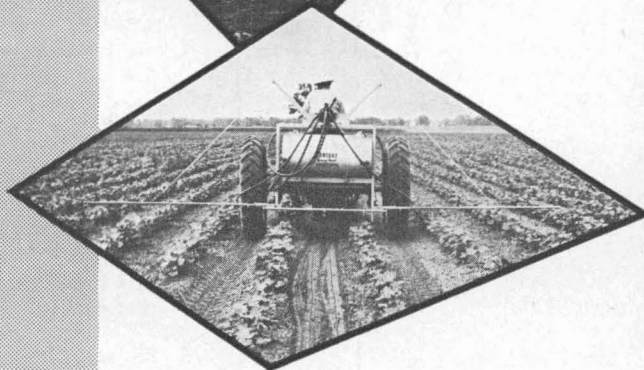
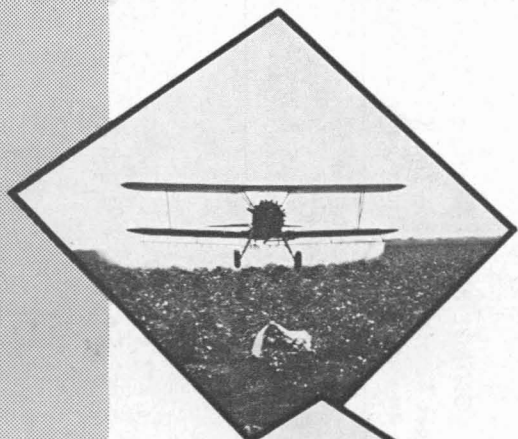


Guide for Controlling

COTTON INSECTS

in the High Plains
and Trans-Pecos
Areas of Texas



GUIDE FOR

Controlling Cotton Insects

IN THE

High Plains and Trans-Pecos Areas of Texas

RECOMMENDATIONS in this guide are based on results of continuing research conducted throughout the State by the Texas Agricultural Experiment Station and the Entomology Research Division, U. S. Department of Agriculture. A committee composed of state and federal research personnel and Extension specialists meet annually to review research results and to make appropriate revisions in recommendations. Because of the constantly changing cotton insect situation, this conference is held to develop the safest, most profitable recommendations for producers in Texas.

The development of resistance to insecticides, deposit of harmful residues in the soil or on neighboring crops and destruction of beneficial insect parasites and predators dictate judicious use of insecticides. If possible, their use should be restricted to actual need based on inspections.

At least 10 species of cotton insects and mites in Texas have shown some resistance to chemicals that once were effective. There is good evidence that the more extensively a material is used, the more rapidly resistance develops.

Fruits, vegetables and animal feeds have been contaminated by insecticidal drift, sometimes resulting in harmful residues. Continued excessive use of certain insecticides results in soil residues which makes growing of root crops in these soils hazardous.

Natural populations of parasites and predators play an important role in the control of cotton insects and should be maintained by avoiding the use of chemicals unless harmful numbers of injurious insects develop.

The use of chemicals is paramount to profitable cotton production in most areas, but a sound insect control program must be part of an integrated one making maximum use of natural and cultural controls. Immediate results and long-range consequences call for careful consideration in developing profitable and effective insect control recommendations.

This guide is a supplement to the State guide, L-218, *Texas Guide for Controlling Cotton Insects*, and is primarily for growers in the Texas High Plains and Trans-Pecos areas. Growing conditions for cotton and cultural practices in these areas differ sharply from many other parts of the State. The boll weevil is not common in all areas and climatic conditions, rainfall and soil type differ considerably.

Cotton insects can be controlled economically by using proper insecticides at the correct time (See recommendations). Insecticides must cover the plants to kill insects. Timely, effective applications of insecticides to control damaging insect infestations should result in substantial profits to the cotton producer, although numerous applications may be required.

Cotton grown under dryland conditions generally suffers lighter insect infestations. Injurious infestations usually are of shorter duration than irrigated cotton. Consequently, fewer insecticide applications may be needed.

INSECT CONTROL PROGRAM

The cotton insect control program for these areas includes three major phases with the following objectives:

1. **Early season control** (insures early fruiting and maturity in certain areas)
2. **Late season control** (insures continued fruiting and protects fruit)
3. **Early stalk destruction and farm cleanup** (reduces overwintering populations of boll weevils, pink bollworms, bollworms and tobacco budworms)

Early Season Control

Base early season control on infestation counts for substantial savings. The early season control program in most years will be conducted primarily to control thrips and fleahoppers. Regular and thorough insect checks by the grower are necessary for good insect control. Every grower should know how to make insect counts, when to apply insecticides based on insect population numbers and how to recognize damage by different cotton insects.

The grower who follows an early season control program based on infestation numbers uses insecticides only when needed.

Application of insecticides during the early fruiting period may create conditions favorable for a bollworm and tobacco budworm buildup. Use, when needed, a well-executed, early season program to control early season pests, such as thrips, overwintered boll weevils and fleahoppers.

Thrips

Heavy infestations of thrips on young cotton may delay plant maturity a few days to a few weeks. Thrips normally cause heaviest damage from plant emergence until early squaring. Serious damage may continue for longer periods. The first sign of thrips damage on newly emerged cotton is wilted, wrinkled, blackened leaves and terminal growth. Number of thrips and time of occurrence vary from season to season.

Fleahoppers

Fleahoppers usually begin damaging cotton when fruiting begins and continue to do so throughout the season. Base control measures on infestation counts and the apparent loss of small, terminal forms as cotton fruiting progresses. Protect the first forms to allow the cotton to produce early fruit.

Fleahoppers damage the small squares but do not cause larger squares or bolls to shed. After plants have set more fruit than the cotton can mature under a given set of growing conditions, discontinue fleahopper control. The cotton plant usually sheds additional forms.

Check cotton carefully to determine the degree of infestation before applying insecticides. The presence of aphids, spider mites or other insect pests may influence insecticide selection. (For additional information, see Extension publication B-933, *Cotton Insects*.)

Late Season Control

The bollworm is the principal insect involved in late season control. Others which may occur are fleahoppers, lygus bugs, cotton leafworms, cabbage loopers, aphids, spider mites, garden webworms, beet armyworms, tobacco budworms and stink bugs. Begin control measures when bollworms, tobacco budworms and cabbage loopers are small.

Bollworms

The bollworm is a pest of cotton and many other crops. It causes more damage to cotton in these areas than any other insect.

Eggs generally are laid on the tender growth of the terminal areas of the plant. The eggs hatch in about 3 days and the small worms begin working their way down the cotton plants, feeding on the squares and bolls.

Tobacco Budworms and Beet Armyworms

Damaging numbers of tobacco budworms or beet armyworms may accompany the bollworm population. These species attack cotton in a manner similar to that of the bollworm.

Apply insecticides when the worms are small.

Boll Weevils

The appearance of the boll weevil in the El Paso Valley and the eastern High Plains presents a serious threat to cotton production in these areas. See the table for discussion of infestation counts and control recommendations. Extension publication B-933, *Cotton Insects*, explains the life history and damage.

Overwintered weevils often are confined to small areas of the field after emergence. Spot treatment of the infested areas early in the season will slow down and in some instances prevent the spread of weevils throughout the field. The beneficial insect population within the field will be less affected when treating is confined to only the spots where weevils exist.

Pink Bollworms

See Extension publication L-219, *Ways to Fight the Pink Bollworm in Texas*.

EARLY STALK DESTRUCTION AND FARM CLEANUP

Early harvest, immediate stalk destruction and plowing under debris reduces boll weevil, pink bollworm, bollworm and tobacco budworm populations. These practices force the boll weevil into starvation before time to enter winter quarters, prevent late season buildup of weevils, pink bollworms, bollworms and tobacco budworms and reduce the overwintering population. The addition of 0.5 lb. of methyl parathion or 0.25 lb. of Guthion per acre to arsenic acid or phosphate-type defoliants has proved beneficial in reducing potential overwintering boll weevil populations. Do not add methyl parathion or Guthion to chlorate defoliants and/or dessicants. See L-219, *Ways to Fight the Pink Bollworm in Texas*.

BENEFICIAL INSECTS

Natural populations of beneficial insects help control cotton pests such as the bollworm, cotton aphid and spider mite. Never rely entirely on beneficial insects to control cotton insects, but examine fields frequently to determine the need for insecticides.

The introduction or release of either trichogramma wasps or convergent lady beetles has proved ineffective in controlling damaging bollworm populations.

GENERAL INFORMATION

In the late season program, dusts and sprays are equally effective when properly applied. Repeat the application as soon as possible if the insecticide is washed off within 24 hours, except when aphicides are used.

When infestations are heavy, increase dosages to the maximum and apply at 5-day intervals or less.

For detailed information on the use of sprays and spray machinery, see Extension L-486, *Insecticidal Spraying of Field Crops with Ground Machinery*.

Apply dusts when the air is relatively calm. Dew on plants is not necessary. Dusts and wettable powders are washed off more easily by light showers than sprays. Place dust nozzles on ground machines 4 to 6 inches above the plants.

Ground machines and airplanes are equally effective for applying insecticides. For best results with airplanes, flag the swaths so that they overlap. Increase dosages recommended in this guide by at least 50 percent when an airplane is used in making early season applications. Apply aerial spray at 3 or 4 gallons per acre.

Some insecticides are particularly destructive to honeybees. Make a determined effort to prevent their destruction, since bees help pollinate many agricultural crops.

For additional information, contact your county agents, the Extension entomologists, College Station, Texas, or the area Extension entomologist, Lubbock, Texas.

CONVERSION TABLE—POUNDS OF ACTUAL INSECTICIDE IN DIFFERENT QUANTITIES OF SPRAY CONCENTRATE*

Insecticide	Gal.	2 qt.	1 qt.	1 pt.
Aldrin	2.0	1.0	0.5	0.25
Bidrin	8.0	4.0	2.0	1.0
DDT	2.0	1.0	0.5	0.25
DDT	3.0	1.5	0.75	0.375
Demeton	2.0	1.0	0.5	0.25
Dieldrin	1.5	0.75	0.375	0.187
Endrin	1.6	0.8	0.4	0.2
Ethion	4.0	2.0	1.0	0.5
Guthion	2.0	1.0	0.5	0.25
Heptachlor	2.0	1.0	0.5	0.25
Malathion	5.0	2.5	1.25	0.675
Methyl parathion	2.0	1.0	0.5	0.25
Methyl parathion	4.0	2.0	1.0	0.5
Methyl Trithion	4.0	2.0	1.0	0.5
Parathion	2.0	1.0	0.5	0.25
TDE	2.0	1.0	0.5	0.25
Toxaphene	6.0	3.0	1.5	0.75
Carbophenothion (Trithion)	4.0	2.0	1.0	0.5
BHC-DDT	2.4	1.2	0.6	0.3
Strobane-DDT	6.0	3.0	1.5	0.75
Toxaphene-DDT	6.0	3.0	1.5	0.75
	3.0	Pounds Actual Carbaryl (Sevin)	1.0	0.5
Pounds of Carbaryl (Sevin) 80% wetttable powder required	3.75	2.5	1.25	0.625

*Certain formulations may differ in the amount of actual insecticide per gallon. See the manufacturer's label for specific concentration and adjust spray mixtures accordingly.

CAUTION

All insecticides are poisonous. Follow carefully all precautions on the label. Take special care in handling parathion, endrin, methyl parathion, demeton, Bidrin, Di-Syston, Guthion and phorate (Thimet). Avoid prolonged contact with the skin or breathing of the vapors or drift from either sprays or dusts.

Take special precautions to prevent drift from contaminating neighboring vegetables or forage crops at the time cotton is sprayed or dusted.

INSECTICIDAL MIXTURES

Commercial mixtures of emulsifiable concentrates containing several insecticides are being marketed in the State. Know the contents of such mixtures and apply recommended dosages of the required insecticides to give control of the pests involved.

EARLY SEASON CONTROL PROGRAM (Insecticides listed at random)

Increase Dosages Recommended in This Guide at Least 50 Percent
When Using an Airplane to Make Early Season Applications

Insects	Insecticides	Pounds per acre of actual insecticide to be applied as spray unless otherwise indicated ¹	Remarks
Application at planting time for control of:			
Thrips	A. Di-Syston (Granules-in-furrow)	0.5-1.0	Provide control for 5 to 6 weeks following planting. When used at maximum recommended rates under conditions of cool, wet weather, phorate or Di-Syston may cause some delay in emergence or stunting and result in stand reduction. Injury may be more pronounced on light sandy soils. Exercise care in using systemic insecticides with pre-emergence herbicides.
Aphids	B. Phorate (Granules-in-furrow)	0.5-1.0	
Spider mites	C. Phorate (Pretreated seed)	1.0-1.5 lb. per 100 lb. seed	
Leaf miners			
Cutworms and certain armyworms	A. Strobane-DDT (2-1 mixture) ² B. Toxaphene-DDT (2-1 mixture) ² C. Endrin ^{2,9}	2.0-3.0 2.0-3.0 0.3-0.4	Examine seedling cotton for presence of these pests. Apply treatment as needed.
Darkling beetles	A. Heptachlor ^{2,4} B. Dieldrin ²	0.5 0.375	Brown-to-black beetles which feed around base of seedlings. Damage resembles cutworm attack. Begin control when damage warrants it.
Garden webworms	Use insecticides recommended for bollworm control.		
Thrips and fleahoppers	A. Dieldrin + DDT ² B. Guthion ³ C. Strobane-DDT (2-1 mixture) ² D. Carbaryl (Sevin) ⁵ E. Toxaphene-DDT (2-1 mixture) ² F. Heptachlor + DDT ^{2,4} G. Endrin + DDT ^{2,9} H. Bidrin ^{2,8}	0.2-0.25 + 0.5 0.125-0.25 1.25-2.25 0.5-1.0 1.25-2.25 0.25-0.375 + 0.5 0.2-0.3 + 0.5 0.1-0.25	THRIPS—Begin control measures as soon as damage is apparent on seedling plants. Damage is characterized by wilted, deformed and blackened leaves. Silvering of the lower leaf surface also is common. Apply sprays at 7-day intervals if infestation persists. If difficulty is encountered in controlling thrips substitute methyl parathion ^{6,10} at 0.25 lb. per acre for DDT. FLEAHOPPERS—After cotton is old enough to produce squares, examine the main stem terminal buds (about 3-4 in. of top of plant) of 100 cotton plants at several representative points in the field. As cotton reaches the fruiting stage, apply control measures when 15-20 fleahoppers are found per 100 terminals. As plants increase in size and fruit load, larger populations may be tolerated without serious damage. Base later treatments on numbers of fleahoppers and on damage as indicated by excessive loss of small squares. Apply sprays at 7-day intervals.
Cotton aphids	A. Malathion B. Methyl parathion ^{6,10} C. Parathion ⁶ D. Demeton ^{2,7}	0.625-0.9 0.25-0.375 0.25-0.375 0.125-0.25	In early season, apply insecticides as needed. In late season, begin treatment when honeydew appears. Demeton, parathion, malathion or methyl parathion may be combined with other sprays.
Overwintered boll weevils	A. Carbaryl (Sevin) ⁵ B. Guthion ³ C. Methyl parathion ^{6,10} D. Methyl Trithion ^{2,4} E. Toxaphene-DDT (2-1 mixture) ² F. Strobane-DDT (2-1 mixture) ² G. Endrin + DDT ^{2,9}	1.25-1.5 0.25 0.25-0.375 0.25-0.375 2.0-3.0 2.0-3.0 0.3-0.4 + 0.5-1.0	Where weevils are found, apply just before first squares are one-third grown to prevent egg laying. If emergence of more weevils from hibernation sites occurs, additional treatment may be necessary. These insecticides also control thrips and cotton fleahoppers. Guthion, carbaryl (Sevin), Methyl Trithion and methyl parathion produce rapid, effective control of overwintered boll weevils in areas where they are resistant to chlorinated hydrocarbons. See text for discussion under boll weevils.

Extending the early season control program beyond the one-third grown square stage may create conditions favorable for a bollworm buildup. However, if fleahoppers are present in injurious numbers it may be necessary to initiate the late season control program.

LATE SEASON CONTROL PROGRAM (Insecticides listed at random)

Insects	Insecticides	Pounds per acre of actual insecticide to be applied as spray or dust	Remarks
Apply dusts at 10-15 lb. per acre unless otherwise indicated.			
Bollworms	A. Strobane-DDT (2-1 mixture) ² B. Endrin + DDT ^{2,9} C. Toxaphene-DDT (2-1 mixture) ² D. Carbaryl (Sevin) ⁵	3.0-4.5 0.3-0.5 + 1.0-1.5 3.0-4.5 2.0-3.0	HOW TO CHECK FOR BOLLWORMS—Examine the terminal buds (upper 3-4 in. of plant) of 100 cotton plants and 100 consecutive squares and bolls at each of several points in the field. Begin treatment when bollworm eggs and 4 or 5 young worms are found per 100 terminals or 5% of the small squares and bolls have been injured by small bollworms. Make additional applications as needed. DDT resistant bollworms and tobacco budworms occur in several areas of Texas. DDT alone may be used to control these pests where resistance does not occur. Check fields closely 2 to 3 days after each application to be sure of effective

Where tobacco budworms, beet armyworms, and/or resistant bollworms are encountered, add 0.5 to 1.0 pound of methyl parathion^{6,10} to one of the above-listed recommendations.

TDE² may be substituted for DDT in

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LATE SEASON CONTROL PROGRAM (Insecticides listed at random)

Insects	Insecticides	Pounds per acre of actual insecticide to be applied as spray or dust	Remarks
Apply dusts at 10-15 lb. per acre unless otherwise indicated.			
Bollworms	A. Strobane-DDT (2-1 mixture) ²	3.0-4.5	HOW TO CHECK FOR BOLLWORMS—Examine the terminal buds (upper 3-4 in. of plant) of 100 cotton plants and 100 consecutive squares and bolls at each of several points in the field. Begin treatment when bollworm eggs and 4 or 5 young worms are found per 100 terminals or 5% of the small squares and bolls have been injured by small bollworms. Make additional applications as needed. DDT resistant bollworms and tobacco budworms occur in several areas of Texas. DDT alone may be used to control these pests where resistance does not occur. Check fields closely 2 to 3 days after each application to be sure of effective control. If needed, repeat application immediately using one recommended material plus methyl parathion.
	B. Endrin + DDT ^{2,9}	0.3-0.5 + 1.0-1.5	
	C. Toxaphene-DDT (2-1 mixture) ²	3.0-4.5	
	D. Carbaryl (Sevin) ⁵	2.0-3.0	
<div>Where tobacco budworms, beet armyworms, and/or resistant bollworms are encountered, add 0.5 to 1.0 pound of methyl parathion^{6,10} to one of the above-listed recommendations.</div>			
TDE ² may be substituted for DDT in any of the above mixtures.			
Boll weevils	A. Carbaryl (Sevin) ⁵	1.6-2.4	HOW TO CHECK FOR BOLL WEEVILS—Examine cotton weekly. Pull 100 squares, at least one-third grown, at random, taking a few squares at several representative places in the field. If 15 to 25% or more have weevil punctures, begin treatment. Apply insecticides at 5-day intervals. Under extremely heavy buildups, the intervals may need to be 3 days. See text for discussion under boll weevils.
	B. Strobane-DDT (2-1 mixture) ²	3.0-4.5	
	C. Methyl Trithion ^{2,13}	0.5	
	D. Methyl parathion ^{6,10}	0.375-0.5	
	E. Endrin + DDT ^{2,9}	0.3-0.4 + 0.5-1.0	
	F. Toxaphene-DDT (2-1 mixture) ²	3.0-4.5	
	G. Guthion ³	0.25	
	H. Calcium arsenate ² (dust only)	10-15	
<div>Under conditions of heavy boll weevil infestations where it is desirable to reduce weevil numbers quickly, use Guthion or add Methyl Trithion or methyl parathion to toxaphene-DDT, Strobane-DDT or endrin-DDT.</div>			
Cotton aphids	Use insecticides as recommended for early season control.		
Fleahoppers	Use insecticides as recommended for early season control.		
Spider mites	A. Carbophenothion (Trithion) ²	0.375-0.75	Treat when leaves begin to turn yellow. Demeton, Ethion or carbophenothion generally are more effective for controlling the two-spotted mite. Two applications at 5-day intervals may be necessary with all materials except demeton.
	B. Methyl parathion ^{6,10}	0.25-0.375	
	C. Ethion ^{2,12}	0.375-0.75	
	D. Parathion ⁶	0.25	
	E. Demeton (Systox) ^{2,7}	0.25	
Lygus and stink bugs	A. Strobane-DDT (2-1 mixture) ²	1.5-3.0	Begin treatment when 7 to 10 bugs per 100 sweeps with a 15 to 16-inch net are found. Apply dusts or sprays at 5 to 7-day intervals or as required.
	B. Toxaphene-DDT (2-1 mixture) ²	1.5-3.0	
	C. BHC-DDT (3-5 mixture) ^{2,11}	1.25	
	D. DDT ²	1.0	
Leafworms	A. Guthion ³	0.25	Apply dust or sprays when cotton leafworms first appear. Young worms are easier to kill than old worms.
	B. Parathion ⁶	0.125-0.25	
	C. Carbaryl (Sevin) ⁵	1.0-1.25	
	D. Methyl parathion ^{6,10}	0.125-0.25	
	E. Toxaphene-DDT (2-1 mixture) ²	1.5-3.0	
	F. Strobane-DDT (2-1 mixture) ²	1.5-3.0	
Cabbage loopers	A. Endrin ^{2,9}	0.4-0.5	Begin treatment when small worms first appear.
Grasshoppers	A. Dieldrin ²	0.2	Apply insecticide when damaging infestations appear. Use baits for control of "jumbo" grasshoppers. (Ask your county agent about bait mixtures.)
	B. Aldrin ²	0.25-0.375	
	C. Heptachlor ^{2,4}	0.25-0.375	
	D. Toxaphene ²	1.5-3.0	
	E. Carbaryl (Sevin) ⁵	1.5-2.0	
Pink bollworms	A. Carbaryl (Sevin) ⁵	1.5-2.0	Apply DUSTS at 15 lb. per acre at 5-day intervals. Apply SPRAYS at 5-day intervals.
	B. DDT ²	1.5-2.0	
	C. Guthion + DDT ^{2,3}	0.187-0.375 + 1.5-1.0	

¹Dusts are effective, but sprays are considered more practical under early season conditions.

²Do not graze or feed treated plants, including gin waste, to dairy animals or animals being finished for slaughter.

³Do not apply within 1 day of harvest. Do not pasture fields or feed gin waste if late applications are made.

⁴Do not apply after bolls open.

⁵Problems may be encountered in spraying wettable powder with low-volume farm sprayers; follow manufacturer's directions carefully.

⁶Do not apply within 5 days of hand picking.

⁷Do not apply within 21 days of harvest.

⁸Do not apply within 10 days of harvest.

⁹Workers entering fields within 5 days of application should wear protective clothing.

¹⁰If entering fields within 24 hours after application, wear protective clothing.

¹¹Do not apply when rotating with root crops.

¹²Do not apply after 25% of bolls are open.

¹³Do not apply after half the bolls are open.