acephate may improve control.
	buprofezin Courier 40SC	16	9-12.5 ozs	0.25-0.35	12(H) / 14(D)	

Premixed or Co-Packed Insecticide Products:

Products listed below are available as premixes or co-packages of two insecticidal active ingredients. When using premixed or co-packaged products, be sure the use of all active ingredients is necessary. Unnecessary applications or use of reduced rates of an active ingredient may lead to or intensify insecticide resistance.

- bifenthrin, avermectin B1 (Athena)
- bifenthrin, imidacloprid (Brigadier)
- dicrotophos, bifenthrin (Bidrin XP II)
- flubendiomide, buprofezin (Tourismo)
- imidacloprid, cyfluthrin (Leverage)
- lambda-cyhalothrin, chlorantraniliprole (Besiege)
- lambda-cyhalothrin, thiamethoxam (Endigo)
- spinosad, gamma-cyhalothrin (Consero)
- zeta-cypermethrin, bifenthrin (Hero)
- chlorpyrifos, lambda-cyhalothrin (Cobalt Advanced)
- zeta-cypermethrin, chlorpyrifos (Stallion)