Texas A&M AgriLife Extension

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2019 Insect and Mite Pests Control Suggestions for Cotton

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Integrated Pest Management

An Integrated Pest Management (IPM) program designs compatible and ecologically sound combinations of pest suppression tactics, using both cultural practices and biological control methods. Cultural practices include manipulation of planting dates, stalk destruction, and variety selection, and biological control methods include conservation of existing natural enemies and application of insecticides when needed.

The economic injury level (EIL) and the economic threshold (ET) are core IPM concepts. The EIL is the smallest level of pest population (or amount of injury) that will cause economic loss. The ET is the pest density or population level at which curative action should be taken to prevent pest populations from reaching economically damaging numbers. The ET is also referred to as the action threshold and is the practical rule used to determine when to take management action.

Major factors to consider when using insecticides include:

- Efficacy and residual activity of the product
- Protection of natural enemies of cotton pests
- Possible resurgence of primary and secondary pests after applications
- Development of insecticide resistance in pest populations

Pest Management Considerations

Scouting

Regular field scouting is crucial to any pest management program. It is the only reliable way to determine whether pests have reached the economic threshold. More than just "checking bugs," scouting determines insect density and damage levels by using standardized, repeatable sampling techniques. It also monitors beneficial insect activity, diseases, fruiting, plant growth, and weeds as well as the effects of pest suppression practices.

Growers or crop consultants should check fields at least once and preferably twice a week to determine what species are present, their density, and the amount of damage. Most pests can be monitored visually by thoroughly checking whole plants or plant terminals. However, for some pests such as plant bugs (for example, the verde plant bug), a more reliable sampling method is to use a beat bucket, drop cloth, or sweep net.

Insecticide Resistance Management

The Insecticide Resistance Action Committee defines insecticide resistance as an inherited change in the sensitivity a pest population has to an insecticide, "reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species." Reliance on insecticides that act the same way can cause pests to develop resistance to the entire class of insecticides. This phenomenon applies to transgenic traits as well.

To delay resistance, growers should use IPM principles and integrate other control tactics into their insect and mite control programs. One strategy to avoid or delay resistance development in pest populations is to rotate insecticide groups to take advantage of different modes of action. Tank-mixing products from the same insecticide class is not recommended. The combination of insecticide rotations and tank mixtures that have insecticides with different modes of action reduces the

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chance of selecting individual pests that are resistant to certain classes of insecticides. These practices may delay the development of resistance, provide better control of target pests, and enhance the long-term sustainability of cotton production systems.

Biological Control

Weather, inadequate food sources, and natural enemies can hold insect and mite infestations below damaging levels. Biological control relies on parasites, pathogens, and predators to help control pests. Recognizing the impact of these natural control factors and, where possible, encouraging their action is a key IPM component.

Natural enemies in cotton include assassin bugs, big-eyed bugs, collops beetles, damsel bugs, ground beetles, lacewing larvae, lady beetles (or ladybugs), minute pirate bugs, spiders, syrphid fly larvae, and a variety of tiny wasps that parasitize the eggs, larvae, and pupae of many cotton pests. Avoiding the use of broad-spectrum insecticides (such as pyrethroids) until they are needed helps conserve existing populations of natural enemies and prevents the development of economically damaging pest infestations. Selecting insecticides that are more toxic to the target pests than they are to natural enemies minimizes the impact insecticides have on natural enemies.

Cultural Control

Cultural practices can influence insect pest infestations—some may increase the possibility of encountering damaging pests while others may reduce their likelihood. Some cultural practices include:

- **Controlling weeds** – Destroying weed and cover crops at least 3 weeks prior to planting eliminates the green bridge that pests such as cutworms, wireworms, spider mites, and other pests use before moving onto cotton.
- **Managing surrounding vegetation** – Plant bugs, cotton fleahoppers, and spider mites often develop large populations along field borders or within adjacent fallow fields and pastures. Timely mowing of these habitats reduces these sources of pests.
- **Guiding plant growth** – Efficient use of plant growth regulators and avoiding excessive fertilizers helps maintain a manageable crop canopy. Rank growth cotton is more attractive to many pests such as plant bugs and bollworm. Additionally, adequate insecticide application coverage is easier to achieve in non-growthy cotton.
- **Managing crop maturity/earliness** – Timely planting and using early maturing varieties shortens the period that crops are susceptible to yield loss by insect pests.

Bt Transgenic Cotton

Bt cotton is genetically altered by inserting genes from a common soil bacterium, *Bacillus thuringiensis,* to make proteins that are toxic to specific groups of insects. For example, currently available Bt traits in cotton specifically target caterpillar pests such as beet armyworm, cotton bollworm, and tobacco budworm. Conventional or non-Bt cotton does not produce such insecticidal proteins and is more vulnerable to worm damage.

Table 1. Bt technologies currently available in cotton

Bt technologies	Proteins expressed
Second generation	
Bollgard II	Cry1Ac + Cry2Ab
WideStrike	Cry1Ac + Cry1F
TwinLink	Cry1Ab + Cry2Ae
Third generation	
WideStrike 3	Cry1F + Cry1Ac + Vip3A
Bollgard 3	Cry1Ac + Cry2Ab + Vip3A
TwinLink Plus	Cry1Ab + Cry2Ae + Vip3Aa19

Cotton varieties with three Bt genes have excellent activity against cotton leaf perforators, loopers, pink bollworm, and tobacco budworm, and good activity against beet armyworm, cotton bollworm, fall armyworm, and saltmarsh caterpillar. Some situations may require supplemental insecticide treatment for bollworm and fall armyworm.

Table 2. Expected occurrence of insect and mite pests in cotton

Crop growth stage	Common pests	Occasional pests
Emergence to 1st square	Thrips, wireworms	Aphids, spider mites, cutworms
1st square to bloom	Aphids, cotton fleahopper, plant bugs (verde plant bug, *Lygus*)	Spider mites, bollworm
After 1st bloom	Bollworm, plant bugs, stink bugs, fall armyworm, whiteflies	Aphids, beet armyworm, spider mites

Thrips

Thrips attack leaves, leaf buds, and very small squares, causing silvering of the lower leaf surface, deformed or blackened leaves, and loss of the plant terminal. Thrips damage is most evident during cool, wet periods when seedling cotton plants grow slowly. Preventive in-furrow or seed treatments are an effective way to manage thrips. Under adverse growing conditions, a foliar treatment may be needed in addition to preventive in-furrow or seed treatment. The presence of immature thrips is a good indicator of loss of residual control by insecticide seed treatments. The action threshold is one thrips per true leaf. Foliar applications, when needed, provide the most benefit when applied at the first or second true leaf stage.

Table 3. Thrips

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Seed treatments				
Gaucho 600	Imidacloprid	12.8 fl oz/100 lbs seed	0.375 mg AI/seed	
Aeris	Thiodicarb + Imidacloprid	25.6 fl oz/100 lbs seed	0.375 mg ai/seed + 0.375 mg AI/seed	
Cruiser 5FS	Thiamethoxam		0.300–0.340 mg AI/seed	
Avicta Elite Cotton Plus	Thiamethoxam + Abamectin + Imidacloprid		0.865 mg AI/seed	
Acceleron	Imidacloprid			
Acceleron Elite	Imidacloprid + Clothianidin			
Acephate	Acephate*	0.28–0.4 lb/ 100 lbs seed		
At planting in-furrow treatments				
Velum Total	Imidacloprid	14–18	0.237–0.305	9.1–7.1
Admire Pro	Imidacloprid	7.4–9.2	0.266–0.331	17.30–13.91
Orthene 97	Acephate*	8–16	0.487–0.974	2–1
Acephate 90	Acephate	8.9–17.6	0.5–0.99	1.80–0.91
Foliar sprays				
Bidrin 8 / Dicromax 8	Dicrotophos*	1.6–3.2	0.1–0.2	80–40
Acephate 90	Acephate*	2.5–3.3	0.141–0.186	6.4–4.85
Orthene 97	Acephate	2.5–3.0	0.152–0.183	6.4–5.33
Radiant SC	Spinetoram	4.25–8	0.0332–0.0625	30–16
Dimethoate 2.67	Dimethoate*	5.28–24	0.110–0.500	24.24–5.33
Dimethoate 400	Dimethoate	4-8	0.125–0.25	32–16

*Various generics/brands available

Wireworms

Wireworms (click beetle larvae) and false wireworms (darkling beetle larvae) are cotton pests in the Texas High Plains. The larvae damage cotton by feeding on the root, hypocotyl, and cotyledon of plants before the plants emerge from the soil. The most severe damage occurs when the hypocotyl is severed, killing the plant and reducing the stand.

Minimize wireworm infestations through clean cultivation and clean fallowing. Infestations are most severe in no-tillage or reduced-tillage situations, particularly following alfalfa, cover crops, or grain. Planting shallow and under warm conditions often allows cotton seeds to quickly germinate so plants can rapidly outgrow the potential for wireworm injury. There is no post-emergent insecticide option for wireworm control. Preventive seed treatments with systemic insecticides do help reduce wireworm damage to some extent.

Cotton fleahopper

When fleahoppers are abundant early in squaring stages, a heavy square loss can cause poor boll set and reduce yield. The first 3 weeks of squaring are the most sensitive to cotton fleahopper feeding, particularly in dryland cotton production.

Insecticides applied during early bloom can result in outbreaks of aphids, bollworm, and tobacco budworm because of the destruction of predaceous insects and spiders. Avoid using broad-spectrum insecticides after the second week of squaring.

Table 4. Cotton fleahopper action thresholds

<table>
<tr><th>Region</th><th>Fleahoppers</th><th colspan="2">Cotton growth stage</th></tr>
<tr><td>Blacklands</td><td>10–15 per 100 terminals (terminal inspection)</td><td colspan="2" rowspan="3">During squaring</td></tr>
<tr><td rowspan="2">Coastal Bend
Winter Garden
Lower Rio Grande Valley</td><td>15–25 per 100 terminals (terminal sampling)</td></tr>
<tr><td>In development: 20–40 adults and nymphs per 100 plants (beat bucket sampling)</td></tr>
<tr><td rowspan="5">Panhandle
South Plains
Permian Basin
Rolling Plains
Trans Pecos</td><td rowspan="5">25–30 per 100 terminals (terminal inspection)</td><td>Week of squaring</td><td>Square set</td></tr>
<tr><td>1st week</td><td>< 90%</td></tr>
<tr><td>2nd week</td><td>< 85%</td></tr>
<tr><td>3rd week</td><td>< 75%</td></tr>
<tr><td colspan="2">After 1st bloom, treatment is rarely justified.</td></tr>
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Table 5. Cotton Fleahopper

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Vydate	Oxamyl	8–32	0.125–0.5	16–4
Orthene 97	Acephate*	4	0.244	4
Acephate 90	Acephate	4.4	0.248	3.64
Intruder Max 70/Strafer Max	Acetamiprid	0.6–1.1	0.025–0.05	26.67–14.55
Carbine 50	Flonicamid	1.7–2.8	0.053–0.089	9.41–5.71
Centric 40	Thiamethoxam	1.25–2.5	0.0313–0.0625	12.8–6.4
Admire Pro	Imidacloprid*	0.9–1.7	0.032–0.061	142.2–75.3
Alias 4	Imidacloprid	1–2	0.0313–0.0625	128–64
Dimethoate 400	Dimethoate*	8	0.25	16
Bidrin 8 / Dicromax 8	Dicrotophos*	4.0–8.0	0.25–0.5	32–16

*Various generics/brands available

Aphids

Early season: Parasites and predators usually control aphids on seedling cotton. Neonicotinic n-furrow insecticides and seed treatments used for thrips control provide suppression of early-season aphid populations.

Mid to late season: Natural controls such as parasites, pathogens, predators, and unfavorable weather can keep aphid populations below damaging levels. Cotton aphid populations can increase when treatments with nonselective insecticides for other pests destroy their natural enemies. Scout fields infested with cotton aphids twice a week since aphid numbers can increase rapidly. From plants across the field, sample a minimum of 60 leaves divided among the top, middle, and lower portion of a plant to determine actual infestation levels. Treat when the population reaches 40 to 70 aphids per leaf before first cracked boll and 10 aphids per leaf after first cracked boll.

Table 6. Aphids

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Sivanto 200	Flupyradifurone	7.0–10.5	0.0913–0.137	18.29–12.19
Sivanto Prime	Flupyradifurone	7.0–14	0.0913–0.183	18.29–9.14
Carbine 50	Flonicamid	1.4–2.8	0.044–0.089	11.43–5.71
Intruder Max 70/Strafer Max	Acetamiprid	0.6–1.1	0.025–0.05	26.67–14.55
Bidrin 8	Dicrotophos*	4.0–8.0	0.25–0.5	32–16

*Various generics/brands available

Fall armyworm

Proper identification of fall armyworm larvae is critical for effective control. Look for a prominent white, inverted "Y" mark on the front of the head. Because of the similarity in damage and difficulty in distinguishing small fall armyworm larvae from bollworm, include them along with bollworm and budworm counts and base your treatment decisions on the cumulative total of caterpillars counted. Currently, planting Bt cotton is the most effective way to control fall armyworm. Three-gene Bt cotton (Bollgard 3, WideStrike 3, and TwinLink Plus) sustain lower fall armyworm populations compared to two-gene Bt cotton. However, under heavy fall armyworm pressure, even three-gene Bt cotton may require treatment.

Table 7. Fall Armyworm

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Prevathon	Chlorantraniliprole	14–27	0.047–0.09	9.14–4.74
Steward EC	Indoxacarb	9.2–11.3	0.09–0.11	14–11.5
Lannate LV	Methomyl	24–36	0.45–0.68	5.5–3.5
Orthene 97	Acephate*	16	0.974	8
Diamond 0.83	Novaluron	6–12	0.0389–0.0778	21.33–10.67
Blackhawk	Spinosad	2.4–3.2	0.054–0.072	6.67–5

*Various generics/brands available

Bollworm/tobacco budworm

Prior to bloom: Treat when eight or more larvae (¼ inch or longer) are present per 100 plants, or when populations threaten to reduce square retention below 80 percent.

After first bloom: Treat when square and boll sampling show the presence of 6 percent or more injury and worms. Alternatively, 8,000 to 10,000 worms per acre is also an acceptable threshold to justify foliar treatment.

In areas with heavy worm pressure and where injury to Bt cotton is common (for example, South Texas), use an egg-based threshold of 20 percent egg lay (20 percent of plants with at least 1 egg) for non-Bt and two-gene Bt cotton (Bollgard II, TwinLink, and WideStrike). Do not rely on the egg threshold in areas where bollworm pressure is relatively light and injury to Bt cotton is uncommon (for example, West Texas).

Insecticide choice and timing are important for these thresholds to be efficient. Timing insecticide application toward small larvae has proven to be most effective. Once the larvae reach second instar (more than ¼-inch long), they commonly move deeper into the plant canopy and burrow into fruiting structures, which greatly limits insecticide exposure. Pyrethroids perform poorly against bollworm and budworm and should be used cautiously. They may also flare aphids and spider mites. Diamides (such as Prevathon and Besiege) are the products of choice for bollworm control in cotton. Besiege is a mix of the diamide and a pyrethroid, so flaring secondary pests may occur. Other insecticides used for bollworm management in cotton include spinosad, indoxacarb, and methomyl, but these insecticides tend to be less effective or exhibit shorter residual activity.

Fields that have accumulated 350 DD60 (degree days 60) beyond 5 NAWF (nodes above white flower) are no longer susceptible to first or second instar bollworm/tobacco budworm larvae.

Table 8. Bollworm and Tobacco Budworm

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Blackhawk	Spinosad	1.6–3.2	0.036–0.072	80–40
Prevathon	Chlorantraniliprole	14–27	0.047–0.09	9.14–4.74
Radiant SC	Spinetoram	2.8–8	0.0219–0.0625	45.71–16
Lannate LV	Methomyl	24–36	0.45–0.68	5.5–3.5
Steward EC	Indoxacarb	9.2–11.3	0.09–0.11	14–11.5
Delta Gold 1.5	Deltamethrin*	1.6–2.6	0.019–0.030	80–49.23
Cypermethrin 2.5	Cypermethrin*	2–5	0.04–0.1	64–25.6
Fanfare 2	Bifenthrin*	2.6–6.4	0.04–0.10	49.23–20
Brigade 2	Bifenthrin	2.6–6.4	0.04–0.10	49.23–20
Discipline 2	Bifenthrin	2.6–6.4	0.04–0.10	49.23–20
Silencer	Lambda-cyhalothrin*	3.2–5.12	0.025–0.04	40–25
Warrior II	Lambda-cyhalothrin	1.60–2.56	0.025–0.04	80–50
Declare 1.25	Gamma-cyhalothrin*	1.28–2.05	0.0125–0.02	100–62.44
Mustang Maxx	Zeta-cypermethrin*	2.64–3.60	0.0165–0.0225	48.49–35.56
Asana XL	Esfenvalerate*	5.8–9.6	0.03–0.05	22–13
Baythroid XL	Beta-cyfluthrin*	1.6–2.6	0.013–0.021	80–49.23

Pyrethroids applied alone will not provide adequate control of bollworms and tobacco budworm
*Various generics/brands available

Stink bugs

Stink bugs have piercing-sucking mouthparts and damage cotton by piercing the bolls and feeding on the developing seeds. Stink bug feeding often results in dark spots about ¹⁄₁₆ inch in diameter on the outside of bolls. These dark spots do not always correlate well with the internal damage. Damage to the internal boll wall is a good indication that lint and seed are affected. Recent research by entomologists at the University of Georgia and Clemson University suggests that decisions to treat for stink bug infestations are best made based on the percentage of bolls with evidence of internal damage (warts or stained lint associated with feeding punctures). Use a 10 percent to 15 percent boll injury threshold during weeks 3 through 5 of bloom, 20 percent during weeks 2 and 6, and 30 percent or more during weeks 7 or later of bloom. Detection of 1 stink bug per 6 row-feet would also justify treatment.

Use suggested insecticides to control southern green, green, and Conchuela stink bugs. Brown stink bug populations tend to be more tolerant to pyrethroids than other stink bugs in cotton.

Table 9. Stink Bugs

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Acephate 90	Acephate*	13.3	0.748	1.20
Orthene 97	Acephate	12	0.731	1.33
Fanfare 2	Bifenthrin*	2.6–6.4	0.04–0.10	49.23–20
Discipline 2	Bifenthrin	2.6–6.4	0.04–0.10	49.23–20
Brigade 2	Bifenthrin	2.6–6.4	0.04–0.10	49.23–20
Bidrin 8 / Dicromax 8	Dicrotophos*	4.0–8.0	0.25–0.5	32–16
Baythroid XL	Beta-cyfluthrin*	1.6–2.6	0.013–0.021	80–49.23
Mustang Maxx	Zeta-cypermethrin*	2.64–3.60	0.0165–0.0225	48.49–35.56
Mustang	Zeta-cypermethrin	2.8–3.8	0.033–0.045	45.71–33.68
Silencer	Lambda-cyhalothrin*	3.2–5.12	0.025–0.04	40–25
Silencer VXN	Lambda-cyhalothrin	3.2–5.12	0.025–0.04	40–25
Warrior II	Lambda-cyhalothrin	1.60–2.56	0.025–0.04	80–50
Declare	Gamma-cyhalothrin*	1.28–2.05	0.0125–0.02	100–62.44
Asana XL	Esfenvalerate*	5.8–9.6	0.03–0.05	22–13
Delta Gold 1.5	Deltamethrin*	1.6–2.6	0.019–0.030	80–49.23

Brown stink bugs tend to be more tolerant to pyrethroids than other stink bugs; Bifenthrin is best pyrethroid for brown stink bug
*Various generics/brands available

Lygus and verde plant bugs

The abundance of *Lygus* bugs in relation to the fruiting condition of the cotton plants determines the need for control measures. Inspect fields for *Lygus* bugs at 4- to 5-day intervals throughout the fruiting period. Before peak bloom, using a sweep net is the most accurate way to sample for *Lygus*. After peak bloom, a drop cloth is best.

During the first 2 weeks of squaring: Treat at 1 to 2 *Lygus* bugs per 6-foot row or 8 per 100 sweeps with unacceptable square set.

From the third week of squaring to first bloom: Treat at 2 to 3 *Lygus* bugs per 6-foot row or 15 per 100 sweeps with unacceptable square set.

After peak bloom: 4 to 6 *Lygus* bugs per 6-foot row or 15 to 20 per 100 sweeps with unacceptable fruit set. No treatment is needed when NAWF = 5 + 350 DD60s.

Verde plant bugs are cotton pests primarily in coastal South Texas. Treat for verde plant bugs when, using the beat-bucket method, you find more than 20 to 25 bugs per 100 plants.

Table 10. Plant Bugs

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Vydate	Oxamyl	8–32	0.125–0.5	16–4
Intruder Max 70/Strafer Max	Acetamiprid	0.6–1.1	0.025–0.05	26.67–14.55
Acephate 90	Acephate*	4.4–17.6	0.248–0.99	3.64–0.91
Orthene 97	Acephate	4–16	0.244–0.974	4–1
Diamond 0.83	Novaluron	9–12	0.0584–0.0778	14.22–10.67
Carbine 50	Flonicamid	1.7–2.8	0.053–0.089	9.41–5.71
Dimethoate 4	Dimethoate*	8	0.25	16.0
Bidrin 8 / Dicromax 8	Dicrotophos*	4.0–8.0	0.25–0.5	32–16
Admire Pro	Imidacloprid*	0.9–1.7	0.032–0.061	142.2–75.3
Alias 4	Imidacloprid	1–2	0.0313–0.0625	128–64
Centric 40	Thiamethoxam	1.25–2.5	0.0313–0.0625	12.8–6.4

*Various generics/brands available

Spider mites

Spider mites feed by piercing plant cells with their mouthparts and sucking the liquid contents of the cells. Damaged leaves develop white or yellowish specks, called stipules. Specking damage is Phase I damage. As feeding increases and the mites persist, the damage spreads, leaves develop a reddened appearance (Phase II damage), and eventually turn brown. Treat when 40 percent or more of the plants show noticeable leaf damage and the mite population is growing.

Table 11. Spider Mites

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
ABBA Ultra	Abamectin*	2–8	0.00469–0.01875	64–16
Agri-Mek SC	Abamectin	1.0–1.25	0.00547–0.00684	128–102.4
Oberon 4SC	Spiromesifen	3–8	0.09–0.25	42.7–16
Zeal 72WSP	Etoxazole	0.67–1	0.03–0.045	23.88–16
Portal	Fenpyroximate	16–32	0.05–0.10	8–4

*Various generics/brands available

Beet armyworm

Beet armyworms have a characteristic small black dot directly above the second true leg. Young beet armyworms hatch, "web up," and feed together on leaves. Damaged leaves, called hits, turn tan and are distinctive and easy to see when you walk through fields—a quick way to determine if the field is infested. Bt traits provide good control of beet armyworm infestations. Treat when there are more than 10 percent infested plants or 15 larvae per 100 plants.

Table 12. Beet Armyworm

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Confirm 2F	Tebufenozide	4–16	0.06–0.12	32–8
Prevathon	Chlorantraniliprole	14–27	0.047–0.09	9.14–4.74
Lannate LV	Methomyl	24–36	0.45–0.68	5.5–3.5
Steward EC	Indoxacarb	9.2–11.3	0.09–0.11	14–11.5
Blackhawk	Spinosad	1.6–3.2	0.036–0.072	80–40
Intrepid 2F	Methoxyfenozide	4–10	0.06–0.16	32–13
Diamond 0.83	Novaluron	6–12	0.0389–0.0778	21.33–10.67
Radiant SC	Spinetoram	4.25–8	0.0332–0.0625	30–16

Whiteflies

Silverleaf whitefly and bandedwing whitefly are the two most common whitefly species that infest Texas cotton.

Table 13. Whitefly action thresholds

Insecticide option	Silverleaf whitefly	
Adulticide	When ≥40% of the 5th node leaves are infested with 3 or more adults	
Insect growth regulator (IGR)	When ≥40% of the 5th node leaves are infested with 3 or more adults and nymphs are present	When ≥40% of quarter-sized disks* contain at least one large nymph
Cotton stage	**Bandedwing whitefly**	
Before open bolls	50 whitefly nymphs per 5th node leaf	
After open bolls	25 whitefly nymphs per 5th node leaf	

*Quarter-sized area taken between the main middle vein and one of the main lateral veins from a 5th node leaf

Table 14. Whiteflies

Product name/ trade name	Insecticide active ingredient/s	Formulated rate (fl oz or oz/acre)	lb active ingredient/acre	Acres treated per gallon/lb
Intruder Max 70/Strafer Max	Acetamiprid	1.7–2.3	0.075–0.1	9.41–6.96
Sivanto 200/ Sivanto Prime	Flupyradifurone	10.5–14.0	0.137–0.183	12.19–9.14
Oberon 4	Spiromesifen	3–8	0.09–0.25	42.7–16
Knack	Pyriproxyfen	8–10	0.054–0.067	16–13
Courier 3.6	Buprofezin*^	9–12.5	0.25–0.35	14.22–10.24
Acephate 90	Acephate*^	8.9–17.6	0.5–0.99	1.8–0.9
Orthene 97	Acephate^	8–16	0.487–0.974	2–1
Centric 40	Thiamethoxam^	2.0–2.5	0.05–0.0625	8–6.4
Admire Pro	Imidacloprid*^	1.3–1.7	0.0467–0.0611	98.46–75.29

*Various generics/brands available
^Recommended for bandedwing whiteflies only

Premix Insecticide Products

The following products are available as premixes of two or more insecticides.

Table 15. Premix insecticide products

Insecticide trade name	Insecticide active ingredient	Formulated rate (fl oz or oz/A)	Acres treated per gallon/lb	Primary pests controlled (See product label for other pests that may be controlled and specific rates)
Skyraider	Bifenthrin + Imidacloprid	2.6–6.4	49.23–20	Plant bugs, stink bugs, whiteflies
Brigadier	Bifenthrin + Imidacloprid	3.8–7.7	33.68–16.62	Plant bugs, stink bugs, whiteflies, saltmarsh caterpiller
Hero	Zeta-Cypermethrin + Bifenthrin	3.6–10.3	35.55–12.43	Grasshoppers, bollworm, stink bugs, saltmarsh caterpillar
Besiege	Lambda-cyhalothrin + Chlorantraniliprole	6.5–12.5	19.69–10.24	Most caterpillar pests, stink bugs
Intrepid Edge	Methoxyfenozide + Spinetoram	4–8	32–16	Most caterpillar pests
Leverage 360	Imidacloprid + Beta-cyfluthrin	2.8–3.2	45.71–40	Grasshopper, plant bugs, stink bugs
Bidrin XP II	Dicrotophos + bifenthrin	8–12.8	16–10	Plant bugs and stink bugs
Obelisk	Imidacloprid + Avermectin B1	1.6–3.2	80–40	Spider mites, stink bugs, plant bugs
Athena	Bifenthrin + Avermectin B1	7–17	18.29–7.53	Spider mites, stink bugs, plant bugs
Endigo ZC	Lambda-cyhalothrin + Thiamethoxam	4.5–6	25.6–23.27	Plant bugs, stink bugs, whiteflies
Gladiator	Zeta-Cypermethrin + Avermectin B1	19	6.74	Spider mites, stink bugs
Fyfanon Plus ULV	Malathion + Gamma cyhalothrin	8.00–16.00	16–8	Stink bugs, plant bugs, bollworm
Acenthrin	Acephate + Bifenthrin	6.0–21.0	21.33–6.1	Stink bugs, plant bugs, saltmarsh caterpillar, beet armyworm
FrenzyAttack/ Match-Up/Tundra Supreme/Voltage EndureX	Chlorpyriphos + Bifenthrin	6.9–16.4	18.55–7.80	Stink bugs, plant bugs, saltmarsh caterpillar, beet armyworm
Bolton	Chlorpyriphos + Gamma-cyhalothrin	13–23	9.85–5.57	Stink bugs, plant bugs, saltmarsh caterpillar, beet armyworm
Cobalt	Chlorpyriphos + Gamma-cyhalothrin	19–42	6.74–3.05	Stink bugs, plant bugs, bollworm
Cobalt advanced	Chlorpyriphos + Lambda-cyhalothrin	16–42	8-3	Stink bugs, plant bugs, bollworm
Kilter	Imidacloprid + Lambda-cyhalothrin	3.0–5.0	42.67–25.6	Plant bugs, stink bugs
Triple Crown	Z-cypermethrin + bifenthrin + imidacloprid	4.5–6.4	28.4–20	Plant bugs, stink bugs, bollworm
Argyle	Bifenthrin + Acetamiprid	5.0–9.0	25.6–14.22	Plant bugs, stink bugs
Stallion	Zeta-Cypermethrin + Chlorpyrifos	9.25–11.75	13.84–10.89	Stink bugs, plant bugs, bollworm

Nozzle Selection

For adequate coverage of the target, insecticides require smaller droplets than do systemic herbicides. When choosing nozzles for insecticide applications, consider both the droplet size and the spray volume. Smaller droplets provide better coverage, but larger ones are less likely to drift.

Air induction nozzles recommended for new herbicide technologies produce a coarser spray that is less prone to drifting. However, these nozzles can reduce insecticide penetration through dense plant canopy, resulting in less thorough coverage. To improve penetration through the plant canopy,

- increase the final volume (no less than 10 gallons per acre with a preference of 15 gallons per acre),
- lower the boom to just above the plants,
- increase the operating pressure, and
- slow down the travel speed.

Research indicates that penetration is better with hollow-cone nozzles compared to air induction nozzles when using high final volumes (15 to 20 gallons per acre). To improve aerial application coverage, increase the spray volume (about 5 gallons per acre) where practical.

Always read the label. Pesticide product labels may specify what droplet size and spray volume to use. This information will direct nozzle selection and, in turn, affect spraying equipment configuration and calibration.

Boll Weevil Eradication

The boll weevil has been successfully eradicated from most of Texas. In 2018, boll weevil captures occurred in only two zones in the East Texas Maintenance Area: The Lower Rio Grande Valley and the South Texas Winter Garden. Post-eradication pheromone trapping continues in order to detect potential re-infestations. Immediately report evidence of boll weevil infestations to the Texas boll weevil eradication officials.

Pollinator Protection

Cotton is not a preferred plant for honey bee foraging. However, cotton flower nectar can be attractive to bees, although it is relatively low in sugar content. Cotton also produces nectar in extra floral nectaries, which are frequented by pollinators due to their spatial availability and relatively high sugar content. To limit pollinator exposure to insecticides:

- Follow recommended treatment thresholds
- Treat before 7:00 a.m. or after 7:00 p.m.
- Avoid insecticide applications when honey bees or wild bees are actively foraging
- Minimize drift towards beehives or other habitats attractive to insect pollinators
- Apply selective insecticides that are not toxic to bees, when possible
- Avoid insecticide tank mixes or pre-mixed products that contain insecticides not needed for the target insect pest
- Contact beekeepers within 1 mile of the treatment area 48 hours before application to make them aware of when and where insecticides will be applied

For more information

Educational videos about cotton insect pests and plant growth and development: https://www.youtube.com/playlist?list=PLLBc-PrZSLQcvdVBr85PsKG-zhygWM-yIL

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