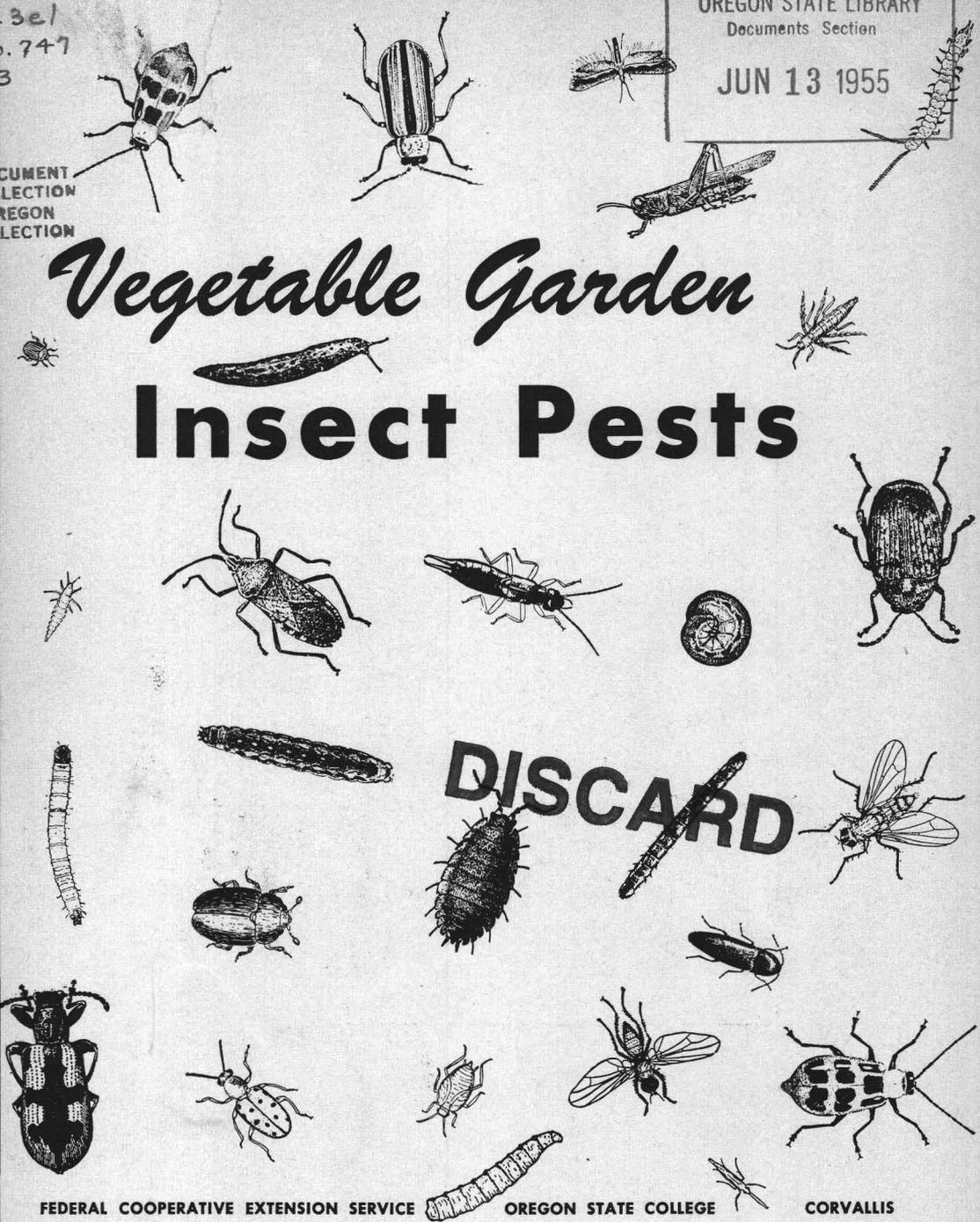


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Vegetable Garden Insect Pests



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Safety Precautions

All insecticides are poisonous to us in some degree. However, insecticides can be, and are, used with safety by hundreds of people every day. The following suggestions will help you.

- ✓ Avoid spilling concentrated insecticides on the skin. If there is accidental contact with these materials, wash off immediately with soap and water before continuing your work.
- ✓ Store all insecticides out of reach of children and irresponsible persons.
- ✓ Read the label and follow the manufacturer's recommendations and precautions.
- ✓ Keep labels intact. If the label is lost, destroy the material.

Vegetable Garden Insect Pests

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This bulletin has been prepared for the home, or small acreage, vegetable grower. Commercial growers may obtain more detailed information on specific insect pests from County Extension Agents or from Oregon State College.

Home gardeners can control most insect pests by the proper use of insecticides. There are many kinds of insecticides and ways of preparing or formulating each kind for use. Most of the materials useful in the home garden are available in small packages at seed or garden-supply stores. Multi-purpose insecticide and fungicide combinations are also available. These products will carry the brand names of national or local manufacturers and the labels will list the ingredients.

The dilute dust formulations, such

as 5% DDT, 1% rotenone, etc., are widely used for home gardens because they are easy to handle and apply. Some products are sold in dual-purpose containers which serve as dust applicators.

Insecticides also are available as liquid concentrates which form a milky emulsion when diluted with water. These emulsions can be applied easily with a compressed-air hand sprayer. Some manufacturers are now marketing garden hose spray guns especially designed for use with their products. If this type of equipment is used, the manufacturer's directions should be followed.

Wettable powder formulations require constant agitation in the spray tank and cannot be applied satisfactorily with the type of equipment us-

Insecticide	Amount to mix with 1 gallon water	Dust concentration
Aldrin	1 tablespoon of 25% E.C. ¹	2½%
Baits	Purchase ready prepared	
Chlordane	4 teaspoons of 40% to 45% E.C.	5%
CPR ²		
DDT	1 tablespoon of 25% E.C.	5%
Dieldrin	1 tablespoon of 25% E.C.	2½%
Heptachlor	1 tablespoon of 25% E.C.	2½%
Lindane	1 tablespoon of 20% E.C.	1½%
Malathion	1 to 2 teaspoons of 50% E.C.	4% or 5%
Methoxychlor	1 tablespoon of 25% E.C.	5%
Nicotine sulfate ³	1 teaspoon of 40% solution	4%
Pyrethrum	1 to 2 teaspoons of E.C.	0.3%
Rotenone	1 to 2 teaspoons of E.C.	¾% to 1%
Sabadilla		20%

¹ E.C.—Emulsifiable (or liquid) concentrate.

² CPR—Contains rotenone, pyrethrins, and activator. Use as directed on label.

³ Add small amount of laundry soap to improve effectiveness of nicotine sulfate sprays.

ually available to the home gardener. Insecticides are also available in a granular form for use in soil treatments. (See discussion under "Total Soil Treatments.")

The preceding table gives the concentrations of dust formulations commonly available, and suggested dilution rates for the spray materials. The main thing to remember, however, is to read the label and follow the recommendations of the manufacturer.

Symphylids

Symphylids are small, white, centipede-like creatures that live in the soil. They feed on germinating seeds, roots, and tubers of nearly all vegetable varieties. They are present in most soils and are serious pests of many vegetable and flower gardens.

Aldrin, dieldrin, or heptachlor, at the rate of 10 pounds of actual insecticide per acre (9 pounds of 2½% dust or granular formulation per 1,000 square feet) have given satisfactory results in about half of the experimental trials. These insecticides were mixed with the soil as described under "Total Soil Treatments." As yet, no sure control measures have been developed.

Total Soil Treatments

You can control wireworms, cucumber beetle larvae, tuber flea beetle larvae, carrot rust fly larvae, and white grubs by treating the garden soil with aldrin, heptachlor, or dieldrin. In addition, plant injury from seed-corn maggot, onion maggot, and cabbage (turnip or radish) maggot will be reduced greatly or eliminated.

It is important that the insecticides be mixed thoroughly with the soil. Work the soil to planting tilth *before* applying the insecticide. Then work in

the material with a rotary tiller, or fork and rake, thoroughly. Deep working of the insecticides (6 to 8 inches) is important for wireworm, white grub, and cabbage maggot control. A shallower mix (3 to 4 inches) is sufficient for control of the other soil pests.

To treat 1,000 square feet of garden space, use ¼ pound of actual insecticide. For example, use 9 pounds of 2½% granular formulation. Or if you prefer to apply the insecticide as a spray and have available a trombone, compressed air, or power sprayer, mix 1 pint of emulsifiable concentrate in 5 to 10 gallons of water for each 1,000 square feet of soil to be treated. This treatment should be effective for at least *two years*. Starting with the third year, work about one-fifth of the original dose into the soil each spring. This should keep the concentration up to an effective level for all the pests mentioned above. *Caution*—Do not overdose. Plant injury can result from excessive amounts of insecticide in the soil.

Cutworms

Cutworms are the larvae of large, dull-colored moths, often attracted to lights in summer. These worms spend the winter as partially grown larvae or as pupae (resting stage) in the soil. It is the overwintering larvae which cause damage to newly planted gardens in the spring. In late spring, the larvae transform into moths which lay eggs in June and most of the summer. A new brood of cutworms may then do damage to late-planted beets, corn, and other vegetables in July.

Cutworm baits, available ready-mixed on the market, are effective when plant growth is sparse and when applied in the evening. The bait is

most likely to be taken if the ground is wet, following a rain or irrigation.

If worms are cutting plants at or below the ground level, spray or dust DDT on the area infested and irrigate, or rake DDT dust into the top layer of soil. When the cutworms are feeding on the foliage of crops such as beets, one application of 5% DDT dust will handle them. It is important to kill the worms at this stage, since they will later damage the beet itself.

Cabbage Maggots

This pest of crucifer or cole crops is the larva of a fly. The eggs are laid around the bases of plants during most of the growing season. Insecticides should be placed where they will come into immediate contact with the hatching maggots. Since the eggs hatch in 2 or 3 days, it is very important that the insecticides be applied promptly at the time indicated in the recommendations. Two control measures are involved, depending on the type of crop.

The "stem" or "leafy" type crop (cabbage, cauliflower, broccoli, etc.) does not require perfect control. In the plant bed, a soil treatment of $\frac{1}{4}$ pound per 1,000 square feet of aldrin, heptachlor, or dieldrin will protect the small plants satisfactorily. If the seedlings are to be started in exposed flats, the sterilized soil can be treated with aldrin, heptachlor, or dieldrin at the rate of about 1 teaspoon of 2½% dust per square foot of soil 3 inches deep. Immediately after transplanting the sets into the garden, dust or ring the bases of the plants ($\frac{1}{2}$ teaspoon per plant) with any of the above-mentioned materials or with lindane or chlordane dusts.

Protection of root crucifers (turnips, radishes, etc.) is more difficult,

since one maggot can ruin the edible root. Total soil treatment with aldrin, heptachlor, or dieldrin will usually give satisfactory control, depending on the soil type, severity of attack, and other factors. Several other treatments have been worked out, one of which is described here. Emulsifiable concentrates of heptachlor or aldrin are diluted in water and sprayed or dribbled along the rows after the plants come up. For home gardeners, an emulsion consisting of 1 tablespoon of the liquid concentrate in 1 gallon of water may be used. One pint of this dilute emulsion will treat 20 feet of row per application. A coarse, fan-type spray can be used to wet an area about 1½ to 2 inches wide directly along the rows, or the emulsion can be dribbled along the rows from a tin can with a large nail hole punched in the bottom. Three applications are necessary; the first just when the seedlings are showing the first true leaves, and the next two applications at about 10-day intervals.

Onion Maggot

This insect is the larva of a fly and a close relative to the cabbage and seed-corn maggots. It attacks only onions. The total soil treatment will control this pest satisfactorily in most soil types. If experience shows that something more effective is needed, a furrow drench, as described below, may be tried.

Dribble an emulsion (1 tablespoon liquid heptachlor concentrate to 1 gallon water) down the seed furrow at the rate of about 1 pint of the emulsion per 20 feet of row. Then close the furrow and pack firmly. After the seedling onions emerge, two or three more applications of the emulsion can be made along the rows at about 10-day intervals.

Control of Vegetable Insect Pests

Insect and damage

Control

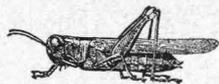
Vegetables Generally

Cutworms: Several species of dingy, soil-inhabiting worms damage crops by cutting off seedlings at soil line; eating holes in edible roots; feeding on foliage.



Standard poison bait effective if vegetation sparse. DDT dust kills larvae on foliage and on recently watered soil. Worms most active in spring or early summer. Attack all vegetables. See section on Cutworms.

Grasshoppers: Well known insects which may be very injurious to vegetables and flowers in late summer.



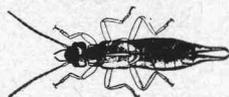
General sprays or dusts of aldrin, heptachlor, or chlordane.

Slugs: Small molluscs common to western Oregon. Very destructive to seedling vegetables, flowers, and root crops, especially in rainy years.



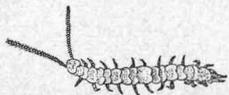
Metaldehyde-arsenic baits, applied in evening, are standard recommendation. Metaldehyde dust, applied when needed, may be more effective where slugs are abundant. Repeat control after rainy periods.

Earwigs: Pests to seedlings, flowers, and young trees; mostly around dwellings.



Spread special earwig bait according to directions on package. Apply bait in evening as earwigs feed at night. General dusting of premises with DDT or Malathion is also effective.

Symphylids: Small, white, centipede-like animals. Attack root systems of most garden plants which they stunt or kill.



No satisfactory control measure developed yet. See section on Symphylids.

Wireworms: Brown, jointed larvae of click beetles. Kill young plants; ruin edible roots and tubers.



Soil treatments with aldrin, heptachlor, DDT, dieldrin. Thorough and deep (6 to 8 inches) mixing of insecticides in soil before planting. See section on Total Soil Treatments.

tures on lower sides of leaves. Leaves turn yellow and die.



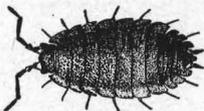
mites are serious in some seasons, usually in late season.

Blister beetles: Large black or gray beetles which eat foliage of vegetables and flowers.



DDT, Malathion, methoxychlor sprays or dusts. Serious pests only in certain seasons.

Pill bugs, sow bugs, millipedes: Many-legged arthropods which inhabit moist, shaded areas. May attack seedling plants or fruits in contact with soil.



Malathion dust where abundant, or general dusting of DDT in areas affected. These pests prefer decaying organic matter and are serious in wet seasons or in greenhouses.

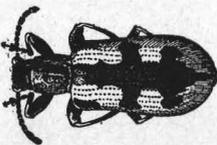
Seed-corn maggot: White larva of a fly similar to cabbage maggot. Attacks most vegetables, mainly the germinating seeds.



Total soil treatments with aldrin, heptachlor, or dieldrin will suppress injury. Large seeds (beans, corn) treated with an insecticide **plus** a fungicide can be purchased. See section on Total Soil Treatments.

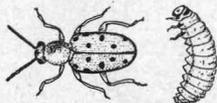
Asparagus

Asparagus beetle: Bluish-black, yellow-spotted beetle. Adults damage sprouts by feeding and egg laying. Beetles and gray larvae defoliate ferns.



Rotenone, CPR, methoxychlor, DDT dusts are effective on both adults and larvae. DDT should be used only on the ferns after cutting season. Control in late season important to reduce numbers of beetles overwintering as well as to protect ferns.

12-spotted asparagus beetle: Brick-red, black-spotted beetle. Adults appear later in spring, attack both sprouts and ferns. Larvae feed on berries only.



Control measures followed for regular asparagus beetle will take care of 12-spotted species.

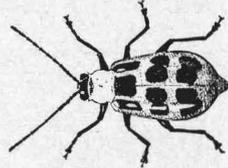
Control of Vegetable Insect Pests—Continued

Insect and damage

Control

Beans

Western spotted cucumber beetle: Yellowish-green, black-spotted beetle common to western Oregon. Adults attack seedlings and green pods.



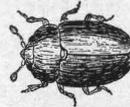
Adults easily killed with most insecticides recommended for home gardens (lindane, CPR, methoxychlor, DDT, malathion.) Beetles migrate in large numbers, so repeated applications may be necessary.

Black bean aphid: Black plant louse which forms colonies on leaves and pods.



Malathion or nicotine sulfate as dusts or sprays when needed. Temperatures above 70° F. best for nicotine.

Nitidulid beetle: Small, black beetles which infest blossoms of beans and flowers. Cause blossom drop.



No effective control known. Beetles migrate in large numbers during late July and early August. Injury affects the yield of beans only, not the quality.

Beets (garden)

Western spotted cucumber beetle: Yellowish-green, black-spotted beetle may attack seedlings. Feeds on foliage at all stages of growth.

Dusts or sprays of DDT, methoxychlor, lindane, rotenone, malathion or CPR are effective. Apply lightly when needed. Do not apply DDT to foliage to be eaten for greens.

Broccoli and Brussels Sprouts—See Cabbage

Cabbage, Cauliflower, and Other "Stem" Crucifers

Aphids: Gray, mealy plant lice which suck sap from all cole crop plants. Form large colonies and weaken or kill the plants.



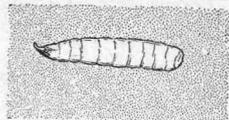
Malathion or nicotine sulfate dusts or sprays. Start control measures early in season and repeat when necessary. Use laundry soap with nicotine sprays to improve control.

cabbage worm, cabbage looper, diamond-back moth larvae and other caterpillars which feed on the foliage of cole crops.



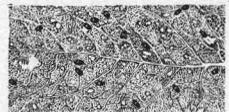
materials are effective if applied carefully and as often as needed. Worms may be active during entire growing season. Do not use DDT after heads begin to form.

Root maggots: White maggots may kill or weaken plants by feeding on the roots. Egg-laying fly active during most of season.



Heptachlor, chlordane, aldrin, lindane, dieldrin dusted or ringed (1/2 teaspoonful per plant) around bases of plants— treatment should be made within 24 hours of setting plants out in field. See section on Total Soil Treatments.

Cabbage flea beetle: Small, blue-black, jumping insects which eat holes in leaves of all cole crops.



DDT dust best when plants are young, because of long residual action of DDT. Rotenone, lindane, CPR, etc. can be used later in season or when repeated applications can be made.

Carrots

Rust fly: Straw-colored maggots; ruin the roots for eating.



Aldrin, chlordane, heptachlor or dieldrin as soil treatments. See section on Total Soil Treatments.

Aphids: Yellowish-gray plant lice on foliage in certain seasons.

Nicotine sulfate or malathion sprays or dusts when needed. Aphids hard to see; weaken plants if not controlled.

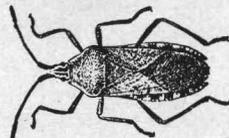
Cucurbits (Squash, cucumbers, etc.)

Aphids: Dark-colored plant lice form large colonies on undersides of leaves and progressively kill foliage. Often attended by ants.



Nicotine sulfate or malathion sprays or dusts. Direct to undersides of leaves. Do not apply malathion heavily when leaves are wet— injury to leaves may result.

Squash bug: Large, dark insects appear in late spring. Suck juices from squash plants, etc.—kill leaves and whole vines.



Repeated applications of 20% sabadilla dust directed under leaves and at base of plants. Important to kill overwintered adults before they lay eggs or kill seedling plants. Hand picking effective—bugs hide under boards placed in field.

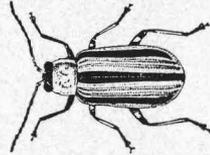
Control of Vegetable Insect Pests—Continued

Insect and damage

Control

Cucurbits (Squash, cucumbers, etc.)—Continued

Cucumber beetles: Striped beetles serious foliage feeders in certain seasons. Spotted cucumber beetle not a serious pest of cucurbits.



Methoxychlor dust very effective against both species. Apply lightly. Most other new insecticides may cause plant injury if applied heavily and when leaves are wet.

Eggplant

Western potato flea beetle, Western spotted cucumber beetle: Tiny, black, jumping beetles eat holes in leaves. Yellowish-green spotted beetles feed on young plants.

Dust lightly with any of the regular garden materials such as DDT, methoxychlor, lindane, rotenone, CPR. Repeat when necessary.

Spider Mites: Tiny, spider-like creatures on under sides of leaves.

Mites may be particularly injurious to eggplant. See 'spider-mites' under "vegetables generally".

Lettuce

Western spotted cucumber beetle, various worms: Common black-spotted green beetles, semi-looper worms and other leaf-eating insects sometimes attack lettuce.

Methoxychlor dusts effective for spotted beetles and semi-looper worms, especially. Rotenone, CPR, and similar dusts or sprays will help. Young lettuce plants most susceptible to attack by insects.

Onions

Onion maggot: White worm which kills seedlings and ruins older onion bulbs. Parent fly lays eggs



Control difficult in some soils. Pour heptachlor emulsion (1 tablespoon of liquid concentrate per gallon water) along furrow at seedling time at rate of about 1 pint per 20 feet of row. See sections on Onion

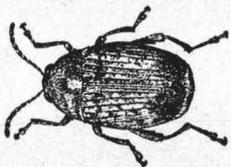
age to turn white or silvery and wilt. Reduces onion yields seriously.



tive. Thrips appear in mid-season; may not be serious in western Oregon most seasons.

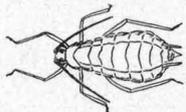
Peas

Pea weevil: Egg-laying weevils appear when first pods are setting. Grubs feed on inside of the green peas.



DDT dusts, two or three applications at 2-week intervals as soon as first pods set. Early application necessary to kill adult weevils before egg-laying starts. No control possible after eggs are laid.

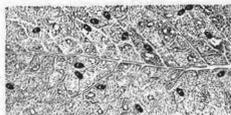
Pea aphid: Large, green plant lice which form large colonies in the growing tips of the vines.



DDT effective, but very slow acting. Malathion or nicotine sulfate sprays or dusts more effective. Thorough applications important.

Potatoes

Western potato flea beetle: Bronze-black, jumping beetle which eats holes in the foliage.



Dust with DDT when needed. If soil insecticides (see Total Soil Treatments) are used, foliage feeding may be minor.

Tuber flea beetle: Similar to Western flea beetle, but jet black. Larvae feed on and seriously damage tubers.

Aldrin, dieldrin, heptachlor soil treatment at rate of 2 pounds actual material per acre (see section on Total Soil Treatments on how to apply and mix).

Colorado potato beetle: Large striped beetles and reddish grubs both eat foliage and vines. Eastern Oregon.



DDT dust applied when necessary. Spot dusting at intervals early in season may save having to dust whole potato patch later or losing plants to beetles.

Control of Vegetable Insect Pests—Continued

Insect and damage

Control

Radishes and Other Root Crucifers

Aphids: Same gray-colored plant louse which infests cabbage and other "stem" crucifers (cole crops).



Malathion or nicotine sulfate dusts or sprays. Aphids not as important on "root" crops unless greens are to be eaten.

Cabbage flea beetle: Same blue-black jumping beetle as found on other cole crops.

DDT dust in early stages of plant growth. Very important to protect seedling radishes, turnips, etc.

Diamond-back moth: Small larvae of a moth which eat holes in leaves, mostly from under sides.



DDT or malathion or similar types dust, directed to under sides of leaves.

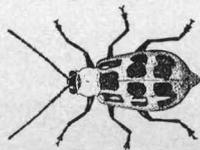
Root maggots: White maggots or worms which feed on the roots and ruin them for food. Parent is a fly.



Heptachlor or aldrin emulsion drenches along rows. One tablespoonful of concentrate in 1 gallon water; apply about 1 pint of emulsion to 20 feet of row; three applications at 10-day intervals beginning when seedlings are about 1 inch high. See sections on Total Soil Treatments and Cabbage Maggots.

Spinach

Western spotted cucumber beetle: Spotted beetles eat holes in leaves. May be serious on the seedling plants.



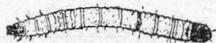
DDT and most other insecticidal dusts or sprays effective. Do not use DDT close to harvest—methoxychlor, rotenone, CPR can be used when plants are larger than seedlings.

Corn earworm: Large, green (also brown, black, or red) worms which get into tips of ears and feed on silk and kernels. Serious in most areas.



DDT dust daubed onto silks of each ear with a brush—three to four applications at 3-day intervals. Start when silks first appear. DDT sprays in ear zone also effective.

Larvae of Western spotted cucumber beetle: Long, straw-colored worms in soil which attack corn seedlings and roots. Stunts plants or makes stalks fall over.



Soil treatment with heptachlor or aldrin as described in Total Soil Treatments.

Tomatoes

Western potato flea beetle: Small, black beetles (same as on potatoes) which attack the leaves in early summer.

Dust lightly with DDT or methoxychlor as needed. Important to watch plants for flea beetle damage when tomato sets are still small.

Hornworm: Very large green worms with diagonal stripes and single "horn" at back end.



Hand picking of worms (or snipping with scissors) effective in small plantings. Dust with DDT. Pest only in eastern Oregon.

Turnips—See Radishes
