

Soil Pests—Their Detection and Control

WIREWORMS

Wireworms injure vegetable crops by killing seeds or seedlings and tunneling and scarring tubers, roots, or bulbs.

Detection: The above injury to young plants or tubers frequently is sufficient evidence to warrant control measures. Further evidence can be obtained by sampling, using either of the following methods:

Method 1

A technique using baits has been developed for evaluating wireworm potential before planting. The bait stations should be established 2 to 3 weeks before the anticipated planting date. Fields where small grain or grasses have been grown the preceding 2 or 3 years are the best candidates for bait stations.

Because wireworm infestations are often localized within a field, it will be necessary to place the bait stations randomly throughout the field such as placing two bait stations at the highest elevation in the field, then two stations on a slope and finally two stations in the lowest point in the field. One bait station per acre is desirable.

Follow this procedure for baiting:

1. Mix 1 cup of wheat, corn, or oat seed at each station.
2. Bury the bait about 4 inches deep. Cover the ground over each bait station with an 18-inch square of black plastic. The plastic collects solar heat and speeds germination of the corn and wheat, which entices overwintering wireworms.
3. Mark each station with a flag or stake.
4. Dig up the bait stations in 10 to 14 days and count the number of wireworms.

Method 2

1. Be sure the soil temperature at the 6-inch depth ranges between 45° and 85°F and that soil moisture is equivalent to that desired for planting.
2. Collect soil samples from 20 scattered sites per acre. Each sample should represent a soil profile 12 inches deep and 6 inches in diameter.
3. Sift soil and count wireworms.

Control: If you find an average of one wireworm per bait station (Method 1) or if you find five or more wireworms in 20 soil samples (Method 2), a labeled soil insecticide should be used. In some instances, several wireworms may be found in one bait station and none in others. Wireworm infestations tend to concentrate in some locations. It may be possible to limit treatment to areas of the field where the wireworm concentration is heaviest.

When to apply: Insecticides can be applied either in the spring or fall when the soil temperature at the 6-inch depth is at least 50°F

and soil moisture is equivalent to that desired for planting. Frequently, the insecticide is applied immediately before planting. When early spring planting is required, a fall treatment is suggested.

What to Use: See the crop protectant section for each crop for appropriate chemical to use.

How to apply: When intended as a broadcast application, use a low-gallonage sprayer or granule distributor designed for low dosages. Immediately after application, mix insecticide with soil to a depth of at least 6 inches by disking twice in opposite directions.

In a band treatment as with potatoes, apply an appropriate soil insecticide at planting 3 to 6 inches deep along both sides of the row.

GARDEN CENTIPEDES (SYMPHYLANS)

Garden centipedes are arthropods that are related to insects. They feed on germinating seed and fibrous roots of many plants, including most vegetable species, and on decaying plant material. They are often associated with moist areas of a field and typically establish in spots or field edges. Rotation does not appear to be an effective control. If a spot becomes established, the crops planted into that area have a difficult time growing out of the damage, because the symphylans are continuously grazing on the fibrous roots.

Detection: The first symptom is an area or patch of poorly developing plants, similar to other root problems. Check the soil in these areas so that treatment can be made before planting the next crop, as there is no practical post-planting control. A common practice is to flag off the spot and treat that area with soil insecticides in the following fall or spring. Soil solarization has not been an effective control. It is reasonable to assume that symphylans can be transported in soil on field equipment. Dig up the soil and look for small, slender (less than 0.25 inch) white centipede-like animals that move quickly and try to avoid light. Another method of sampling is to drop the soil into a bucket of water. The symphylans will float to the top. Symphylans have 12 pairs of legs on 14 body segments. Do not confuse the symphylans with true centipedes—centipedes eat other arthropods and are considered beneficial. Symphylans have beaded antennae. Centipedes are not typically white in color and have large Chilicerae with venomous fangs. Dry or cold [less than 45°F] soil will reveal few, if any, symphylans.

When to treat: If samples are taken in the spring, control is generally warranted if there is an average of over two symphylans per shovelful of soil. Samples taken in September or October may average four or five per shovelful and will warrant treatment before the next crop. Insecticides are generally applied before spring planting, and fumigant treatments are usually made in the fall. Note: Effectiveness of soil-applied insecticides decreases as soil temperature decreases below 55°F.

What to use: See the crop protectant section for each crop for appropriate materials to apply. Apply fumigants in the same manner as described in the in the “Nematode Control in Vegetable Crops” tables in the Disease Control section. Follow all label directions and restrictions when using these materials.

CUTWORMS

There are a number of cutworm species that attack vegetable plants. Some attack the tuber, spear, or fruit by chewing the edible portion, rendering them unmarketable. Others attack the seedlings or transplants, killing them outright or causing them to be unproductive. Cutworms are attracted to light and can lay eggs on transplants growing in greenhouses that are lighted at night. The cutworm eggs and larvae may be accidentally transferred to the field with the plants.

Most cutworms are night feeders and hide under sod clumps, stones, decaying vegetation, etc., during the day. Weedy, minimum-tillage fields or field coming out of pasture are especially attractive egg-laying sites for cutworm adults (moths). During periods of drought, low-lying areas in fields are more subject to attack than other areas, presumably because of more desirable conditions.

Control: Where cutworms are suspected, a broadcast incorporation treatment may be necessary just before planting. This treatment should be worked into the soil immediately after applying and just before planting.

Even if a broadcast treatment is used, fields should be scouted for cutworm damage within a week of planting or plant emergence. If cutworms are actively cutting plants, a postplanting contact treatment maybe necessary. The following procedures may help improve control when a contact insecticide treatment is used:

1. Direct sprays at the base of the plants where cutworms are actively feeding.
2. Increase the amount of water used to at least 30 gallons per acre, especially in dry weather.
3. Spray between midnight and 5 A.M., when cutworms are most active.
4. Cultivate after insecticide application to improve contact with cutworms, especially in dry weather. In all cases, consult the label for application details.

GRUBS

Grubs are the larvae of Scarab beetles and can be serious soil pests in vegetable crops. Most vegetables can be attacked, and serious problems have occurred in potatoes, sweetpotatoes, beans, corn and spinach. Grubs cause damage by feeding on the roots and underground parts of the plant from one to several inches below the soil surface. The plants may yellow and wilt, which causes a pattern of patchy growth in fields where plants are dead or dying. If injured plants are pulled up, the roots will be found to have been eaten off, and usually the curve-bodied grubs can be found in the soil.

Adult beetles lay eggs in the soil during June and July. As the soil cools in the fall, the grubs work their way deep into the soil and return to the surface the following spring. Depending on the insect, grubs may take from 1 to 3 years to become adults and may cause problems year after year.

Control: Grub damage is usually associated with grassy or weedy fields. Cleaning fields may help prevent serious grub damage. Problems may often occur in crops planted to fields that were previously in sod or turfgrass.

No effective insecticides are labeled for grub control in vegetables. However, soil insecticides that are applied for wireworm control may also be effective in reducing grub populations.

MAGGOTS

The two most important maggots can become significant pests during the growing season. The adult of the maggot (a fly) fluctuates in abundance in different areas in different years; because it is impossible to determine when and where maggots will attack and because nothing can be done once the injury is noted, preventive controls are good insurance before planting if there were previous maggot problems.

Seed Corn Maggot: Seed attacked by seed maggots usually fails to sprout or, if it does, it is weak or sickly. Injury is most severe in wet, cold springs and on land high in organic matter. Manure and other organic matter should be thoroughly worked into the soil in the fall so is not as attractive to the egg laying seed corn maggot flies in the spring.

Control: Best control is achieved by using a seed treatment. Seed treatment options are listed in the insect control section.

Cabbage Root Maggot: Plants whose roots are attacked by the root maggot will appear riddled with maggot tunnels, and underground fleshy parts of these plants rot. Above ground, plants appear off-color, will wilt, and will seldom reach full growth.

Control: Seed treatments, transplant water treatments, in-furrow treatments, preplant broadcast, and post-plant treatments may be recommended depending on the crop. Refer to the insect control section for specific recommendations.

SLUGS

Slugs are not insects, but are related to snails. All slugs require damp or humid surroundings for development. During the day, slugs seek shelter under protective debris and will avoid the drying effects of sun and wind. As a result, weed control is a useful management tool to any slug problem.

Control: Iron phosphate baits are often used. Beer traps can be effective in small areas. Place 1/2 inch of beer in a shallow flat pan. Slugs are attracted to the beer and drown upon entering the pan. Baits are often the most effective means of control. Consult your local Extension office for treatment options.

NEMATODES

Determine the degree of infestation *before* applying a nematicide. To do this, collect soil and root samples and submit these samples to your state’s Plant Diagnostic Laboratory or Nematode Detection Laboratory.

Procedures for submission and sampling are noted below. Contact your local Extension office for specific information on how to submit your samples.

HOW TO COLLECT SOIL AND ROOT SAMPLES FOR NEMATODE DETECTION

Whenever nematode damage is suspected, an examination of both soil and roots is necessary to determine to what extent nematodes are involved.

The following suggestions are made so that samples will be collected properly and arrive at the laboratory in good condition.

Collecting: If a large area in a field is believed to be involved, collect samples from edges of the affected area. Take a mixture of roots and soil from at least 10 separate sites within the root zone or under at least 10 plants. This can be accomplished by unearthing each plant with a shovel and taking a handful of soil and roots or by using a soil sampling tube (3/4-inch diameter) until 1 quart of soil is obtained.

Samples collected after the host plant is plowed down are very misleading and should not be used. Send only a single blended sample from each field. Do not mix samples from several fields.

Handling: After collecting and mixing a composite soil and root sample, place it in a plastic freezer bag and close the bag tightly to prevent the sample from drying out. Protect the samples from high or freezing temperatures.

Submitting. Consult your state's diagnostic lab for its procedure and form required. The following information may be necessary so that control recommendations, if any, can be made.

Include with each sample:

1. Date collected.
2. Crop to be planted, present crop, and history of affected area.
3. Name and address of person submitting the sample and grower.
4. Plant symptoms.

****Be sure to mark samples: "For Nematode Detection."**

Selecting a Nematicide: Dosage, restrictions, and crop specificity are listed on the manufacturer's label and must be carefully followed to ensure satisfactory results.

Rates for nematicides and multipurpose soil fumigants are provided in the NEMATODE CONTROL IN VEGETABLE CROPS section of this handbook.

A plastic film seal is needed when methyl bromide or certain other fumigants are used as noted on the product label. These plastic films increase the efficiency of treatments.

Apply fumigant-type nematicides to a depth of 6 to 8 inches. Immediately after application, soils should be dragged, rolled, or cultipacked to delay loss of fumigant. A light irrigation through sprinklers will also delay gas escape.

At least 2 to 3 weeks should intervene between the application of the nematicide and the time a crop is planted. See manufacturer's label recommendations for specific crops and waiting times. There are many fumigants and nematicides available, consult the disease control section of this handbook for a list of options.

One week after application, work soil to a depth of several inches so that gases may escape. Severe injury or death of sensitive plants, such as tomato, may occur on heavy soils following heavy rains or if increased rates of a fumigant are used.

Because of a reduction of nitrifying bacteria by the nematicide, at least 50% of the nitrogen in the initial fertilizer application should be in the nitrate form.