

How To Control GARDEN INSECTS

By W. A. PRICE **RECEIVED**

AUG 5 - 1947

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Circular 435

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics
Agricultural Extension Division

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IF A VEGETABLE GARDEN is to furnish plentiful supplies of good-quality vegetables for the family table, it is usually necessary to protect the plants against insects. Though a great variety of insects infest gardens and may be found at various times on garden plants, only certain ones are generally common and injurious. These common insects are the ones to guard against particularly. The principal methods of control are spraying or dusting the plants with various poisonous materials, baiting, trapping, and picking the insects or their eggs by hand and destroying them. Some insects are more easily destroyed by one method; some by another. In this circular methods of control suitable for the most common garden insects are described.

Insecticides are generally applied by dusting or spraying. Dusts have the advantage over sprays in that dusts take less time to apply, are usually already mixed, require no agitator or shaking to keep them mixed, and are less apt to injure foliage. Sprays have the advantage over dusts in that sprays give better coverage, stick to the plants better, can be applied in rather windy weather, and can be combined with a greater variety of materials for disease control.

In the small garden, dusts are best applied with a plunger-type metal duster of about 2 quarts capacity, having a long, adjustable, upturned nozzle suitable for treating the under sides of the leaves. Sprays are best applied with a compressed-air sprayer of about 3 gallons capacity, having an upturned nozzle. For larger gardens a knapsack or rotary duster or wheelbarrow sprayer is needed. If a large acreage is to be treated a horse-drawn duster or power-driven sprayer having a capacity of 50 to 200 gallons is required.

Insects which attack garden crops can be divided into two general classes: those with chewing mouthparts such as grasshoppers, cutworms, and blister beetles; and those with sucking mouthparts such as plant lice and the harlequin cabbage bug. Chewing insects are usually controlled with stomach poisons applied to the leaf surface. Sucking insects are best controlled by contact insecticides applied to their bodies or to the surfaces upon which they crawl. Paris green, lead arsenate, calcium arsenate, and cryolite are stomach poisons; nicotine and pyrethrum are contact insecticides. Materials such as rotenone and DDT act both as contact and stomach poisons and are therefore of rather wide use for both sucking and chewing insects.

Some vegetables such as beets, carrots, radishes, lettuce, peas, celery, onions, and endive rarely need insecticidal treatment and sometimes it is unnecessary to treat tomatoes, corn, and greens. On the other hand,

potatoes, cabbage, broccoli, beans, cucumbers, squash, and melons are so severely attacked by several kinds of injurious insects that these vegetables usually need almost continuous protection if the grower is to get a satisfactory crop.

MEXICAN BEAN BEETLE

(Plant attacked: beans)

Spray

Use derris or cube containing 4-percent rotenone, 2 pounds to 50 gallons of water or, on a small scale, 4 level tablespoonfuls to a gallon. Start spraying when beetles first appear. Repeat application 7 to 10 days later. Use upturned nozzle and spray the under side of the leaves where the beetle and its larvae do most of their feeding.

Dust

Use derris dust containing at least 0.75-percent rotenone applied to the under side of the leaves. Repeat at 7-day intervals as long as necessary. A dust made by mixing thoroughly 4 pounds hydrated lime, 1 pound calcium arsenate, and 1 pound fine sulfur may also be used, but this dust must not be used after the pods are formed. Use upturned nozzle and dust the under side of the leaves.

Other Materials

Other materials which give good control when applied to the under side of the leaves are cryolite-sulfur sprays or dusts, magnesium arsenate, barium fluosilicate, and calcium arsenate-bordeaux spray. The last mentioned material is apt to cause foliage injury, especially in damp, cool weather. Materials not recommended for use on beans are DDT, lead arsenate, fly spray, and barium carbonate.

POTATO INSECTS

(Colorado potato beetle, flea beetle, leaf hopper and potato aphid)

Tests in many states show striking increases in yield where DDT has been used to control potato insects. The use of DDT has eliminated the necessity of including bordeaux mixture for flea beetle and leaf hopper control but some fungicide such as bordeaux or one of the fixed coppers is still needed where blight is troublesome.

Spray

Use $\frac{1}{2}$ pound actual DDT (equivalent to 1 pound of a 50-percent wettable powder) to 50 gallons of water. For blight control, combine the DDT with 5-5-50 bordeaux mixture (See directions for mixing on page 8). For 3 gallons of spray use $3\frac{1}{2}$ level tablespoonfuls of a 50-percent wettable DDT powder. For blight control add 5 ounces of powdered bluestone and 5 ounces of fresh, hydrated spray lime. Make first treatment when first Colorado potato beetles appear, or when potatoes are 2 to 4 inches high. Repeat 2 to 4 times at 10-day to 2-week intervals, or until the tops begin to die.

Dust

Use 3-percent DDT dust. For blight control use DDT in combination with one of the fixed coppers. Make first treatment as above and repeat 3 to 5 times at 10-day intervals.

Other Materials

Spray with paris green 1 pound and hydrated lime 1 pound to 50 gallons of water, or with calcium arsenate 2 pounds and hydrated lime 2 pounds to 50 gallons of water. For smaller quantities, use 2 level teaspoonfuls of paris green and 2 level teaspoonfuls of hydrated lime, or 10 level teaspoonfuls of calcium arsenate and 10 level teaspoonfuls of hydrated lime, to each gallon of water. If bordeaux mixture is being used for flea beetles and diseases, the calcium arsenate or paris green may be added to this spray, substituting the proper strength liquid bordeaux for the water.

(Directions for mixing the bordeaux spray are given on page 8).

CABBAGE WORMS—VARIOUS KINDS

(Plants attacked: cabbage, broccoli, kohlrabi, kale, cauliflower, collards)

Use derris or cube dust containing at least 0.75-percent rotenone. Dust at the rate of 20 to 30 pounds per acre. Repeat applications at 7- to 10-day intervals. On cabbage a 3-percent DDT dust may be used with excellent results.

A mixture of calcium arsenate 1 part and hydrated lime 4 parts can be dusted on young cabbage (before heading starts) with good results. Dust early in the morning when plants are wet with dew.

STRIPED CUCUMBER BEETLE

(Plants attacked: squash, melons, cucumbers, pumpkins)

Get gypsum or land-plaster from a builder's supply company or wherever available. The builder's kind may contain hair, which should be removed by sieving through a window screen. Thoroughly mix 9 pounds of gypsum with 1 pound of calcium arsenate. Put the mixture in a gunny sack or can with perforated top and dust the hill as soon as cracks are seen where the plants are about to come through the ground. Repeat every 3 or 4 days until the vines are past the critical stage.

A 10-percent sabadilla dust is also recommended.

SQUASH BUG

(Plants attacked: squash, pumpkins, cucumbers, and melons)

Dust

Use 10-percent sabadilla dust, which is effective against both nymphs and adults. Thorough application is needed because the bugs tend to hide under foliage. It has been reported that a 5-percent chlordane dust is very effective against this pest.

Other Control Methods

Hand-pick bugs and crush egg masses as fast as they appear on the young plants in the spring, and supplement these operations with trapping. The bugs seek shelter at night under boards, shingles, and similar flat objects which may be placed on the ground among the plants. Examine these places each morning and destroy the bugs found.

Many squash bugs collect about and feed upon crushed pumpkin and squash in the field just after frost has killed the vines. At this time it is often possible to kill many of them with very little effort. Step on them or sprinkle them with kerosene.

SQUASH VINE BORER

(Plant attacked: squash)

Dust

Treat plants at weekly intervals during late June and July with 1-percent rotenone dust. A 3-percent DDT dust is said to give good protection, with no foliage injury, on Hubbard and Buttercup squashes. Acorn squashes are severely stunted by DDT.

Other Control Methods

If vines become infested, slit the stems lengthwise at the point of attack, crush or remove the borers, and immediately cover the wounded parts of the stems with moist soil.

HARLEQUIN CABBAGE BUG

(Plants attacked: cabbage, kohlrabi, kale, cauliflower, collards, mustard, turnips.)

Dust

Use 1-percent rotenone dust or 10-percent sabadilla dust. Make first treatment as soon as adults appear and repeat application at 7-day intervals as long as necessary.

Other Control Methods

This insect can be controlled, on a small scale, by hand-picking the adults in the fall and again in the spring before egg laying starts. The eggs, usually laid in masses on the under side of the leaves, should be destroyed by hand.

BLISTER BEETLES

(Plants attacked: potatoes, tomatoes; and to a less extent other garden plants.)

Dust

Use 3-percent or 5-percent DDT dust or barium fluosilicate, 1 volume diluted with 3 volumes of talc or wheat flour, well mixed and

applied to the insects as a dust. Make applications promptly at the first appearance of the beetles, and repeat as often as the beetles appear.

Brushing the Beetles into a Pan

Brushing the beetles into a pan containing kerosene is a satisfactory way to control the insect, on a small scale. Valuable plants can be protected by covering them with mosquito netting.

CORN EAR WORM

(Plants attacked: corn, tomatoes, lima beans)

Dust

Use 5-percent DDT dust to control this insect on tomatoes. For best results begin treatment before the worms appear, applying the first dust when the first fruits are set and repeat treatments twice at 2-week intervals.

Bait

Good control can be had on tomatoes with a bait made of cryolite 1 part and cornmeal 10 parts. Apply the bait by hand over each plant, paying particular attention to each fruit and bloom cluster. Time treatments as indicated above.

Other Control Methods

To protect corn from ear worm damage, clip off the silks and shucks to the tip of the cob 4 to 6 days after the first silks show signs of browning. Destroy the parts clipped off to kill eggs or young ear worms contained therein.

EUROPEAN CORN BORER

(Plant attacked: corn)

A 5-percent DDT dust is recommended. If it is desirable to apply the chemical as a spray, use $\frac{1}{2}$ pound wettable 50 percent DDT powder in 50 gallons of water. Spray from above in order to cover, thoroughly, the whorl of the plant. Whether a dust or a spray is used, make 3 or 4 applications at 5-day intervals, beginning when corn is about 30 inches high, or when 50 percent of green tassels show in the whorl, or when there is an average of one egg mass per stalk.

ONION THRIPS

(Plant attacked: onions)

Dust

A 5-percent DDT dust is very effective in preventing injury to plants by thrips. Two applications should be made, 7 days apart, beginning when thrips are first noticed.

CUTWORMS

(Plants attacked: nearly all garden plants but especially corn, beans, cabbage and tomatoes)

For transplanted plants, such as cabbage and tomatoes, in a small garden, put a protective collar of stiff paper around the stems of the plants at the time of setting. The collar should reach 1 inch into the soil and extend 1 to 3 inches above the ground.

For large gardens and fields, use a poisoned bait made by mixing, while dry, 25 pounds of bran and 1 pound paris green and adding enough water (2½ to 3 gallons) to make the bait moist. Broadcast the bait in the evening after sunset. Apply at the rate of 12 pounds to the acre, and repeat the application when necessary.

GRASSHOPPERS

(Plants attacked: nearly all garden plants)

Use the same bait as recommended for cutworms. Apply the bait in early morning to that part of the field under direct attack.

Two new insecticides, chlordane and benzene hexachloride, appear very promising for grasshopper control. Use chlordane, 2 pounds of a 50-percent wettable powder in enough water to spray each acre of the crop to be protected from grasshoppers. For best results, concentrations of grasshoppers should be sprayed directly with this suspension. If barrier action is to be taken, a swath 20 to 30 feet in width should be sprayed around fields toward which grasshoppers are migrating. (When using chlordane on tobacco, use formula having the minimum amount of solvent.) As an alternative to chlordane apply benzene hexachloride as a dust (containing 1-percent of the gamma isomer) to infested vegetation at the rate of 30 pounds per acre.

FLEA BEETLES

(Plants attacked: nearly all garden plants)

Use rotenone dust containing 0.75- to 1-percent rotenone or 3-percent DDT dust. Rotenone dust is preferred on vegetables whose leafy parts or pods are to be eaten soon after treatment.

Rotenone sprays containing ground derris or cube root (4-percent rotenone content) 2½ pounds in 50 gallons of water are effective. DDT ½ pound (or its equivalent, 1 pound of a 50-percent wettable powder) per 50 gallons of water is recommended for use on potatoes (see under potato insects). Bordeaux mixture is very effective in preventing injury to plants by these pests. Thorough application should be made at 7- to 10-day intervals. Directions for mixing bordeaux sprays are on page 8.

Barium fluosilicate and cryolite dusts may also be used with good results.

APHIDS OR PLANT LICE

(Plants attacked: practically all garden plants)

Use nicotine sulfate (40-percent), 1 part to 800 parts of water ($\frac{1}{2}$ pint to 50 gallons or 1 teaspoonful to 1 gallon of water). Add soap at the rate of 2 pounds to 50 gallons or a 1-inch cube to 1 gallon. Apply with considerable pressure and direct the spray to the under side of the leaves, or wherever necessary to wet the insects. Nicotine gives best results at temperatures above 70° F.

A pyrethrum spray is also very effective and works better at lower temperatures than nicotine. Use 1 part of a pyrethrum concentrate containing 2-percent pyrethrins diluted with 400 to 800 parts of water, depending on the species of aphid involved. This will require respectively 1 to $\frac{1}{2}$ teaspoonful per gallon of water.

Pyrethrum dust is effective against plant lice and 5-percent DDT dust gives good control of the pea aphid.

HOW TO MAKE BORDEAUX MIXTURE

For small gardens it is convenient to buy dry commercial bordeaux mixture, but generally these ready-mixed sprays are not so effective as those freshly mixed. To make a 5-5-50 bordeaux mixture (the formula widely used) dissolve 5 pounds of powdered bluestone in 4 gallons of water using a wooden bucket or earthenware jar for the purpose. In another container mix 5 pounds of hydrated lime in 4 gallons of water. Then pour about 38 gallons of water into a 50-gallon barrel, and while stirring the water in the barrel vigorously, pour in the lime water, straining it through cheesecloth to remove any coarse particles. Then, while still stirring the mixture vigorously, slowly add the bluestone solution, also strained through cheesecloth. Add enough water to make 50 gallons, and stir thoroughly.

To prepare 3 gallons of a 5-5-50 bordeaux mixture use 5 ounces of powdered copper sulfate (bluestone) and 5 ounces of fresh hydrated spray lime. Mixing may be done in the spray tank by washing each material through cheesecloth into the partly filled tank. Constant stirring while mixing is essential. Bordeaux mixture should be used the same day it is made.

Lexington, Kentucky

June, 1947

Cooperative Extension Work in Agriculture and Home Economics: College of Agriculture and Home Economics, University of Kentucky, and the United States Department of Agriculture, cooperating. Thomas P. Cooper, Director. Issued in furtherance of the Acts of May 8 and June 30, 1914.