

Control of Cotton Insects and Diseases

COTTON is often seriously damaged by such insects as the boll weevil, leaf worm, flea hopper, red spider, and boll worm, and by such diseases as rust, wilt, and anthracnose. It is the purpose of this leaflet to discuss briefly the habits and appearances of some of these pests and to give control measures for them.

COTTON INSECTS

Boll Weevil

The boll weevil is the most widely known and the most important insect pest of cotton. The females puncture the squares and deposit their eggs in them; later in the season they also deposit eggs in the bolls. The larvae (grubs) which emerge from the eggs feed in the squares causing them to turn yellow, flare open, and usually drop from the stalk. Infested bolls usually do not drop but fail to produce a full boll of cotton. The yield of cotton may be reduced 50 to 75 per cent if weevils are very numerous at the time the crop is being set.

How to Dust Cotton.—Although such cultural practices as the liberal use of fertilizers, the growing of small, early maturing varieties, and the destruction of all cotton stalks early in the fall are helpful in controlling the boll weevil, it is often necessary to dust cotton with calcium arsenate to prevent serious damage. When dusting is necessary, the calcium arsenate should be applied with a dust gun at the rate of 5 to 6 pounds per acre. The distributors of the dust gun should be set a few inches above the tops of the cotton plants and the dust gun should be adjusted to put out the dust in a thin cloud which completely covers the plants. Cotton may be dusted with good results at any time during the day or night, provided the air is calm. If a heavy rain occurs within 24 hours after dusting the application should be repeated.

When to Dust.—The most difficult problem in controlling the boll weevil is that of knowing when to dust and when not to dust the cotton. In general it is profitable to dust cotton only when the expected yield is one-half bale or more per acre, when boll weevils are numerous during the fruiting season, and when the price of cotton is ten cents a pound or above. If sufficient fertilizer has been used to produce one-half bale per acre and cotton is approxi-

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mately ten cents a pound, the problem then becomes one of determining whether or not weevils are numerous enough to warrant dusting with calcium arsenate.

The only way to know whether or not boll weevils are numerous enough to warrant dusting is to make infestation counts of the squares. In making these counts 100 squares are examined in each of several places in a field. Stalks of cotton are selected at random and each square is examined for punctures (Fig. 1) before counting is begun on a new one; squares on the ground are not counted. The number of punctured squares among 100 examined is the per cent infestation at a given place.

Infestation counts are begun as soon as the cotton is squaring freely and are made at weekly intervals until the average per cent infestation in a field reaches 10 per cent or above. Three applications of calcium arsenate are then made at intervals of four to six days. Following this series of dustings, infestation counts are again made each week and an additional dusting is made whenever needed to keep the infestation below 20 per cent. This method of determining infestation and applying calcium arsenate is continued until the crop is set. If weevils are numerous late in the season when the squares are becoming scarce but before many of the bolls are mature, one or two applications of calcium arsenate may be made to protect the young bolls.

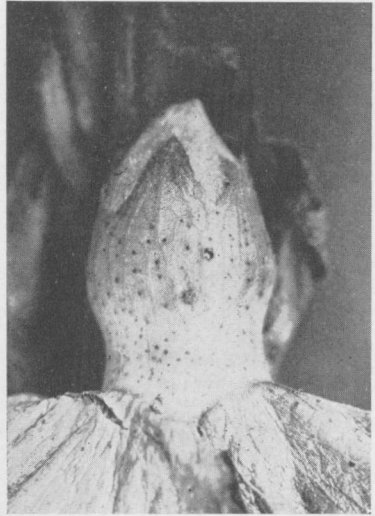


FIGURE 1.—Punctured Square of Cotton (enlarged about 3 times). This square contains two punctures.

Kind of Dust Gun to Use.—The kind of dust gun needed will depend upon the amount of cotton to be dusted. An ordinary one-row hand gun, selling for about \$15, is satisfactory for dusting 3 to 5 acres of cotton. A mule drawn two-row or four-row dust gun, however, is more satisfactory for the average farmer. Such a dust gun may be purchased through the Farm Bureau or elsewhere at prices ranging from \$40 to \$70 each, depending upon the make and the type of the gun. A four-row dust gun usually differs from a two-row gun only in the number of distributors for the dust; the dusting machinery proper is the same. The cost of the four-row gun is \$5 to \$10 more than that of the two-row gun. Several factors, such as the abundance of rainfall and the presence or absence of numerous short rows in a field, will affect the acreage that may be dusted with any dust gun. In general, however, a

two-row gun will dust 20 to 30 acres of cotton and a four-row gun, 40 to 60 acres throughout the season.

Amount of Calcium Arsenate Needed.—The total amount of calcium arsenate required to dust an acre of cotton varies greatly from year to year. The largest amount ever used during a season in experiments at Auburn was 75 pounds per acre; the average amount was approximately 40 pounds. It is suggested, therefore, that 40 pounds of calcium arsenate be purchased in the spring for each acre of cotton to be dusted. If part of the dust is not needed, it may be stored in a dry place and used later. Calcium arsenate, stored in the tightly closed steel drums in which it is purchased, will keep 5 to 6 years or longer without losing its power to kill insects.

Cost of Dusting.—The average cost of dusting an acre of cotton was approximately \$5 a year in experiments conducted at Auburn. This cost included the following: \$3.20 for 40 pounds of calcium arsenate at 8 cents a pound, \$1.20 for 4 hours of man labor and 4 hours of mule labor, each at 15 cents an hour, and \$0.60 for depreciation on the dusting machinery. In figuring the cost of depreciation, it was assumed that a \$60 two-row dust gun would dust 25 acres of cotton for each of four years. It should be remembered that the costs given here are average figures and that the total cost of dusting an acre of cotton may be considerably more or considerably less during any given year, depending upon the price of calcium arsenate and labor and upon the number of dustings required.

Profits to be Expected.—Reasonable profits may be expected from properly dusting cotton. In experiments conducted by this Station the gains from dusting have varied from no gain to 931 pounds of seed cotton per acre. The large gains were made on fertile soils during years that boll weevils were very numerous and the small gains on poor soils or during seasons that boll weevils were not numerous. The six-year average gains on three types of soil receiving from 300 to 500 pounds fertilizer per acre were 240 pounds of seed cotton per acre on sandy loam, 252 pounds on Black Belt clay, and 282 pounds on red clay. Since the average yearly cost of dusting an acre of cotton was \$5, or \$3.80 exclusive of labor, profits of \$5 to \$15 per acre may be expected. These profits are at least sufficient to pay for the fertilizer applied to the cotton.

Pre-Square Poisoning.—Although the usual procedure in controlling the boll weevil is to dust the cotton with calcium arsenate at the time the crop is being made, it may be necessary

to protect cotton by applying poison before the plants begin to square. If weevils are very numerous early in the year, pre-square poison may be dusted or mopped on the young plants before the squares appear. In pre-square dusting, calcium arsenate is applied with a dust gun at the rate of 4 to 5 pounds per acre. In pre-square mopping, calcium arsenate is applied in a syrup mixture to the buds of the cotton plants. The mixture used consists of 1 pound calcium arsenate, 1 gallon of water, and

1 gallon of syrup thoroughly mixed together. In making the poison mixture, the calcium arsenate should be stirred into a small amount of water. The remaining part of the water and the syrup should then be added. The sweet poison should be applied with a small cloth mop on the end of a stick two to three feet long. One pound of calcium arsenate will make enough of the mixture to cover two acres of cotton. The cost of mopping is approximately \$0.25 per acre. Mopping is of no value after the cotton begins to square.

Pre-square poisoning is of some value in controlling boll weevils if they are numerous on young cotton but is no insurance against boll weevil damage later in the season.

Leaf Worm

The cotton leaf worm may do serious damage to cotton in the summer or early fall by eating the leaves of the plants before the bolls are mature. This insect passes the winter in tropical regions and many of the adults, which are brownish-colored moths, fly northward in the spring and summer to lay their eggs. The eggs are deposited on the underside of cotton leaves; they hatch in four to five days to form caterpillars, sometimes called army worms. These larvae (worms) vary considerably in color and general appearance (Fig. 2) but are green or yellowish in color with light and dark stripes running lengthwise the body and with black dots occurring on the head and in rows on the sides near the back. When disturbed these worms jerk or jump in a very characteristic manner. After feeding on the leaves of the cotton for ten days to two weeks the worms reach a length of about 1½ inches and are full grown. The worms then fasten themselves to the plant with webs and are later transformed into moths. Three to four weeks after the appearance of the first leaf worms on cotton, a second generation is likely to appear;

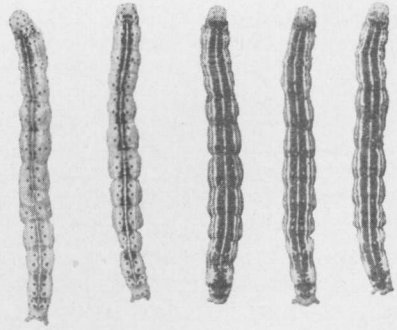


FIGURE 2.—Larvae of the Cotton Leaf Worm (natural size). Note the variations in color.

the worms of this and succeeding generations are usually much more numerous than those of the first. Serious damage will be done if the worms become numerous before the bolls mature.

The cotton leaf worm can be controlled by dusting the cotton with calcium arsenate. Dusting should be done whenever worms appear in large numbers on cotton with immature bolls. The dust may be applied undiluted with a dust gun at the rate of 5 to 6 pounds per acre, or it may be shaken from cloth bags on the ends of poles. If bags are used each pound of calcium arsenate should be mixed with 9 pounds of hydrated lime to prevent wasting large quantities of the arsenical. An application made with a dust gun is cheaper and more effective than one made with poles and bags.

Flea Hopper

The cotton flea hopper has become a pest of considerable importance during the past few years, although only an occasional outbreak occurs. This insect (Fig. 3) is a pale green bug which is about $\frac{1}{8}$ inch long when full grown. The adults have four wings and are able to fly from plant to plant, whereas the nymphs (young) are wingless.

Injury is produced by the insect attacking the terminal buds and the very small squares of cotton. Both young and adults

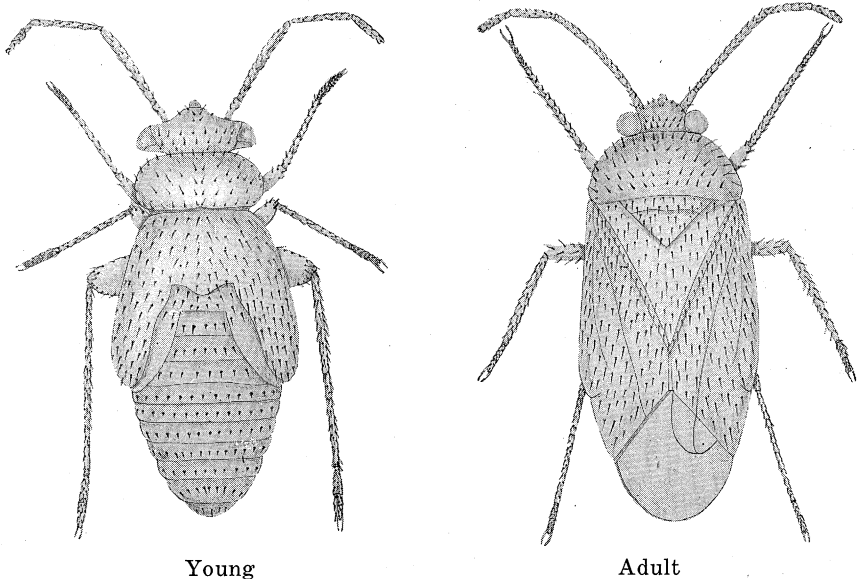


FIGURE 3.—Nymph (young) and adult of the Cotton Flea Hopper (enlarged about 16 times).

suck the juices from buds and squares causing them to drop off. The cotton plants set little or no fruit and have a characteristic upright growth.

The cotton flea hopper may be controlled by dusting cotton with superfine sulphur at the rate of 10 pounds per acre. The sulphur should be applied with a dust gun at intervals of 4 to 6 days until the insect is under control. If boll weevils are numerous the sulphur may be mixed with calcium arsenate in the proportion of 2 pounds of sulphur to 1 pound of the arsenical and the mixture applied at the rate of 16 pounds per acre.

Red Spider

The red spider is not a true insect but is a tiny mite that sometimes becomes numerous on the leaves of cotton during dry summer months. The leaves assume a red or rusty color, become dry, and finally drop from the plants.

Red spiders pass the winter and early spring on green plants that may grow along fence rows or in yards, gardens, or waste places. When the weather becomes warm in the spring the mites multiply and spread to other plants by crawling on the ground or from leaf to leaf. Thus cotton is infested by the mites crawling from the winter host plants to the adjacent cotton plants. As the red spiders become more numerous they migrate to other cotton plants and thereby gradually spread the area of infestation. The infestation may also be spread by man or domestic animals passing from infested to uninfested areas in a field.

In controlling the red spider it is helpful to keep down all weeds around the cotton fields. This practice destroys many of the breeding places and greatly decreases the chances of a serious outbreak of red spiders. If an infestation is discovered just as the mite begins to spread to the cotton, the infested plants should be pulled up and burned or they should be thoroughly sprayed with kerosene to destroy both mites and plants. If the red spider has spread over a considerable area of cotton before the infestation is discovered, the infested cotton should be dusted with sulphur as recommended for the cotton flea hopper. Should there be a few days of rainy weather, however, the dusting may not be necessary as cool, damp weather is detrimental to the red spider.

Boll Worm

The boll worm is also called the corn ear worm and the tomato fruit worm. It is a green to brownish-colored caterpillar which is about two inches long when full grown and is marked with alternating light and dark stripes running lengthwise the body.

The cotton boll worm eats holes in the squares and bolls, causing the squares to drop and the bolls to rot. Cotton may be

at least partially protected against boll worm damage by dusting with calcium arsenate. It is desirable that this dusting be done as a part of the boll weevil control program so that the control of the boll worm is incidental.

COTTON DISEASES

Rust

This disease of cotton, which more commonly appears on the poorer soils throughout the State, has been called by several names, such as black rust, yellow leaf-blight, and potash hunger. The cotton plant usually shows little signs of this trouble until mid-season at which time yellowing, reddening, curling, and dropping of the leaves may occur in sequence. Plants in large areas may be completely bare of leaves by late summer or only a few leaves may remain at the ends of the branches, while the plants in the rest of the field have complete foliage. The premature shedding of leaves may reduce the yields of such plants.

Control.—Where this disease is general in a cotton field a soil-building program should be followed, that is, a rotation with other crops by which humus is added to the soil. The plowing under of summer green-manure crops, such as cowpeas, velvet beans or of winter cover crops such as Austrian peas or vetches will aid materially in the control of this disease. In addition to the above practice, the cotton should be fertilized with 50 pounds of muriate of potash per acre. If these recommendations are followed the disease should be controlled in a few years.

Wilt

This disease of cotton is more or less generally known as wilt or black root. Both names are very appropriate since the first sign of disease is a general wilting of the plant or a portion of it, which eventually ends in the death of the plant. When closely examined the plant tissues just under the bark appear blackened instead of being the normal yellowish to greenish color. The disease is far more common on sandy soils than on the clay soils; however, it may sometimes be found on the latter. This disease is becoming very common throughout Alabama. The damage is usually more severe where nematode injury or "root knot" appears in the same field.

Control.—The best control is the use of a highly wilt-resistant variety of cotton. There are a number of such varieties but the following have proved more satisfactory in Alabama: Dixie-Triumph, Cleve-wilt I, Cook 27-54, Cook 307-92, and Cook 307.

When nematodes are present, nematode-resistant crops should be used in a rotation with cotton. The following resistant crops are desirable to use in the rotation: corn, oats, and other grasses followed by or accompanying such legumes as Brabham, Iron, and Monetta cowpeas, velvet beans, Laredo soybeans, or peanuts.

Anthracnose

The most conspicuous stage of this disease is a boll rot or boll spot, which, under favorable climatic conditions of high temperature and abundance of moisture, may cause considerable loss. On the bolls the disease first appears as small, water-soaked spots, which soon increase in size and may completely destroy the boll; however, as the disease develops the spots change into brown or black spots with reddish borders and pink centers. Badly diseased bolls never open; slightly diseased bolls may open but will show a pink staining of the lint or a matting of the locks. In some cases only one lock is destroyed.

The fungus causing the disease grows into the bur, lint, and seed where many small spores are formed. These spores may live from year to year in or on the seed. When such seed are planted the fungus grows into the seedlings, killing them before they appear above ground, or it may cause a type of "damping-off" by attacking the young plants near the soil line. The fungus may also live from one year to another on old cotton plants in the field.

Control.—The practical methods of control are: Use at least a one- or a two-year rotation of crops and use seed that are free of disease. Disease-free seed may be obtained by selection of seed from disease-free fields or by storage of seed for at least three years.

DEPARTMENTS OF ZOOLOGY-ENTOMOLOGY AND BOTANY AND
PLANT PATHOLOGY