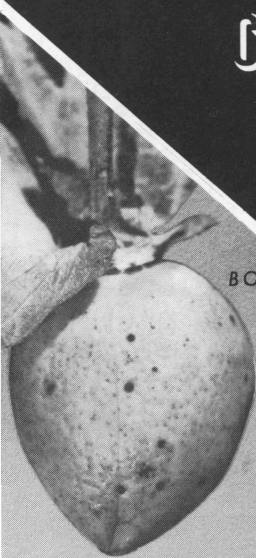


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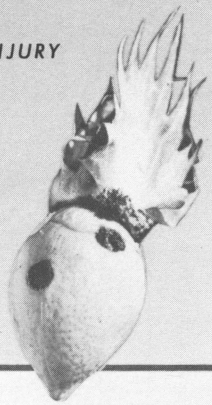
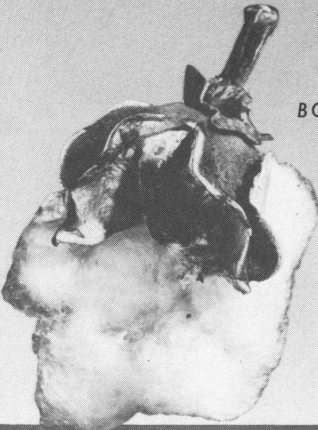
# COTTON INSECTS



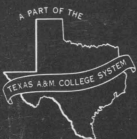
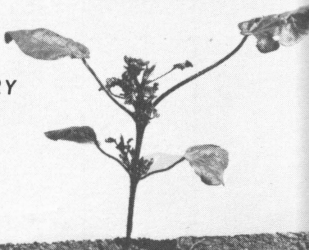
BOLL WEEVIL INJURY



BOLLWORM INJURY



THRIPS INJURY



THE AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS  
TEXAS AGRICULTURAL EXTENSION SERVICE

J. E. Hutchison, Director, College Station, Texas

# L-218, TEXAS GUIDE FOR CONTROLLING COTTON INSECTS — 1961

**COTTON INSECTS** can be controlled economically by the use of the proper poisons at the correct time (See Table). *Poisons must cover the plants to kill insects.* Plants usually are not protected from insect attack on new growth or if poisons are washed off.

Substantial profits have been made, *even when a large number of poison applications were necessary for maximum yields*, by controlling damaging infestations of boll weevils and bollworms on cotton growing on fertile soils. On upland soils where insect infestations do not last long, fewer applications may be needed. The control program for 1961 includes three phases:

1. **EARLY SEASON CONTROL** (insures early fruiting and maturity)
2. **LATE SEASON CONTROL** (based upon infestation)
3. **EARLY STALK DESTRUCTION AND FARM CLEANUP**

The grower must carry out an adequate control program to obtain greatest benefits. All the acreage usually needs early season control. Cotton should be inspected before applying insecticides to determine the degree of infestation and to check for pests such as aphids and spider mites which may influence the choice of insecticides if these pests are present with other pests.

The dryland acreage should receive late season treatment when infestation counts indicate that it is needed. Cotton growing under irrigation or on other high-yielding land usually needs protection throughout most of the growing season.

For information on the identification, life history and nature of damage of the major cotton insects, see B-933 *Cotton Insects*.

## **Early Stalk Destruction and Farm Cleanup**

Early harvest, immediate stalk destruction and plow under of debris before the first frost reduce boll weevil and pink bollworm populations. These practices force the boll weevil into starvation before time to enter winter quarters, prevent late season buildup of weevils and pink bollworms and reduce the numbers that survive the winter. (See L-219 *Ways To Fight The Pink Bollworm in Texas*.)

## **When to Apply Insecticides**

### **Pink Bollworm**

Pink bollworm counts should begin after cotton has been blooming for at least five days. Select five representative locations in the field, step off 300 feet of row and count the number of rosetted blooms. Add the total

number of rosetted blooms from these five locations and multiply by 10 to obtain the number of worms per acre. When approximately 350 or more worms are found per acre, begin treatment immediately.

When less than 350 worms per acre are found, make boll inspections as soon as first bolls are four weeks old and continue at weekly intervals. Walk diagonally across the field and collect at least 100 bolls (two-thirds grown or larger). Crack the bolls and examine the inside of the boll carpel (hull) for tunnels made by small worms. Start treatment when 10 to 15 percent of the bolls are infested and continue until 70 percent are open.

If pink bollworms and boll weevils occur simultaneously, add suitable insecticides to the DDT for effective control of both pests.

### **Other Insects**

Methods of making infestation records and criteria to be used in determining need for treatment are given in the remarks column of the various pests in the Table of this Guide.

Application of insecticide near the time bollworms usually appear may create conditions favorable for these pests to build up in damaging numbers. A well planned early season program should be employed to control early season pests such as thrips, overwintered boll weevils and fleahoppers. It is important to time these treatments so that insecticidal applications may cease at least 30 days before bollworms usually appear unless injurious infestations make additional treatments necessary. Avoiding insecticidal applications during this period permits beneficial insects to build up as an aid to bollworm control.

Although beneficial insects may aid in controlling cotton pests such as the bollworm, cotton aphid and spider mite, *growers should never rely entirely on beneficial insects* to control cotton insects, but should examine their fields frequently to determine the need for insecticides.

**A 5-DAY SCHEDULE IS NECESSARY TO MAINTAIN EFFECTIVE CONTROL OF THE BOLL WEEVIL, BOLLWORM AND PINK BOLLWORM.**

## **Treatment with Systemic Insecticides at Planting Time**

Results of research show that four to six weeks' protection from planting date has been obtained against thrips, aphids, spider mites and leaf miners with phorate (Thimet) applied to *planting seed* and Di-syston applied as *granules*. Overdosing with these materials may retard early growth. One-half to 1 pound of the active ingredient of phorate plus an equal amount of carbon per bushel of seed planted per acre appears to be a relatively safe

dosage. Di-syston should be used in the granular form at the rate of  $\frac{1}{2}$  to 1 pound of the technical material per acre applied in the furrow at time of planting. Use extreme care in handling seed treated with phorate or applying granules of Di-syston because of the toxicity of these compounds to man. Under weather conditions unfavorable for germination, these treatments may reduce the stand of cotton.

## **Three-way Insecticidal Mixtures**

Commercial mixtures of emulsifiable concentrates containing three insecticides are being marketed in the State. In most instances they will give control of several pests. However, they are often formulated in such proportions that the needed dosage of one of the necessary insecticides is not sufficient to control a certain pest. For example, insufficient amounts of needed insecticides for bollworm or boll weevil control may be applied when such mixtures are used resulting in poor control. Therefore, growers should know the contents of such mixtures and make sure that they are applying recommended dosages of the insecticides required to give control of the pests involved.

The actual amounts of technical materials per gallon of emulsifiable concentrate may vary from those listed in the guide. In such cases, consult your county agent or the extension entomologist for amounts to use. In addition to percentages, the manufacturer's label should list the pounds of active ingredients contained in each gallon.

## **Caution**

**All insecticides are poisonous. Follow precautions on the labels strictly. Take special precautions in handling parathion, methyl parathion, demeton, Di-syston, Guthion and phorate (Thimet) to avoid prolonged contact with the skin or breathing the vapors or drift from either spray or dust.**

**Be mindful of insecticidal drift that may contaminate neighboring vegetables or forage crops at the time cotton is sprayed or dusted. Plan crop locations in advance to eliminate this problem. Livestock should not graze in treated cotton fields.**

## 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 poison is washed off within 24 hours, except when demeton and other aphicides are used. Increase dosages to maximum indicated in the Table when necessary to obtain control.

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

Apply sprays when wind velocities do not exceed 12 miles per hour and when leaves are dry. Poison "run-off" may occur if leaves are wet. For early season treatment with ground equipment, one or two cone-type nozzles per row, placed 10 to 15 inches above the tops of plants are sufficient. Nozzle spacings of 20 inches on the boom are adequate for late season control. Apply sprays at approximately 60 pounds pressure and at 2 to 8 gallons per acre. As a safety measure, mount spray booms on the rear of the tractor.

Ground machines and airplanes are equally effective for applying poisons. For information on how to

calibrate and adjust spray machines, see L-486 *Insecticidal Spraying of Field Crops with Ground Machinery*. For best results with airplanes, flag the swaths so that they overlap. Increase dosages recommended in the Guide by at least 50 percent when an airplane is used in making early season applications. Apply sprays at 2 to 2½ gallons per acre except in West Texas; increase the amount to 3 or 4 gallons per acre for this area.

Some poisons are destructive to honeybees. A determined effort should be made to prevent their destruction, since bees help pollinate many agricultural crops.

Supplemental guides for the Lower Rio Grande Valley and the High Plains and Trans-Pecos areas are available.

The recommendations in this Guide are based upon results of experiments conducted by the Texas Agricultural Experiment Station of the A&M College of Texas and the Entomology Research Division, United States Department of Agriculture.

For additional information, contact your county agent or write the extension entomologist, College Station, Texas.

**EARLY SEASON CONTROL PROGRAM**

**(INSECTICIDES LISTED AT RANDOM)**

INSECTS	INSECTICIDES		AMOUNT OF SPRAY CONCENTRATE PER ACRE	REMARKS
	DUSTS	SPRAYS AND LB. OF TOXICANT PER GAL.		
Cutworms and certain armyworms	Dusts are effective, but sprays are considered more practical and economical under early season conditions.	A. DDT (2 lb.) B. Toxaphene-DDT (4 lb.-2 lb.) C. Toxaphene (6 lb.)	1/2 to 1 gal. 1 1/3 to 2 qt. 1 1/3 to 2 qt.	Examine seedling cotton for presence of these pests. Apply treatment as needed.
Thrips	Dusts are effective, but sprays are considered more practical and economical under early season conditions.	A. Toxaphene-DDT (4 lb.-2 lb.) B. Endrin (1.6 lb.) + DDT (2 lb.) C. Heptachlor <sup>1</sup> (2 lb.) + DDT (2 lb.) D. Dieldrin (1.5 lb.) + DDT (2 lb.) E. Sevin <sup>2</sup> (85% W.P.) F. Strobane <sup>3</sup> -DDT (4 lb.-2 lb.)	1 1/2 pt. to 1 1/2 qt. 1 to 1 1/2 pt. + 1 qt. 1 to 1 1/2 pt. + 1 qt. 1 to 1 1/2 pt. + 1 qt. .6 to 1.2 lb. 1 1/2 pt. to 1 1/2 qt.	Thrips usually damage cotton from the time it emerges until the plants are 4 to 6 weeks old. If thrips are present, make first application soon after emergence. Early planted cotton in most areas may not need thrips protection until the four-leaf stage. In either case, make the second application 7 days after the first. INCREASE DOSAGES RECOMMENDED IN THIS GUIDE AT LEAST 50% WHEN AN AIRPLANE IS USED TO MAKE EARLY SEASON APPLICATIONS.
The following phosphate insecticides may be substituted for DDT in the above mixtures to control thrips: (1) Malathion 0.5 lb. (1 pt.) (2) Methyl parathion 0.25 lb. (1 pt.)				
Apply sprays at 7-day intervals.				
Overwintered boll weevils	Dusts are effective, but sprays are considered more practical and economical under early season conditions.	A. Methyl parathion (2 lb.) B. Toxaphene-DDT (4 lb.-2 lb.) C. Strobane-DDT (4 lb.-2 lb.) D. Malathion (5 lb.) E. Sevin (85% W.P.)	1 to 1 1/2 pt. 1 1/3 to 2 qt. 1 1/3 to 2 qt. 1 1/3 to 2 pt. 1.2 to 1.5 lb.	These insecticides will also control thrips and cotton fleahoppers. For maximum benefit, make applications for overwintered boll weevil control between the time that the plants begin to square and before the first squares become one-third grown to prevent egg laying. Control of weevils will save early squares and will delay mid- and late season infestation buildup. Damaged blackened terminals are a characteristic sign of adult weevil feeding.
Fleahoppers	Dusts are effective, but sprays are considered more practical and economical under early season conditions.	A. Toxaphene-DDT (4 lb.-2 lb.) B. Endrin (1.6 lb.) + DDT (2 lb.) C. Heptachlor (2 lb.) + DDT (2 lb.) D. Dieldrin (1.5 lb.) + DDT (2 lb.) E. Sevin (85% W.P.) F. Strobane-DDT (4 lb.-2 lb.)	1 1/2 pt. to 1 1/2 qt. 1 to 1 1/2 pt. + 1 qt. 1 to 1 1/2 pt. + 1 qt. 1 to 1 1/2 pt. + 1 qt. .6 to 1.2 lb. 1 1/2 pt. to 1 1/2 qt.	Treatments for thrips and overwintered boll weevils will also control fleahoppers; however, injurious fleahopper infestations may develop after this period. Subsequent treatment for fleahoppers should be made ONLY when need is indicated by infestation records. HOW TO CHECK FOR FLEAHOPPERS — After cotton is old enough to produce squares, examine the main stem terminal buds (about 3-4 in. of the top of plant) of 100 cotton plants at several representative points in the field. Begin treatment when 15 to 35 fleahoppers (nymphs and adults) are found per 100 terminals.
The following phosphate insecticides may be substituted for DDT in the above mixtures to control fleahoppers: (1) Malathion 0.5 lb. (1 pt.) (2) Methyl parathion 0.25 lb. (1 pt.)				
Apply sprays at 7-day intervals.				

Where no resistance to insecticides has been encountered in controlling boll weevils, thrips and fleahoppers, one of the chlorinated hydrocarbons listed under thrips and fleahoppers may be used without DDT.

Cotton aphids	Dusts are effective, but sprays are considered more practical and economical under early season conditions.	A. Methyl parathion (2 lb.) B. Parathion (2 lb.) C. Demeton (2 lb.) D. Malathion (5 lb.)	1 to 1 1/2 pt. 1 to 1 1/2 pt. 1/2 to 1 pt. 1 to 1 1/2 pt.	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.
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**LATE SEASON CONTROL PROGRAM**

**(INSECTICIDES LISTED AT RANDOM)**

INSECTS	INSECTICIDES		AMOUNT OF SPRAY CONCENTRATE PER ACRE	REMARKS
	DUSTS	SPRAYS AND LB. OF TOXICANT PER GAL.		
Boll weevils and bollworms	A. 5% methyl parathion-10% DDT B. Low-lime calcium arsenate-1% parathion C. 10% malathion-10% DDT D. Calcium arsenate E. 10% Sevin-40% sulfur F. 2 1/2% Guthion-10% DDT	A. Methyl parathion (2 lb.) + DDT (2 lb.) B. Toxaphene-DDT (4 lb.-2 lb.) C. Malathion (5 lb.) + DDT (2 lb.) D. Sevin (85% W.P.) E. Strobane-DDT (4 lb.-2 lb.) F. Guthion <sup>1</sup> (1.5 lb.) + DDT (2 lb.)	1 to 1 1/2 qt. + 2 to 3 qt. 1 1/2 to 2 qt. 1 to 1 1/2 qt. + 2 to 3 qt. 1.8 to 2.4 lb. 1 1/2 to 2 qt. 1 1/4 pt. + 2 to 3 qt.	HOW TO CHECK FOR BOLL WEEVILS—Examine cotton weekly for boll weevils. Pull 100 squares, at least one-third grown, at random, removing a few squares at several representative places in the field. If 15 to 25% or more have weevil punctures, begin treatment. Two or more applications of insecticides are required to control weevils. Calcium arsenate dust used for boll weevil control is less effective for bollworm control than other listed materials. DURING HEAVY WEEVIL INFESTATIONS, SHORTEN INTERVALS TO 4 DAYS. WITH METHYL PARATHION AND MALATHION, SHORTEN THE INTERVAL TO 3 DAYS UNTIL CONTROL IS OBTAINED.

Where no resistance to insecticides has been encountered in controlling boll weevils, one of the following also may be used:

- |   |                                     |                                    |
|---|-------------------------------------|------------------------------------|
| A. 20% Strobane-40% sulfur              | A. Heptachlor (2 lb.) + DDT (2 lb.) | 1 pt. to 1 qt. +                   |
| B. 2 1/2% heptachlor-10% DDT-40% sulfur | B. Dieldrin (1.5 lb.) + DDT (2 lb.) | 2 to 3 qt.<br>1 1/4 pt. to 1 qt. + |

<b>bollworms</b>	<p>B. Low-lime calcium arsenate-1% parathion  C. 10% malathion-10% DDT  D. Calcium arsenate  E. 10% Sevin-40% sulfur  F. 2½% Guthion-10% DDT</p>	<p>B. Toxaphene-DDT (4 lb.-2 lb.)  C. Malathion (5 lb.) + DDT (2 lb.)  D. Sevin (85% W.P.)  E. Strobane-DDT (4 lb.-2 lb.)  F. Guthion<sup>3</sup> (1.5 lb.) + DDT (2 lb.)</p>	<p>2 to 3 qt.  1½ to 2 qt.  1 to 1½ qt. +  2 to 3 qt.  1.8 to 2.4 lb.  1½ to 2 qt.  1¼ pt. + 2 to 3 qt.</p>	<p>ton weekly for boll weevils. Pull 100 squares, at least one-third grown, at random, removing a few squares at several representative places in the field. If 15 to 25% or more have weevil punctures, begin treatment. Two or more applications of insecticides are required to control weevils.  Calcium arsenate dust used for boll weevil control is less effective for bollworm control than other listed materials. DURING HEAVY WEEVIL INFESTATIONS, SHORTEN INTERVALS TO 4 DAYS. WITH METHYL PARATHION AND MALATHION, SHORTEN THE INTERVAL TO 3 DAYS UNTIL CONTROL IS OBTAINED. Apply dusts at 10 to 15 lb. per acre at 5-day intervals. Increase dosages where heavy bollworm infestations occur. Apply sprays at 5-day intervals. In areas where pink bollworms and bollworms are a problem, use a minimum of 1½ lb. DDT per acre.</p>
Where no resistance to insecticides has been encountered in controlling boll weevils, one of the following also may be used:				
	<p>A. 20% Strobane-40% sulfur  B. 2½% heptachlor-10% DDT-40% sulfur  C. 20% toxaphene-40% sulfur  D. 2½% dieldrin-10% DDT-40% sulfur  E. 2½% endrin-40% sulfur  F. 3-10-40 mixture</p>	<p>A. Heptachlor (2 lb.) + DDT (2 lb.)  B. Dieldrin (1.5 lb.) + DDT (2 lb.)  C. Endrin (1.6 lb.)  D. 3-5 mixture (gamma BHC .9 lb.-DDT 1.5 lb.)</p>	<p>1 pt. to 1 qt. +  2 to 3 qt.  1¼ pt. to 1 qt. +  2 to 3 qt.  1½ pt. to 1 qt.  1½ to 2 qt.</p>	
<b>Bollworms</b>	<p>A. 10% DDT-40% Sulfur  B. 20% Strobane-40% sulfur  C. 2½% endrin-5% DDT-40% sulfur  D. 20% toxaphene-40% sulfur  E. 2- or 3-10-40 mixture  F. 2½% endrin-40% sulfur  G. 10% Sevin-40% sulfur</p>	<p>A. DDT (2 lb.)  B. Toxaphene-DDT (4 lb.-2 lb.)  C. Endrin (1.6 lb.) + DDT (2 lb.)  D. Endrin (1.6 lb.)  E. Sevin (85% W.P.)  F. Strobane-DDT (4 lb.-2 lb.)</p>	<p>2 to 3 qt.  1½ to 2 qt.  1¼ to 1¾ pt. +  1 pt. to 1 qt.  1 to 1¼ qt.  1.8 to 2.4 lb.  1½ to 2 qt.</p>	<p>HOW TO CHECK FOR BOLLWORMS—Examine the terminal buds (upper 3-4 in. of the 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. Apply dusts at 10 to 15 lb. per acre at 5-day intervals. Apply sprays at 5-day intervals.</p>
<b>Cotton aphids</b>	Use sprays as recommended for early season control. 1% methyl parathion, 1% parathion or 4% malathion dust may be used at 10-15 lb. per acre.			
<b>Spider mites</b>	<p>A. 2½% methyl parathion  B. 1% parathion  Apply dusts at 10-15 lb. per acre</p>	<p>A. Methyl parathion (2 lb.)  B. Parathion (2 lb.)  C. Demeton (2 lb.)</p>	<p>1 to 1½ pt.  ½ to 1 pint  ½ to 1 pint</p>	<p>Treat when leaves begin to turn yellow. Demeton or increased dosages of methyl parathion or parathion are necessary to control the two-spotted mite. Make two applications of methyl parathion or parathion at 5-day intervals. Demeton or methyl parathion or parathion may be mixed with other sprays.</p>
<b>Lygus and stink bugs</b>	<p>A. 10% DDT-75% sulfur  B. 20% toxaphene-40% sulfur  C. 3-10-40 mixture</p>	<p>A. DDT (2 lb.)  B. Toxaphene-DDT (4 lb.-2 lb.)  C. 3-5 mixture (gamma BHC .9 lb.-DDT 1.5 lb.)</p>	<p>1½ to 2 qt.  1 to 2 qt.  1½ to 2 qt.</p>	<p>When 8 to 10 bugs are found per 100 squares or young bolls, begin treatment. Apply dusts at 10-15 lb. per acre at 7 to 10-day intervals. Apply sprays at 7 to 10-day intervals.</p>
<b>Leafworms</b>	<p>A. 1% methyl parathion  B. 1% parathion  C. Low-lime calcium arsenate-1% parathion  D. 2½% Guthion  E. 4% malathion  F. Calcium arsenate  G. 10% Sevin-40% sulfur</p>	<p>A. Methyl parathion (2 lb.)  B. Parathion (2 lb.)  C. Toxaphene-DDT (4 lb.-2 lb.)  D. Guthion (1.5 lb.)  E. Malathion (5 lb.)  F. Sevin (85% W.P.)</p>	<p>½ to 1 pt.  ½ to 1 pt.  1 to 2 qt.  1¼ to 1¾ pt.  ½ to 1 pt.  1.2 to 1.5 lb.</p>	<p>Apply dusts or sprays when cotton leafworms first appear and at 5-day intervals until control is obtained. Young worms are easier to kill than old worms. The BROWN COTTON LEAFWORM can be controlled effectively with parathion (2 lb. per gal.) ½ to 1 pt., malathion (5 lb. per gal.) ½ pt. or endrin (1.6 lb. per gal.) 1¼ pt. per acre. Apply dusts at 10-15 lb. per acre.</p>
<b>Cabbage loopers</b>	<p>A. 2½% endrin-40% sulfur at 18 lb. per acre</p>	<p>A. Endrin (1.6 lb.)</p>	<p>1 to 1¼ qt.</p>	<p>Begin treatment when small worms first appear. Regular applications of toxaphene-DDT or 2-or 3-10-40 for bollworms usually prevent heavy looper damage.</p>
<b>Grasshoppers</b>	<p>A. 20% toxaphene-40% sulfur  B. 5% heptachlor-40% sulfur  C. 2½% dieldrin-40% sulfur  D. 2½% aldrin-40% sulfur</p>	<p>A. Toxaphene (6 lb.)  B. Heptachlor (2 lb.)  C. Dieldrin (1.5 lb.)  D. Aldrin (2 lb.)</p>	<p>1 to 2 qt.  1 to 2 pt.  ¾ to 1½ pt.  1 to 1½ pt.</p>	<p>Apply insecticide when damaging infestations appear. Baits are preferred for control of "jumbo" grasshoppers. (See your county agent for bait mixtures.) Apply dusts at 10 to 15 lb. per acre.</p>
<b>Pink bollworms</b>	<p>A. 10% DDT  B. 10% Sevin-40% sulfur  C. 2½% Guthion-10% DDT</p>	<p>A. DDT (2 lb.)  B. Guthion (1.5 lb.) + DDT (2 lb.)  C. Sevin (85% W.P.)</p>	<p>3 qt. to 1 gal.  1 to 2 pt. +  2 to 3 qt.  1.8 to 2.4 lb.</p>	<p>Apply DUSTS at 15 lb. per acre at 5-day intervals. Apply SPRAYS at 5-day intervals. See text for additional information and how to make infestation counts for pink bollworms.</p>

pt. = pints      qt. = quarts      gal. = gallons      lb. = pounds      W.P. = Wettable Powder

<sup>1</sup>Do not apply heptachlor and Strobane after the bolls open.

<sup>2</sup>Problems may be encountered in spraying wettable powder (Sevin) with low-volume farm sprayers; follow manufacturer's directions carefully.

<sup>3</sup>Do not make applications of Guthion at the rate of 0.25 lb. per acre within 5 days of harvest; at a higher rate, do not apply within 21 days of harvest.