# 7 Steps to EFFICIENT COTTON PRODUCTION

# Foreword

Cotton is one of the three major cash crops in North Carolina. Normally it brings in an income of approximately one hundred million dollars per year. With acreage control during 1950, competition from synthetic fibers, and other major post-war adjustments, the question naturally arises as to just what is the future of cotton in the economy of North Carolina.

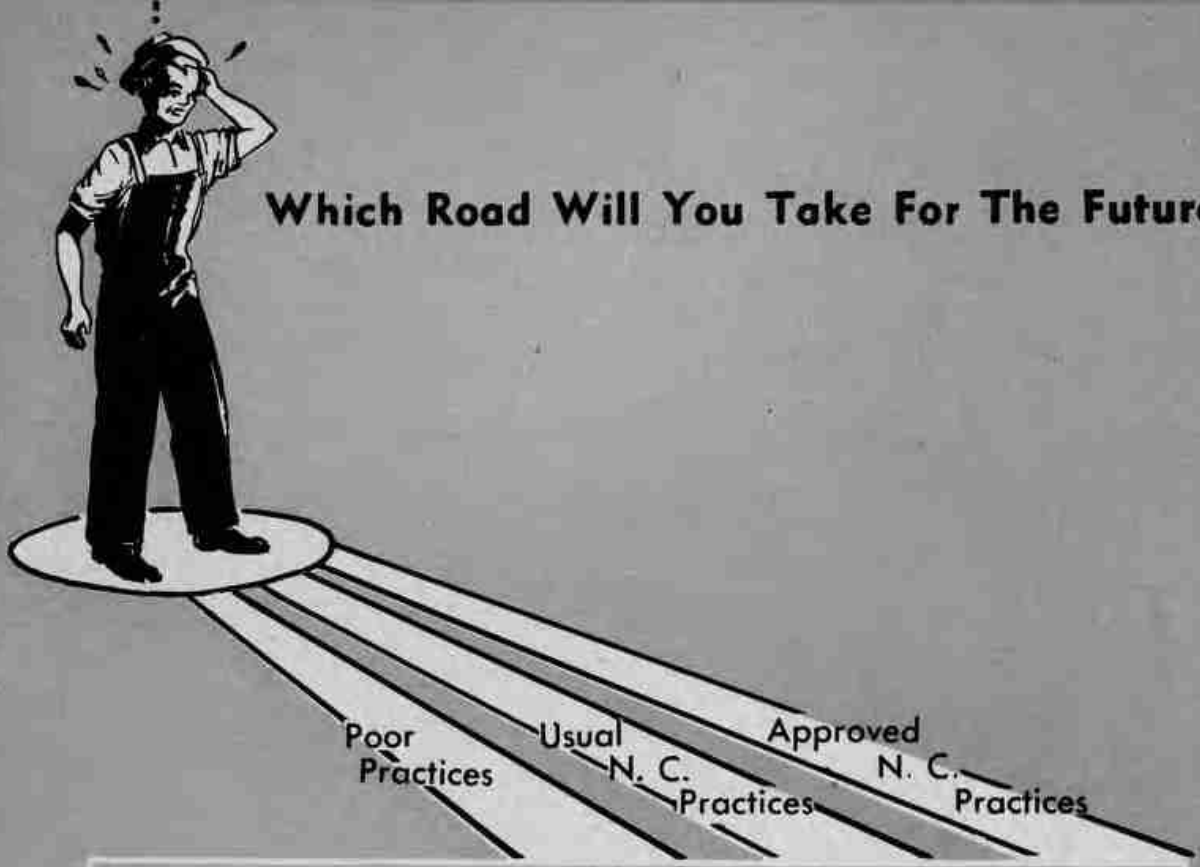
With the continuation of present conditions, it would appear that the price of cotton is practically fixed at approximately parity or perhaps slightly below. With the probability of an actual ten to fifteen percent reduction in planted acres, our only hope of maintaining an income of one hundred million dollars for this crop is through an increase in production per acre.

The factual information presented in this publication shows that it is possible for cotton farmers to increase income from cotton by thirty-five to fifty percent with a minimum increase in cost. This would more than offset any lost income due to acreage reduction.

No single practice will do the job, but by following a complete production program such as using good treated seed, planting and cultivating properly, using the proper amount of fertilizer and applying it at the right time, following a complete insect control schedule, and marketing the crop efficiently will very materially increase the yield and the profit. The future of cotton production in North Carolina will be determined largely by finding ways to reduce labor costs, and producing a high quality product which is in the most demand, together with increased efficiency in all phases of cotton production. These factors will determine whether or not cotton will remain one of the major crops in North Carolina. The recommended practices outlined in this publication deserve your careful consideration.

I. O. Schaub,

Director




| Items | ½[1] Bale Per Acre | 1[1] Bale Per Acre | 1½[1] Bale Per Acre |
|---|---|---|---|
| **Costs** | | | |
| Seed | $ 2.25 | $ 2.48 | $ 2.48 |
| Fertilizer | 6.00 | 10.00 | 14.00 |
| Side Dressing | .00 | 4.39 | 8.24 |
| Poison | .00 | 6.25 | 12.12 |
| Hauling to gin | .75 | 1.50 | 2.25 |
| Ginning | 4.06 | 8.11 | 12.17 |
| Man Labor: | | | |
| Harvest | 18.72 | 37.44 | 56.16 |
| Other | 17.96 | 25.38 | 15.16[2] |
| Mule labor | 3.20 | 4.80 | 5.62 |
| Tractor | 1.93 | 1.93 | 1.93 |
| Equipment | 2.15 | 2.15 | 2.15 |
| Total | $57.02 | $104.43 | $132.28 |
| **Receipts** | | | |
| Lint | $72.96 | $145.92 | $218.89 |
| Seed | 8.95 | 17.90 | 26.86 |
| Total | $81.91 | $163.82 | $245.75 |
| Net returns (land, buildings, management) | $24.89 | $ 59.39 | $113.47 |

[1] Land used in these calculations is assumed to be of the same physical makeup.

[2] This assumes use of mule weeder which reduces man hours for hand chopping.

This table is based on estimated per acre costs and returns in cotton production with partial mechanization, North Carolina, 1949.

# 7 STEPS TO EFFICIENT COTTON PRODUCTION

1. Plant Recommended Seed.
2. Lime and Fertilize as Needed.
3. Distribute the Fertilizer Properly.
4. Mechanize Planting and Cultivation.
5. Apply Sidedressing According to Need.
6. Follow Complete Insect Control Program.
7. Sell Cotton on Grade and Staple Value.

## 1. Plant Recommended Seed

Plant Coker 100 Wilt variety of cotton. Use chemically treated seed. Do not use or chemically treat seed that germinate less than 80 per cent, or seed that are over two years from breeder. Treating planting seed insures better stands and stronger plants.

**Reginned Seed**—Dust with 4 oz. of New Improved Ceresan, Ceresan M, or Dow 9B, or 8 oz. of 2 percent Ceresan per 100 lb. of seed. Applying the chemical as a slurry gives equally good results.

**Acid Delinted Seed**—Dust with 3 ounces of New Improved Ceresan, Ceresan M, or Dow 9B, or 6 ounces of 2 percent Ceresan per 100 lb. of seed. Delinted seed cannot endure excessive moisture, or cold wet soil conditions as well as reginned seed. However, acid delinted seed will drop more uniformly than reginned seed, and reginned seed will drop more uniformly than fuzzy seed.

Plant as soon as danger of cold weather is past. An early crop is desirable under boll weevil conditions. Use 32 to 36 inch rows. Where tractor cultivation is used or on land producing heavy foliage, it may be desirable to increase row width to 40 inches.

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This bulletin was prepared by J. A. Shanklin, Extension cotton specialist, in cooperation with W. L. Nelson, professor of agronomy, N. C. Experiment Station; George D. Jones, in charge, Extension entomology, and others.

**Hill Dropping Desirable**—Use 4 to 6 seed per hill, 12 inches apart on light to medium soils; 5 to 7 seeds per hill on heavier soils. Sixteen to 20 pounds of seed per acre is needed with 3 foot rows.

**Sowing in the Row**—This method requires more seed and more chopping than hill dropping. Under unfavorable conditions, sowing may assure a better stand. Plant about 12 seed per foot of row. This will require about 6 pecks per acre with a 3 foot row.

Thin, if necessary, when plants have 4 to 6 leaves per stalk, and when danger of dying is past. Leave 3 to 4 plants per foot of row for a final stand of 30,000 to 40,000 stalks per acre. Do not destroy a good stand by chopping.

## 2. Lime and Fertilize as Needed

a. **Apply Lime if Needed**—Keep your soil at pH 6.0 to 6.5 for best cotton production. Send a sample of soil to the Soil Testing Division, N. C. Department of Agriculture, Raleigh, N. C. Lime as recommended, at least two months before planting.

b. **Adapt Your Fertilizer at Planting to Your Crop Rotation and Soil Conditions**—Use 500 to 700 pounds of fertilizer per acre in the Coastal Plain, 600 to 800 pounds in the Piedmont area. Fertilize according to soil test or as suggested below.

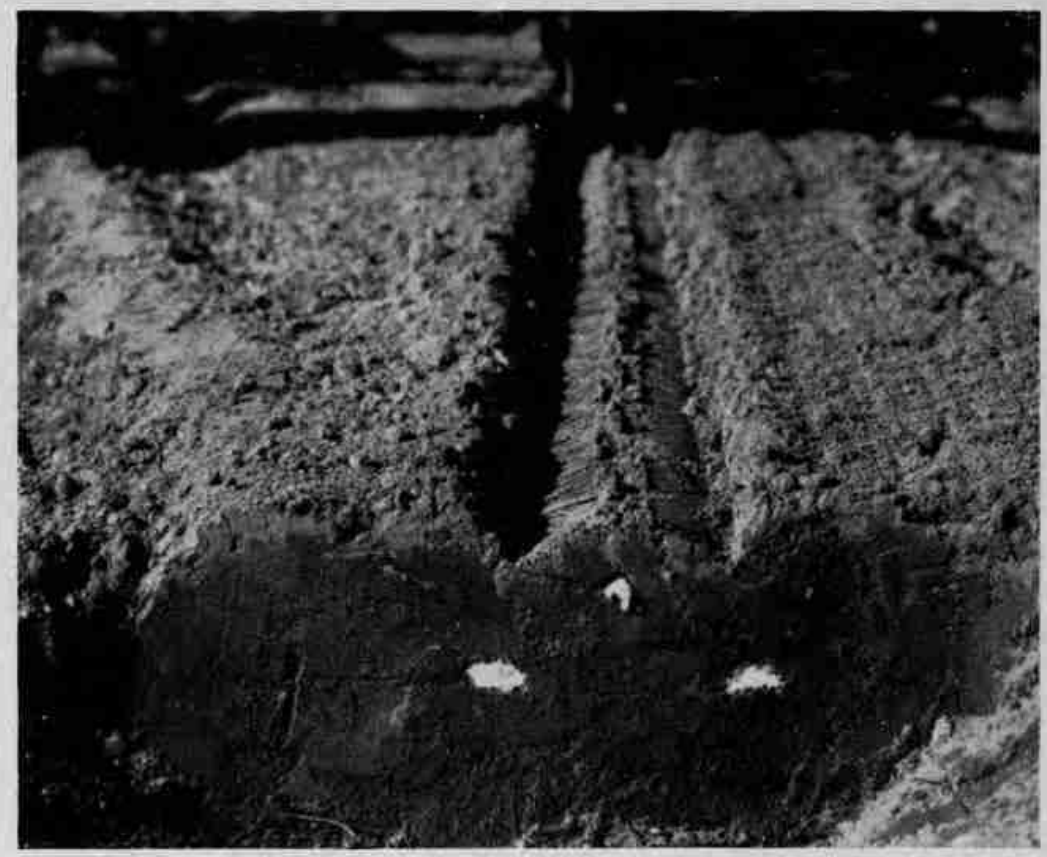
| | | Coastal Plain 500-700 lbs./A of | Piedmont 600-800 lbs./A of |
|---|---|---|---|
| 1. | In rotation with non-legume crops | 5-10-5 or 4-10-6 | 4-12-4 |
| 2. | In rotation with legumes for hay, peanuts or on potash deficient soils | 5-10-10 | 4-12-8 or 5-10-10 |
| 3. | In rotation with legumes for seed or turned, or on soils of high organic matter | 3-9-9 | 3-12-6 |

## 3. Distribute Fertilizer Properly

Proper placement prevents injury from fertilizer and results in better stands. For efficient use of fertilizers, it is essential to prevent seed and root injury. Results from the North Carolina Experiment Station over a 9 year period show an average yield increase of 17 percent in favor of side-placement.

**Side Placement Is Recommended**—Place the fertilizer 3 inches to one or both sides of the seed and 2 inches below the level of the seed.

Fertilizer attachments are available for tractor equipment which will place the fertilizer in either one or two bands to the side and below the level of the seed. Such equipment should be carefully set up and checked to assure correct placement of fertilizer.



**A cross section of a cotton row showing the proper placement of fertilizer in bands, 3" to the side and 2" below the seed. (Photo by G. A. Curtis, Bureau of Plant Industry, USDA, Beltsville, Md.)**

**Mix Fertilizer with Soil**—Where side-placement equipment is not available, mix the fertilizer with the soil in the row and bed on the fertilizer. This should be done about 10 days before planting.

## 4. Mechanize Planting and Cultivation

Tractor-mounted planting and cultivating equipment makes a substantial saving in both time and labor. A two-row tractor is preferred where the acreage will justify the investment. Tractor planters and cultivators should be carefully set up and aligned on a level floor. High speed sweeps set with wing tips not more than ½ inch higher than the point and operated shallowly permit high speed cultivation with minimum damage to cotton roots. By careful

**A two-row, tractor-mounted planter, with fertilizer attachments for band placement and row marker. This machine can plant 2 acres per hour.**

adjustment and operation, ridges can be kept more nearly flat so that cotton may be "dirted" throughout the cultivating season. Cultivation should always be shallow and should only be frequent enough to control grass and weeds.

**A two-row tractor, equipped with rotary hoe attachments, cultivating small cotton at 5 m.p.h.**

Rotary hoes of either the broadcast or cultivator attachment types are excellent implements for breaking a crust before plants emerge and for closely cultivating small cotton at speeds of 3½ to 5 m.p.h. For best results a rotary hoe should not be operated at less than 3½ m.p.h.

The cultivator attachment type rotary hoe works very well as a fender (shield) to prevent covering cotton; doing shallow scratch cultivation in and around the small plants; and gently sifting the soil from the side sweeps around the plants.

The first two of three cultivations may be done with very little plant damage by the use of rotary hoes and various sweep combinations. Timely cultivations with rotary hoes, while grass is still in the hair stage of growth, will eliminate much hoeing.

A smoothly harrowed, well prepared field, with old crop residue finely cut and turned under, makes the planting operation easier. A uniform, well prepared seed bed makes it possible to cultivate with less damage to plants. This results in a more uniform stand which eliminates much of the hand labor required in production.

## 5. Apply Sidedressing According to Needs

The fertilizer at planting plus sidedressing should supply about 60 pounds of nitrogen (N) for average soils. Leaf shedding, due to nitrogen or potash deficiency, reduces the yield and quality of lint.

Select combinations of materials most economical for your conditions. Example: 600 pounds of 4-10-6 = 24 lbs. N (600 × 4%N), 60 — 24 = 36 pounds to be supplied. The additional 36 pounds of N can be supplied by:

85 pounds Uramon (42% N)
110 pounds Ammonium Nitrate (33% N)
180 pounds Calnitro or ANL (20.5% N)
225 pounds Nitrate of Soda (16% N)

Reduce or omit the amount of sidedressing on dark soils or on soils where the crop follows legumes. Increase the amount of sidedressing on very sandy soils.

Where additional potash is needed, mix 50 to 100 pounds of muriate of potash with the nitrogen sidedressing.

**Good insect control is essential in obtaining profitable returns from high fertilization.**

## NITROGEN DEFICIENCY

The entire leaf first becomes light green in color. The leaf then turns yellow and red, and shedding occurs, starting first with the lower leaves. This deficiency is often seen by early August. Early leaf shedding reduces yield since the leaves manufacture the material which make up the lint.

## PHOSPHORUS DEFICIENCY

The plants are small in size and the leaves very dark green in color. This deficiency is difficult to identify unless cotton receiving higher rates of phosphorus fertilizer is available for comparison. Phosphorus deficiency causes delayed fruiting—a very serious trouble when boll weevil damage is severe.

## POTASH DEFICIENCY

Yellowing occurs between the veins on the leaves and yellow spots appear, particularly near the tip and edge. The tip and edge finally turn yellow, curl downward and become brown in color, followed by leaf shedding. As in the case of nitrogen deficiency, early leaf shedding, due to potash deficiency, decreases yields.

### DEFOLIATION OR FORCED LEAF SHEDDING

Defoliation is recommended on heavy foliage cotton where there is danger of boll rot or where it is desirable to hasten maturity for early picking. Cotton can be forced to shed the leaves early by dusting with 20 to 40 pounds of cyanamid in the dust form.

This material should be applied when the last bolls expected to mature are at least 30 days old. The dust can be applied by airplane or by any other equipment suitable for dusting.

## 6. Follow Complete Insect Control Program

Cotton, like most all crops, has insect enemies which can cause serious harm. During 1949, the boll weevil spread across the state and caused serious losses. Some growers suffered total loss; thereby, losing their seed, fertilizer and labor. Many farmers had no equipment for applying insecticides. Treatment was often too late and weather factors prevented others from maintaining proper coverage. Boll weevils probably cost growers 25 million dollars in 1949. The weather favored development of the pest and caused weevils to reach their greatest numbers since 1923. Thrips, plant lice, the boll worm, and red spiders, are also pests that can build up in numbers and cause damage.

### CONTROL PROGRAM

Many factors enter into a complete control program. Lack of equipment, poor application of insecticides, and improper timing of treatments can affect control work. Rainy conditions can favor increase in development of the pest and excessive rains can wash off the insecticide making it necessary to repeat within 24 to 48 hours. On the other hand, temperatures of about 10° F above zero, will kill many overwintering weevils, and thus reduce early season damage. Migration of weevils during the latter part of the season may make it necessary to apply materials to protect late bolls. Little can be done to change many of the factors mentioned above, but growers can plan operations, study seasonal developments and survey reports, and apply insecticides at the best possible time.

## Use of Poisons

Calcium arsenate cannot be used in many parts of the state because of light soils. Mopping the plants with the molasses-calcium arsenate mixture as a pre-square insect control program requires too much labor to justify its use. More effective insecticides are available now. They will kill by contact as well as when eaten. Several applications of poisons may be necessary when the infestation is high. (Study the table on inside back cover as no one program will be suitable for all conditions.)

## Timing of Applications

The movement of boll weevils from wintering quarters usually continues for several weeks. Some weevils appear while the cotton is small. Others will not show up until ofter the first squares appear. The use of a few early planted rows as a trap crop to attract the first weevils may be helpful. Too, especially in the upper Piedmont and northern part of the state, spot dusting of localized infestations may be practiced. For high yields one must protect both early and late bolls. During some seasons the late cotton is seriously damaged by second brood migrating weevils. During 1949 from three to seven applications on the average were necessary for yields giving about a bale of cottton per acre. Best control was obtained when the treatments were started just after the first squares appeared about June 15 in southern counties and continued into late August with 2 to 3 late applications being made in the worst infested areas. Your county agent can advise regarding seasonal developments and weevil conditions. Statewide surveys will be made throughout the season.

## Application of Materials and Equipment

While most of the recommended insecticides in dust form can be purchased as a spray emulsifiable concentrate, dusts will no doubt be used generally. If sprays are used they should contain the same amount of insecticide per acre as in dusts. While sprays can be applied as a rule during the day, other factors must be considered. Location of water and time required to re-fill the spray tank may be a factor on some farms. Spray equipment is fairly expensive and it must be mounted properly on a tractor if it is to give good service. Nozzle arrangement per row is very important. Three nozzles per row are considered best for treatment of mature cotton. One nozzle per row will be sufficient for treatment when plants are small. Wheel guards or special shields may be used to protect

# BOLL WEEVIL


Cotton plant showing *a*, punctured squares on ground; *b*, square showing egg puncture; *c*, larva in square; *d*, pupa in square; *e*, adult emerging from square; *f*, larva and pupa in boll; *g*, adult. (Punctured squares on ground about one-fourth actual size, adult about 6 times actual size. other stages actual size.

(See other side for life history and control)

Picture Sheet No. 15

Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, United States Department of Agriculture

# Boll Weevil

(*Anthonomus grandis* Boh.)

## Life History and Injury

Boll weevils pass the winter as adults in weeds, grass, woods trash, or other protected places near cottonfields. They leave winter quarters and return to cottonfields in the spring when the weather is warm enough for cotton to grow, and they remain there until frost. Boll weevils prefer to feed on and to lay their eggs in squares, but they also attack bolls. Eggs are laid singly in deep punctures made within the squares or bolls, and after 3 to 5 days they hatch into white larvae, or grubs. The grubs feed for 7 to 14 days and then change into pupae within the squares or bolls. The adults emerge from the pupae in 3 to 5 days and cut their way out. After feeding on blooms, squares, or bolls for 3 to 4 days, the females are ready to lay eggs. The complete life cycle from egg to adult weevil requires about 3 weeks when temperatures are high, and there might be seven or eight generations a season.

The leaflike bracts at the base of the punctured squares open up or flare, and the square turns yellow and dies. Most of the punctured squares and small bolls are shed, but some remain hanging to the plants. Large punctured bolls are not shed, but the lock in which a grub feeds fails to develop properly, and the lint is cut, stained brown, and decayed. When several weevil grubs develop within a boll, as often occurs, the entire boll is ruined.

**Grateful acknowledgement and thanks is made to the Clemson College Agricultural Extension Service for use of the color engravings on the opposite page.**

plants when applying insecticides. No general recommendation can be given for spray mixtures at present.

Airplane applications have proved satisfactory when the proper interval between treatments have been maintained and when proper distribution of the insecticides was carried out. The swath width should be no greater than the wing span. Some poor results have been reported. Careful planning and study of each field should be made as many fields are too small, and trees or electric lines may present serious hazards.

**CAUTION:** The newer organic insecticides in use today are more efficient than some of the ones used formerly. Users and handlers should observe strict precautions at all times. When used properly they do not present a hazard to man, animals or plants.

Do not use more than the recommended amount of the insecticides, and avoid applying the materials so the wind drift will carry the poisons into ponds, or streams, or on crops and pastures.

Avoid working in dust or spray during application. Wear a respirator whenever prolonged exposure is necessary.

Persons working with insecticides day after day should study the labels on the containers, know the first aid measures suggested, and be prepared to provide treatment in case of any emergency caused by an accident, broken hose, or other conditions. Soap and water and an extra change of clean clothing should be provided for those engaged in continual work. All loading and mixing should be done in the open. Use rubber-coated gloves when handling the materials and avoid all unnecessary skin contact. In case liquid concentrates are spilled on the skin or clothing, immediately remove clothing and bathe affected parts with soap and water. Call a physician if any complications develop.

Burn all empty containers and bury the ashes or cover them with soil in a place where drainage will not contaminate drinking water.

## 7. Sell Cotton on Grade and Staple Value

To assure full value of your cotton do not take your cotton to the gin when it is green or wet. Always patronize a gin equipped with modern ginning equipment.

Every bale of cotton offered for sale should be properly classed before selling. The Smith-Doxey free classing service is offered through the county agent. Ask the ginner to submit samples of your cotton for free classification. A card showing the grade, staple, gin preparation, and government support value of each bale of cotton classed will be returned to the grower.

# RECOMMENDATIONS FOR THE CONTROL OF COTTON INSECTS

| Insects | Insecticides | Application |
|---|---|---|
| 1. Boll Weevil | 3% gamma BHC[1]—5% DDT | Where weevils are a problem each year make 3 applications, 6-8 lb. per acre, at 5-7 day interval starting when squaring begins; watch conditions and if infestation rises to 10% make 2 or 3 additional applications using 10-15 lb. per acre at 5 day intervals. |
| | or | |
| | 20% Toxaphene | Same as above |
| | or | |
| | 10% Chlordane, 5% DDT[2] | Same as above |
| 2. Aphid (Plant louse) | 3% gamma BHC—5% DDT | 10 lb. per acre, at 5 day intervals, for heavy infestation. Usually one application will bring pests under control. May need to be applied very early. Treatment for boll weevil should hold population in check. |
| 3. Thrips, Fleahopper, and Plant Bugs | 3% gamma BHC—5% DDT | 10 lb. per acre, as necessary (control usually achieved when dusting for other insects.) |
| | or | |
| | 20% Toxaphene | Same as above |
| | or | |
| | 5% DDT | Same as above |
| 4. Bollworm | 3% gamma BHC—5% DDT | 8-10 lb. per acre, at 5 day intervals, when 4-5 worms found per 100 terminals. |
| | or | |
| | 20% Toxaphene | Same as above |
| 5. Red Spider | Sulphur | 20 lb. per acre in case of outbreak (control usually achieved where sulphur is included with BHC, Toxaphene or Chlorodane. |
| 6. Leafworm | 3% gamma BHC—5% DDT | 10 lb. per acre, as necessary (control usually achieved when dusting for other insects.) |
| | or | |
| | 20% Toxaphene | Same as above |

*[1] Technical grade benzene hexachloride containing 8% of the gamma isomer*
*[2] Experimental results have been variable. In some areas results have been quite effective.*

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