

Connecticut Agricultural Experiment Station
New Haven

Control of the European Corn Borer by Sprays and Dusts

NEELY TURNER



Self-propelled power duster operating in a field of corn. The photograph was taken at eight in the evening. Note mask to protect the operator from breathing dust, and the headlight.

EXPERIMENTS conducted on a commercial scale during 1940 proved definitely that dual-fixed nicotine dust applied four times, at intervals of five days, produced a highly profitable increase in yield of borer-free early sweet corn. Previous tests using small field plots had demonstrated the effectiveness of treatments and the 1940 experiments established their practical value.

Market Hybrid sweet corn was dusted June 11, 16, 21 and 28 (the last treatment was delayed two days by rain) using a two-row,

self-propelled duster. The dust cost \$35 an acre, labor \$2.00 (at 50 cents an hour) and the use of the machine \$4.50, or a total of \$41.50. The dusted corn, harvested July 18 to 24, yielded 6,910 borer-free No. 1 ears to the acre and 3,450 infested ears which could be marketed. The crops sold on the farmers' market for \$350. Corn not dusted (from the same field) brought less than \$100 an acre for 2,600 borer-free ears, and produced about 7,500 heavily infested ears which could not be sold.

In order to realize the greatest profit from the dusted corn, the ears were sorted as "borer-free" and "infested". Borer-free ears had no signs of borer feeding and sold at a premium of from 50 cents to one dollar a hundred ears more than the infested corn. In roadside market terms, this meant a difference of five to ten cents a dozen ears. The cost of sorting was about the same as the cost of picking. Since this was early corn, the price was relatively high, \$3.50 to \$4.00 a hundred for borer-free ears. However, as long as borer-free corn can be sold for as much as \$2.50 a hundred ears, dusting should prove profitable.

Seasonal History of the Corn Borer on Corn

Control measures for the European corn borer are based on important facts concerning the life history and habits of the insect. The seasonal history is as follows: The mature larvae pass the winter within their burrows in the stalks. During the last half of May, these larvae transform to pupae, and the moths emerge late in May and during the first half of June. The eggs are deposited in masses on the undersides of the lower leaves of the corn plants. The young larvae hatch within a week or 10 days and may feed for a short time on the leaves, but soon migrate to the main stems. There they feed in the spaces between the leaves in the developing whorls of the main stem and the tillers. A few larvae may feed in the space between the leaf sheaths and the stalks.

As the plant develops, the tassel forms and emerges, and the larvae feed in the tassel buds and stalk. Later they migrate down to the main stalk and to the ear shoots. Larvae that hatch after the tassel has formed enter developing ear shoots or leaf sheaths.

The period of egg hatching lasts from about June 5 to July 1 in normal seasons.

The larvae become fully grown in July, pupate at once, and emerge as moths during the last half of July and all of August. They fly to fields of late corn, and infest the plants as described above. The second generation larvae appear early in August and are present until late in September. They pass the winter in this stage.

Control by Application of Insecticides

The use of sprays and dusts to control the European corn borer on sweet corn is based on the fact that the young larvae feed for some time between the leaves in the growing whorl and in the ear shoot. If the spaces between these leaves are kept filled with toxic

material, a large percentage of the larvae may be killed. Repeated applications are necessary because sprays or dusts applied in the whorl stay on the developing leaves, which grow out and away from the whorl. The new leaves formed in the center are, therefore, not covered. As a rule, four 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, starting as soon as the first eggs hatch and repeating the treatment four times at five-day intervals. 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.

Control Materials

Dusts

Dual-fixed nicotine dust (developed by Dr. C. H. Batchelder of the Federal Bureau of Entomology and Plant Quarantine) has been the most effective dust material used in our experiments. *This is not the same nicotine dust that has been used for control of aphids and should not be confused with it.*

Dusting has been done successfully both by hand and by machine. In either case the first two applications on early corn (about June 10 and 15) are made with nozzles directed downwards into the whorls of the plants. The last two applications (about June 20 and 25) are made on the developing ears. From 150 to 200 pounds of dust are required for the four applications on one acre.

Dusts containing one percent rotenone have been used in several experiments. Invariably the control obtained was substantially less and the percentage of borer-free ears much smaller than with dual-fixed nicotine dust. As a rule, rotenone dusts produce about 50 percent borer-free ears, and dual-fixed nicotine from 66 percent to 75 percent borer-free ears.

Sprays

The use of derris, cubé or timbo ground roots (4 percent rotenone content) in sprays has provided control as satisfactory as that of dual-fixed nicotine dust. Any of these three materials may be used at the rate of one pound in 25 gallons of water. The spraying is done on the same dates and in a similar manner as described above for dusting. The cost of spraying is somewhat less than the cost of dusting.

Compressed air hand sprayers and wheelbarrow hand sprayers have been used in spraying corn.

Sprays versus Dusts

In effectiveness there is little choice between sprays and dusts. In dry years, sprays are somewhat better than dusts, and in wet years the reverse is true. A good hand duster is about the same price as a wheelbarrow sprayer. One man with a duster can treat one acre of corn in about three or four hours. Two men working with either knapsack or wheelbarrow sprayers can treat an acre in five or six hours.

Dusting must be done in early morning or late evening when there is little wind. Spraying can be done at any hour.

Transportation of water to the field and weighing and mixing of spray materials are avoided by dusting.

Inexpensive, self-propelled power dusters are on the market and can be used effectively not only on corn but also on beans, celery, tomatoes, melons and cucumbers. This machine will dust an acre of corn in about an hour.

No self-propelled sprayers suitable for small fields of corn are available at present.

What Corn Can Be Treated Profitably?

First early sweet corn, maturing in normal seasons before August 1, has been treated profitably in several parts of the State. As a rule, corn picked during August is reasonably free from corn borers, and even if it is lightly infested, it is less expensive to sort out the few infested ears than to dust or spray. September corn is usually heavily infested, but the price is sometimes too low to justify the use of sprays or dusts. If late corn is to be treated, the same methods as described above may be used, with the dates of application about August 5, 12, 19 and 26.

Some Suggestions Regarding Treatment

Early sweet corn has been so heavily infested by the European corn borer in Connecticut that there is little use in planting this crop unless it is to be sprayed or dusted.

Since dusting or spraying corn is an entirely new problem to most growers, it would be advisable to try it on a small scale the first season. Even one-half acre treated properly, with a few rows left untreated for comparison, is more satisfactory than five acres dusted or sprayed only once or twice.

It seems necessary to sort treated corn to obtain full financial returns from the crop. While this is a new idea, it must be remembered that apples, peaches, potatoes, carrots, beets, and tomatoes are all sorted before marketing.

The early hybrid varieties of corn are more suitable for treatment because they grow more uniformly and produce larger yields to the acre than the older varieties.

Inexpensive dust masks are available to protect the operator from inhaling any dust.

Dusting has been done between daylight and 9:00 a. m. (Standard time) and between 8:00 p. m. and 11:00 p. m. (by use of lights) with equal effectiveness. The corn plants are dry in the evening, and there is less discomfort to the operator.

The seasonal life history of the corn borer varies with weather conditions. Exact dates of applications may be obtained from the County Farm Bureaus or Extension Service.