

## HOW TO CONTROL

# Wireworms

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**W**IREWORMS are among the worst insect pests of both field and garden crops, and they have been extremely difficult to control. Yet cultural practices and modern insecticides offer good possibilities of keeping them in check.

### What Are Wireworms?

**WHAT DO THEY LOOK LIKE?**—The common wireworms are round, reddish-brown or yellowish larvae which are the immature forms of the click beetles. They vary in size from less than  $\frac{3}{8}$  to more than  $1\frac{1}{2}$  inches in length, depending on age and species. They are hard, slender, wire-like, distinctly segmented, and shiny (figs. 1 and 3).

Each has three pairs of short legs, one pair on each of the three front segments following the head. They are very active and when disturbed will wriggle away and quickly burrow into the ground.

The click beetles, or the adults of the wireworms, are brownish, black, or grayish in color with long, slightly flattened bodies varying from  $\frac{1}{4}$  to  $\frac{3}{4}$  inch in length (fig. 5). These adults are relatively harmless to crops. Some larvae feed on decaying vegetable matter such as old stumps and are not injurious; however, the wireworms of agricultural importance feed on the underground parts of plants and cause much damage to crops.

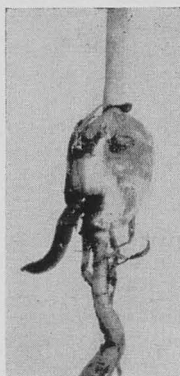
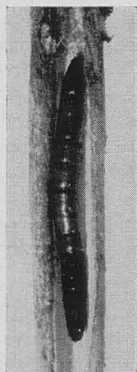


Fig. 1 (left). Wireworm damage to corn seedling. Note part of the wireworm. Fig. 2 (right). Wireworm in its tunnel inside the stem of a plant.



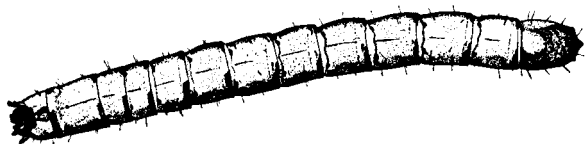


Fig. 3. Wireworm larva.

**WHAT DAMAGE DO THEY DO?**—The worst wireworm injury comes early in the spring when these worms may cause a failure of corn and small grain germination by boring into the sprouting kernels or seeds. During cool and wet spring weather when corn or grain does not sprout readily, the wireworms may invade and hollow out the seed before it germinates. The injured seed is often attacked by rot-producing organisms, and a serious loss of stand may result.

The wireworms often tunnel through the underground stems and roots of young plants. This type of injury may result in stunting, yellowing, wilting, and death of the plants. Sometimes the wireworms bore upward in the stem, kill the central shoot, and leave only a few lower and outer leaves green.

Young plants are in greatest danger before they become well rooted. Wireworms may completely ruin corn or small grain plantings, and replanting may be necessary. Because of the continuous feeding habits of wireworms throughout the growing season, the reseeded crop may be attacked again or may fail to mature before frost.

A wide range of other crops may be badly injured by wireworms during the growing season. Some of them are: potato tubers, corms and various bulbs, beets, turnips, sugar beets, other root crops, all sorts of vegetables, nursery seedlings, annual and perennial flowers, and wild and cultivated grasses.

**WHERE DOES DAMAGE OCCUR?**—Normally the click beetle females lay their eggs in the soil of grassy land. While feeding on the roots of grasses, wireworms seldom cause much visible damage to the pasture or sod land.

If the sod land is plowed under and a susceptible crop is planted on it, the wireworms will feed on the young crop seedlings. For this reason, crops that are usually injured by wireworms should not be sown on recently plowed sod land.

A poorly drained soil is another dangerous place for susceptible crops, because some types of wireworms prefer it.

## Life History of Common Wireworms

The length of the life cycle of the different kinds of wireworms varies from 1 to 5 years or more. Most species need 2 or 3 years to mature.

In May and early June the females lay their eggs, which are hardly visible to the naked eye. The eggs soon hatch, and the tiny, young wireworms begin feeding on decaying vegetable matter in the soil. They cause little or no damage at this early stage. Some species may lay eggs in the fall, and the young larvae overwinter.

Their first winter is spent in the soil several inches deep. By the middle of the second summer they grow in size, shed their skins several times, and may do some damage to crops. Then another winter is spent in the soil.

In the spring of the third year they are the most destructive and feed greedily until late summer. Then they move downward to about 4 or 5 inches below the surface and change to pupae in neatly made small earthen cells. The pupa (fig. 4) is soft-bodied, helpless, and white or creamy in color. This is a vulnerable stage of the insect, and some pupae can be destroyed by timely plowing and deep cultivation.

The pupal stage lasts about 2 or 3 weeks; in August the pupae turn into beetles. The beetles usually remain in the earthen cells or nearby in soil all winter. In the following spring they move upward to the surface of the ground, mate, and the females begin to lay their eggs, starting a new life cycle of wireworms over again.



Fig. 4. Wireworm pupa.

**FALSE WIREWORMS**—Dry soil and plains areas may occasionally be infested with “false wireworms.” Although they belong to a different family of beetles, they resemble wireworms in appearance and habits, and they can be controlled by the same measures used for true wireworms.

## Control by Cultural Practices

Since wireworms are most abundant in grassy sod, meadowland, or poorly drained soil, careful cultural practices are often the most practical means of control. The methods used will depend greatly on whether the wireworms are to be controlled in the field or garden.

The rotation of crops and the following control recommendations are most suitable for field crops, although they can also be followed on smaller areas. The following cul-

tural measures are designed to make it difficult for wireworms to breed and develop:

1. On newly broken sod or pasture land, plant crops that are resistant to wireworms for a year or two before planting susceptible crops such as corn, potatoes, or onions. Resistant crops include soybeans, flax, millet, peas, buckwheat, rape, and vetch. Barley is less susceptible than other small grains.

2. Fallowing the land for a season will reduce wireworm populations. Disking and harrowing as necessary will keep down plant growth and starve the worms.

3. If the land is apt to be continuously infested, use a suitable rotation with more legumes than grass. After the legumes, plant crops less subject to injury for one or two years before planting a susceptible crop.

4. Fall plowing in areas where wind erosion is not a problem will destroy many of the delicate pupae.

5. Shallow tillage in spring and early summer may bring some eggs to the surface and kill them by heat or drying.

6. Improvement of drainage in poorly drained soils may help reduce wireworm injury.

7. Under conditions of light or suspected infestations, use 5 or 10 pounds of extra grain seed per acre to allow for possible wireworm injury.

8. You can trap wireworms in gardens by planting cull potatoes or a small handful of corn about 3 inches deep, 2 feet apart within the rows, and in rows 3 to 4 feet apart. Wireworms will invade the potatoes or corn which should be lifted about 2 weeks after planting and destroyed together with the wireworms inside.

9. Apply commercial fertilizers at the time of planting to stimulate plant growth.

10. Seed when there is sufficient soil moisture and pack the seedbed properly in order to produce prompt germination of the seed and shorten the most susceptible period of injury.

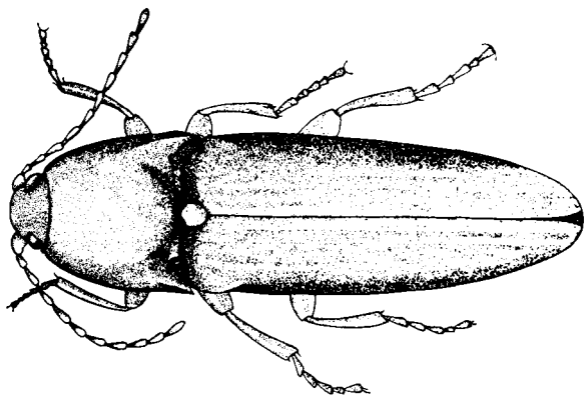


Fig. 5. Adult wireworm.

# Control by Insecticides

Modern insecticides offer a successful means of controlling wireworms at a reasonable cost. Chemical control has become a widely accepted method, especially on high-value land.

**FORMULATIONS**—Insecticides may be applied as sprays, dusts, granulated formulations, or fertilizer-insecticide mixtures depending on the form of insecticide on hand and the type of machinery available. The insecticides may be applied as broadcast soil applications, band applications, side dressings, seed treatments, in transplant water, or as soil fumigants.

A **BROADCAST SOIL APPLICATION** is one of the most effective and practical methods of control. A single application of aldrin, heptachlor, or dieldrin at the rate of 2 pounds of actual insecticide per acre—or chlordane at 4 pounds actual insecticide per acre—worked into the soil before planting is recommended on light soils for control of wireworms in small grains, corn, potatoes, other field crops, and vegetables. On peat, muck soils, or high organic soils the rate of application should be increased to 3 pounds of actual aldrin, heptachlor, dieldrin per acre or 8 pounds of actual chlordane. The amounts of the different insecticide formulations to use per acre are given in table 1. The insecticide should be worked into the top *four to six inches of soil as soon as possible after application.*

**Table 1. Amounts of insecticide to use per acre for broadcast soil applications**

Formulation	Light Soils		Peat, Muck, High Organic Soils	
	Aldrin Hepta- chlor Dieldrin	Chlordane	Aldrin Hepta- chlor Dieldrin	Chlordane
25% wettable powder .....	8 lbs.	16 lbs.	12 lbs.	32 lbs.
50% wettable powder .....	4 lbs.	8 lbs.	6 lbs.	16 lbs.
25% emulsifiable (2 lbs./gal.) .....	1 gal.	2 gal.	1½ gal.	4 gal.
45% emulsifiable (4 lbs./gal.) .....		1 gal.		2 gal.
15.6% emulsifiable (1½ lbs./gal.) .....	1½ gal.		2 gal.	
5% granules or 5% dust	40 lbs.	80 lbs.	60 lbs.	160 lbs.

**INSECTICIDE-FERTILIZER MIXTURES** are available. Aldrin, dieldrin, and heptachlor are often mixed with commercial fertilizers. These mixtures should be calibrated to give 2 pounds of actual insecticide per acre on light soils and 3 pounds of actual insecticide per acre on organic soils at the desired rate of fertilizer application.

**IN SMALL GARDENS**, 5% chlordane dust may be applied at about 2 pounds per 600 square feet. Or 2½% aldrin, heptachlor, or dieldrin dust may be applied at about 1½ pounds per 600 square feet. An alternative

method is to add 2 ounces of 25% emulsifiable aldrin or heptachlor—or 2½ ounces of 15.6 emulsifiable dieldrin, or 2 ounces of 45% emulsifiable chlordane—to a quantity of water in a sprayer or sprinkling can and spray it over an area of 500 square feet. The insecticide should be promptly worked into the top 3 to 6 inches of soil.

**BAND OR ROW APPLICATIONS** of insecticides may be used to control light to moderate infestations of wireworms, but these methods of application are generally less effective than broadcast soil applications. For band or row applications or side dressings, 1 pound of actual aldrin, heptachlor, or dieldrin is recommended per acre.

Placement of the insecticide at or near the level of the seed is desirable. This may be accomplished by a separate applicator for applying granules. The mixtures of insecticides and fertilizers may not always be satisfactory for both purposes, since fertilizers are recommended 2 to 6 inches below the seed and insecticides should be placed near the level of the seed. If a mixture is placed deeply, the seed should be treated separately for good protection against wireworms.

**TRANSPLANT WATER** may be used as a carrier for insecticides. The recommended amounts to use are given in table 2. Use the transplant water at a rate of 200 to 300 gallons per acre or ½ to ⅔ cup per plant. The wettable powders will require frequent stirring to prevent settling, but they are less likely to injure the plants than the emulsifiable concentrates.

**Table 2. Amounts of insecticide to use per 50 gallons of transplant water**

Insecticide	Wettable Powders		Emulsifiable Concentrates		
	25%	50%	25% (2 lb/gal)	45% (4 lb/gal)	15.6% (1½lb/gal)
Chlordane .....		½ lb.*		½ pint	
Aldrin .....	½ lb.*	¼ lb.	½ pint		
Heptachlor .....	½ lb.*	¼ lb.	½ pint		
Dieldrin .....	½ lb.*	¼ lb.			11 oz.

\* For small amounts use 2 level teaspoons per gallon.

**SEED TREATMENTS** with insecticide-fungicide combinations have been used to control root maggots on such diverse crops as onions, corn, beans, and sugar beets. Although some control of wireworms can be obtained by seed treatments, this method appears to be useful primarily for light infestations of wireworms and is less effective than either broadcast soil applications or applications to the row. The usual insecticide-fungicide combinations consist of either heptachlor, aldrin, dieldrin, or lindane combined with either thiram or captan.

For each bushel of corn, use either 1½ ounces of 75% wettable aldrin or 2 ounces of 50% wettable heptachlor, aldrin, or dieldrin in combination with either 2 ounces 50% thiram, 1½ ounces 75% thiram, or 2 ounces of 50%

captan. The mixture may be added dry to the seeds, or a slurry treatment may be used. The same rates of application may be used for seed treatment of small grains.

For each 100 pounds of beans, use either  $\frac{2}{3}$  ounce 75% aldrin or 1 ounce of 50% wettable heptachlor, aldrin, dieldrin, or lindane in combination with either 4 ounces of 50% thiram or 3 ounces of 75% thiram. A sticking agent such as 4% methyl cellulose is recommended. Suspend the required amounts of insecticide and thiram in 1 pint of 4% methyl cellulose per 100 pounds of seeds. Mix the wet mixture with the seeds by raking and shovelling them until they are dry.

For seed treatment of onions, mix two ounces of insecticide (50% wettable heptachlor, dieldrin, or aldrin) and 2 ounces of 50% thiram with each pound of seed in the hopper of the planter. The agitator in the hopper keeps the dry materials mixed with the seeds. Onion seeds are sometimes pelleted with an insecticide-fungicide mixture to control smut and maggots. Detailed directions may be obtained from your county agricultural agent or state experiment station.

**SOIL FUMIGATION** with ethylene dibromide is effective but is less practical than other methods. This solution must be drilled into the soil with special machines to a depth of 6 to 8 inches but not less than 3 weeks before planting. About 10 gallons of a 40% solution or 3 gallons of an 85% solution are used per acre. Small areas may be treated by hand by putting one teaspoonful of 10% ethylene dibromide solution 6 inches deep at 1-foot intervals.

## Precautions

Insecticides are poisonous materials and should be handled with care. Observe all safety precautions given on the insecticide labels. Use protective clothing and avoid contamination of the skin. Be especially careful in handling insecticide concentrates. Store insecticides in safe places out of reach of children. Wash out, puncture, and dispose of all empty insecticide containers. Use insecticides at the proper time, at recommended rates, and on crops for which the insecticides have been approved in order to obtain effective insect control and meet insecticide residue tolerances.

## Timely Hints

In some areas and in some fields, wireworms are a problem almost every year. In such areas it is especially important to consider wireworm control in planning rotations and in the pre-planting preparations.

If wireworm infestations are known to be limited to certain parts of a field, broadcast soil applications may be used on only the infested areas. This is a practical way of keeping expenses at a minimum.

Although seed treatment may be appealing because of its low cost in materials and labor, it can not be expected to give adequate control of heavy infestations of wireworms. Broadcast soil applications give the most effective control of heavy infestations.

Some crops may not be included in the general recommended uses of the different insecticides. In such cases, follow the current label instructions.

Always follow the directions on the insecticide labels and the recommendations from your County Agent and Experiment Station.

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