CONTROL OF CABBAGE WORMS

By H. D. BROWN, First Assistant in Olericulture

Altho there are several kinds of worms which feed upon cabbage and related crops, the chief injury in this section of the country is done by the imported cabbage worm (*Pontia rapae*) and the cabbage looper (*Autographa brassicae*). The other worms which attack cruciferous crops seldom do much damage, and since they are all readily controlled by the same measures, no special mention will be made of the less common cabbage worms.

DESCRIPTION AND LIFE HISTORY

The imported cabbage worm, whose adult is the common white butterfly, is the most destructive of all the cabbage worms. The male butterfly has one black spot on the fore-wing, while the female has two. Both sexes have a black spot on the hind-wing. The full-grown larva is about an inch and a fourth in length, green in color, with a light yellow streak down the middle of the back.

The winter is spent in the pupal stage. Very early in the spring the butterflies emerge and begin to lay their eggs. The eggs hatch in from 5 to 10 days and the larvae mature in from 10 to 14 days. The pupal stage lasts from 7 to 14 days. There are three or four generations a year in Illinois.

The adult of the cabbage looper is a grayish brown butterfly with a somewhat smaller wing expansion than the imported cabbage butterfly. It usually flies about during the evening or on dark days, consequently it is not often seen. The larva is about the same size as the
important cabbage worm, but differs in that it has no legs on the third and fourth abdominal segments, which causes it to walk with a looping gait. The pupa is inclosed in a silken cocoon. The life history is much the same as that of the common cabbage worm.

**INJURY**

All of the injury to the plants is done by the larvae. They may entirely destroy small plants or they may tunnel into the larger cabbage heads and make them unfit for market purposes. Both pests feed upon cabbage and cauliflower in preference to other plants, but they will feed upon practically all of the cruciferous crops and they (especially the cabbage loopers) are frequently found on lettuce, celery, and beets.

**CULTURAL METHODS OF CONTROL**

Clean cultural methods aid considerably in holding the worms in check. The pupae, which hibernate over winter on fence posts, old boards, old cabbage stumps, or other similar places, should be destroyed. A few cabbage plants left standing in the field, after the fall crop has been removed, may be a means of destroying many of the last brood of worms, if the plants are properly treated with poison. The stumps left from the cutting of the early cabbage crop should be covered with poison, or destroyed, as they offer an excellent breeding place for the brood of worms that causes so much damage to the late crop. The plowing of the field during late fall or early winter would undoubtedly kill many of the pupae.

**PARASITES**

In recent years the cabbage worms have been held in check, to a great extent, by a number of parasites. The two most important of these parasites are minute flies (*Apanteles glomeratus* and *Pteromalus puparum*). These small flies lay their eggs in the larva of the cabbage worm and feed upon its tissues. The first parasite mentioned leaves the cabbage worm and spins a cocoon, while the latter completes its development inside the cabbage worm and pupa. From one to several hundred parasites may be found in each host.

As these parasites depend upon worms for their food, they die when they have nearly exterminated the cabbage larva, as these are probably their chief host, altho they feed upon the larva of other insects. They usually get a good start on the late brood, and leave so few live pupae that the early cabbage crop is seldom damaged. In the fall of 1915 fully 98 percent of the pupae found by the writer were full of the small parasite (*Pteromalus puparum*). During the spring
so few of the cabbage worms are to be found that a great many of the parasites die for lack of food. This gives the cabbage worms a chance to multiply and do considerable damage to the late crop.

SPRAYING

The application of spray materials to cabbage and cauliflower is rather discouraging because the material will not adhere to the leaves. A special resin-lime spray mixture, recommended by F. A. Sirrine, has proved very effective for sticking to the foliage. The stock solution is made from the following constituents:

- Pulverized resin: 5 pounds
- Concentrated lye or potash: 1 pound
- Fish oil or any cheap animal oil except tallow: 1 pint
- Water: 5 gallons

The resin, oil, and one gallon of water, are heated in an iron kettle until the resin is dissolved. The lye is then dissolved and slowly added. The other four gallons of water are then added and the mixture boiled until it will unite with cold water, making a clear amber-colored liquid. Add more water in case the solution has boiled down to less than five gallons. One gallon of this stock solution, diluted with 16 gallons of water, 3 gallons of milk of lime, and 1/4 pound of Paris green or 1 pound of powdered arsenate of lead, forms a spray which adheres very readily to cabbage foliage and is effective against the worms. This spray sometimes causes a roughening of the cabbage leaves which undoubtedly does some damage.

In case the resin-lime spray is not used it is better to use arsenate of lead than Paris green, as it sticks to the foliage better. If the spray is applied as a fine mist, so that it does not form drops on the cabbage and run off, a fair degree of success may be obtained without the use of a "sticker." Two pounds of dry arsenate of lead should be used to 50 gallons of water, or .6 of an ounce (4 level tablespoonfuls) to each gallon of water.

A strong solution of "Black leaf 40" (1 part to 500 parts of water) will kill all the small worms that are hit by the spray.

The small worms may also be killed by spraying the plants with hot water. It is best applied thru a sprinkling can, at a temperature of 130° to 150° F. The large worms cannot be killed by this method unless the water is so hot that it will injure the plant. Applying hot water frequently is a practical method of control for a small patch of 100 plants or less.

DUSTING

The simplest way of controlling cabbage worms is by dusting on a mixture consisting of one part, by weight, of powdered arsenate of lead, and sixteen parts of air-slaked lime. A cheesecloth bag serves
very well for applying the dust. It is shaken over the plants until the leaves are covered with dust. The material may be applied either when the plants are wet or dry, but it should not be applied before a rain, as it is easily washed off. Paris green may also be used in this manner.

This method has the advantage of being easy to apply, it requires no equipment for application, can be applied quickly, and no time is spent in the preparation of the material. It has the disadvantage of being more easily washed off by rains than the resin-lime mixture. The cost of the material used by the dusting method would probably be a little more than for the spraying method, but the additional cost of application and preparation of the spray mixture would more than offset this item of expense.

For quick results the proportion of arsenate of lead to lime may be increased. One part of lead to eight parts of lime is not an excessive amount. There are also special dusting guns for sale which throw a dust over the plants. These guns require that the material applied be very fine, consequently it is best to use pure arsenate of lead. This makes the dusting more expensive, but of course it does not require so much dust for each plant as when lime is mixed with the poison.

**TIME OF APPLICATION**

For the early crop one application as the heads begin to form is usually sufficient. If the worms were killed on the early crop, one or two applications may be sufficient for the fall crop. As a rule, however, the late crop will need several applications. One should be made while the plants are small, possibly while they are in the seed bed, another when the plants have made some growth, and another when the heads are a quarter to three-quarters formed. Repeated rains may wash off so much of the material that more frequent applications may be necessary. Careful observations of the number of worms present is the only true indication of the number of applications necessary.

It is good practice never to apply an arsenical poison to the cabbage heads later than ten days before marketing, as there may be some danger to the consumer. Hellebore may be used either as a spray or dust up to the time of marketing. However, since the poison touches only the outside leaves, and these leaves are trimmed off by the gardener and the housewife, there is little danger of poisoning except in extreme cases of carelessness. Cauliflower should not be treated after the heads begin to form.