

Connecticut Agricultural Experiment Station
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INSECTICIDES TO CONTROL
THE EUROPEAN CORN BORER

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Applying spray to the main whorl of the corn plant.
Second application. (U.S.D.A. Photo)

DURING the past two years the Connecticut Agricultural Experiment Station and the United States Bureau of Entomology and Plant Quarantine have carried out coöperative experiments to control the European corn borer, *Pyrausta nubilalis* Hubn., by means of insecticides. The technical results of these investigations will be published elsewhere.

This circular is a revision of Circular 114, published last year, and has been prepared to bring the practical results of the work to Connecticut corn growers.

Although this work is still in the experimental stage, sufficient evidence has been accumulated to show that sprays and dusts may be used to protect early sweet corn from serious injury by the corn borer.

SEASONAL HISTORY OF THE CORN BORER ON CORN

The European corn borer passes the entire winter in the larval stage within its burrows in the stalks. During the last half of May, the larvae transform to pupae, and the moths emerge late in May and during the first half of June. Eggs are deposited in large masses on the undersides of the leaves. The larvae hatch within a week or 10 days and may feed for a short time on the leaves, but later migrate to the main stems. They then feed in the spaces between the leaf sheaths and the stalks and especially in the developing whorls of the main stem and the tillers. As the larvae grow they bore into the stalks and developing ears. They mature in July, pupate, and emerge as moths during August and early September.

The second generation of corn borers develops during the latter half of August and September, and may cause severe injury to corn maturing at that time. The full-grown larvae live over the winter in their burrows in the stalks and ears.

MECHANICAL CONTROL

The mechanical control measures that have been recommended provide for the proper disposal of the stalks and ears to destroy the borers in them. These are:

1. Cut the stalks close to the ground, put them in the silo, or feed to live stock and destroy the refuse.
2. Plow under cleanly, at least 6 inches deep.
3. Cut the stalks of corn and larger weeds close to the ground and burn them.
4. Store infested ears of dry corn in screened cribs to prevent escape of the moths.

CONTROL BY APPLICATION OF INSECTICIDES

The use of insecticides to control the European corn borer in early market corn is based on the fact that the young larvae feed for some time between the leaves in the growing whorl. If the spaces between these leaves are kept filled with toxic material, a large percentage of the larvae can be killed. To accomplish this, several applications of sprays or dusts are necessary during the time that larvae are hatching. These are applied to the growing whorls of the main stalks and of each tiller, starting as soon as the first eggs hatch and repeating the treatment at five-day intervals for about two weeks. At the time of the final application, early market corn is usually in full tassel, and the material should cover the developing ears to prevent entry by migrating larvae.

In normal seasons applications are required about June 5, 10, 15 and 20. In 1935, cool weather retarded emergence of the corn borer and the first application was made on June 15.

MATERIALS FOR SPRAYS

Pure ground derris root, phenothiazine and nicotine tannate were suggested as sprays in Circular 114. The first two are dry powders and are simply weighed out and mixed with water. Nicotine tannate must be prepared by mixing liquid tannin and 50 percent free nicotine in dilute solutions. Few growers have used nicotine tannate on account of the difficulties of preparation.

Phenothiazine (thio-diphenyl-amine) has been highly effective in controlling the corn borer, but is not at present (March, 1937) available commercially.

Pure ground derris root, 4 percent rotenone, is readily available and has proved highly satisfactory in sprays on early market corn. Pure ground cubé root, 4 percent rotenone, is equally satisfactory. At the present time these are the most practical materials for corn borer control.

SPREADERS

In order to obtain the best results, it is necessary to use a spreader in corn borer sprays. Three available materials have proved satisfactory and have not injured corn plants in the amounts used. These are: *Areskap*, a phenyl-phenol preparation (dry powder); *Ultrawet*, a dry powder made from petroleum sulfonates; and *SS-3*, a self-emulsifying liquid containing a sulfated alcohol combined with a resinous sticker.

It is probable that many insecticide manufacturers will prepare mixtures of ground derris root with suitable spreaders ready for use by the grower.

PREPARATION OF THE SPRAY

To 25 gallons of water is added one of the following spreaders: *Areskap*, 1.5 ounces (avoirdupois); *Ultrawet*, 2.0 ounces (avoirdupois); or *SS-3*, 1.5 liquid ounces. One pound of derris is mixed with a small amount of this spreader solution to form a thin paste and then added to the 25 gallons of water.

It is very important that the exact amounts of spreader be used, since larger amounts may injure the corn and smaller quantities may fail to provide adequate spreading properties.

METHOD OF APPLICATION

The only practical sprayer used to date has been a hand sprayer, either a knapsack or compressed air type. The spray mixture is prepared in a barrel and poured through a fine screen into the hand sprayers. If an acre or more of corn is to be treated, at least three sprayers with operators should be available. A two-foot rod with an auto-pop valve has been most practical. In making the application, enough material is used on each whorl, whether main stalk or tiller, to wet the developing leaves thoroughly. Later applications should also cover the growing ears.

The total cost of spraying an acre of corn, including both materials and labor, has been estimated at \$15, but may be slightly higher, depending on the rate of pay and the efficiency of the labor.

DUSTS

Dr. C. H. Batchelder of the Federal Bureau of Entomology and Plant Quarantine has developed a dual-fixed nicotine dust which has been very effective in experiments. This dust is prepared by mixing nicotine tannate dried on kaolin with nicotine sulfate dried on bentonite. It may be purchased mixed, ready for use, and containing 4 percent nicotine. **This dust is not the same nicotine dust that has been used for control of aphids and should not be confused with it.**

In experimental trials, dual-fixed nicotine dust has been applied to the growing whorls of main stalks and tillers, and later to the developing ears. A hand duster was used and the application dates were the same as for sprays.

In the tests this dust was as effective as the sprays and was, of course, much more easily applied.

WHAT CORN CAN BE TREATED PROFITABLY?

To date only first early sweet corn, maturing in July, has been sprayed or dusted profitably. As a rule, corn maturing during August is too lightly infested for profitable spraying or dusting. Corn maturing in September and October is frequently heavily infested, but to date experimental treatment has not been entirely satisfactory. Sprays or dusts to control second generation borers in corn are usually required on August 11, 16, 21 and 28, and September 2.

Growers who have had heavy infestations of corn borers in the past may use sprays profitably. In some sections of the State, the losses have been small and spraying is unnecessary at present.

It is suggested that growers who want to try these materials use them conservatively the first season. Since the methods are new and careful work is required to obtain satisfactory results, it would be advisable to treat only a portion of the entire crop. The corn treated should not exceed the amount that can be covered in two days with the equipment and labor available. The crop from the treated block can be compared with the crop from untreated corn and should show the grower whether or not the spraying is practical and profitable.

These sprays will not control the corn ear worm.