CONTROL OF THE STRIPED CUCUMBER BEETLE

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The striped cucumber beetle (*Diabrotica vittata*) is one of the most familiar garden insects, and one of the most destructive, with which vegetable growers must contend. The injury done to cucumber, squash, pumpkin, watermelon, and muskmelon vines by this pest is often the cause of the failure of these crops. Besides the damage which the beetle and its larvae do directly to the plants, the adult beetles are spreaders of a bacterial wilt (*Bacillus tracheiphilus*).

LIFE HISTORY

The adult beetle (see illustration) hibernates in the fall under rubbish or boards, or in the ground. These beetles emerge in the spring several weeks before the cucurbitous, or vine crops appear. During this time they feed upon a wide range of vegetation, but congregate immediately upon any vine crops which they may find. They feed ravenously for five to ten days on the vine crops, regardless of any poison which may have been applied to the plants. After that they begin to pair and refuse to eat any portion of a plant protected by insecticides.

The eggs are laid the latter part of June and during July and hatch in about ten days. They may be laid wherever the beetle is feeding, but will not hatch unless deposited in a moist place.

The larvae likewise require moisture, and will soon perish if forced to remain for any length of time in contact with an extremely dry soil. Consequently they are likely to be found at the base of the plant along the stem, and upon the fruit where moisture is available. They are about three-tenths of an inch long, white, with dark brown head
and anal plate. The larvae feed for about a month and then pass into the pupal or resting stage.

The adults begin to emerge about the first of August and continue until the latter part of September. There is only one generation a year in central and northern Illinois; in southern Illinois there may possibly be a partial second generation.

**INJURY**

The greatest injury is done by the adult beetles. They may either totally destroy the small plants soon after they appear above the ground, or they may eat sections from their bases, so weakening the plants that they are easily destroyed by winds. Later they congregate on the blossoms and destroy the pistils and pollen, and seriously interfere with the setting of the fruit. It is at this stage that injury by bacterial wilt is usually noticed.

Bacterial wilt is carried from plant to plant by the mouth parts of the insect; the twelve-spotted cucumber beetle (*Diabrotica duodecimpunctata*) also carries the infection in the same way. No other means of spreading this disease is known. A plant wilts down in a few days after infection. The wilting is presumably caused by the growth of bacteria in the vascular tissues, which eventually shut off the water supply from the upper portion of the plant.

The larvae also do considerable damage, when they exist in large numbers, by feeding at the bases of the plants, by tunneling up into the stems, and by feeding upon the fruits. An attack of the larvae at the base of a plant may cause the plant to wilt, and the death of a plant caused by larvae in this manner is often erroneously attributed to bacterial wilt.

**CONTROL**

The logical time to begin the fight against the beetles is in the fall several weeks before they go into winter quarters, for it is these beetles which emerge in the spring and cause all the damage to the crops.

In the control measures outlined in the following, no special remedy is suggested for bacterial wilt; there is no known remedy, except to control the beetles which spread the disease.
The control measures during the fall are based on the fact that the beetles at this time exhibit a great greed for food. After the main vine crops have been killed by the first frost, large numbers of the beetles can be poisoned by completely covering with poison a few squash vines which have been protected from the frost. Hubbard or Boston Marrow squash plants are the best to use for this purpose, as the beetles prefer these to any of the other vine crops, including other varieties of squash.

The poison may be dusted on the plants in the morning while the dew is on, or it may be applied in the form of a spray. If dusted on, it is best to use powdered arsenate of lead, for Paris green is liable to injure the foliage. If applied as a spray, the solution should be of double strength. Four pounds of the paste or 2 pounds of the powdered arsenate of lead should be used to each 50 gallons of water. Paris green when applied as a spray should be used at the rate of 1/2 pound to 50 gallons of water. Paris green should be added to freshly slaked lime and the mixture diluted to the proper proportion. One pound of fresh stone lime should be used with each half pound of Paris green.

Another method of killing the beetles in the fall is to leave a number of immature Hubbard squash scattered about the field. The beetles will congregate on these in great numbers after the vines have been killed by a slight frost. Early in the morning while it is still cool, many of the beetles can be collected by picking up the squash and brushing the beetles into some receptacle from which they cannot escape. They will make very little effort to fly away when they are stiff from the cold.

Large quantities of squash bugs (*Anasa tristis*) and of the twelve-spotted cucumber beetle will also be collected in this way, as they congregate in the same manner. As the two latter insects spend the winter in the adult stage, their capture is a valuable means of control for two more destructive cucurbitous pests. The writer has collected several quarts of a mixture of these three insects on different occasions, in less than fifteen minutes. Small boys could render valuable service in this kind of work. The principal objection to hand picking is that a few of the beetles will still feed upon the partly green stems of the old plants and of course will be missed. This can be overcome to a certain extent by raking up the old vines and immature squash on piles of dry straw. After the beetles congregate, which will take a week or ten days, the vines may be burned. The straw placed under the vines hastens the burning so that few of the beetles escape. Dry straw placed over the top of the pile at the time of burning is an advantage. A few immature squash scattered over the field after the burning afford a means of collecting any beetles which have escaped.
CONTROL MEASURES DURING THE SPRING AND SUMMER

In the spring the method of control for the first five or ten days after the beetles appear on the plants is essentially the same as the method of applying poison described for the fall treatment. Advantage is taken of their ravenous feeding habit during this period by applying poisons to the crops upon which they are feeding. If cucurbitous crops other than squash are the main crops, it will be advisable to apply the poison to a trap crop of Hubbard squash, driving the beetles from the main crop with air-slaked lime or Bordeaux mixture. The beetles naturally prefer the squash plants, but a sufficient number should be started throughout the patch so that they will have no difficulty in finding them. If the beetles appear in excessive numbers on the trap squash vines, they may be killed with a strong contact insecticide, such as pure kerosene. Of course the vines so sprayed will be killed.

After the beetles begin to pair it is useless to apply poison to the plants, for the beetles refuse to eat on the protected parts of the plants. Consequently, the best method of control is to keep the main vine crop covered with Bordeaux mixture (4-2-50) and plant a succession of squash seed for a trap crop upon which the beetles may feed. The Bordeaux mixture is a strong repellent and also acts as a preventive of certain diseases which are likely to occur at any time.

In small home gardens where it is not feasible to spray with Bordeaux mixture, air-slaked lime and turpentine may be dusted on the plants. One tablespoonful of turpentine added to each quart of lime will give an odor very disagreeable to the beetles. A tin can with perforated bottom distributes the lime and turpentine satisfactorily.

The following methods may fit the needs of special cases, or they may be used in combination with some of the above control measures. 1

If the seeds are sown thickly, enough plants may survive the attack of the beetles to insure a good stand.

Coverings of cheesecloth or wire screen will give protection to young plants, but are rather expensive for large areas. The cloth must not be so thick as to shade the plants, yet it must be woven closely enough to prevent the beetles from entering it. The covering must not be left on too long or the plants will be stunted. In the eastern states a manufactured wire covering is used very successfully.

Plants started early in a hotbed, in dirt bands, or on inverted sods, will have made a good growth before they are transferred to the field, and will therefore have a better chance against the beetles.

Dry pyrethrum, dusted over the plants while the dew is on, will kill some of the insects.

Such materials as road dust, black death, moth balls, ashes, charcoal, soot, and many other preparations are of no value except to scare the beetles away at the time of application.

1There is no one method which will entirely exterminate the pest; consequently it is necessary to use several remedies, and to apply them diligently at the proper times. Since the beetles have considerable power of flight, it is important that growers located within one-quarter mile of each other cooperate in their methods of control.