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Replaces F. S. No. 18 - Some Insects
attacking corn.

F.S. 49

Control Corn Rootworms

Corn rootworms have caused more damage to corn in South Dakota than has any other soil insect. Losses from 8 to 12 bushels of corn per acre are common in untreated fields infested with rootworms. Infested fields are often difficult to harvest because of plants leaning or falling across rows.

Application of either aldrin or heptachlor to the soil has proven practical and profitable, considering losses that can occur without treatment. The cost for the insecticide per acre will vary from \$1 to \$2.20, depending on the method used in treatment. This small investment in chemical can return you approximately \$6 to \$10 an acre in net profit.

As their name implies, rootworms feed on the roots of the developing plant. This feeding begins when the corn plant is small and may result in a large part of the root system being destroyed. Wounds caused by these worms permit diseases such as root rots to get started.

Symptoms may not show until later in the season, but they consist of stunted, lodged plants with characteristic "goosenecking" where plants have leaned and then turned upward again as they grow. Infested plants can be easily pulled out of the ground. A comparison of the root system of a normal and infested plant is shown in Figure 1. Inspection of the roots on infested plants earlier in the summer may show the presence of rootworms feeding either on the roots or tunneling inside.

TYPES OF ROOTWORMS

Three different corn rootworms, the northern, the western and the southern, are found in the state. The adult beetles of these three are shown in Figure 2. Adults are quite active in August and September, flying around corn fields and feeding on pollen and silks. The worm stage of all three beetles is quite similar and appears as shown in Figure 3. The southern corn

Figure 1. Left—Root system of normal plant. Right—Root system of plant attacked by rootworms.



By W. M. Hantbarger, Extension Entomologist,
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Control Corn Rootworms

Cooperative Extension Service



Figure 2. Left—Adult beetles of the southern corn rootworm. Actual size $\frac{1}{4}$ inch in length. Color: greenish-yellow to green with black spots. Middle—Adult beetles of the northern corn rootworm. Actual size $\frac{1}{6}$ to $\frac{1}{2}$ inch in length. Color: greenish-yellow to green with no markings. Right—Adult beetles of the western corn rootworm. Actual size $\frac{1}{6}$ to $\frac{1}{2}$ inch in length. Color: greenish-yellow to green with black stripes.



Figure 3. Larva or corn rootworm. Actual size $\frac{1}{2}$ inch in length. Color: yellowish-white worms with light brown heads. (Photo courtesy of Iowa State University Extension Information Service.)

rootworm does not overwinter in the state, but adults fly in during June to lay eggs around new corn plants. Fortunately, this rootworm is not usually so troublesome as are the other two.

The northern and western corn rootworms overwinter from eggs laid in the fall by adult beetles around old corn plants. There is some indication that eggs may be laid in alfalfa fields, since corn following

alfalfa may be affected. Eggs hatch into worms the latter part of June and they soon begin feeding on corn roots.

Corn rootworms are most abundant in nonrotated corn fields in the southern part of the state although the problem is spreading northward. The longer corn has been grown continuously on the same land, the greater the chances are for damage from rootworms. Rotation may be used to control rootworms, but this rotation plan should take land out of corn for more than 1 year to be effective. It is possible that eggs laid by the adult beetles do not all hatch the first season.

Another insect which might be mistakenly called a rootworm is the wireworm. An illustration of this pest is found in Figure 4. Wireworms can injure corn by feeding on the seed or on the roots of the developing plants. Affected plants may suddenly start drying up when 6 to 16 inches tall; frequently the central shoot withers and turns yellow. Should plants recover, they probably will be stunted. Wireworms are more of a problem in newly-broken sod and in soil with high organic content. Control measures outlined for rootworms will control wireworms unless infestations are heavy, then dosages should be doubled.

HOW TO APPLY THE INSECTICIDE

Apply aldrin or heptachlor as a soil treatment when preparing the soil for planting in the spring, or during the planting operations. Two general methods of applying the insecticides are a broadcast treatment or a row treatment. Broadcast applications give good carry-over of insecticide into the second year so that treatment is not required 2 years in succession. No special equipment is required since a sprayer or fertilizer spreader can be used.

Row treatments call for only one-half the insecticide

Figure 4. Wireworms. Actual size from $\frac{1}{4}$ to $\frac{1}{2}$ inch in length. Color: yellowish-brown to brown. Body smooth and hard.



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. Soil treatment in rows is effective for just one season. Granular attachments for planters cost around \$55 to \$60 for each two-row unit.

Broadcast Treatment: For the broadcast method, you must use a pound of actual insecticide per acre, either aldrin or heptachlor. With 20% granules, this would mean application of 5 pounds per acre. With emulsifiable concentrates containing 2 pounds of ingredient per gallon, apply one-half gallon of the insecticide per acre with sufficient amount of water.

For best results, work broadcast applications 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 by this method of working into the soil. Work broadcast applications, especially with 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 it will be necessary to get on one-half pound of actual aldrin or heptachlor per acre. This means that you will need to apply $2\frac{1}{2}$ pounds of 20% granules per acre or spray 1 quart of the 2-pound-per-gallon emulsion with sufficient water per acre.

A number of planter attachments for applying granules in the row are available. Most of them are designed to deposit the granules just behind the planter shoe before the dirt falls back into the furrow.

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 24 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 at least seed level but preferably slightly above the seed.

DECIDING ABOUT SOIL INSECTICIDE

Don't take a chance on losing 8 to 12 bushels of corn an acre to the rootworms. If you live in a rootworm area (primarily the southern half of the state) it will pay to apply a soil treatment—

1. If corn is to be planted on last year's corn ground.
2. If corn is to be planted on ground out of corn for only 1 year.
3. Anytime wireworms are known to be a problem.