

Connecticut Agricultural Experiment Station
New Haven

Control of the European Corn Borer by Sprays and Dusts¹

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FOR the past four years the Connecticut Agricultural Experiment Station and the United States Bureau of Entomology and Plant Quarantine have carried out cooperative experiments to control the European corn borer, *Pyrausta nubilalis* Hubn., by means of insecticides. In these experiments certain insecticides were effective in controlling the corn borer on sweet corn and the cost of application was justified by the higher yield of borer-free ears. The materials mentioned in this circular have been tested thoroughly in experimental plots and have also been used by a few growers. The experimental work is not complete, and this is a report of the progress made to date.

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

¹ Revision of Station Circular 118.

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 offered 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 livestock 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 sweet 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, in our experiments 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 the corn is usually in full tassel, and the treatment must cover the developing ears to prevent entry by migrating larvae.

Materials for Sprays

Pure ground roots of derris, cubé and timbo have been used as spray materials. These roots contain rotenone and other toxic compounds. Experiments indicated that there is little difference in the insecticidal value of roots sold under these three names, provided all have at least 4 percent rotenone and at least 12 percent total extractives.

In order to obtain the best results it is necessary to use a spreader in corn borer sprays. Several spreaders have proved satisfactory and have been available on the market. Among these are *Areskap*, a phenyl-phenol preparation (powder); *Ultrawet*, a powder made from petroleum sulfonates; and *Spreader-Sticker*, a self-emulsifying liquid containing a sulfated alcohol combined with a resinous sticker. The powdered spreaders have proved to be preferable because they could be weighed and mixed more easily than the liquid material.

Preparation of the Spray

In our experiments, one of the spreaders was added to ground derris, cubé or timbo roots. To each pound of root was added 1.5 ounces of *Areskap*, 2.0 ounces of *Ultrawet*, or 1.5 liquid ounces of *Spreader-Sticker*. The root and spreader were mixed thoroughly and made into a thin paste with a quart of water. The paste was added to 25 gallons of water.

Several insecticide manufacturers have prepared and marketed mixtures of derris, cubé or timbo root with the proper amount of a suitable spreader. It is, of course, unnecessary to use additional spreader with such preparations. Experiments have shown that it is necessary to use the exact amounts of spreader mentioned, since larger amounts may injure the corn and smaller quantities fail to provide adequate spreading properties.

Application of the Spray

Experimental sprays were applied by four-gallon, compressed-air hand sprayers and by wheelbarrow hand sprayers with two hose outlets. The spray mixture was prepared, stirred thoroughly, and strained through a 30-mesh screen to remove large particles which might clog nozzles. Enough material was used on each whorl, whether main stalk or tiller, to wet the developing leaves thoroughly. When the tassels formed, the spray was applied to the developing ears and not to the tassels. The wheelbarrow type of sprayer was used with one man to move the sprayer and do the pumping, and two men to apply the spray.

The total cost of spraying an acre of corn, including both materials and labor, was about \$22.50.

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. The material is available commercially and has been used by growers with success. *This dust is not the same nicotine dust that has been used for control of aphids and should not be confused with it.*

The dust was applied by means of bellows-type hand dusters. The nozzle was directed downwards, directly into the developing whorls. After the tassels formed, the dust was directed on the developing ears. Some growers have used four-row power dusters successfully on early corn but these are usually too low for late corn.

The cost of dusting an acre of corn four times was about \$25, including both material and labor.

Application Schedule

The standard schedule used in experiments was started when the first eggs hatched. Three additional applications were made at intervals of five days. In normal seasons, applications were necessary on June 5, 10, 15 and 20 on early corn. The second generation, which develops in August and September, required five applications, about August 10, 15, 20, 25 and 30.

Since the proper dates for spraying and dusting vary with weather conditions, it is necessary for these dates to be set for each season. Fortunately these can be determined at least a week in advance. As in previous seasons, the County Farm Bureaus will be notified in advance or the information can be obtained from the Experiment Station.

To date these schedules have been more effective than any modification tried. However, experiments will be continued in an effort to work out a less complicated schedule. Results in 1938 indicated that the only change which could be made without great loss in effectiveness was three applications at weekly intervals on early corn and four applications at weekly intervals on late corn.

What Corn Can be Treated Profitably?

Corn maturing before August 1 has been heavily infested in many sections of the State, and can be treated profitably. The same is true of late corn maturing after September 1. The August corn has been less heavily infested and the price received too low to justify spraying or dusting.

What Results Can be Expected?

The use of either sprays or dusts has not completely eliminated all corn borers from the treated fields. The following table gives the results of experiments in terms of number one size, borer-free ears (sprays and dusts cannot be compared here):

Year	Season	Treatment	PERCENT NO. 1 BORER-FREE EARS	
			Treated	Untreated
1935	early	spray	90	59
	late	"	79	52
1936	early	spray	93	51
	"	dust	99	85
1937	early	spray	72	36
	"	dust	67	42
	late	spray	75	40
1938	early	dust	78	50
	late	"	70	18

The results show that when the infestation was very heavy, a low percentage of borer-free ears on untreated plots, about 70 percent of the treated ears were borer-free.