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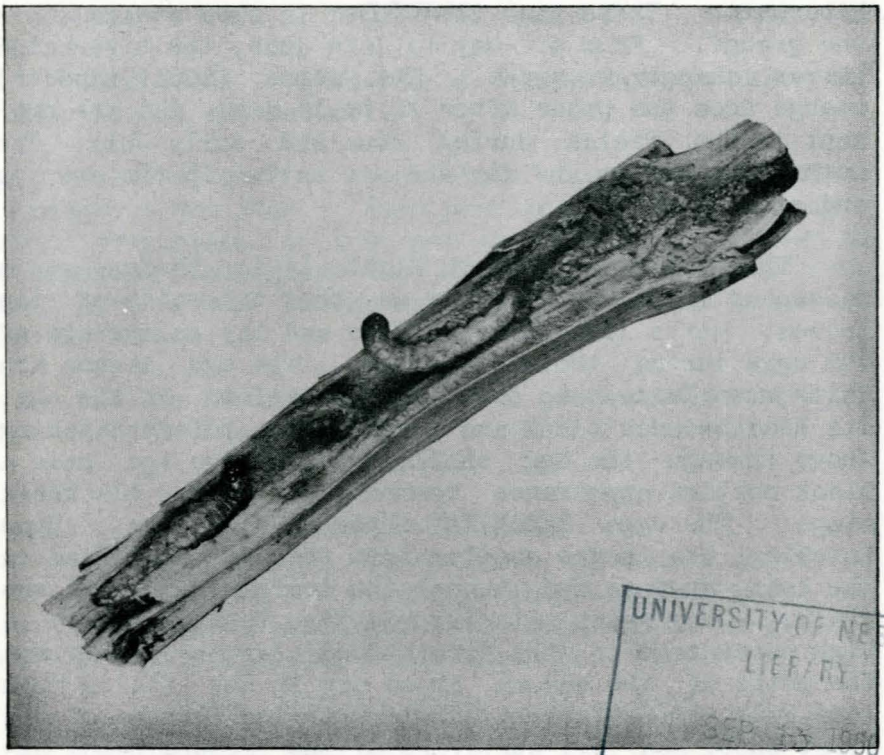
EUROPEAN CORN BORER CONTROL for NEBRASKA



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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE, AND THE UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING, H. G. GOULD ASSOCIATE DIRECTOR, LINCOLN.

European Corn Borer Control for Nebraska[1]

The European corn borer was found in five counties of eastern Nebraska in 1946. Each year it has spread westward until in 1949 it was found in 68 counties extending as far as Lincoln County in the Platte River Valley and Dundy County in the Republican River Valley. Corn borer populations are largest in the Eastern counties and along the river valleys. This trend of increasing population is expected to continue in 1950.

LIFE CYCLE

Only mature corn borer larvae can successfully hibernate. These pass the winter in corn stalks above the ground. From mid-May to late June, the hibernated larvae change to pupae. The moths (adult insects) emerge from the pupae after 10 to 14 days and are present in the fields during June and early July. The moths hide during the day and are active in the evening and at night.

They fly from plant to plant laying their eggs in masses of 15 to 20, usually on the underside of the leaves. Moths live 10 to 24 days and lay an average of 400 eggs during their life span. The egg masses are white when laid. As each larva develops in the egg, its head becomes black and a day or two before hatching shows through the egg shell, giving the egg mass a black mottled appearance commonly called the blackhead stage. The eggs hatch in three to nine days. Upon hatching, the larvae scatter from the egg mass, feed on the leaf surface and tunnel the leaf mid-rib and the stalk. They reach maturity in five to six weeks. A high percentage of the first brood larvae pupate and the moths of the second brood are in the fields from late July to September. Late maturing larvae of the first brood and all survivors of the second brood hibernate.

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[1] Prepared by the Entomology Department Staff, University of Nebraska.

CROP DAMAGE

Damage to the crop is caused by the larvae feeding on the leaves, tunneling the leaf mid-rib causing leaf breakage and tunneling the stalk cutting the flow of plant food and causing stalk breakage.

Feeding in the earshank cuts off food flow to the ear and reduces ear size and yield. Stalk and earshank tunneling causes breakage before and during picking. This increases the corn loss and makes picking more costly.

CONTROL

Corn borer control is of three types, cultural, insecticidal and natural.

Cultural control consists of farm practices used throughout the year. Each practice may destroy only a small proportion of the population but when used on every farm throughout the community the entire area will have fewer borers and therefore less danger of severe damage.

The use of insecticides will protect the field infested by killing the larvae present at that time.

CULTURAL CONTROLS

1. The date of planting corn is the most effective cultural practice. All corn should be planted at the best average date for the area.

Extremely early or late planted corn is most likely to be severely damaged.

2. Plowing five to six inches deep and cleanly covering all stalks and trash is very effective.

3. Stalk cutters vary in effectiveness. Under good conditions some cutters may destroy 90 percent of the borers. Others are less efficient. Good stalk cutting makes clean plowing easier.

Thorough double disking where stalks are well cut is as effective as stalk cutting but less effective than plowing.

4. Where corn is used for ensilage and the stalks are cut within two inches of the ground, all of the borers present will be killed.

5. Shredding for fodder, where the stalks are cut into 1/2-inch pieces or less, will kill the borers.

6. Burning is not recommended because it is not effective in killing borers. It destroys fertility and increases soil erosion.

7. No varieties or hybrids are immune to corn borer attack. Hybrids vary in the amount of injury they can withstand. Select a hybrid that yields well and has strong stalks and earshanks.

8. Light traps have not proved effective or practical as a control for corn borers.

NATURAL ENEMIES

Natural enemies that feed upon the various stages of the corn borer are numerous and include insects, spiders, mites, birds and mammals. These groups combined may destroy as much as one-third of the population, but they cannot be depended upon as a consistent control measure.

CHEMICAL CONTROL

Individual fields of the growing crop can be protected and losses reduced by the proper use of insecticides. Insecticides should be used only when necessary to protect the crop. The following instructions give

the best methods for the use of insecticides. To obtain good results, it is necessary to follow directions carefully.

Following a review and discussion of the activities connected with the control of the European corn borer by the use of insecticides during 1949, at a conference held in Chicago, January 6-7, 1950, the following recommendations were adopted for 1950 by the North Central States and Federal Entomologists. These approved methods of insecticidal control supplement such other means of combat as recommended above.

Most satisfactory control of the corn borer has been obtained through the use of DDT in dilute water sprays properly applied. Satisfactory control has been obtained with low gallonage sprays, concentrated suspensions, and dusts. Low gallonage emulsions in airplane sprays are also practical. Concentrated sprays in oil are not recommended.

Applications by aircraft have been found least efficient but their use is indicated where applications from the ground are impractical.

MATERIALS

DDT and Ryania are the two materials which have given most satisfactory results. Of these DDT is more available and less expensive.

In general, benzene hexachloride, chlordane, toxaphene, methoxychlor, and TDE (also called DDD) do not give satisfactory control at economical dosages.

Parathion has shown considerable promise but is a deadly poison and in view of the known hazards to those handling or applying it, this material is not recommended.

Although parathion is a highly effective insecticide for many purposes it should not be used where a

safer material would give reasonably satisfactory control.

Where situations demand and when the operator is in a position to enforce proper precautions, its use may be justified. Under such conditions, see state recommendations for details of use and precautions.

The Nebraska Experiment Station and the Agricultural Extension Service do not recommend the use of Parathion for any purpose whatsoever.

FIELD CORN

Both first and second generations of the European corn borer infest field corn.

Application Rates and Dosages of Insecticides: The dosage and application rates for use in spray applications are as follows:

Insecticide	Equipment	Dosage per acre per application (Pounds technical)	Application rate mixed spray per acre per application (Gallons)
DDT emulsion concentrates 1/	Ground	1 1/2	5 to 10
DDT wettable powders	Ground	1 1/2	Not less than 15
DDT emulsion concentrates 1/	Aircraft	1 1/2	2 to 5

1/ Use only emulsions that have been found to be safe for application on growing corn.

Equipment: Ground sprayers equipped with a boom and providing two to four nozzles per row, with pressure ranging from 40 to 150 pounds per square inch will give the most satisfactory control. The spray discharge should be directed into the whorl for first-generation and concentrated on the ear zone for second-generation control.

Row-crop sprayers can be modified for corn borer control. The same nozzle adjustments should be used as described above. It may be necessary to delay morning applications until plants are less turgid to prevent plant breakage when using machines of low clearance.

Airplanes with spray boom attachments provided with multiple nozzles, arranged to give as even a distribution as possible across the swath, should be used.

DUSTS

Materials: DDT and Ryania are satisfactory for dust treatments.

Application Rates and Dosages: The dosages and application rates for using dusts are as follows for ground or aircraft equipment:

Insecticide	Dosage per acre per application (Pounds technical)	Application rate of mixed dust per acre per application (Pounds)
DDT, 10%	2	20
DDT, 5%	2	40
Ryania, 40%	12-16	30-40

Equipment: Row crop dusters are suitable for use in corn borer control. Provision must be made for 2 or more nozzles per row. Ground dusters with high air velocity and volume are more satisfactory than those with low velocity and volume.

Nozzle arrangements should provide 2 or more nozzles 5 inches above the plants when applying dust to corn in the whorl stage.

Aircraft may be utilized to apply insecticide dusts when more satisfactory or lower-cost methods are not available. The swath width may vary with different equipment but should be no wider than wing span width or rotor length. Flight height should not exceed 6 feet from top of corn to wheels. For best results treatments should not be undertaken during wind movements in excess of 4 miles per hour.

NUMBER AND TIMING OF TREATMENTS

One or two treatments are recommended, depending on expected intensity of infestation and degree of control desired. For the two-treatment schedule, the first application should start within one week after first hatch in those fields in which as many as 50 or more egg masses per 100 plants have been found, and corn is not less than 35 inches extended height. If eggs continue to be present at the rate of 50 or more masses per 100 plants and conditions remain favorable for borer development, the second application should be made 7 to 10 days after the first. For more exact information on timing follow state recommendations.

For those who wish to make only one treatment the application should be made 10 to 12 days after first hatch in fields as described above.

Under conditions of heavy infestation, treatment to control second generation borers to prevent stalk breakage and ear dropping will be profitable. Treat at first hatch if there are 100 egg masses per 100 plants.

CANNING CORN

Adjustment of ground equipment for applying sprays or dusts to canning corn should be the same as described on preceding pages for field corn. In addition, when dusts are used in the early tassel stage, direct one nozzle downward at the tassel and the other in an angle at the ear-shoots. Direct nozzles in an angle at the ears when applying to sweet corn in the early silking stages.

Application rates and dosages for canning corn are listed as follows, in descending order of their effectiveness for borer control.

Insecticide	Wetting agent[1] Pounds per 100 gals.	Dosages per acre per application (Pounds technical)	Application rate mixed spray per acre per application (Gallons)
Sprays - Ground Machines			
High Gallonage			
DDT (wettable powders)	1/3	1 1/2	75 to 100
DDT emulsions[2]		1 1/2	75 to 100
Ryania 100%	1/3	6	75 to 100
Low Gallonage			
DDT (wettable powders)		1 1/2	Not less than 15
DDT emulsion concentrates[2]		1 1/2	5 to 15
Dusts - Ground Machines			Pounds
DDT 10%		2	20
DDT 5%		2	40
Ryania 40%		12-16	30 to 40
Sprays - Aircraft			Gallons
DDT emulsion concentrates[2]		1 1/2	2 to 5
Dusts - Aircraft			Pounds
DDT 10%		2	20
DDT 5%		2	40

1/ Wetting agents such as Ultrawet E or Areskap should be used.
2/ Use only emulsions that have been found to be safe on growing corn.

Application Timing:

A. Early plantings subject to infestation by the 1st-generation borer.

1. Basis for determining the need for treatment.

a. Overwintering borers abundant in the locality.
b. Canning varieties are 25 or more inches in extended height.
c. Examination of plants shows 20 or more egg masses per 100 plants on varieties with maturities of 75 days or less.
d. Examination of plants shows 50 or more egg masses per 100 plants on varieties with maturities of more than 75 days, and
e. During very early seasons, late-maturing varieties may be so advanced in growth that treatments will be warranted at egg-mass levels of less than 50 per 100 plants.

2. Plant examinations for corn borer egg masses.

a. Inspections should be started when the corn is 25 inches in extended height, and
b. Moth flight has begun.
c. Interval of plant examinations--every 4 days.
d. Continue examinations until egg-deposition is completed.
e. Particular attention should be directed to undersides of lower leaves.

3. Timing the applications.

a. Make the first application:

(1) On early-maturing varieties when there are 20 or more egg masses per 100 plants and one or more of the egg masses shows signs of hatching.
(2) On late-maturing varieties 7 days after the first evidence of hatching.

b. Make succeeding applications at 5-day intervals as long as 20 or more unhatched egg masses per 100 plants are found.

B. Planting subject to infestation by the 2nd generation borer.

1. Bases for determining the need for treatment.

a. First-generation borers known to be abundant in the locality.
b. Plantings will not be harvested during the succeeding 12 days.
c. Examination of plants shows 20 or more egg masses per 100 plants.

2. Plant examination for corn borer egg masses.

a. Start examinations for egg masses when dissection of 1st-generation tunnels in earlier planted fields shows moth emergence, or when moth flight has been observed, or when advised to do so by state and local agricultural agencies.
b. Interval of examinations--every 3-4 days.
c. When making egg counts, pay particular attention to flag-leaves and husks, as well as undersides of true leaves.

3. Timing applications.

a. Make first application when the first blackhead or hatched egg-mass is observed if there are 20 or more egg-masses per 100 plants.
b. Continue treatments at 5-day intervals as long as there are 20 or more unhatched egg-masses per 100 plants or until 12 days in advance of harvest.

It is recognized that special conditions in some states may require deviation from this timing schedule

and it is therefore advisable to follow the suggestions of your responsible state agencies.

MARKET SWEET CORN

The treatment requirements for market sweet corn are the same as the high gallonage sprays and ground machine dusts recommended for early-maturing canning corn, except that, as a rule, a full schedule of 4 or 5 treatments is necessary to get the degree of control required. First treatment should be applied when the first eggs begin to hatch. Repeated applications are needed at 5-day intervals until egg-hatching is completed.

CAUTION

DDT, like other insecticides, is a poison. Experiments have shown, however, that practically no DDT reaches the kernels inside the husks of corn treated according to instructions. Roasting ears or mature grain from such plants may be eaten or fed to livestock with complete safety. On the other hand, light residues may remain on the leaves, stalks, husks, and silks. Such evidence, as is now available, indicates that DDT residues left on the plants, following use of this insecticide in strict accordance with directions, will not produce ill effects on livestock to which such plants are fed. Some of the DDT, however, may be excreted in their milk and deposited in the body tissues, especially in the fat. Therefore, until more information is available on the possible poison hazards to man from consuming the residues occurring in milk and meat, DDT treated plants or portions thereof should not be fed to dairy animals or animals being finished for slaughter.