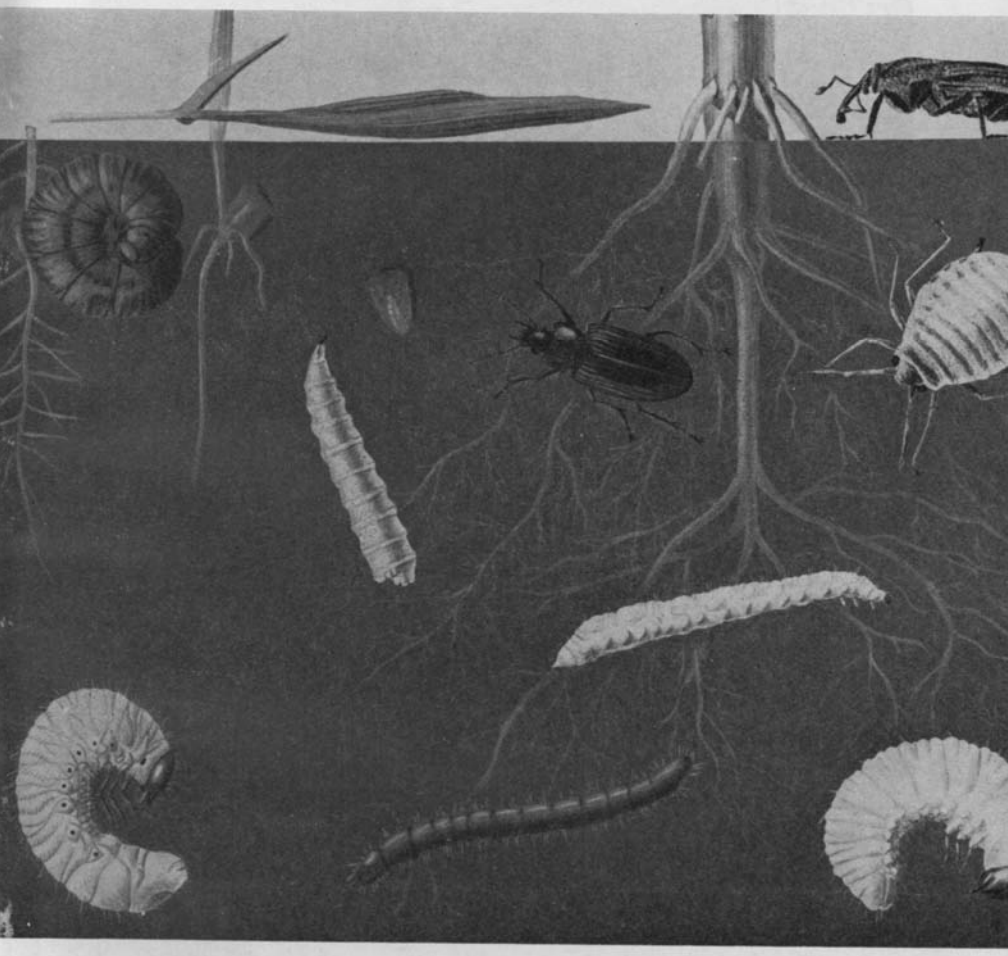
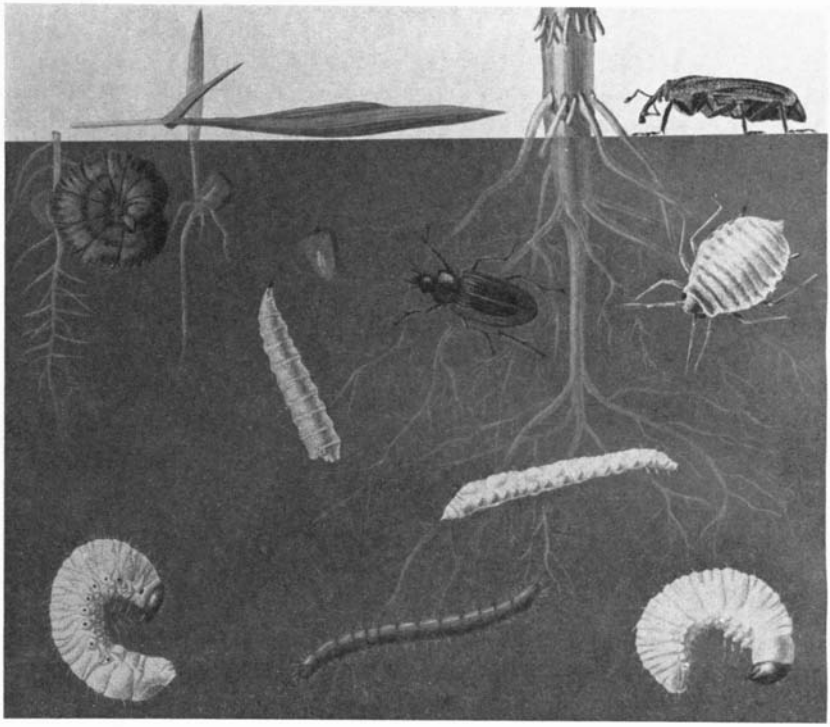
Profitable Control of UNDERGROUND CORN INSECTS

For identification of these insects, see next page.



Circular 805

UNIVERSITY OF ILLINOIS · COLLEGE OF AGRICULTURE
Extension Service in Agriculture and Home Economics
in cooperation with the Illinois Natural History Survey



The location in the picture and the maximum length when fully grown of insects discussed in this circular are: on top of ground at right, billbug — 1/2"; below ground at upper left, cutworm — 1 1/2"; top middle on roots, seed-corn beetle — 3/8"; top right also on roots, corn root aphid — 1/8"; middle row left, seed-corn maggot — 1/2"; middle row right, northern or southern corn rootworm — 1/2"; bottom left, white grub — 1 1/4"; bottom middle, wireworm — 1 1/4"; and bottom right, grape colaspis — 1/4".

This circular was prepared by H. B. Petty and Stevenson Moore III, of the College of Agriculture and the Illinois Natural History Survey. It is based on a report of a 5-year study made in Illinois cornfields by J. H. Bigger of the Illinois Natural History Survey and R. A. Blanchard of the U. S. Department of Agriculture and published as Illinois Experiment Station Bulletin 641.

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Cooperative Extension Work in Agriculture and Home Economics: University of Illinois, College of Agriculture, and the United States Department of Agriculture cooperating. Louis B. Howard, *Director*. Acts approved by Congress May 8 and June 30, 1914.

UNDERGROUND INSECTS of corn steal profits from Illinois farmers every year. In the past 5 years, they cut corn yields an average of 8 to 10 bushels an acre in 5 out of every 20 Illinois fields. In another 4 out of every 20 fields, they cut yields 5 to 8 bushels an acre, and in still another 5, reduced yields 3 to 5 bushels an acre. Thus only 6 of every 20 fields escaped with a loss of less than 3 bushels an acre. They reduced average yields in the state 5 to 6 bushels an acre each year.

In many fields, their attacks cause poor stands, so fields must be replanted. They prune the roots so severely in many fields that the plants lodge and harvest is slowed down, or at least made more difficult. There is no way to measure the resulting inconvenience to the farmer.

The damage these pests do may begin when the seed is planted and continue until harvest. Not all species are present in any one field in the same year, but many of them, in various combinations, may be.

WHAT ARE THESE INSECTS?

There are at least 10 kinds of insects that attack corn underground. Some attack the seed, others the roots, or the stalk just below soil level.

Seed-corn beetles, seed-corn maggots, and wireworms attack the seed between the time it is planted and it germinates, and so reduce stands. Maggots and beetles are most damaging in cool, damp springs. They do not seem to be affected by crop rotations. Wireworms are usually most damaging in low, poorly drained areas and, in at least some instances, are worst in corn following small grain.

Loss of stand, primarily as a result of seed damage by these 3 pests, averages 6.3 percent. This average loss was shown in a study of underground insect damage by entomologists of the Illinois Natural History Survey in 352 tests in Illinois fields during a period of 5 years. When fields have to be replanted because of insect damage, these 3 insects along with cutworms and billbugs are usually to blame.

Grape colaspis attacks corn after red clover, mammoth clover, ladino, alsike clover, or second-year soybeans. The small, comma-shaped grubs strip the tiny root hairs from the plants in June and early July. Unable to get enough phosphorus, the plants turn purple, a typical symptom of phosphate deficiency. Severely damaged plants never fully recover.

Northern and southern corn rootworms scarify and tunnel the roots of corn in June and July. They may almost completely destroy the root system. The plants become top heavy in August and September and lodge. Lodging not only cuts yields seriously, but creates picking trouble and picker losses. Northern corn rootworm is a pest of corn grown for more than 2 years in succession in the same field. In the larval (or worm) stage, it attacks the roots; in the adult stage, the fresh silks. The adults feeding on the silks may be so abundant that they affect pollination and as a result the ears do not completely fill. Southern corn rootworms migrate into Illinois as beetles in the spring and deposit their eggs in cornfields, particularly fields in which there are grassy weeds. The newly hatched worms immediately attack the corn roots.

Wireworms attack the young plants as well as the seed. They drill a hole in the base of the stalks just below the surface of the soil. The center of the plant then wilts and either dies or becomes stunted and deformed. If it lives, it produces no ear or at most a small nubbin.

Black cutworms concentrate in low areas where water has stood. It is here the black cutworm moth likes to lay her eggs. The cutworms that hatch migrate from these areas, cutting off corn as they go until no plants are left in a large area.

White grubs of a particular species have begun to adapt themselves to present farming conditions. These grubs most commonly attack corn or soybeans following soybeans. When infestations are heavy, they may destroy entire areas of a field at any time from June to harvest. If the plants do not die, they often lodge severely. Thus far these white grubs have attacked corn only in the central half of the state.

Billbugs are usually most abundant in bottomland fields or in fields where nutgrass grew the previous year. They may migrate out of grass waterways and destroy the adjacent corn. Although they attack the plant above ground, they remain in the soil during the day.

Corn root aphids, maintained by colonies of cornfield ants, feed on the roots near the base of the plants. They suck the juice from the plants and stunt them severely. If corn root aphids are a problem, ant colonies are abundant in the field.

HOW TO PREVENT UNDERGROUND INSECT DAMAGE

Two insecticides, aldrin and heptachlor, when properly applied, will control practically all the underground insects of corn. These insecticides may be broadcast over the entire field at 1½ pounds of actual

chemical per acre, or may be applied as a band or row treatment at 1 pound of actual chemical per acre. They must be in the soil, however, not on top of it. Both insecticides are commonly available in Illinois and in comparisons seem to give the same results. They are marketed in three different forms, as sprays, granules, and fertilizer-insecticide mixtures.

Sprays are emulsifiable concentrates containing either 2 or 4 pounds of actual chemical per gallon. They are mixed with water. If 1½ pounds of actual chemical per acre is to be applied broadcast, use 3 quarts of 2-pound concentrate or 3 pints of 4-pound concentrate per gallon for each acre.

Granules are tiny particles of clay impregnated with the insecticide. They contain either 10 or 20 percent of the chemical by weight. Seven and one-half pounds of 20-percent granules contains 1½ pounds of actual insecticide — enough to apply broadcast to 1 acre.

Fertilizers are mixed with either aldrin or heptachlor. If the insecticide is to be applied in the fertilizer, the amount of fertilizer used per acre must contain the recommended amounts of insecticide per acre. Otherwise, insect control will not be satisfactory.

Aldrin and heptachlor used in recommended amounts will have little if any effect on earthworms and no effect on soil microorganisms such as nitrifying bacteria.

HOW TO APPLY INSECTICIDES

Broadcast. Any of the forms may be used for over-all field treatment. Everything considered, broadcast treatment will usually give the most consistent and satisfactory results. Disk the material into the soil immediately after it is applied, particularly if the air temperature is above 60°. Many farmers put a sprayer boom on the front of the tractor to spray a swath the width of the disk and pull the disk behind the tractor. There is probably a little more leeway in the amount of time that may elapse between application and disking when the insecticide is applied in granules or in fertilizers than there is when it is applied as a spray. Nevertheless, the sooner the material in any form is disked into the ground, the better the results will be.

In the row. Aldrin or heptachlor in any of the three forms may be applied at planting as a band or in-the-row treatment. Of all row treatments, band sprays have produced the best results. To band spray, put a nozzle in each planter shoe to spray the soil as it falls over the seed. The average sprayer now on the farm can be adapted for this operation or special units can be purchased.

Granular insecticides applied in a narrow band in the soil over the row are perhaps next in effectiveness. Special applicators for band application are on the market. The granules should be dropped in the planter shoe, so that they are covered by the soil. Granules spread on the surface of the ground will be ineffective.

The most common method of applying these insecticides in the row has been in starter fertilizer using split boot attachments on the planter. Placing fertilizer-insecticide mixes deep in the ground and on only one side of the row is not recommended. Although putting the fertilizer in deep on only one side of the row may be the preferred method of placing the fertilizer, it may be the least effective way of placing the insecticide.

HOW TO TIME APPLICATIONS

Insecticides can be applied in the row only at planting time. They can be broadcast and disked in the same day the corn is planted, but for best results they should be applied 10 days or 2 weeks before the corn is planted. The insects then have plenty of time to come in contact with the insecticide and they are controlled before the corn is even planted.

Recent research leads to the belief that aldrin and heptachlor, at least in fertilizers and possibly as granules, can be applied during December, January, and February and then plowed under in the spring. Moisture, aided by thawing and freezing, works the insecticide into the soil. During these months, temperatures are also so low that the insecticide does not escape as a gas. More information concerning this method of application is needed, but at present it appears to offer the possibility of making applications during the slack season.

WHAT FIELDS NEED TREATMENT? HOW LONG WILL TREATMENT LAST?

There are no hard and fast rules for determining what fields could most profitably be treated. Therefore every farmer will have to study his own situation and make his own decisions. There are, however, some rule-of-thumb guides that may prove helpful.

Use soil insecticides to prevent seed and seedling damage in all fields. Seed-corn maggots, seed-corn beetles, cutworms, and billbugs cut stands an average of 6.3 percent in Illinois fields. Stands in all rotations appear to be equally affected.

Use soil insecticides to control root-feeding insects on all these fields:

1. Fields in corn for more than 2 years in succession. Corn on such fields is likely to be damaged by northern corn rootworms, particularly in the northern half of the state and in bottomland throughout the state.

2. Bottomland fields and any others with a history of wireworm damage. Black cutworms and wireworms are commonly serious pests in such fields.

3. Fields plowed out of sod, particularly bluegrass or timothy sod. Wireworms, grubs, root aphids, and cornfield ants are likely to damage these fields.

Most of the fields in corn a second year, or in corn following clover, alfalfa, or soybeans might well be treated.

The fields least likely to be damaged are those following small grains, but even in them, wireworms are occasionally a problem.

Aldrin and heptachlor will control some insects the year following application. In 3 of 5 years, however, the difference in stand between the year-old treatments and the new treatments was more than enough to pay for the cost of the new application.

DOES SOIL TREATMENT REPLACE INSECTICIDE SEED TREATMENT?

Treating the seed with an insecticide when the soil is also to be treated with an insecticide is of no value. Treating the seed in the planter box may actually reduce stands because of mechanical factors. After the planter has been operating a few hours, the seeding rate becomes erratic because the insecticide gums up the plates. The insecticide dust also replaces the seed in the bottom of the box, so dust is planted instead of seed. But if the seed is to be treated in the planter box, the box should be emptied often and the plates cleaned.

The best way to use seed treatment is to treat the seed before it is taken to the field. Use a metal drum for treating it and sift out the excess dust.

Remember seed treatment protects the seed from insect damage only from the time it is planted until it germinates. It does not protect either the roots or the stalk from insect damage.

SOME COMMON MISTAKES

Using less-than-recommended amounts of insecticide has been farmers' most common mistake in recent years. When they used recommended amounts of insecticide, they controlled 84 percent of the

wireworms, 94 percent of the white grubs, and 95 percent of the rootworms. But when they used less-than-recommended amounts, they controlled only 64 percent of the wireworms, 79 percent of the white grubs, and 83 percent of the rootworms.

A second common mistake has been failure to disk broadcast applications in immediately. When these applications are made, air temperatures are commonly above 60° and the insecticides vaporize. For this reason, the material must be disked in immediately unless it is spread during the winter months. If it is disked in 4 hours after it is spread, control is reduced 50 percent. If it is disked in 24 hours after it is spread, there is no control.

HOW TO CHECK RESULTS

To check the results of treatment, leave two or more strips 12 rows wide through the field and put no insecticide on these strips. Mark these areas carefully. Make careful counts of stand in each of 5 places in the untreated strips and in the treated areas next to it. For each 1-percent difference in stand, there may be a difference of 0.85 percent in yield. This difference is a rule-of-thumb guide, but it does take into account both the effect of loss in stand and reduction in size of ear.

At harvest, pick rows of equal length in treated and untreated areas and compare yields. This is the best and only accurate method of measuring corn yields.

Soil insecticides —

- Provide insurance against replanting because of insect damage
- Insure easier picking because of less lodging
- Save an average of 5 to 6 bushels of corn an acre
- Return their cost 3 times or more in 25 percent of all fields, 2 to 3 times in 18 percent, and 1 to 2 times in 24 percent

If all Illinois cornfields were treated, total corn savings would more than pay for the cost of treatment and the farmer would have the added benefits of easier picking and less replanting.

When using insecticides, be sure to read and follow the directions and precautions given on the container label.

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