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INSECT ENEMIES

To be successful in controlling insect pests, preventive or remedial measures must be applied early. If spraying is deferred until insects infest the plants in large numbers, great difficulty is experienced in getting rid of them. It is emphatically much easier to kill a few insects than a whole host. If they are once allowed to obtain the upper hand, the crop will be so much injured that it frequently will not pay to attempt to save it.

The important point that must be grasped in connection with the control of insect pests is that they may, from the point of view of the gardener, be divided into two groups—"biting" insects and "sucking" insects.

The biting insects eat the leaves, roots, or stems of the plants attacked, and their presence is usually obvious even to a casual observer.
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The sucking insects obtain their food, not by eating the leaves, but by inserting their "beaks" into the plant tissue and sucking its juices. Since it is not feasible to poison the sap of plants to kill the insects, the best method is to spray them with what are known as "contact" insecticides. These must be applied in such a way that they actually come in contact with the insects. Soap solutions, kerosene emulsion, and nicotine are the principal contact sprays.

Sometimes, instead of using sprays it is more convenient to use dry insecticides in the form of powder. This is particularly the case when a spray-pump is unavailable or the water supply not close at hand.

No matter in what form these insecticides are applied, the operation must be done thoroughly or little benefit will result. The contact sprays should be applied with force in such a way that every insect is covered. To apply the stomach poisons a fine, mist-like spray should be used which will coat the leaves with a thin film of poison. If too much is applied there is a tendency for the mixture to run into globules, which concentrates the poison at the tip of the leaves. This may result in injury to the plants and is not effective in coating the whole of the leaves.
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The feeding habits of some insects make it almost impossible to control them by spraying; so traps, poison bait, hand picking, repellents, or screening the plants to prevent access of insects are resorted to. These measures are fully described in connection with the insects against which they are used. Following are some of the more important insect pests.

BEETS.—Flea-beetles (small, very active insects, as indicated by their name), blister-beetles, and various caterpillars, which eat the leaves, attack beets. Lead arsenate\(^1\) should be applied as soon as the injury is noticed.

CABBAGE.—Probably the worst insect pest of this crop is the cabbage-worm, a green caterpillar which hatches from eggs laid on the leaves by the common white butterflies, which may be seen flitting about the garden from early spring until fall. Spraying the plants with arsenate of lead to which a “sticker” has been added to make it adhere to the leaves is a standard remedy. Cabbage is also attacked by flea-beetles and caterpillars of various kinds, which are controlled by the same methods adopted for the cabbage-worm.

CAULIFLOWER.—Same pests as cabbage.

\(^1\) Various spray formulas will be found at end of chapter.
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CORN.—The *corn earworm* is one of the worst of the pests attacking corn. This is a caterpillar which at first feeds on the "silk" and later penetrates the ear and eats the kernels. It is very difficult to control this insect. Lead arsenate sprayed or dusted on the silk as soon as it appears is a partial remedy.

CUCUMBER.—The *striped cucumber-beetle* is about a fourth of an inch in length, yellow in color, with three black stripes on the wing covers. It eats the leaves of the young plants and if unchecked ruins the chances of obtaining a crop. One of the best ways of dealing with this insect is to prevent it from gaining access to the plants by the use of cheese-cloth or wire mosquito-netting screens. These can be made by tacking the material used over bottomless boxes, not so high as to shade the plants, but of sufficient width and length to give them room to grow. Another method is to place two or three short sticks in the center of the hill and over these spread a "tent" of cheese-cloth, holding down the edges with stones and earth. Tobacco dust sprinkled plentifully over and around the plants acts as a repellent.

The *twelve-spotted cucumber-beetle* may be controlled by the same measures and by spraying with lead arsenate.

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EGG-PLANT is subject to the same pests as the potato.

KALE and KOHLRABI are attacked by the same insects that attack cabbage.

MUSKMELON is subject to the same insects as the cucumber.

ONION.—Thrips is a tiny insect which infests onions, sucks the sap from the leaves, and causes them to assume a silvery appearance. Most vegetables are subject to its attack. It can be controlled by using a contact spray, such as nicotine solution or kerosene emulsion.

POTATO.—The most troublesome insect pest of the potato is the well-known Colorado potato-beetle. This may be controlled by picking the insects from the plant by hand, or by dusting the leaves with Paris green which has been diluted by mixing it with fifty times its bulk of air-slaked lime. Spraying the plants with lead arsenate is even more effective.

The flea-beetle eats small holes in the leaves, making them appear as if they had been riddled with shot. The spray treatment adopted for the Colorado beetle will also take care of them.

Blister-beetles are slender insects varied in color which attack potatoes and many
other vegetables. Lead arsenate is the best remedy.

Pumpkin is likely to be affected with the same pests as cucumber and squash.

Squash.—This crop is subject to the same pests as cucumber. The squash-bug, or stink-bug (which also attacks cucumbers and melons), is grayish-brown in color and about three-fourths of an inch long. It exhales a very offensive odor which makes hand picking, one of the most effective means of controlling it, an extremely unpleasant task. The measures adopted against the cucumber-beetles are also effective in controlling this pest. Other remedies that may be tried are the collection and destruction of the conspicuous eggs which are to be found in masses on the under sides of the leaves, and trapping the adults by placing shingles on the ground around the plants. The insects will congregate under these and can then be destroyed by stepping on them.

Tomato.—The tomato-worm, the larva of a Sphinx-moth, sometimes occasions much damage. Hand picking is a good remedy, or the plants may be sprayed with lead arsenate. If the latter course is followed, care must be taken to clean the tomatoes thoroughly before eating them. The tomato is also
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subject to the same insect pests as the potato.

**Watermelon** is attacked by the same insects that infest cucumbers.

Practically all vegetable crops are subject to attack by the following insects:

**Aphis, or Plant Lice.**—These occur in both small and large species in a great variety of color. They injure the plants by sucking their juices, and frequently cause the leaves to become curled and deformed. Usually these insects are to be found on the soft growing tips of the plants or on the under sides of the leaves. Prompt application of remedial measures is necessary. The green-colored forms are usually the easiest to kill, and a simple soap solution is generally effective. The black aphids are more tenacious of life, and a stronger insecticide must be used, such as nicotine solution or kerosene emulsion.

**Cutworms** are the larvae of several species of moths. They are especially partial to beans, cabbage, corn, onions, and tomatoes. They are usually dark-colored, greasy-looking caterpillars which spend most of their time, when they are not eating, just underneath the surface of the ground. They cut off the plants by eating through the stems. Several different measures should be in operation at
the same time to rid a garden of cutworms. One of the most effective is the use of poisoned bait, but this is not advisable when live stock have access to the garden. The bait should be strewn liberally close to the plants. Shingles or thin boards may be placed on the surface of the soil. The cutworms will congregate under these and can then be killed by any means that suggests itself. Hunting for them at night, when they are feeding, with a lantern or flashlight, is another method of reducing their numbers.

Two very important soil pests are white grubs and wireworms. They attack potatoes and the roots of many garden crops. The former are large, clumsy, white grubs, the larvae of the June beetle. Wireworms are long, slender, shining grubs, which may be of any color from light yellow to dark brown. They are the larvae of click-beetles. It is very difficult to control these pests. Frequent, deep tilling of the soil is probably the best remedy. If chickens are allowed access to the garden plot when it is being plowed or spaded they will eat a great many of them. Wireworms may be trapped by attracting them to buried pieces of carrot or potato. These traps must be examined every morning and the insects congregated on them killed.
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Following are the formulas for the various insecticides recommended.

STOMACH POISONS FOR BITING INSECTS

Lead-arsenate Solution

1 oz. lead arsenate (paste) to 1 gal. of water or
\[
\frac{1}{2} \text{ " " (dry) " " " " " }
\]

This can also be obtained as a fine powder for dusting upon the plants. This method is less economical of material.

Paris Green

\[
\frac{1}{2} \text{ oz. Paris green} \left\{ \begin{array}{c}
1 \frac{1}{2} \text{ " lime}
\end{array} \right\} \text{ to 3 gal. of water}
\]

When using Paris green as a powder it is advisable to dilute it with from twenty-five to fifty times its bulk of air-slaked lime. This acts as a carrier and renders it possible to distribute the poison more economically and effectively. It is inadvisable to use these poisons, Paris green and arsenate of lead, on heading cabbages or vegetables that are shortly to be eaten, as there is some danger of poisoning the consumers.
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Pyrethrum Powder

1 oz. pyrethrum to 2 gal. of water

Can also be applied as a powder. It is a good insecticide for use on vegetables that are shortly to be eaten, as there is no danger of poisoning human beings by its use. Can also be used as a contact spray.

Hellebore Powder

2 oz. hellebore to 1 gal. of water

The hellebore should first be boiled in water and then diluted to make one gallon. It is very similar in its action to pyrethrum.

CONTACT INSECTICIDES FOR SUCKING INSECTS

Soap Solution

2 oz. laundry soap to 1 gal. of water

Nicotine Solution

\[
\frac{1}{2} \text{ oz. 40\% nicotine} \quad \text{to 3 gal. of water}
\]

1 " soap

The soap is added to this solution to assist in spreading the mixture and to make it come in close contact with the insects.
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Resin Fish-oil Soap

Is recommended by U. S. Department of Agriculture to be added to contact sprays and fungicides, to act as a "sticker" when they are to be used on crops with smooth leaves to which the spray will not stick.

Use two ounces to three gallons of spray mixture.

POISON BAIT FOR CUTWORMS

3 lbs. wheat bran
2 oz. white arsenic or powdered lead arsenate
½ pint cheap molasses

Mix all together and add enough water to make a mash that will stick together. This is very poisonous and extreme care must be exercised in its use.