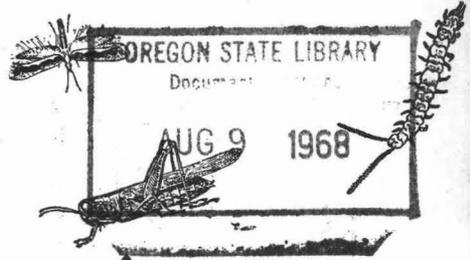
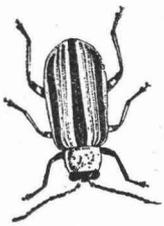


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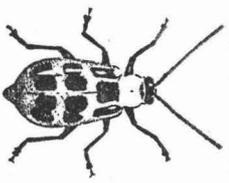
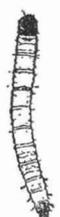
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# Vegetable Garden

# Insect Pests



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# 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 appropriate information from county Extension agents or from the *Oregon Insect Control Handbook*, for sale at the OSU Book Stores, Inc.

Home gardeners can safely control most insect pests by the proper use of insecticides. There are many different insecticides and many ways of preparing or formulating each kind. All of the materials recommended in this publication for use in the home garden are available in small packages at seed or garden-supply stores. Multipurpose insecticides 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

## Avoid Pesticide Residues on Vegetables

- (1) Apply pesticides to plants only at the rates recommended.
- (2) Always wash vegetables thoroughly in running water before using.
- (3) Strip and discard outside leaves from head lettuce, cabbage, and so forth.
- (4) Observe the suggested time interval between the last application of an insecticide and harvest. These intervals may vary considerably both with the insecticide and the crops to which it is applied. The specific time intervals between application and harvest are listed on the labels. If instructions are followed, only insignificant amounts of residue will remain on the treated veg-

## Pesticides Can Be Used Safely

The pesticides suggested in this bulletin have been selected on the basis of their effectiveness, availability, and safety. These pesticides are among the less hazardous to the user, and can be used safely if precautions are observed.

Follow the manufacturer's precautions on the pesticide label. These are not intended to frighten the user, but to impress upon him the need for careful use of pesticides.

- ✓ Store pesticides in a safe place, out of reach of children.
- ✓ Destroy empty containers or those without labels.
- ✓ Do not keep pesticides in beverage bottles or other containers which previously have been used for food or drink.
- ✓ When mixing and using pesticides, avoid getting them on the skin. Avoid spilling concentrated insecticides on the skin. If there is accidental contact, stop what you

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 or trombone-type hand sprayer. Sprayers which attach to the garden hose are preferred by some. If this type of equipment is used, follow the manufacturer's directions.

Wettable powder formulations require constant agitation in the spray tank and cannot be applied as satisfactorily as the emulsions with the type of equipment usually available to the home gardener. Insecticides are sometimes available in a granular form for use as broadcast or furrow treatments.

Concentrations of dust formulations commonly available and the suggested dilution rates for the spray materials are shown at the right. The main thing to remember, however, is always to read the label and follow the recommendations found there.

pesticides suggested in this bulletin are as follows:

PESTICIDE	INTERVAL
Carbaryl (Sevin)	1 to 3 days
DDT	On leafy type vegetables, do not apply after edible parts start to form
Diazinon	7 to 10 days
Dicofol (Kelthane)	2 days
Malathion	1 to 7 days
Methoxychlor	3 to 14 days
Rotenone	1 day

spraying. It is advisable to wear rubber gloves when handling pesticides.

### CABBAGE MAGGOTS

The "stem" or "leafy" type cole crops (cabbage, cauliflower, broccoli, etc.) do not require perfect control of these root maggots. Also, control is seldom needed in the plant bed where sets for transplanting are grown. Im-

### Common Insecticides and Concentrations for Small-Quantity Use

Insecticide	Amount to mix with 1 gallon of water	Approximate dust concentration
Baits	Purchase prepared	-----
Carbaryl (Sevin)	2 to 4 tablespoonfuls 50% W.P. <sup>1</sup>	5%
Chlordane	1 to 2 tablespoonfuls 44% E.C. <sup>2</sup>	10%
DDT	1 tablespoonful 25% E.C.	
	1 tablespoonful 50% W.P.	5%
Diazinon	2 teaspoonfuls 25% E.C.	4%
Dicofol (Kelthane)	2 teaspoonfuls 18.5% E.C.	3%
Lindane	1 tablespoonful 20% E.C.	1%
Malathion	2 teaspoonfuls 57% E.C.	4%
Metaldehyde	Prepared baits or 1 tablespoonful 50% W.P.	15%
Methoxychlor	1 tablespoonful 50% W.P.	5%
Rotenone	1 to 2 teaspoonfuls E.C.	1%

<sup>1</sup> W.P. = Wettable powder.  
<sup>2</sup> E.C. = Emulsifiable concentrate.

## ONION MAGGOT

mediately after transplanting, the sets can be treated individually as follows: dust or ring the bases of the plants ( $\frac{1}{2}$  teaspoon per plant) with chlordane, diazinon, or lindane dusts. If the maggots in your area are resistant to the aldrin-chlordane family of insecticides, only the diazinon treatment will be effective. Liquid application of these same materials can be made, if preferred, by merely spraying or pouring the dilute spray emulsions at the bases of the transplants ( $\frac{1}{2}$  cup of liquid per plant). See dilution chart on page 3.

Protection of root crucifers is more difficult, since one maggot can ruin the edible root. At the present time, there is no sure way to protect turnips and rutabagas, but there are two programs which may be suggested for home gardeners.

The adult fly is susceptible to dusts or sprays of DDT, methoxychlor, diazinon, or malathion and weekly applications of one of these materials will prevent many eggs from being laid. Applications should also be made soon after a rain or sprinkler irrigation. An-

other method which has had some degree of success is the application of two or three drenching sprays of diazinon along the rows. Use one teaspoonful of liquid concentrate in one gallon of water and use heavily enough to wet the soil around the roots. The first application should be made when the first true leaves are showing; the second about mid-season; and the last not later than 10 days before maturity.

Radishes can also be protected by the methods described for turnips and rutabagas, but a third method may be suggested. Dilute granules or dust of diazinon can be sprinkled in the furrow at the time of planting. Because the concentration of the granules or dusts may vary according to the manufacturer, follow label directions for rate of application. A small screw-cap jar with holes punched in the lid can be used to apply these dry materials. (Note: The furrow treatment method described for radishes is not recommended for turnips or rutabagas because of injury to seedlings and lack of satisfactory maggot control on crops that require a longer growing period.)

This insect, the larva of a fly and a "cousin" to the cabbage maggot, attacks only onions and a few closely related plants. Early in the season, seedlings are actually killed by the maggots and, later, maturing onions are ruined for storage.

For effective control, sprinkle diazinon dust or granules into the open furrow at the rate of about  $\frac{1}{2}$  tablespoonful of 4% material per 20 feet of row. Other concentrations of dusts or granules can be used, but follow the directions on the label for rate of application. A small screw-cap jar with holes punched in the lid can be used like a salt shaker to apply these materials.

Onions grown for mature bulbs may also be protected by light treatment with DDT. Start treating soon after planting, before seedlings emerge. Continue dusting or spraying at 10-day intervals until the end of June. Two or three more treatments should be made, but the last not closer than 30 days before harvest. For green or bunching onions, malathion should be substituted for DDT.

**VEGETABLES GENERALLY**

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



Cutworm baits, available ready-mixed on the market, are effective when plant growth is sparse. Baits are more effective when applied in the evening and when the ground is wet. If worms are cutting plants at or below the ground level, spray or dust DDT on the area infested and irrigate or rake DDT into the top layer of soil. When cutworms are feeding on foliage of crops such as beets, one application of DDT should give control. Do not apply DDT to edible portions of plants.

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



Use sprays or dusts of malathion, carbaryl (Sevin), or chlordane. Attempt to keep grasshoppers out of the garden by early application to vegetation around outside edges. Avoid application of chlordane to the edible portions of vegetables.

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



Metaldehyde baits, applied in the evening, are usually effective. Metaldehyde dust, or wettable powder formulations, may be more effective in the spring when newly hatched slugs are abundant. Repeat control after rainy periods. Baiting in September and October after the first fall rains is particularly effective since this precedes the period of heaviest egg laying.

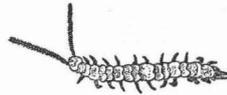
**Earwigs:** Pests of seedlings. They also infest ears of corn and leafy vegetables.



Spread earwig bait according to directions on the package. Apply in the evening as earwigs feed at night. DDT or malathion are also effective. Do not apply DDT to edible portions of vegetables.

**Symphylans**

**(Symphylids):** Small, white, centipede-like animals. They attack root systems of most garden plants which they stunt or kill.



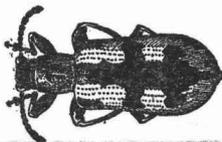
No satisfactory chemical control measure is available for home gardeners. Thorough pulverization of the soil with rotary tillers when the soil is on the dry side and easily put into good tilth will scatter and destroy symphylans. This practice makes it possible to grow crops in infested soil without resorting to the use of chemicals.

## Control of Vegetable Insect Pests—Continued

<i>Insect and damage</i>	<i>Control</i>
<p><b>Wireworms:</b> Brown, jointed larvae of click beetles. They kill young plants; damage edible roots and tubers.</p>	<p>To control wireworms, use a pre-planting soil treatment with diazinon or chlordane. Apply either of the insecticides at the rate suggested on the label and mix thoroughly with the soil to a depth of 6 to 8 inches.</p>
<p><b>Spider mites:</b> Tiny, spider-like creatures on the lower sides of leaves. The leaves turn yellow and die.</p>	<p>Use malathion, diazinon, or dicofol (Kelthane). Direct the spray or dust to the undersides of leaves. Spider mites usually appear in late season. Repeated applications are often necessary for satisfactory control. Do not apply diazinon or dicofol (Kelthane) to eggplant.</p>
<p><b>Blister beetles:</b> Large black or gray beetles which eat foliage of vegetables and flowers.</p>	<p>Use DDT, malathion, methoxychlor, or carbaryl (Sevin) sprays or dusts. Do not apply DDT to the edible portions of plants.</p>
<p><b>Pillbugs, sowbugs, millipedes:</b> Many-legged arthropods which inhabit moist, shaded areas. They may attack seedling plants or fruits in contact with soil.</p>	<p>These pests prefer decaying organic matter but may be serious in wet seasons or in greenhouses. Use malathion, chlordane, carbaryl (Sevin), or DDT, but do not apply chlordane or DDT to the edible portions of plants.</p>
<p><b>Seed-corn maggot:</b> White larvae of a fly similar to cabbage maggot. It attacks most vegetables, mainly the germinating seeds.</p>	<p>There is no satisfactory chemical for control of this pest. Avoid planting seeds when the soil is excessively wet. Damage is most likely to occur when heavy cover crops have been worked into the soil. If damage is severe, replant.</p>

### ASPARAGUS

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



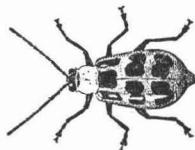
Rotenone, methoxychlor, malathion, carbaryl (Sevin), or DDT dusts or sprays are effective on both adults and larvae. DDT should be used only on the ferns after cutting season. Control in late season is important to reduce numbers of overwintering beetles as well as to protect ferns.

both sprouts and ferns. Larvae feed on berries only.

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## BEANS

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



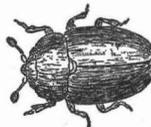
Adults may be controlled with most insecticides recommended for home gardens, including methoxychlor, carbaryl (Sevin), diazinon, rotenone, and DDT. Beetles frequently migrate in large numbers, so repeated applications may be necessary.

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



Use malathion or diazinon as dusts or sprays when needed.

**Nitidulid beetle:** Small, black beetles migrate into gardens and infest blossom of beans and cause blossom drop. A nuisance on flowers.



Beetles may migrate into gardens in large numbers during late July and early August, but they do not cause serious damage.

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



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## BEETS

Dusts or sprays of DDT, methoxychlor, diazinon, carbaryl (Sevin), or rotenone are effective. Apply lightly when needed. Do not apply DDT to foliage to be eaten for greens.

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## BROCCOLI and BRUSSELS SPROUTS—See Cabbage

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### CABBAGE, CAULIFLOWER, and Other "Stem" Crucifers

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



Use malathion or diazinon dusts or sprays. Start control measures early in the season and repeat when necessary.

## Control of Vegetable Insect Pests—Continued

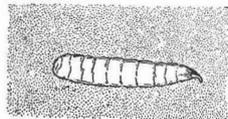
### *Insect and damage*

**Cabbage worms:** Imported or common cabbage worm, cabbage looper, diamond-back moth larvae, and other caterpillars which feed on the foliage of cole crops.



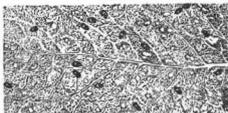
Rotenone, DDT, malathion, diazinon, methoxychlor, and carbaryl (Sevin) are effective. Worms may be active during the entire growing season and regular applications may be necessary to protect plants. Do not use DDT after heads begin to form.

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



Chlordane, lindane, or diazinon dusted or ringed (1/2 teaspoonful dust per plant) around bases of plants will protect them from damage. Treatment should be made within 24 hours of setting plants out in the field. See the section on cabbage maggots, pages 3 and 4.

**Cabbage flea beetle:** Small, blue-black, jumping insect which eats holes in leaves of all cole crops.



DDT or methoxychlor are most effective because of longer residual action, but do not use DDT after edible parts start to form. Carbaryl (Sevin), rotenone, lindane, or malathion can be used later in the season if repeated applications are needed.

### CARROTS

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



The carrot rust fly has not been a problem for several years. If it should be causing damage, apply diazinon dust or granules in the furrow at planting time as suggested by the manufacturer, or use diazinon as suggested for wireworm control.

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



Apply diazinon or malathion sprays or dusts when needed. Aphids are hard to see and they 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. They are often attended by ants.



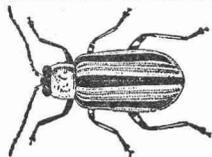
Use diazinon or malathion sprays or dusts. Direct insecticides to the undersides of leaves, and do not apply when leaves are wet since plant injury may result.

in late spring. They suck juices from squash plants, etc.—kill leaves and whole vines.



aid in control. It is important to kill overwintered adults before they lay eggs or kill seedling plants. Hand picking is effective—bugs hide under boards placed in fields.

**Cucumber beetle:** Striped beetles are serious foliage feeders in certain seasons. The spotted cucumber beetle is not a serious pest of cucurbits.



Use methoxychlor, diazinon, carbaryl (Sevin), or rotenone dusts or sprays. Apply lightly. Many insecticides cause plant injury if applied heavily and when leaves are wet. Do not use DDT on cucumbers or squash.

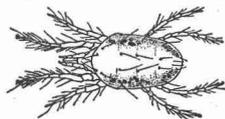
**Western potato flea beetle and western spotted cucumber beetle:** Tiny, black, jumping beetles eat holes in leaves or yellowish-green spotted beetles feed on young plants.



## EGGPLANT

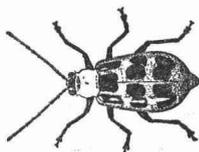
Treat lightly with DDT, methoxychlor, malathion, or rotenone. Repeat when necessary.

**Spider mites:** Tiny, spider-like creatures on undersides of leaves.



Mites may be particularly injurious to eggplant. See "spider mites" on page 6. Do not use diazinon or dicofol (Kelthane) on eggplant.

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



## LETTUCE

Methoxychlor, diazinon, carbaryl (Sevin), or rotenone dusts or sprays are effective. Young lettuce plants are most susceptible to attack by these insects.

**Onion maggot:** White worm which kills seedlings and ruins older onion bulbs. Parent fly lays eggs on soil around plants.



## ONIONS

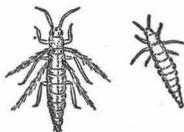
Use diazinon dust or granules in furrows at planting time. See the section on onion maggots, page 4.

## Control of Vegetable Insect Pests—Continued

### *Insect and damage*

### *Control*

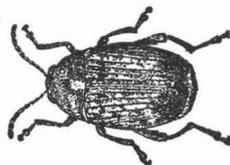
**Thrips:** Tiny insects which cause foliage to turn white or silvery and wilt. Reduces onion yields.



Use diazinon, DDT, or malathion. Do not use DDT on green or spring onions. Sprays are more effective. Thrips appear in midseason; they are not serious in western Oregon in most seasons.

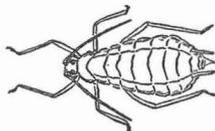
### PEAS

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



Use two or three applications of DDT, malathion, rotenone, or methoxychlor at weekly intervals as soon as the first pods set. Early application is necessary to kill adult weevils before egg-laying starts.

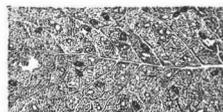
**Pea aphid:** Large, green plant lice which form large colonies in the growing tips of the vines.



Malathion or diazinon sprays or dusts are effective. Thorough application to growing tips and undersides of leaves is important.

### POTATOES

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



Apply DDT, carbaryl (Sevin), or diazinon sprays or dusts. Begin applications to potato foliage when the first leaves appear. Continue applications at 7- to 10-day intervals. Control is aimed at killing adults before they lay eggs.

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



beetles and reddish grubs both eat foliage and vines. They are a pest only in eastern Oregon.



for control of tuber flea beetle will control this pest. Spot treatment at intervals early in the season may save treating whole potato plantings later.

## RADISHES AND OTHER ROOT CRUCIFERS

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



Use malathion or diazinon dusts or sprays. Aphids are not as important on "root" crops unless greens are to be eaten.

**Cabbage flea beetle:** The same blue-black jumping beetle found on other cole crops.



Apply DDT in early stages of plant growth. It is important to protect seedling radishes, turnips, etc. Methoxychlor, diazinon, or malathion can be used later in the season.

**Diamond-back moth:** Small larvae of a moth which eats holes in leaves, mostly from the undersides.



Use DDT, malathion, methoxychlor, diazinon, carbaryl (Sevin), or rotenone directed to undersides of leaves.

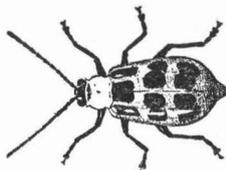
**Root maggots:** White maggots or worms which feed on the roots and ruin them for food. The parent is a fly.



Use the methods of control suggested in the section on cabbage maggots, pages 3-4.

## SPINACH

**Western spotted cucumber beetle:** Spotted beetles which eat holes in leaves. They may be serious on the seedling plants.



Use methoxychlor, rotenone, diazinon, carbaryl (Sevin), or DDT dusts or sprays. Do not use DDT after the seedling stage.

## SQUASH—See Cucurbits

## Control of Vegetable Insect Pests—Continued

### *Insect and damage*

### *Control*

#### SWEET CORN

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



Use DDT, carbaryl (Sevin), or malathion dust daubed onto silks of each ear with a brush. Make three to four applications at 3-day intervals and start when silks first appear. DDT sprays in the ear zone are also effective.

#### TOMATOES

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



Apply DDT, carbaryl (Sevin), diazinon, or methoxychlor lightly, as needed. It is important to watch plants for flea beetle damage when tomato sets are still small.

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



Hand picking of worms (or snipping with scissors) is effective in small plantings, or apply DDT. A pest only in eastern Oregon.

#### TURNIPS See radishes