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EC65-1596 Revised 1965 Corn Rootworm Control

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CORN ROOTWORM

Control

WESTERN CORN ROOTWORM

NORTHERN CORN ROOTWORM

SOUTHERN CORN ROOTWORM

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CORN ROOTWORM CONTROL

By Robert E. Roselle

and

Gerald T. Weekman

Three kinds of corn rootworms occur in Nebraska—the western, the northern, and the southern. The western is the most destructive. It has spread across the entire state, and is the predominant species in the corn growing areas.

The western corn rootworm is highly resistant to chlorinated hydrocarbon insecticides such as aldrin, BHC, and heptachlor. These materials no longer control western corn rootworms.

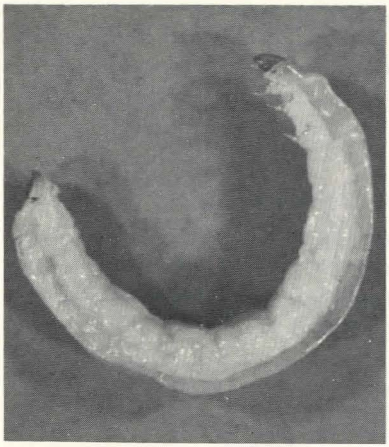
Western and northern corn rootworm beetles lay eggs in the soil. Each female lays about three or four hundred eggs during summer and fall, mostly in the upper two to eight inches of soil. Eggs overwinter, hatching the next spring in late May and early June. Time of hatching depends to some extent on soil temperatures and continues for several weeks.

Adults of the southern corn rootworm (spotted cucumber beetle) deposit eggs in corn fields in the spring. There may be more than one generation of this species per year.

After hatching, small rootworms invade the root systems of corn, damaging or destroying roots. Grain yields are reduced and lodged plants are difficult to harvest with mechanical pickers. Field losses may be high in severely lodged fields.

Rot organisms often follow rootworm feeding to further damage corn root systems. Usually, the greatest injury occurs from mid-June to mid-July, during which time all corn roots may be destroyed. The resulting loss of corn may vary from total to little, depending upon the number of larvae per plant, time of planting, amount of moisture, soil fertility, and general climatic conditions during and immediately following peak injury.

After larvae finish feeding, they change to a quiet pupa stage in which the "worms" turn into the adult, or beetle stage. Western corn rootworm beetles begin to emerge from the soil in late June, and continue to emerge until September. They may be active in fields until frost. Northern adult emergence is usually a little later in the season.



Corn rootworm larva. White with a dark head and dark spot on tail. About ½ inch long when fully grown.

Lodging of plants due to rootworm injury to roots.

Plants Damaged

Western and northern corn rootworms apparently damage only the roots of corn. They have not been found damaging sorghums or other agricultural crops. Southern corn rootworm larvae will feed on the roots of a large number of plants including corn, sorghum, wheat, cucumbers, other vegetables, and many legumes.

Damage by Adults

After adult rootworms (beetles) emerge, they feed on the leaves, silks, and pollen of corn plants. Beetles will feed on corn leaves before pollen and silk are produced. The feeding results in a parchment-like appearance of leaves. If corn is very small, adult feeding can cause damage to plants by leaf feeding. This is seldom observed, except in late planted corn.

The preferred food is corn silks. If adults are numerous during the pollination period, and silks are chewed severely, poorly filled ears may result. Under these conditions it may be profitable to control adults to protect silks. Late planted corn is more likely to be damaged by adults.

Movement of Beetles

Corn rootworm beetles will migrate from field to field. They will leave early maturing fields to find more favorable food sources in late fields that are still silking, or will migrate into fields of alfalfa, clover, or weeds to feed on pollen being produced by these plants. Western and northern corn rootworms will deposit eggs in fields other than corn where adult food supplies are present.

Resistant western corn rootworm beetles have steadily migrated east and north from southwestern Nebraska across the entire state, and into adjacent states. Westward migrations have been slower, however the insect is well established in western Nebraska.

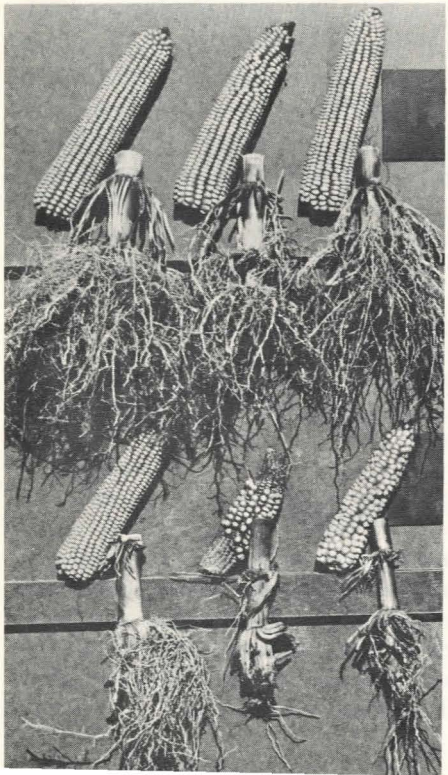
Preventing Larvae Damage

The most effective method of preventing damage to corn is to use an organic phosphate granular insecticide as a soil application before eggs begin to hatch. The following materials and formulations are recommended:

Insecticide	Amount per acre (40 inch rows)
Diazinon, 10% granules	10 pounds
Diazinon, 14% granules	7 pounds
Thimet, 10% granules	10 pounds
Ethyl parathion[a], 10% granules	10 pounds
Compound 4072[b], 10% granules	10 pounds

[a] Most ethyl parathion granules for control of corn rootworms are stabilized by various methods to retard decomposition of the chemical in storage or in the soil.
[b] Corn treated with 4072 shouldn't be used for any purpose before maturity.

If corn is planted in rows less than 40 inches, the amount per acre must be increased. Use the recommended amount above for every 13,200 feet of row.



Corn treated at planting time with a recommended organic phosphate granular insecticide (top). Untreated corn in the same field (bottom).

Insecticide Combinations

Aldrin and heptachlor in combination with organic phosphate insecticides were tested in 1964. These combinations were effective for control of corn rootworms because of the organic phosphate (parathion or Thimet) insecticide.

Aldrin or heptachlor granules may be of benefit in fields infested with wireworms, cutworms, and white grubs, but are not recommended for corn rootworm control.

Observations indicate that the organic phosphates at rates for rootworm control do not give adequate control of other major soil insects.

Methods of Application

Granules can be applied with commercially available granular applicators at planting time or at first or second cultivation.

At planting time, apply the insecticide as a band about 4 inches to 6 inches wide directly over the row, but not with the seed. Work the band of insecticide into the upper one-half inch of soil by application in front of press wheels or covering disks, or by dragging chains behind the planter. Make applications with deep listing behind the covering disks, and press the granules into the soil with a press wheel or chains.

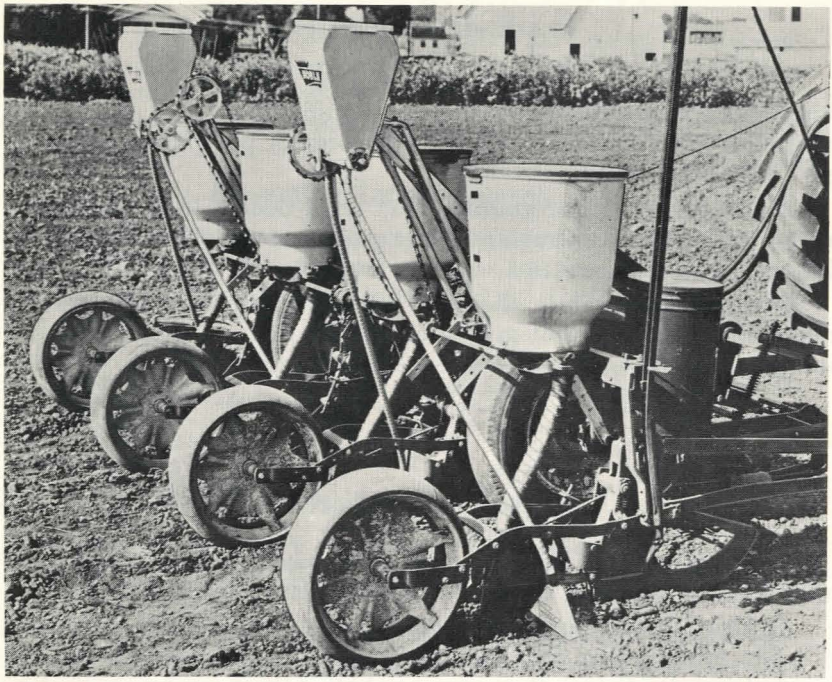
At cultivating time, make or obtain special attachments for cultivators. Apply granules at the base of the plants, and cultivate immediately to incorporate the insecticide into the soil. Make cultivation applications before June 7 in most years.

Treatments at cultivation time may be delayed by wet fields, allowing severe damage to roots before insecticides can be applied. The delay may extend beyond the time effective soil treatments could be applied.

Emergency treatments at lay-by time can be made by applying granules at the base of the plants. Use disk hillers to cover the insecticide with soil. If you spray, use 1 pound actual diazinon (1 quart of diazinon Ag 500) per acre in 15 to 20 gallons of water. Apply with nozzles on drops from the boom so that the spray is directed at the base of the plants. Cover the spray with disk hillers.

Emergency treatment will not kill all rootworms present because the insecticide will not penetrate the soil. It will help reduce future injury by establishing a barrier between rootworms and developing roots.

Tubes that deliver granules from hoppers should be as straight as possible. Curves in tubes will hinder the flow of granules and result in uneven distribution.



Insecticide granules applied in a 6-inch band between the planting shoe and press wheels of a corn planter.

Calibrate Equipment

Make sure that at least 10 pounds of 10% granules or 7 pounds of 14% granules are applied per acre. Application equipment must be carefully calibrated. You can do this with measured plastic tubes, or by catching and weighing granules delivered over a measured distance.

Here is one method of field calibration (using 10% granules and based on 40 inch rows, one-quarter mile long):

1. Fill each hopper. Attach a bag to catch all granules delivered from each hopper.

2. Make one round of quarter-mile rows at speed that will be used for planting.

3. Weigh the granules caught in each bag. If there are 2 pounds in each bag, the application rate is correct.

The above method can be used on ½ mile rows by catching the granules delivered over one ½ mile trip through the field.

Rates of delivery may vary from day to day, or even from morning to afternoon, depending upon the amount of moisture granules absorb. If you calibrate equipment in the early morning, recalibrate after air temperature has increased. Granules left in hoppers during the night may be moist the next morning. For greater accuracy, don't keep granules in hoppers overnight.

Factors Affecting Control

Many factors may affect control of larvae in the soil. If the soil remains dry following application, control may be reduced. Organic phosphates are subject to break-down in excessive moisture. When water stands in fields following application, control may be lessened.

Control will be influenced if insecticides are applied in narrow bands, or if wind blows granules off the row. Use spreaders on delivery tubes, and shield them if wind interferes with the distribution over the row.

Organic phosphate insecticides break down in the soil much more rapidly than do the chlorinated hydrocarbons such as aldrin and heptachlor. Some late hatching worms may not be controlled because of chemical deterioration.

Crop Rotations

When beetles emerge they tend to remain in corn fields if the plants are attractive to them. Otherwise they may fly to flowering legumes, sorghum, and weeds where they feed on pollen and deposit eggs. Corn planted in such fields the next year may be damaged.

Larvae developing from eggs laid in fields where corn is not planted the following season perish. Crop rotations will therefore reduce corn rootworm populations if practiced over a long time and in extensive areas. Rotations will not affect populations of southern corn rootworms.

Adult Control

Adult control to reduce the next year's larval population may require several applications because beetles emerge over a period of several weeks and migrate from field to field. Controls should begin about the second week of August and be repeated as necessary. To protect silks, apply control measures before silks are severely chewed, and before the production of pollen has stopped.

Materials that can be used as sprays are:

Material	Amount per acre	Waiting period before harvest
Sevin, 80% wettable powder	1½ pounds	7 days
Malathion, 5 lbs. per gallon	1½ pints	0
Diazinon, 4 lbs. per gallon	1 pint	2 days

Aerial operators may use more toxic materials such as 4 ounces of parathion or methyl parathion. **These materials should never be used by farmers for spraying.** Fields sprayed with parathion or methyl parathion should be posted showing the material used, the date sprayed, and the date it is safe to enter fields. Parathion sprayed fields should not be entered for 5 days, and should not be harvested for at least 12 days following application.

Cautions

All insecticides are poisonous. Thimet, parathion 4072 and Di Syston are very poisonous. In granular forms they can be used safely when all safety precautions are observed. Safety precautions when handling insecticide granules are:

1. Wear rubber gloves when opening containers and filling hoppers. If cotton gloves are worn, discard or launder at the end of each day's work. If gloves become contaminated, remove them at once. Wash hands with soap and water before eating or smoking, and if they contact granules.

2. Always stand upwind when filling hoppers. **Never** breathe fumes or dust. If large bags make it difficult to handle granules, use a respirator approved for Thimet or parathion, and wear a rubber apron when holding bags against the body.

3. Wear a long sleeved shirt or coveralls and a hat, and **stand away** from the hopper when filling.

4. Store all materials out of reach of children and pets and burn empty containers immediately after they are empty, standing away from the smoke. **These safety precautions are very important to protect children and animals.**

5. Never leave granules in hoppers in the field or around the farm yard.

6. Bury spilled or unused granules 16 inches in the soil.

7. In case of contamination, change clothes **immediately** and take a bath. Use clean clothes every day that materials are handled.

8. **Always** read and reread the labels until they are completely understood . . . and **always** follow the label precautions.

9. In case of accidental poisoning, go to the nearest physician or hospital immediately.

The Nebraska master poison control center is located at the Childrens Memorial Hospital, Omaha, Nebraska. This center is the best source of information for physicians in cases of accidental poisoning. The number is 553-5400, area code 402.

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