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Cotton Insect Control In Arizona, 1961

The University of Arizona

Cooperative Extension Service
And
Agricultural Experiment Station

Bulletin A-2

Contents

See your local County Agent for additional information on controlling cotton insects, and for other information on agricultural and home-economics subjects. Ask for a copy of the following University of Arizona publications on cotton:

Circular 233, " Diseases of Cotton."

Circular 246, "Pick Quality Cotton."

Circular 249, "When You Buy or Build a Field Sprayer."

Circular 261, "Operating Field Dusters in Arizona."

Circular 268, "Growing Short Staple Cotton in Maricopa County."

Bulletin 275, "Growing Short Staple Cotton in Yuma County."

Circular 274, "The Pink Bollworm in Arizona."

Bulletin 283, "Chemical Control of Annual Weeds in Cotton."

Folder 75, "More $$$ for your Cotton."

Folder 82, "Sprayer Calibration."

This publication is issued by The Cooperative Extension Service and The Agricultural Experiment Station of The University of Arizona. See your local County Extension Agent for additional information.

The University of Arizona
College of Agriculture
Agricultural Extension Service
J. W. Pou, Director

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Cotton Insect Control In Arizona, 1961

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The University of Arizona

Do a Good Job of Farming

Control of cotton insects is very important to you as a grower.

But control alone will not give high yields or good quality cotton. Neither will just following good farming practices. It takes a combination of **good seed, good farming practices,** and **proper insect control** on your part.

Check the "good farming" practices listed below. Be sure they are being followed on your farm.

√ **Always prepare a good seed bed.**

√ **Use certified seed.**

√ **Treat all seed with a seed disinfectant.**

√ **Follow good planting practices.**

√ **Follow a good fertilizer program.**

√ **Follow recommended irrigation practices.**

√ **Practice good weed control in fields, on ditch banks, and along fence rows.**

√ **Set up a plan for adequate insect and disease control.**

√ **Practice proper crop rotation.**

√ **Plan for and use a good program of quality harvesting and ginning.**

√ **Destroy cotton stalks early. Plow them under with enough nitrogen so they will break down fast.**

Know Your Insects

Injurious Insects

Learn to recognize the insects which are injurious to cotton.

To check insects, use a bug net 15 inches in diameter at at least 5 points in a field. Swing the net so as to collect the insects in the tops of the plants. This sweeping method is primarily for injurious sucking insects.

Make sweeping with a bug net in early morning or late evening for all sucking insects except the black fleahopper. It is best to check for it during the middle of the day.

For chewing insects, look for and count the worms in the growing tips of the plants. See details under bollworms and other worms listed in this bulletin.

Beneficial Insects

Remember that there are beneficial as well as harmful insects in a cotton field. Learn to know these beneficial insects. Most of them are predators.

You may catch big-eyed bugs, aphis lions, Orius, nabids, assassin bugs, and several plant spiders. These feed on Lygus, stink bugs, and rapid plant bugs. They also may feed on the eggs and small stages of the cotton bollworm and other worms.

You may catch the ladybird beetle in both larval and adult stages. This insect feeds on aphids and thrips. The larvae look like tiny gila monsters.

Nearly all of these insects feed on aphids. There are other beneficial insects that you may see in field demonstrations that your County Agricultural Agent will hold in your area.

Know What You Are Doing

Do not dust or spray as a preventive measure or just because your neighbor dusts or sprays.

Apply insecticides when needed and when weather conditions are favorable. Consider other crops and beneficial insects when controlling the injurious insects.

There are many types of ground spray equipment for sale. Be sure to secure a sprayer that gives a good coverage of the plant from bottom to top at all times, and gives 40 pounds or more of pressure.

Never use spray equipment that has been used for applying 2, 4-D, or other herbicides.

Apply insecticides as recommended. But remember that rank stalks and heavy foliage need more materials than plants of open growth.

Tall rank cotton may require heavier applications than those recommended in this circular.

When applying insecticides, do not underdose.

Take Care!

Some crops may be injured by cotton insecticides. Always be careful to read and follow the precautions given below.

- **Never use sulfur in dusts when cotton is near or adjoining cantaloups or melons.**

- Never use toxaphene alone or in mixtures near or adjoining melon fields.

- **Never use any organic phosphate insecticide other than malathion on cotton next to grain sorghums.**

- In areas where cotton fields adjoin alfalfa fields or where drift is a problem read the label and use those materials that are cleared for the adjoining crops.

- **Be careful not to dust or spray apiaries. Honeybees may be injured by some insecticides, so consider your beekeeper when dusting or spraying. Notify beekeepers of your intentions to use control measures if beehives are near the fields to be sprayed or dusted.**

- If fish are present in tanks or ponds of water near areas to be controlled, be sure and not let insecticide "drift" get into the water.

- **Be careful when applying insecticides around livestock or in suburban areas. Use sprays in place of dusts if possible.**

- Heavy desert foliage, alfalfa seed or hay, and sugar beets may be a source of infestation of stink bugs, Lygus, and superb plant bugs. Also, small grains may be a source of thrips, Lygus, stink bugs, mites, and other insects.

- **Remember that desert land may have a heavy rabbit population. This may result in rabbit injury to your cotton. It is best to fence out these pests.**

- Always destroy insecticide containers as soon as they are emptied.

- **Sometimes control of sucking insects may be troublesome because of climatic conditions affecting the insecticides and continued migration from alfalfa and other crops.**

- Because most of the new organic insecticides are insoluble in water, it is not necessary that the plants be wet with dew when the insecticide is applied.

- **BE CAREFUL: Always follow directions when using insecticides. Use only recommended materials.**

- All applicators and handlers of insecticides need to follow the explicit directions on labels of materials. (See page 20 for sample.) Phosphate insecticides are very dangerous, so be sure to wear protective clothing, gloves, and respirator according to directions.

- **Atropine sulfate is an emergency antidote for most phosphate insecticides. It is obtainable only on a doctor's prescription. Call a physician in all cases of suspected poisoning.**

Control These Insects

The principal injurious cotton insects of Arizona, and their controls, are given on the following pages. These recommendations are based on research conducted by workers of The University of Arizona Agricultural Experiment Station, and the U. S. Department of Agriculture, Agricultural Research Service, Cotton Insect Division.

In Early Season

In the higher elevations of Arizona, the control of early season cotton insects is of paramount importance.

This early season control, especially for thrips and aphids, assures an early set and earlier maturity of bolls. It is a **"must"** in the higher elevations, especially during cool weather.

In the lower elevations, the control of thrips and aphids along with beet armyworms, darkling ground beetles, and cutworms should be practiced **if the insects are present.** This allows early setting of fruit and thereby helps prevent rank growth of the cotton plant.

Early control aids maturity which is good for pink bollworm control.

Seed Corn Maggots

Chewing Insects

The seed corn maggot sometimes injures cotton in the seedling stage. It is best to treat seed if a history of this insect is present in your fields.

Control

To treat seed use $2\frac{1}{8}$ ounces of 75 percent wettable lindane powder per 80 pounds of seed. Be sure it is thoroughly mixed. Or you may use 3.2 ounces of actual chlordane to 80 pounds of seed.

Another control is 1.6 ounces of dieldrin to 80 pounds of seed mixed in a slurry treatment.

Best results are secured when this is mixed with a fungicide. Treat only at planting time. See your County Agricultural Agent for specific details of seed treatment.

Cutworms

Chewing Insects

Several species of cutworms sometimes attack cotton seedlings. This is especially true where cotton follows alfalfa, grain, or vegetables.

Control

A toxaphene spray used at the rate of 2 pounds of technical toxaphene plus 1 pound of DDT in 7 gallons of water is very effective. Apply with ground equipment when injury starts to appear.

Many times a preventive spray is needed where a cutworm history is known.

Darkling Ground Beetles

Chewing Insects

Darkling ground beetles are injurious some seasons, especially when cotton follows alfalfa or grain.

Start control of darkling beetles when they start reducing the stand.

Control

Use $\frac{3}{8}$ pound of technical dieldrin as a spray in seven gallons of water. Apply only with ground sprayer.

You may also use a 0.5 pound of technical Heptachlor in 7 gallons of water.

Thrips

Rasping and Piercing Mouth Parts

Thrips cause serious injury to young seedling cotton plants. Not all fields are infested, but when thrips are present they can cause serious injury.

Cotton adjoining alfalfa, weeds or small grains may become heavily infested with migrating thrips, especially at harvest time.

Control

In the higher elevations, start thrips control when the plant is in the 2-cotyledonous stage and thrips are present in the fold of the growing tips. These fold leaves must be opened by hand to find the thrips.

Start controls when one thrips per four plants are present; or for best insurance start applications of insecticides when plants are in the above stage. Two applications at ten-day intervals give desired control.

You may use phorate (Thimet) as a granular or seed treatment if you desire.

In the lower elevations, control thrips when an average of one thrips per plant is present on seedling plants.

A 10 percent toxaphene dust plus 40 percent sulfur at 15 pounds per acre is good. As a spray use 1.5 pounds technical toxaphene per acre.

A 5 percent malathion dust applied at 15 pounds per acre is good. As a spray, use 1 pound of technical malathion in 7 gallons of water.

Or use dieldrin 2.5 percent dust at the rate of 15 pounds per acre. As a spray, use $\frac{3}{8}$ pound technical dieldrin per acre in 7 gallons of water.

Or a 2.5 percent heptachlor dust at the rate of 15 pounds per acre. As a spray use 0.5 pound of technical heptachlor in 7 gallons of water per acre. Applications are more effective with ground equipment than with airplanes. In fact, **when airplanes are used increase the dosage by 50 percent.**

Phorate (Thimet) is being used by many farmers as a seed treatment or applied as granules in the seedbed. Good control of thrips was secured in the higher elevations up to six weeks after planting with either type of application.

In seed treatment, use at the rate of one pound of technical phorate per acre. Granules should be applied at the rate of 10 pounds of 10 percent phorate per acre in the seedbed at time of planting.

Granules are applied with a special attachment for your planter. Seed treated with phorate will be injured when planted in a wet seedbed during cool weather. Granules have not injured the plants.

Phorate (Thimet) is very poisonous and should be used only when you are willing to follow the directions as written on the container.

Aphids

Sucking Insects

The cowpea aphid sometimes causes severe injury to seedling cotton plants.

Control

Controls on seedling plants usually in the higher elevations are accomplished with either a malathion or BHC spray or dust.

Use a 5 percent malathion dust or 2 percent BHC dust at 15 pounds per acre. As a spray use 0.5 pound technical malathion or 0.5 pound gamma isomer BHC in 7 gallons of water per acre.

BHC should not be used on land where root crops will be grown within five years.

Beet Armyworms

Chewing Insects

The beet armyworm feeds on the cotton plant when it is in the seedling stage. In some instances it may partially destroy the crop.

Beet armyworms are not injurious every year, as parasites and predators usually keep them under control.

Control

Start control of beet armyworms when they are reducing the cotton stand in injurious proportions. For control on mid and late season cotton see additional discussion on page 13.

Sprays are more effective than dusts. Use toxaphene, DDT, 4-2 mixture at a rate of ¾ gallon per acre. (This is equivalent to 3 pounds of technical toxaphene and 1½ pounds of DDT.)

Other controls include 15 percent toxaphene plus 5 percent DDT and 40 percent sulfur dust at 10 pounds per acre; 2.5 percent dieldrin, 10 percent DDT dust mixture, or ⅜ pound dieldrin and 1 pound DDT in 7 gallons of water as a spray.

A 2 percent BHC dust also is effective with ground equipment; also 0.5 pound heptachlor in 7 gallons of water.

Leaf Miners

Chewing Insects

Leaf miners have appeared in rather large numbers in some fields in recent seasons. The greatest injury has been on small plants.

Some injury has occurred to plants late in the season from the serpentine leaf miner.

Leaf miners occur only on cotton that is being stressed.

Use controls only when severe injury is being caused to seedlings.

Control

Best controls have been secured with a 2 percent parathion dust applied with ground equipment at 30 pounds per acre, or a spray of 0.5 to 0.75 pound of technical parathion in 10 gallons of water per acre.

In Midseason and Late Season

Lygus Bugs
Black Fleahoppers
Cotton Fleahoppers
Superb Plant Bug

Sucking Insects

Lygus bugs, black fleahoppers, superb plant bugs and cotton fleahoppers are among the most important sucking insect pests of cotton. They feed on squares and small bolls of the cotton plant.

Injury by the superb plant bug is found primarily in the higher elevation counties of the state.

Start control applications when 5 to 6 Lygus, black fleahopper and/or superb plant bugs are found in the bug net after making 100 sweepings over the tops of the cotton plants.

Make these counts at several places in the field. One method is to make one count each at five different points in a field.

Another good method early in the season is to examine plants for small black or brown blasted squares. If Lygus, black fleahoppers, or cotton fleahoppers are present these blasted squares will be present in great numbers.

These squares can be picked up in a bug net. These blasted squares indicate that an application of an insecticide should be made at least twice.

Later in the season, after July 15, punctured squares just prior to blooming are also a very good indication that Lygus bugs or black fleahoppers are causing injury. Examine or pull off and examine 25 squares at a point from several plants. If as many as 5 per 25 are punctured, multiply by 4 and you have a 20 percent infestation.

When this count is present, controls are needed at once. Counts should be made in at least five spots in a field.

In normally growing cotton up to 4.5 feet high, 50 sweeps of the insect net may be made at a point. If the cotton is tall and rank, 25 sweeps of the insect net may be made. Always base your count on 100 sweepings of the net.

Make all sweepings early in the morning or late evenings. After sweeping, look for damage caused by these insects. Check for black fleahoppers only during mid-day.

When cotton fleahoppers alone are present, start controls when you have 16 to 20 of the insects per 100 sweepings.

Control

Use a mixture of 15 percent toxaphene, 5 percent DDT and a high percentage of 325-mesh conditioned sulfur applied at the rate of 20 to 30 pounds per acre.

Or use a spray of 4 pounds of technical toxaphene plus 2 pounds of technical DDT in 7 gallons of water per acre.

Or use a 20 percent toxaphene-sulfur dust mixture applied at the rate of 25 pounds per acre. (This material has looked very good over a period of years.)

Or use 4 pounds of technical strobane plus 2 pounds of technical DDT in 7 gallons of water, or a dust mixture containing 20 percent strobane plus 10 percent DDT and 40 percent sulfur at 20 to 30 pounds per acre.

A dust mixture of 10 percent DDT plus 2 percent dieldrin plus 40 percent sulfur gives good control. A spray of 2 pounds of DDT plus $\frac{3}{8}$ pound of technical dieldrin in 7 gallons of water is also effective.

Or use a dust mixture of 2% endrin with 40% sulfur at 25 pounds per acre.

In using methyl parathion and endrin together be sure to use 0.4 pound of endrin with 0.4 pound of methyl parathion. In a dust use 1.5 percent endrin plus 1.5 percent methyl parathion.

A dust mixture of 5% dylox with 10% DDT at 25 pounds per acre, or a spray mixture of 1 pound dylox with 2 pounds toxaphene plus 2 pounds DDT.

A 5 percent malathion, plus 10 percent DDT, plus 40 percent sulfur dust mixture — or 1 pound technical malathion, plus 2 pounds of technical DDT in 7 gallons of water is effective.

A mixture of one pound of dibrom plus two pounds of DDT in 7 gallons of water has been very effective.

In areas where cotton fields adjoin alfalfa fields or where drift is a problem you may use 1 pound of dibrom per acre. This will control both Lygus and bollworm where repeated applications are used. It usually takes 3 to 5 applications to secure results.

Sevin in a formulation of 7.5 dust plus sulfur has given adequate control with repeated applications at 25 pounds per acre. The sprayable form of 2 pounds failed to control Lygus bugs and black fleahoppers.

Bollworms

Chewing Insects

The bollworm feeds on squares, blooms, and bolls of the cotton plant.

Start control of bollworms (and other chewing insects) when they start appearing in the growing tips of the cotton plant. Eggs are laid on the tender growing tips, where very small worms hatch. The worm eats its egg shell before feeding on the plant, squares, and bolls. Bollworm eggs also are laid on lower portion of the plants.

Bollworms must be controlled when the small worms first appear on the cotton plant.

In recent years, heavy parasitized and predator populations have kept bollworms in check.

Look for bollworms on 50 plants in a row. If you find 3 or 4 small worms in these counts at several points in the field, start dusting or spraying. **You cannot control large bollworms, so don't delay control measures.**

Control

A dust of 15 percent toxaphene, 10 percent DDT and a high percentage of 325-mesh conditioned sulfur will give control at a slower rate when applied at 20-30 pounds per acre per application.

A spray of 4 pounds of technical toxaphene and 2 pounds of DDT in 7 gallons of water also is effective.

A dust of 2 percent gamma isomer BHC plus 10 percent DDT and 40 percent sulfur at 20-30 pounds per acre, or a spray containing 0.5 pound gamma BHC plus 2 pounds DDT in 7 gallons of water also is effective, or a dust mixture of 2.5% dieldrin plus 10% DDT plus 40% sulfur at 20 to 30 pounds per acre.

A dieldrin spray of $\frac{3}{8}$ pound technical plus 2 pounds of technical DDT in 7 gallons of water per acre is effective.

A dust of 5 percent malathion plus 10 percent DDT plus 40 percent sulfur, or a spray of one pound of technical malathion plus 2 pounds of DDT is effective.

A dust of 7.5 percent sevin plus 40 percent sulfur also is effective at 30 pounds per acre. Sprayable sevin at the rate of 2 to 3 pounds per acre in 7 gallons of water is also effective.

One pound of technical dibrom plus two pounds of DDT in 7 gallons of water per acre is effective. Repeated applications of 1 pound of dibrom spray per acre will control bollworms in cotton adjacent to alfalfa fields where drift may be a problem.

A dust mixture of 1.5 percent endrin plus 1.5 percent methyl parathion, or a spray of 0.4 pound of methyl parathion plus 0.4 pound of endrin in 7 gallons of water is also effective.

A spray of trithion 1 pound technical, plus 2.5 pounds of DDT in 7 gallons of water is effective.

A dust mixture of 20 percent strobane plus 10 percent DDT plus 40 percent sulfur is effective. Spray formulation of 4 pounds strobane plus 2 pounds DDT is also effective. Bollworm infectations have a tendency to build up where an application of 0.4 pound methyl parathion plus 1 pound DDT is used. Research shows that DDT when used in sprays with phosphates such as methyl parathion that the DDT rate should be at least 2 pounds per acre.

Cabbage Loopers

Chewing Insects

The cabbage looper has caused considerable foliage injury to cotton plants in some seasons.

Control

Delay control for the cabbage looper until ragging of leaves occurs since a virus may give desired control.

A mixture of 3 pounds of toxaphene plus 1 pound of dibrom in a spray at 7 gallons per acre has been very effective against this insect. A spray mixture of 1 pound of dibrom plus 0.4 pound of endrin in 7 gallons of water is also effective.

A dust mixture of 15 percent toxaphene plus 5 percent DDT plus 2 percent parathion — or a mixture of 1.5 percent endrin plus 1.5 percent methyl parathion plus 40 percent sulfur — can be used at the rate of 30 pounds per acre. Or use a spray mixture of 0.5 pound methyl parathion with 0.4 endrin per acre.

A spray of 2 pounds of technical dylox plus 2 pounds DDT in 7 gallons of water is also effective.

None of the above materials will give over 75 percent control of loopers, but reduction of looper population will often allow a virus to control the loopers before any severe damage can be done.

Thiodan in a spray at 1 pound per acre is also effective.

Cotton Leaf Perforators

Chewing Insects

The cotton leaf perforator causes injury to planted cotton in mid-to-late season. Heavy infestation will retard growth for 30 days in mid-season.

Eggs hatch into small leaf miners that feed within the leaf tissues for a very short period of time. On emerging from the leaf tissue, the small larvae feed for 1½ days, then spin horseshoe webs where they remain for 2 days. The larvae feed from the web area for 2 more days and then pupate.

Due to its habits of feeding for

only short periods, the cotton leaf perforator is difficult to control. **Successful control depends upon starting controls before infestation develops to damaging numbers.** Usually two or more applications of any materials are necessary for control.

Control

Start control when underside of the leaf surface shows extensive feeding injury. Time applications so that they are made when a majority of the larvae are feeding, and not at the common "horseshoe web" stage.

Heavy infestation of the perforator will stunt the growth of cotton.

Use a spray of 4 pounds of technical toxaphene plus 2 pounds of technical DDT. Or use a spray of 1 pound of technical malathion plus 1 pound of technical DDT. Also a spray of 0.4 pound technical endrin 0.4 of methyl parathion per acre can be used. Each material should be applied in 7 gallons of water.

A dust mixture of 5 percent malathion dust plus 10 percent DDT plus 40 percent sulfur when applied at 30 to 40 pounds per acre is effective.

A dust mixture of 15 percent toxaphene plus 5 percent DDT plus 40 percent sulfur is also effective at 30 to 40 pounds per acre.

Four pounds of strobane plus 2 pounds of DDT in 7 gallons of water may be used, or a dust mixture of 20% strobane plus 10% DDT plus 40% sulfur to 20 to 30 pounds per acre.

A 7½ percent sevin dust plus 40 percent sulfur is effective. Two pounds of sevin sprayable in seven gallons of water is also effective.

Sprays of dibrom, 1 pound plus 2 pounds of DDT, or 1 pound dibrom plus 0.2 pound endrin, or dylox 1½ pounds plus 2 pounds of DDT, or 1 pound of trithion plus 2½ pounds of DDT, or 1 pound of technical dilan in 7 gallons of water are effective. Also a mixture of 0.6 pounds dilan plus 0.2 pound endrin.

Leaf Rollers

Chewing Insects

The leaf roller seems to be on the increase in the state.

Control

The control of the leaf roller is best accomplished by proper timing of applications and by heavy poundages of the insecticide being used. Start controls when sweepings of a bug net show an average of one leaf roller moth per sweep.

Early in the season a dust of either 10 percent DDT, or 15 percent toxaphene plus 5 percent DDT, with a high percentage of 325-mesh conditioned sulfur will give control. Either dust should be applied at 20 pounds per acre.

Some growers have used a 2 percent parathion with good results.

The leaf roller is difficult to control. **One application of an insecticide will not control this insect.** Three applications are necessary for control when worms are present in great numbers.

Salt Marsh Caterpillars

Chewing Insects

The salt marsh caterpillar, also known as "woolly worm" may cause some injury to cotton.

Start control of salt marsh caterpillars in August and September when white leaf flags appear on several plants over the field. Be sure that you control these insects with the recommended insecticides **at once.**

Control

Sprays containing 0.4 pound of

technical endrin plus 0.4 pound technical methyl parathion, or 1 pound dibrom technical plus 2 pounds technical DDT, or 1 pound technical trithion plus 2.5 pounds DDT, or 2 pounds technical dylox plus 2 pounds DDT in 7 gallons of water are efective.

A dust mixture of 7½ percent sevin plus 40 percent sulfur is also effective.

A spray of 0.7 pound of technical dilan is effective. Or use a sprayable sevin at the rate of 2 pounds per acre, or a dust mixture of 7.5 percent at 20 pounds per acre.

Beet Armyworms (late)

In recent years where fields were dusted several times with straight DDT and sulfur, the beet armyworm infestation developed very destructive populations. Research showed that when the population levels were at such stage the worms were feeding on terminals, squares, blooms and bolls similar to cotton bollworm.

Control

The following sprays applied by air are effective: 1.5 pounds of dylox plus 2 pounds toxaphene plus 1 pound of DDT; or 1.0 pound technical dibrom plus 0.4 pound technical endrin; or 0.9 pound dilan plus 0.3 pound endrin — all in 7 gallons of water per acre.

Two to three applications are needed when heavy infestations are present on older cotton. If the infestation is primarily on leaves, the infestations can be controlled effectively with these sprays.

Dusts did not give commercial control of these infestations.

Pink Bollworms

Chewing Insects

Farmers in regions where the pink bollworm has been found should get ready at once to combat this insect. (See Circular 274 — The Pink Bollworm in Arizona.)

Control

Follow these rules:

1. Pick cotton as clean as possible, since the larvae of pink bollworms feed in the seed.

2. If cattle or sheep are available, the fields may be pastured rather clean as a means of removing as many bolls as possible.

3. If you do not have livestock to place in the fields, start cutting the stalks with a good stalk cutter of the rotary type as soon as harvesting is completed. Best results have been secured with a flail type stalk cutter.

4. Next, plow your land. Best results have been secured when the plow is set to a depth of 12 inches or more, so that it completely turns over the soil. Repeated tests have proved that worms buried that deep are killed.

5. Follow this plowing with an irrigation that will wet the soil to a depth of 10 to 12 inches.

6. Control of other cotton pests is a big help in the control of pink bollworms.

IMPORTANT!

Under Regulation 7, Arizona Agricultural and Horticultural Commission, all cotton fields must have stalks shredded and plowed under to a depth of 4 inches or more prior to February 1, 1961 in Cochise County, Graham, Greenlee, Santa Cruz, Maricopa, Pinal, and Pima counties.

Regulation No. 4 states that no stub, soca or volunteer cotton shall be allowed to grow within the state of Arizona in 1961.

Supplement No. 4 states that in areas below 2000 feet elevation including the counties of Maricopa and Pinal, long and short staple cotton cannot be planted before April 1, 1961. Above 2000 feet elevation, including the counties of Graham, Greenlee, Cochise, Pima, Santa Cruz and Yavapai, no long staple can be planted before April 1, and no short staple before April 1, 1961.

Spider Mites

Several species of spider mites (not true insects) have appeared in cotton fields in great numbers.

Control spider mites when infestations are found in several points in a field.

Control

Demeton spray at the rate of 3 to 4 ounces of technical material in 7 gallons of water per acre is an effective control for non-resident mites.

A 3 percent aramite dust, or a spray of one pound of 25 percent aramite in 7 gallons of water per acre also may be used. **Do not spray after cotton opens.**

Kelthane 3 percent dust at 40 pounds per acre, or 1 pound of technical kelthane in 7 gallons of water per acre may be used. Ground applications are more effective than applications by airplane.

In some areas, mites have been found to be resistant to organic phosphates. In the resistant areas aramite gives best control, but more than one application is necessary. Sprays containing 1 pound of tedion, or 1 pound of kelthane in 7 gallons of water per acre, applied by ground equipment have given good control of mites in such areas.

Stink Bugs

Sucking Insects

Stink bugs often move into cotton fields near the desert. If they are controlled when first seen in injurious number (1 to 2 per 100 sweeps of the bug net) very little damage will occur.

Stink bugs cause spotted cotton since they suck the juices from bolls. Many times the yields are not reduced, but the quality is reduced along with the income.

Control

Start controls when you catch an average of 1 to 2 stink bugs per 100 sweeps of the bug net at five different points in a field.

A dust of 2 percent gamma isomer benzene hexachloride, 10 percent DDT, and a high percentage of 320-mesh conditioned sulfur will give the best control of stink bugs. Apply it at the rate of 30 pounds per acre per application.

If a spray is used, be certain to apply not less than 0.5 of a pound of gamma isomer benzene hexachloride per acre plus 2 pounds of technical DDT.

Dieldrin in a 2 percent dust plus 10 percent DDT with 40 percent sulfur when applied at 30 pounds per acre, will give control.

A dieldrin spray containing ⅜ pound of technical material plus 2 pounds of technical DDT per acre also is effective.

An alternate effective dust is a 15 percent toxaphene and 5 percent DDT and sulfur mixture applied at the rate of 30 pounds per acre.

A mixture of 4 pounds of strobane plus 2 pounds DDT in 7 gallons of water is effective.

A spray using 4 pounds of technical toxaphene plus 1 pound of technical DDT in 7 gallons of water also is effective as is 2 pounds of methyl parathion in 7 gallons of water, or 4 pounds strobane plus 2 pounds DDT.

Aphids (late)

The true cotton aphid, when appearing in mid to late season, may reduce the quality of the cotton by the presence of honeydew contaminating the lint. When aphids first appear on late cotton, or when any bolls are open, controls should start at once.

Control

Use demeton at the rate of 4 ounces, or malathion 1 pound, plus DDT 2 pounds as sprays in 7 gallons of water per acre. A dust containing 5 percent malathion plus 10 percent DDT plus 40 percent sulfur also may be used.

Cotton Leafworm

The cotton leafworm at times becomes a serious pest in Greenlee, Graham, Cochise, and parts of Pima and Santa Cruz counties. If not controlled it may destroy many squares and defoliate plants, thus reducing yields.

Control

Controls should be started when insects appear rather uniformly over the field.

Good results have been obtained with a dust mixture of 15 percent toxaphene and 5 percent DDT plus 40 percent sulfur applied at 30 pounds per acre.

A dust mixture of 2 percent gamma isomer BHC and 10 percent DDT plus sulfur also has been very effective.

If a spray is desired, use 3 pounds of technical toxaphene plus 1 pound of DDT in 7 gallons of water.

If BHC spray is used, apply 0.5 pound gamma isomer BHC plus 2 pounds of DDT in 7 gallons of water.

Whiteflies

Whitefly adults and nymphs have caused considerable alarm in recent years in Arizona.

Control

Best control is to forget about these insects! If you are unduly alarmed, you can use 25 pounds of 5 percent malathion dust per acre.

Presence of whiteflies is a symptom of stress, possibly a lack of water.

Airplane Application of Insecticides

To Farmers

Control of insects is big business. Why not treat it in that manner?

You are paying the crop duster to dust or spray your crop, so see that it is done correctly.

Before dusting or spraying be sure this activity will not affect livestock, livestock crops, bees, or dwellings nearby.

DO THESE:

When applying insecticides by airplane, be sure to do the following:

1. Furnish competent flagmen in the field.

2. Furnish one person at the flying strip to insure proper loading.

3. Have pre-arranged signal with airplane and ground crew, and flag the airplane out if the insecticide is not being applied correctly and on the right fields.

4. Become familiar with the Arizona Aircraft Applicators Law.

5. **Destroy all containers immediately after emptying.**

To Airplane Applicators

Your job is to apply insecticides under best weather conditions. Know the hazards of the insecticides you are applying.

Remember that you are working for the farmer. The insecticide is his. The crop is his. So make the application under his direction and not just the way you desire.

DO THESE THINGS:

1. Have one man to assist the farmer's worker at the loading field.

2. Be sure to know the location of the field and the insecticide you are to apply.

3. Always follow the flagman. Have pre-arranged signals and if he flags to stop dusting or spraying, follow his request. He is paying for the service you are giving.

4. Do not make swaths wider than the power of your plane will cover. Usually a swath by a 450 HP motored plane should not be over 50 feet in width for dust, and 35 feet in width for sprays.

5. Become familiar with the Arizona Aircraft-Applicators Law.

6. **Destroy all containers immediately after emptying.**

7. As an airplane pilot or loader, follow directions explicitly, especially when using phosphate insecticides.

In many areas, the farmers and applicators sign contracts. Crop dusting or spraying is a business proposition; So why not follow business procedures?

Progress Report on 1960 Research With Some New Insecticides

Shell 4402

Shell 4402 at the rate of 30 pounds of a 1 percent dust or 0.4 pound per acre in a spray controlled Lygus bugs, black fleahoppers, cotton leaf perforators and bollworms.

Dimethoate

Dimethoate at the rate of 0.6 pound per acre in a spray gave effective control of Lygus bugs, black fleahoppers and cotton leaf perforators. It, however, did not control the salt marsh caterpillar and induced a bollworm infestation. It did not control the cabbage looper.

Diazanon

Diazanon at the rate of 0.5 pound per acre controlled Lygus bugs, black fleahoppers and salt marsh caterpillars. When this material was used alone, bollworm infestations developed. These were controlled by the addition of 2 pounds of DDT.

Bacillus Thuringiensis

A dust containing 1 billion spores per gram count was applied at the rate of 50 pounds per acre and gave excellent control of salt marsh caterpillar.

Another formulation containing 3 billion spores per gram and applied at 30 pounds per acre was also effective.

This material is very slow acting as it requires about seven days to reach maximum effectivenes.

In scheduled applications of this material, beet armyworms and bollworms built to destructive numbers.

Sevin

At Yuma, 7-10 day applications of sprayable sevin at the rate of 2 pounds per acre induced a severe infestation of spider mites. Yields were reduced greatly due to mites.

Natural Control

A new fungus disease for Arizona on salt marsh caterpillar was found on these insects in October 1959 and again in 1960. This disease, known as Entomopthora Aulicae (Reich), attacks salt marsh caterpillars and can destroy them.

In Coolidge and parts of the Salt River Valley, research workers found the insect being controlled by this disease. It seems to be very effective for control of salt marsh caterpillars where humidity is very high.

In the Stanfield area of Pinal county, collops beetles helped control the beet armyworm by destroying egg masses in their feeding.

Dilan

Dilan, when used as a spray containing 1.25 pounds per acre, gave effective control of Lygus bugs. A combination of 0.6 pound dilan plus 0.2 pound of endrin per acre gave effective bollworm control.

Thiodan

Thiodan as a spray of 1 pound per acre gave control of the cotton leaf perforator, but failed to control the Lygus bug.

Trade names used in this bulletin do not endorse products named nor imply criticism of similar ones not mentioned.

☛ Read the Label!

Read the reproduction of an actual label on page 20. **Always follow directions for safe use of insecticides.**

Note the term "active ingredients" on the label. It means the amount of **technical material** in each 100 pounds, or if liquid, the amount in each gallon of the concetrate material.

Be careful at all times! Read the label before using ANY insecticide.

Read the Label

BRAND

P. 2

(A DUST CONTAINING PARATHION)

Active Ingredients:

Parathion*	2.0%
INERT INGREDIENTS	98.0%
	100.0%

*O, O-diethyl O-p-nitrophenyl thiophosphate

Warning. EXTREMELY POISONOUS If swallowed or inhaled or absorbed through the skin.

Rapidly absorbed through the skin.

Wear protective gloves, clothing and goggles.

Do not breathe dust or spray.

Wear a respirator or mask of a type passed by the U.S. Dept. of Agriculture for parthion protection.

Keep away from feed or food products.

Wash hands, arms and face after handling and before eating or smoking.

Keep all persons out of the operating area or vicinity where there may be danger of drift. Vacated areas should not be re-entered until drifting insecticides and volatile residues have dissipated.

Poison

First Aid Treatment: Call a physician immediately. Until he arrives, follow the directions here given.

INTERNAL: If swallowed, make patient vomit by giving warm salt water or soapy water. Administer milk or water freely. Have patient lie down and keep warm. Never give anything by mouth to an unconscious patient.

SKIN: Immediately remove all contaminated clothing and flush skin with water for at least 15 minutes.

EYES: Immediately flush with water for at least 15 minutes.

NOTE TO PHYSICIANS ONLY: Therapeutic doses of atropine appear to be effective as an antidote.)

SUGGESTIONS FOR DUSTING

Almonds Walnuts	Aphid and Spider Mites	Apply 20 to 40 lbs. per acre, not later than 30 days before crop to be picked
VEGETABLES OR CROPS GROWN FOR SEED*		
Broccoli Brussel Sprouts Cabbage Cauliflower	Aphids	Apply 20 to 40 lbs. per acre, not more than two applications. Do not apply after the heads begin to form or within 30 days of harvest, whichever is earliest.
*Restrictions not applicable to crops grown for seed.		
Onions	Thrips	Apply 20 to 40 lbs. per acre, one or two dustings, not later than 30 days before harvest.
Peas	Ahpids	Apply 15 to 30 lbs. per acre. Do not apply after bloom.

Consult your local Agricultural Authorities or State Experiment Station for recommendations as to timing and number of applications.

NET WEIGHT 50 LBS.

NOTICE TO USER: Chemical mixtures strong enough to be effective against insects involve the possibility of injury or damage to other animal or plant life with which they come in contact. Climatic, soil and other conditions beyond the manufacturers control, moreover, will necessarily affect results in the use of this material. The manufacturer, therefore, makes no claims, representations or warranties, express or implied, as to the results to be obtained from the use of this material and will not be responsible for any damage to persons, crops, soil or other property arising from its use. The manufacturers only claim, representation or warranty is that the material conforms in content to the description on the label.

CARE SHOULD BE TAKEN TO REMOVE RESIDUE AT HARVEST TIME