TEXAS AGRICULTURAL EXPERIMENT STATION

BULLETIN No. 179 OCTOBER, 1915

DIVISION OF ENTOMOLOGY

# THE HARLEQUIN CABBAGE-BUG

POSTOFFICE:
COLLEGE STATION, BRAZOS COUNTY, TEXAS

AUSTIN, TEXAS
VON BOECKMANN-JONES CO., PRINTERS
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BY

F. B. PADDOCK, B. S. E.

Entomologist in Charge; State Entomologist


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*As of October 1, 1915.
**In Cooperation with the United States Department of Agriculture.

# THE HARLEQUIN CABBAGE-BUG

F. B. PADDOCK, B. S. E., ENTOMOLOGIST IN CHARGE; STATE ENTOMOLOGIST.

Most every one in Texas who grows any cabbage is familiar with this insect, known also by such names as "terrapin-bug," "calico-back," and "fire-bug." This insect seems to be present in most every garden and field in the State in which cabbage is grown. And, when present, this insect is a very serious pest, so that it is dreaded by those who know it. The climatic conditions of the State are favorable to the rapid development, as the winters are mild, which result in a low mortality of the hibernating bugs. Since this insect is practically free from the attacks of predaceous enemies and parasites, the control of it depends mostly upon the grower's efforts.

## ORIGIN AND DISTRIBUTION.

The original home of the harlequin cabbage-bug (*Murgantia histrionica* Hahn) was probably in Central America and Mexico. It now seems most at home in the United States in the semi-tropical regions of Arizona, Texas and New Mexico. How and when this insect was first introduced into Texas from the South is not known. The first record of its occurrence as a pest was in 1864, in Washington county.* Soon after this time the insect was recorded in Louisiana and later in North Carolina. The spread has continued until now the insect is found to a limited extent in Delaware, Maryland, Indiana and Colorado. Along the northern limit of its range this insect is seldom injurious, as the cold winters hold it in check, since but few of the bugs are able to successfully hibernate over them. The spread of this insect over Texas has been most complete. There are now but few localities where the food plants are grown that the harlequin cabbage-bug is not found.

## SPREAD.

The spread of this insect has not been the steady, gradual spread, common to many insects; it has been more in the nature of long jumps. This is probably due to the fact that infested material has been shipped long distances by rail or water. It is not uncommon to find in a shipment of cabbage some outside leaves which have upon them the eggs of the harlequin cabbage-bug. In this manner the pest may suddenly appear in a locality which is a considerable distance from territory that is known to be infested with the insect.

## FOOD PLANTS.

The list of food plants of the harlequin cabbage-bug given by Chittenden (l.c.) includes the following: Cabbage, kale, collard, cauliflower, turnip, radish, mustard, rape, ragweed (*Ambrosia*), pigweed (*Amarantus*), lamb's quarters (*Chenopodium*), shepherd's purse (*Cap-*

*Circular 103, Bureau of Entomology, Department of Agriculture.

*sella bursa-pastoris*), pepper grass (*Lepidium spp.*) and weeds of the mustard family.

## DESCRIPTION.

This insect hardly needs any description for those who are familiar with the pest and its work. It is a very striking insect, about one-half inch long, flattened, and of a shape which has led to the name "terrapin-bug." The back of the adult bug is shining black or metallic blue, marked with red or orange.

The eggs are quite large, white, with black markings so arranged as to suggest a barrel. The eggs are usually laid on the underside of the cabbage leaves, sometimes in regular masses of 12 eggs in two rows, sometimes 13 eggs in an irregular mass.

The immature stages or nymphs of this insect resemble the adults very much in shape and coloring. The most notable difference is the absence of wings in the nymphs. The stages just preceding the adult show wing pads, from which the wings of the adult develop. The small bugs grow by moulting or casting their skins. There are five stages in the growth of this insect which are set off by the moults.

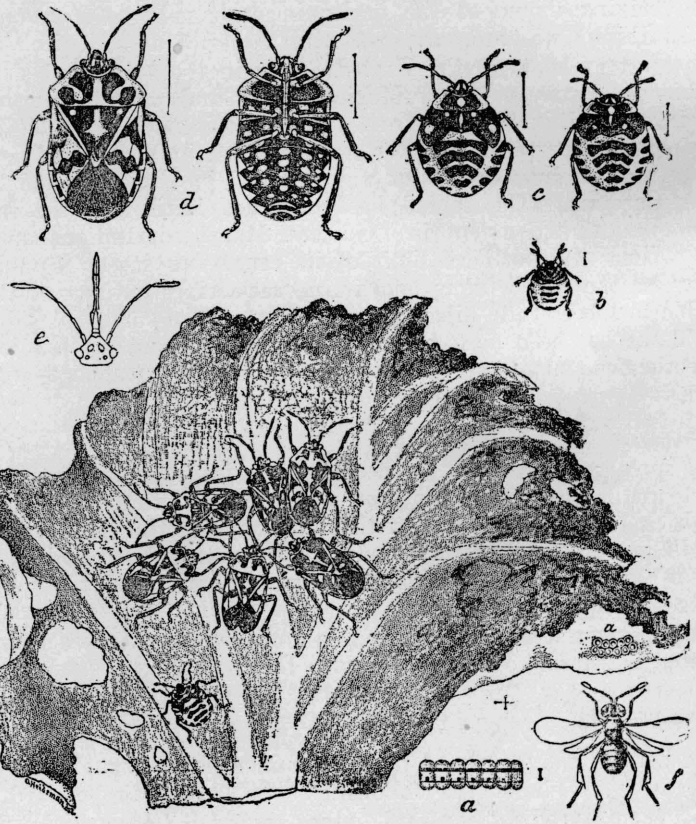


Fig. 1. The Harlequin Cabbage-Bug (*Murgantia histrionica* Hahn): a, eggs—enlarged; b, nymphs,—more enlarged; d, adults seen from above and below—enlarged; e, head and beak of same; f, parasite of eggs—enlarged—bugs and eggs (a) on leaf, natural size (Md. Bull. No. 101).

## INJURY.

These bugs do their injury to the crops by sucking the juices of the plants. This they do by inserting their beak into the tissues of the plant. Those plants attacked soon wilt and appear as though destroyed by fire. The power of these insects for destruction is enormous; half a dozen adult bugs will destroy a small plant in a day. Entire fields of cabbage are often destroyed in three or four days by a horde of these insects.

## LIFE HISTORY.

The life history of this insect is imperfectly known at the present time. The winter is passed by the bugs hibernating in whatever protected places that may be available in or close to the infested fields. Smith*, in North Carolina, says that only strong mature bugs survive the winter in well-protected places. He also says that eggs which are laid too late in the fall to hatch and those bugs which do not mature cannot survive the winter. In the warmer sections of the State the insect may be found feeding in the fields during the greater part of the winter. Over much of the State hibernating places are not sought until November or December. These insects seldom fly from the field to find shelter for the winter, simply availing themselves of whatever protection is at hand. Such protection is usually in the form of crop and weed remnants or winter truck crops, such as mustard and turnips. Over much of the State the bugs may be seen during the warmer days throughout the winter feeding upon turnips, mustard and cabbages. In the extreme southern section of the State it is probable that true hibernation does not take place, the activities of the insect are merely retarded.

The insects leave their hibernating places early in the spring. Over much of the State the bugs may be found in the fields as early as March 1st to 15th. The first brood in the spring is usually found upon wild mustard or closely related plants. In sections where early crops of mustard, radishes and turnips are grown they are attacked. Smith (l.c.) says that mating does not ordinarily occur until the bugs have fed for seven to ten days. He observed that the females of the over-wintering brood laid eggs the day after mating took place and that mating occurs before each mass of eggs is laid. A female lays 12 or 13 eggs in a mass, and as many as eight masses may be laid by a single female at intervals of two to six days.

The eggs of the over-wintering females are usually laid on the wild host plants, mentioned above. These eggs hatch in from four to eight days, depending upon the temperature. Smith (l.c.) found that the over-wintering females lived from twenty-two to sixty-nine days when confined in the cages.

The young bugs which hatch from these eggs do not feed much upon the wild plants but attack cabbage as soon as it is available. The small bugs cannot fly, so their migration is limited. It is evident that the spring supply of food must be close to the cultivated crops in order that the bugs may go from the former to the latter.

The length of the life of the broods of this insect seems to vary consid-

*North Carolina Experiment Station Report, 1909, p. 90.

erably. Smith (l.c.) thinks that perhaps the food supply may govern the rate of growth. Chittenden (l.c.) found that seventy days were required for the first brood of the year to complete its growth. Smith (l.c.) found that fifty-six to sixty-four days were required for the fall generation of insects to complete their life cycle. He also found that those bugs which do not lay eggs before September 1st live during the fall, over the winter and deposit their eggs the following spring. The apparent overlapping of broods is due to the fact that the females may live and deposit eggs over a period of more than two months. It seems probable that in the northern part of the State there are two and perhaps a partial third brood a year; throughout the central sections of the State there are perhaps three full broods, and in the southern sections there may be four generations in a year.

## NATURAL ENEMIES.

This insect is unusually free from the attacks of natural enemies. This, according to Chittenden (l.c), may be due to two causes: the warning type of coloration, and the distasteful odor and flavor. There is one very small parasite which develops in the egg of the harlequin cabbage-bug. Cases are recorded where this parasite has been very effective in the control of this pest. We cannot say how general this parasite is in Texas. The usual climatic check of this pest is not effective in this State. The sudden cold spells are quite fatal to the insect, as the bugs are allured from their hiding places to feed and cannot get to shelter in time to prevent freezing. This factor exerts more influence in this State upon the control of the pest than does continued low winter temperatures.

## METHODS OF CONTROL.

### *Preventive Measures.*

Since the harlequin cabbage-bug is a difficult pest to fight after it has started the destruction of a cabbage field, every effort should be made to prevent the insect from appearing in great numbers. Experience has shown that insecticides cannot be used to hold the insect in check. The adult bugs do not fly much from field to field, unless there is a great shortage of food. As a result of this habit the thrifty farmer can put up a satisfactory fight against this pest. If the bugs are mostly killed in a field there are slight chances of reinfestation from surrounding infested fields. Some of the preventive measures are (1) Fall Destruction, (2) Winter Treatment, (3) Spring Destruction, (4) Clean Cultural Methods, (5) Trap Crops.

*Fall Destruction:* As pointed out by Smith (l.c.), it is often a simple matter to destroy numbers of bugs during the fall. At this time they are congregating about the remains of crops and weeds, feeding some and preparing to go into hibernation. At such times the bugs may be killed by hand-picking, spraying or burning. All bugs killed during the fall will mean that many less to fight the next spring when they will be scattered over the plants. The work put in at this time will prove to be an essential part in the fight against this pest.

*Winter Treatment:* As the bugs hibernate mostly in the fields where they feed, especially during the fall, it is apparent that all excess plant growth in and around the field should be destroyed. The remains of the last crop should be disposed of by plowing under or burning. When such material is destroyed the hibernating quarters of the bugs are gone. With such treatment the chances are much less for the insect to survive the winter. The weeds and trash around and close to the fields should be disposed of in some manner. Rank weeds should not be allowed to grow during the late fall, since they serve as food for the bugs.

*Spring Treatment:* It is very important in the fight against this pest to destroy the bugs early in the spring as they are leaving the hibernating quarters. This should not be delayed until egg-laying has commenced. Smith (l.c.) has shown that usually as much as two weeks may elapse between the time the bugs come out in the spring and the beginning of the egg-laying.

*Clean Culture:* There are several common weeds on which this insect breeds during the early spring. These are named under the food plants. Such weeds should be kept down at all times, not only in the fields to be planted to cabbage, but in adjoining fields and especially waste places. Weeds of any kind should not be tolerated at any time upon any farm, as they serve in one way or another to keep up the supply of insect pests.

*Trap Crops:* Such crops are those planted at such a time that they will prove attractive to a pest before or after the main crop. Trap crops must be destroyed at such a time that the insects cannot leave them and go to the main crop. If well handled, a trap crop may be a very big factor in the control of this insect; if not properly handled, it simply serves as an aid to the pest. Mustard is perhaps the best trap crop to use for the harlequin cabbage-bug, though turnip, kale or cabbage may be used. These crops should be planted at such a time that they will be attractive to the insects during the spring, from the time the bugs leave their hibernating quarters until the egg-laying period is over. When the bugs become very abundant upon the trap crop they should be destroyed either by spraying with pure kerosene, burning or by destroying the trap crop. During the fall the trap crop may be used to a decided advantage. It should be planted so as to be attractive to the insects after the main crop has been harvested and before the bugs seek hibernating quarters.

### *Remedial Measures.*

*Hand Picking:* If the preventive measures have been carefully followed, the number of bugs that will appear during the summer has been materially reduced. But in spite of such precautions some bugs will be present to do injury to the crops. When the bugs first appear upon cabbage, hand picking is perhaps the most satisfactory means of fighting the pest. Here again the habit of the insect, of not flying readily, is decidedly in favor of those attempting to clean their fields by such method. Reinfestation is not very likely to occur. This

process may appear to be expensive and tedious, but by those who have used it, it is considered a satisfactory step in the fight against this pest.

*Spraying:* This method is not entirely satisfactory for the control of this insect. Any material now known to kill the bugs will also kill the plants upon which they are feeding. Kerosene is most used for spraying against the bugs; it is very effective when sprayed undiluted, but of course kills the plants. The best time to use this material is in the destruction of the insects on the trap crops and upon crop remnants. Kerosene emulsion of 15 per cent. strength may be used to kill the young or immature bugs. Directions for making this are appended.

This insect feeds by sucking the juices of the plant, and cannot be controlled by the use of arsenical sprays, as Paris green, London purple and arsenate of lead. Contact sprays must be used, which means that if a bug is not hit with some of the material it is in no way injured by the application.

Some have found the plumber's torch to be very effective in the destruction of these bugs upon trap crops and crop remnants. Under these conditions such treatment may be advisable, but the use of the torch is somewhat limited.

In conclusion, it should be said that the control of this pest depends almost entirely upon the careful use of the preventive measures here outlined. If these have been carefully followed there will be but little danger of severe injury by this pest. Hand picking will usually care for the few bugs which may appear in the fields.

## DIRECTIONS FOR PREPARING KEROSENE EMULSION.

Kerosene emulsion is a very valuable insecticide for the destruction of sucking insects, such as plant lice, scale insects, etc., and for the destruction of insects hibernating in rubbish or collected in large masses on tree trunks, etc. Kerosene emulsion is not a poison but kills by closing up the spiracles or breathing pores of the insects. The ingredients of the emulsion are kerosene, soap and water in the following proportions:

| | |
|---|---|
| Laundry soap | 1 pound. |
| Boiling water | 1 gallon. |
| Kerosene | 2 gallons. |

A low-grade of kerosene, which is cheap, is as satisfactory as the higher-priced illuminating oil and, if desired, fish-oil soap (also called "whale-oil" soap) may be substituted for ordinary laundry soap.

The soap forms a coating around each minute particle of oil, "emulsifying" it and permitting of its then being dissolved or diluted with water. Both the soap and oil are active agents in destruction of the insects.

### PREPARATION.

To prepare the emulsion, shave one pound of laundry soap (or soft soap) into one gallon of soft water (rain water). Have the water boiling hot. As soon as the soap is all dissolved, *remove the solution from*

*the fire* and add the two gallons of kerosene. At once agitate the material *violently*. Continue for at least five minutes. This is best done by the use of a bucket spray pump, turning the hose or nozzle back into the bucket or tub so that the material is constantly pumped vigorously through the pump. In a few minutes a smooth, creamy emulsion is formed, without any free oil. This will get thicker as it cools, but if properly made no free oil will separate out. This is the "stock solution," and will keep indefinitely if sealed from the air. (Do not try to make the emulsion by stirring with a paddle, or similar means, for this does not cause sufficiently violent agitation to thoroughly emulsify the oil.)

DILUTION.

For use on trees or shrubs that are *dormant*, the stock solution may be diluted with 5 to 7 parts of water, forming a spray containing 8 per cent. to 11 per cent. of oil. On trees or plants that are *in leaf*, the stock solution should be diluted with 10 to 15 parts of water, making a spray containing 4 per cent. to 6 per cent. of oil. Soft-bodied insects, such as plant lice, are usually killed with a 5 to 6 per cent. solution. The following table shows how to dilute the stock solution to secure any desired per cent. of oil:

For 4% strength, add 15⅔ gallons water to 1 gallon stock solution.
For 5% strength, add 12⅓ gallons water to 1 gallon stock solution.
For 7% strength, add 8½ gallons water to 1 gallon stock solution.
For 10% strength, add 5⅔ gallons water to 1 gallon stock solution.
For 12% strength, add 4½ gallons water to 1 gallon stock solution.
For 15% strength, add 3½ gallons water to 1 gallon stock solution.
For 20% strength, add 2½ gallons water to 1 gallon stock solution.

Kerosene emulsion is best applied on bright, sunny days when the wind is blowing, since considerable of the oil will evaporate quickly and thus reduce danger of injury to the plants.