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F.S. 180

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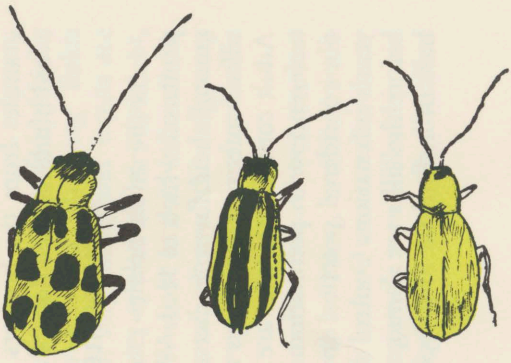
IN SOUTH DAKOTA—1964

By Benjamin H. Kantack, Extension Entomologist



Corn Rootworms—Southern (spotted), Western (striped), Northern (green)

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Corn Rootworm Control in South Dakota

Resistant strains of the western corn rootworm have caused a serious insect problem in South Dakota. The western, northern, and southern species have been present for a number of years. However, the first evidence of resistant strains of western corn rootworms in South Dakota was observed in 1962.

Treatment failures using aldrin and heptachlor, later checked by laboratory tests on adult beetles, indicated that the western corn rootworm population in Lincoln County was becoming resistant. Populations became well established during the 1963 growing season so that the southern and southeastern areas of the state are infested with resistant strains (see figure 1).

Adult specimens of the western corn rootworm have been collected as far north as the North Dakota border, but populations in the more northern counties are at low levels at present.

LIFE CYCLE OF THE CORN ROOTWORM

Adult beetles lay eggs in the soil of corn fields and to a lesser extent in other fields where weeds and flowering plants are present. They deposit the eggs during late summer and fall. Most eggs are found in the first 6 inches of soil, though they have been found from one-half to 15 inches deep. The life cycle of the western corn rootworm is shown in figure 2.

This insect passes the winter in the egg stage and hatching begins in June. It requires several weeks for all eggs to hatch, so larvae of all sizes can be found during late June and early July (see figure 3).

The larvae feed on the root system, eating the smaller roots and tunneling into the larger ones. Many times even the base of the stalk below the soil surface is severely damaged. When the larvae are full grown they change into an inactive state and are called pupae.

Following pupation in the soil, the western corn rootworm adults start to emerge in early July and continue to emerge until early September.

The northern corn rootworm's life cycle is similar to that of the western species but usually the eggs hatch and the adult beetles emerge a little later in the season.

Southern corn rootworm, commonly known as the spotted cucumber beetle, overwinters as an adult and deposits eggs in the corn fields in the spring. There may be several generations of this insect a year. This species has been found to attack sorghum in Nebraska. Serious economic populations of southern corn rootworm have not been encountered on sorghum in South Dakota.

LARVAL DAMAGE

Root injury results from larval feeding, with the smaller roots often completely consumed and the larger roots severely tunneled (see figure 4). Disease organisms often follow injury by rootworm larvae causing further destruction of the root system. The most severe injury usually occurs during the latter part of June and the first 3 weeks in July. Often the entire root system is destroyed.

Losses resulting from a rootworm infestation may range from a light yield reduction to the total loss of the crop, depending on a number of factors. Among these factors are the number of larvae per plant, time of planting, moisture conditions during and following rootworm attack, and general growing conditions.

Yield losses are considerably greater when moisture is lacking during the period of maximum worm feeding. Under these conditions it is hard for the plants to grow new roots. Infested fields often become severely lodged, making mechanical harvesting operations difficult.

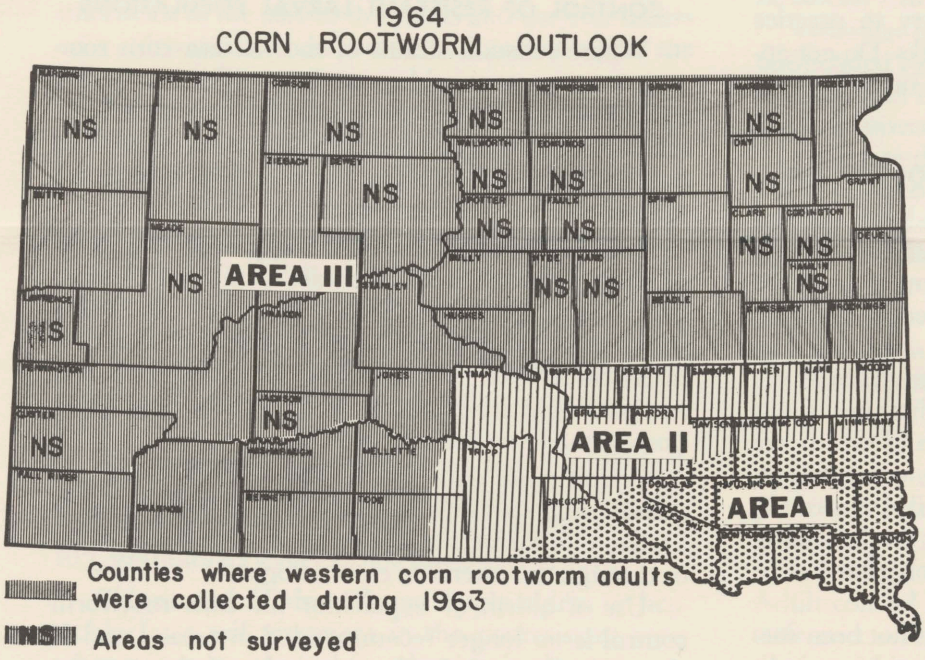

Figure 1. Corn Rootworm outlook for 1964.

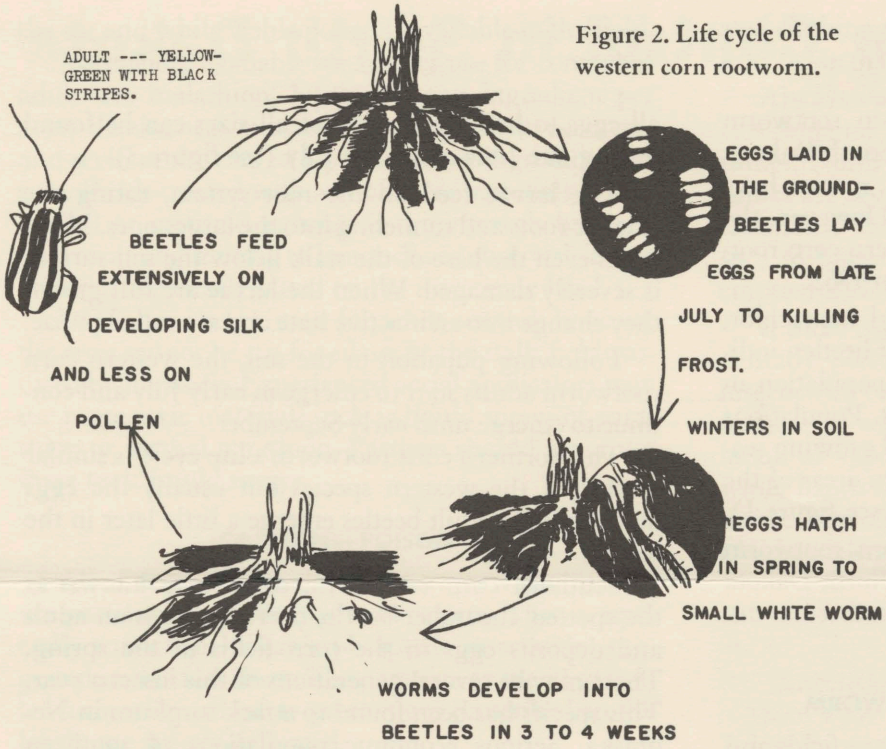

Figure 2. Life cycle of the western corn rootworm.

Figure 3. Larvae of the western corn rootworm.

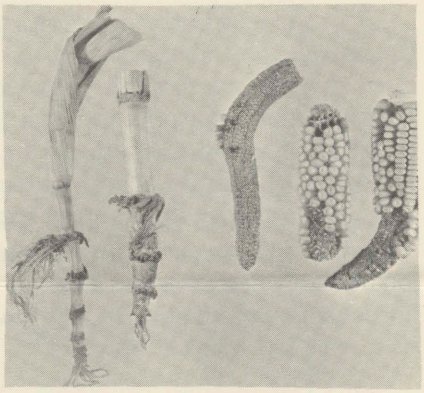

Figure 4. Damaged corn roots mean reduced yield.

POLLINATION AFFECTED BY ADULT BEETLES

Adult beetles, upon emergence from the soil, prefer to feed on corn silks, however they also feed on leaves and pollen of corn. When large numbers of beetles are present during the pollination period, poorly filled ears often result. Fields with late silking plants are usually most severely affected.

When populations of beetles are high during the pollination period, it may be necessary to practice adult control measures to protect the silks. Do not apply insecticide controls for this purpose until the bulk of the plants in the field are in silk.

CONTROL MEASURES FOR LARVAL POPULATIONS

Cultural practices that promote good root systems will help reduce yield loss and lodging. Plant as early as feasible, as experience in the rootworm areas shows that late-planted corn is often more severely damaged than early-planted corn.

Adult beetles disperse from the corn fields as the season progresses and move into adjoining fields where flowering legumes, sorghums, and weeds are present. Thus, if high adult populations were present, corn planted in these fields may be heavily infested the following year. If corn is not planted the following year in these fields the larvae will perish after hatching.

Although the western rootworm has not been successfully controlled by crop rotation, evidence indicates that this practice will reduce western corn rootworm numbers. This reduction in turn will aid in obtaining a better degree of control with the chemical treatments, applied properly and at the right time.

There are no data available on the effect of fall tillage versus spring tillage, disking versus plowing, etc. and the subsequent effect on rootworm infestations. However, any tillage methods which improve the seed bed and promote good root development are recommended.

CONTROL OF RESISTANT LARVAL POPULATIONS

Where resistant strains of the western corn rootworm are present, aldrin or heptachlor treatments cannot be expected to provide adequate protection. Research in the general area of Nebraska, Iowa, and South Dakota indicates that the organic phosphate insecticides are at present the most satisfactory.

Insecticides which have label approval for control of these resistant rootworms are parathion[1] (stabilized form), diazinon, thimet (phorate) and 4072. These materials are all classed as organic phosphate insecticides, toxic to both man and insects. Thimet and parathion are extremely toxic. Follow label directions to the letter for safe use.

Performance data obtained in South Dakota and neighboring states using these materials will be made available to farmers at the local county agent's office or through the extension entomologist.

Use of aldrin or heptachlor for corn rootworm control is no longer recommended in areas I and II shown in figure 2. In the remainder of the counties (area III), western populations are not as well estab-

[1]The only stabilized parathion that has been tested against the western corn rootworm in this area in 1963 was Niran 10G.

lished and the northern corn rootworm species is predominate. Aldrin and heptachlor treatments in this area are still recommended for 1964. There may be a few fields where resistant western corn rootworms are established and in that case, use one of the organic phosphates.

METHOD OF APPLICATION

Organic Phosphates. The four organic phosphates are suggested for application in granular form only, and applied with one of the commercially available granular applicators. Apply in 4- to 7-inch bands over the rows (not with the seed) at planting time and incorporate the insecticide into the upper one-half inch of the soil. This can be accomplished by making the granule application in front of the press wheels or covering disks or by dragging chains behind the planter.

It is of extreme importance that at least 1 pound of active ingredient (10 pounds of 10% granules) be applied in this manner per acre of field. Take care not to exceed this dosage, as this increases the expense of the treatments. Therefore, carefully calibrate the application equipment to obtain the right dosage.

These insecticides can also be applied as side-dressing treatments at first or second cultivation. Special attachments for the cultivator can be purchased or constructed. Use 1 pound active ingredient per acre. Apply at the base of the plants and cultivate immediately to incorporate the insecticide into the soil.

Emergency treatments have also been applied at lay-by time using high clearance machines to place the insecticide at the base of the plants and use disk hillers on a cultivator to incorporate the insecticide into the soil.

Rootworms will still be present in treated fields, particularly outside the treatment band, as none of the insecticides will provide 100% control. Ineffective control may also be encountered when extremely dry conditions prevail during late June and early July. Treatments applied at planting time may be more effective than later treatments under very dry conditions. Also, timing of later treatments is very critical. Control with organic phosphates may also be reduced in spots where water remains standing for periods in a field.

Recommended applications are based on 40-inch row spacings and narrower spacings require a proportionately higher rate. Basically, apply 10 pounds of 10% granules for every 13,080 linear feet of row.

Chlorinated Hydrocarbons. Apply aldrin or heptachlor as a soil treatment in the nonresistant areas when preparing the soil for planting in the spring or during planting operations. Two general methods of applying the insecticides are broadcast or a row treatment. No special equipment is required for broadcast treatments since a sprayer or fertilizer spreader can be used. Row treatments require only one-half the insecticide needed for broadcast applications. This is a decided advantage where large acreages are involved. Row applications call for a granular attachment to the planter or a planter-mounted sprayer.

Broadcast treatment. For the broadcast method, you must use a pound of actual insecticide per acre, either aldrin or heptachlor—5 pounds of 20% granules per acre, or one-half gallon of an emulsifiable concentrate containing 2 pounds of ingredient per gallon with sufficient amount of water.

For best results, work broadcast application into the soil by disking rather than plowing because of the danger of getting the insecticide too deep. However, granular formulations have been plowed under and fair control obtained. Work broadcast applications, especially sprays, into the soil as soon as possible, otherwise the effectiveness of the chemical is reduced.

Broadcast applications are not recommended for listed corn.

Row treatments. On row treatments apply one-half pound of actual aldrin or heptachlor per acre (2½ pounds of 20% granules per acre or 1 quart of the 2-pound-per-gallon emulsion with sufficient water per acre).

When using the sprayer on the planter for row treatments, place the spray nozzle in each planter shoe to spray a band on the soil as it falls over the seed. In the case of listed corn, spray this band behind the moldboard, but ahead of the packing wheels. It should be at least 2 to 4 inches wide.

Granular fertilizer-insecticide mixtures are not recommended for row treatments where placement is at one side and below the level of the seed. For best results, the insecticide needs to be slightly above the seed.

Calibrate the granular applicator with calibrating devices provided by the machine manufacturer or by catching and weighing the granules delivered over a measured distance of the field. Remember that the right amount properly applied is just as important as the insecticide being used. Keep tubes that deliver the granules from the hoppers as straight as possible to avoid hindering the flow of granules.

ADULT BEETLE CONTROL

As the adult beetles emerge they seek attractive plants on which to feed. With corn silks and pollen among their favorite diets, feeding damage on the silks sometimes interferes with proper pollination. Adult control measures are suggested only where interference with pollination appears likely, as they are not considered practical for reducing the following year's infestation. Control measures should be taken before the silks are damaged to where less than one-half an inch of the silk is protruding from the tip of

the ear and while viable pollen is available in the field.

Insecticides available for farmer use for control of adults are malathion, 1 pound active ingredient per acre; diazinon, 8 ounces active ingredient per acre; and sevin at the rate of 1 pound active ingredient per acre. Fields treated with any of these materials can be ensiled or pastured as long as the intervals between treatment and feeding to livestock are observed. These intervals are clearly stated on the insecticide label.

DDT can also be used for adult control, however the crop cannot be cut for silage or the stalk field pastured by livestock. Experienced aerial applicators may use more toxic materials such as liquid sprays of parathion or methyl parathion. **Farmers should never use these toxic liquid sprays.**

CAUTION – POISON

All of these insecticides used for rootworm control are poisonous to both man and insects. This is especially true of the organic phosphate insecticides suggested in this fact sheet. They are safe to use in granular form when **all safety precautions prescribed on the labels are strictly followed.**

Thimet and parathion are extremely toxic, while 4072 and diazinon are somewhat less toxic. All of these materials are extremely dangerous when not handled according to directions.

The first rule in working with any of these materials is to **read the label until it is completely understood. Secondly, follow to the letter the manufacturer's directions on safety precautions.**

Wear protective equipment when opening containers and filling insecticide hoppers—rubber gloves, long-sleeved shirt or coveralls, goggles, hat, and a proper respirator when working in the wind.

Remove protective clothing as soon as possible after use. If any insecticide is accidentally spilled on clothing or parts of the body, remove such contaminated clothing and wash any parts of the body that the insecticide may have contacted.

Always stand upwind and away from the insecticide hoppers when filling. Never breathe dust or fumes. Never haul containers in your automobile as fumes are often inhaled. Store all insecticides or contaminated equipment away from children or pets. Be sure to burn containers immediately after they are emptied and bury unused or spilled granules.

If there is any chance that you may have been accidentally poisoned, consult your local doctor. These insecticides can gain entry into a human body in a number of ways—absorption through the skin, inhalation of vapors, breathing fumes or dust, smoking while hands or face are contaminated with dust, entrance into the eyes. Thus, take all precautions to avoid accidental poisoning.

PRECAUTIONS

Insecticides are poisonous; handle and store them with care. Be sure to read the label and follow the directions. Keep children and pets out of the area where chemicals are stored, mixed, or used.

Do not contaminate feed, feed containers, or water troughs. Carefully clean all contaminated planting equipment. Destroy all emptied containers so they cannot be used for any purpose.

Other Fact Sheets on Corn Production Available from Your County Agent

Planting Corn
Fertilizing Corn
Weed Control in Corn
European Corn Borer Control
Diseases of Corn