

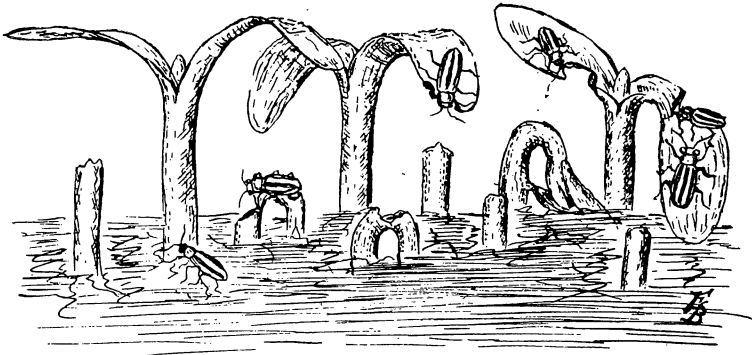
POPULAR EDITION.

BULLETIN No. 158.

MAY, 1899.

New York Agricultural Experiment Station.

GENEVA, N. Y.



HOW TO HANDLE THE STRIPED BEETLE ON CUCUMBER.

F. H. HALL and F. A. SIRRINE.

PUBLISHED BY THE STATION.

BOARD OF CONTROL.

GOVERNOR ROOSEVELT, Albany.
WILLIAM C. BARRY, Rochester, Monroe Co.
S. H. HAMMOND, Geneva, Ontario Co.
MARTIN V. B. IVES, Potsdam, St. Lawrence Co.
A. C. CHASE, Syracuse, Onondaga Co.
F. O. CHAMBERLAIN, Canandaigua, Ontario Co.
F. C. SCHRAUB, Lowville, Lewis Co.
NICHOLAS HALLOCK, Queens, Queens Co.
LYMAN P. HAVILAND, Camden, Oneida Co.
G. HOWARD DAVISON, Millbrook, Dutchess Co.

OFFICERS OF THE BOARD.

MARTIN V. B. IVES,
President.

W. O'HANLON,
Secretary and Treasurer.

EXECUTIVE COMMITTEE.

S. H. HAMMOND,
W. C. BARRY,

F. O. CHAMBERLAIN,
F. C. SCHRAUB,

LYMAN P. HAVILAND
G. HOWARD DAVISON

STATION STAFF.

W. H. JORDAN, Sc. D., *Director.*

GEO. W. CHURCHILL,
Agriculturist and Superin-
tendent of Labor.

H. A. HARDING, M. S.,
Dairy Bacteriologist.

W. M. P. WHEELER,
First Assistant (Animal
Industry).

GEO. A. SMITH,
Dairy Expert.

F. C. STEWART, M. S.,
Botanist.

FRANK H. HALL, B. S.,
Editor and Librarian.

†F. H. BLODGETT, B.S.,
Assistant Botanist
and Entomologist.

VICTOR H. LOWE, M. S.,
†F. A. SIRRINE, M. S.,
Entomologists.

L. L. VAN SLYKE, PH. D.,
Chemist.

S. A. BEACH, M. S.,
Horticulturist.

C. G. JENTER, PH. C.,

WENDELL PADDOCK, B. S.,

*W. H. ANDREWS, B. S.,

C. P. CLOSE, M. S.,
Assistant Horticulturists.

J. A. LECLERC, B.S.,

FRANK E. NEWTON,

*A. D. COOK, PH.C.,

JENNIE TERWILLIGER,

FRED D. FULLER, B.S.,

Clerks and Stenographers.

*E. B. HART, B.S.,

A. H. HORTON,

*CHAS. W. MUDGE, B. S.,
Assistant Chemists.

Computer.

Address all correspondence, not to individual members of the staff, but to the NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.

The Bulletins published by the Station will be sent free to any farmer applying for them.

*Connected with Fertilizer Control.

†Connected with Second Judicial Department Branch Station.

POPULAR EDITION*

OF

BULLETIN No. 158.

HOW TO HANDLE THE STRIPED BEETLE ON
CUCUMBER.

F. H. HALL.

Probably no insect has withstood more methods of repression than the striped cucumber beetle. Each year some new style of plant cover, some new poison or some foul-smelling compound is pronounced by writers in the agricultural press a never-failing defense; yet the little pest returns to the attack every season in increasing numbers and with sharper appetite than before. It may safely be said that no perfect remedy or preventive has yet been found. Only by a combination of two or more measures can we hope to keep even, or perhaps get a trifle the better of the insignificant-appearing little foe. In this bulletin we point out a combination which we believe will be effective in protecting cucumbers, though we must use the squash to do it. To protect the latter is another problem.

Many use- less methods urged. Cucumbers, muskmelons and squashes can scarcely appear above ground in early summer before they are covered with the little quarter-inch long, yellow and black striped beetles; and frequently the

*This is a brief review of Bulletin No. 158 of this Station on Combating the Striped Beetle on Cucumber, by F. A. Serrine. Anyone specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin; and the names of those who so request will be placed upon the Station mailing list to receive future bulletins, popular or complete as desired.

ravenous fellows cluster about the hills to watch the earth rise above the sprouting plantlet or even dig down into the soft soil to get a first taste of their favorite vine. The damage they do is probably more noticeable at this time than later ravages. The beetles, emerging from their winter quarters below frost line, are most voracious eaters; and at the same time the vines are small and unable to withstand the injury. The beetles of this brood, though, and of the succeeding one, feed upon the stems, which weakens the vine; and also upon the flowers, which prevents the setting of the fruit. The larvæ which come between the two broods feed on and in the stems, making them weak and subject to disease attacks, and on the fruits where these touch moist earth.

The striped cucumber beetle (*Diabrotica vittata*)

How the beetles live. is a distinctively American insect and is found in almost every section east of the Rockies. It was first mentioned in this State in 1843 and has probably been found in injurious numbers in some part of the State every year since that time. The beetles belong in the same family as the Colorado potato beetles. They are much smaller and have a three-striped back instead of the ten stripes of the potato beetle. They are probably too well known to require much description, but they are sometimes confused with another beetle, of about the same size, which often feeds with the striped beetle on the flowers of squashes and cucumbers. This other beetle is spotted, not striped, and is commonly called the "twelve-spotted beetle."

The young striped beetles feed during late summer and fall upon the fruits of the cucurbits, especially damaging muskmelons; upon late planted beans, eating both vines and young pods; and upon the flowers of golden rod and aster. They do not mate during the fall and dissections show that they are not sexually mature at this time. They simply eat and heap up fat among their tissues to carry them through their long hibernation. Most of them pass the winter in little cells which they have burrowed out in the soil below frost line; but some of them probably seek other sheltered positions where they feel the heat of spring quicker, and from which they emerge quite early in

mid-spring. They do not appear in injurious numbers until late in May or early in June.

The beetles, made hungry by their long fast, feed voraciously for five or ten days, before commencing to pair, eating anything in line of their food plants which is available, old or young, tender or tough, clean or dirty. During this time they can be poisoned; but later they become fastidious in their tastes and will eat no part of the vine which bears traces of poison. They show at all times a decided preference for the squash, and this preference is a God-send to the cucumber or muskmelon grower. It enables him to protect his crop and to poison some of the beetles by using the squashes as a lure and as a poisoned trap-crop. After their first hunger is satisfied and while they are mating the beetles are very shy, flying at the first alarm. By dusting the vines with plaster or lime, which disturbs the insects and at the same time makes a cloud to fly before the wind, the beetles can be driven temporarily from a field. Their disappearance after the application of some repellent or driver has often been ascribed to some quality of the material applied but the effect is really due only to the timidity of the beetles. They fly off at the alarm but soon return and may often be found burrowing through the supposedly offensive tobacco dust to get at some choice bit of vine, or be seen seated on the plant above the kerosene or turpentine soaked corn cob, reveling in the perfume.

Egg laying begins about July 20, possibly earlier, and lasts about one month. The eggs are deposited with little care, usually one in a place and probably wherever the female happens to be feeding. They have been found in the hairs of the leaves at the growing tips of the vines and on the ground under the leaves or runners. The eggs are light yellow in color, oval or elliptical in shape and but little larger than a pin point.

The larvæ which hatch from these eggs live in the moist earth and in the stems, feeding upon the tissues of the latter and upon the vines and fruits where these rest upon the soil. These larvæ are like wire worms in shape, but white, with small brown heads and dark sections at the tail. The tail end is as wide as the body, the head end only about half as wide. These larvæ require about a month to feed and develop. They then form little cells, not

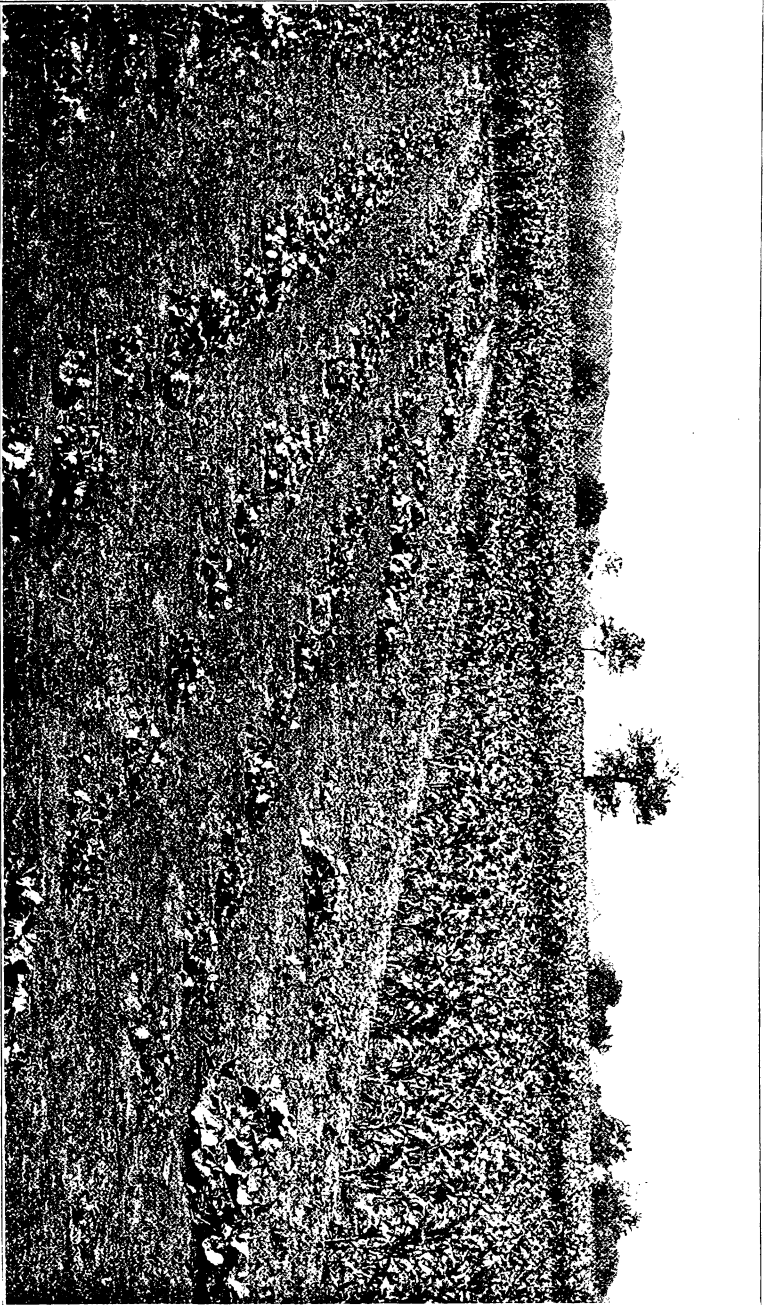
cocoons, below the surface of the soil and emerge as perfect beetles in from one to two weeks. The new brood begins to appear, on Long Island, about September 10. Though there is thus but one brood during a year, some of the old beetles live until some of their progeny have become "hard shells." Mature insects are thus found from spring until frosts drive them under ground.

**How to
combat
them.**

As already stated, poisons can be used with success against these beetles for only a short time in the spring, when they begin to feed; and again, in the fall, against beetles of the new brood. This fall poisoning will succeed only where there is not an abundance of wild fall flowers; for the beetles will desert any poisoned crop for the unpoisoned flowers and will feed upon the flowers to a considerable extent, any how, if they are to be found. Many poisons were tested upon the cucumber fields of Long Island, during 1897 and 1898, including Paris green, laurel green, green arsenite (arsenite of copper¹) and lead arsenite. These were applied dry, in water, in Bordeaux mixture, and in resin-lime mixture, alone; and in various combinations. Green arsenite, dry, gave best results. It was found a waste of the poisons to apply them in Bordeaux mixture, as the mixture so repelled the insects that they would not eat the sprayed vines to secure the poison. These poisons, applied in water, are liable to burn or stunt the plants. It is necessary, then, if we wish to poison the beetles, to use a trap crop to attract the insects and to apply the poison to this crop instead of to the plants we design to protect.

On small areas it may be advisable to shut in the small plants of the growing crop by the well-known cloth-topped boxes; by the tent-like cloth covers spread over arched hoops or wires; by boxes made from a rectangular piece of cloth and two short 6-inch boards with cleats attached to insert in the soil and hold the boards upright; or even 6-inch wire plate-covers. Covers, however, are too expensive on large areas and they have the disadvantage of frequently making the plants weak so that winds will snap them off or twist and ruin them when the covers have to be removed. If covers are used alone their removal leaves the

¹ Lead arsenite is also colored and sold under the incorrect name "green arsenite."



CUCUMBER FIELD WITH SQUASHES ON BORDER.
Photographed June 19, '98.

unprotected vines not only for feeding places but for breeding places for the beetles.

Bordeaux mixture, if thoroughly and frequently applied makes as efficient a protection as the covers, is much cheaper and at the same time protects the plants from diseases. This mixture (1-to-11 formula) should be sprayed upon the cucumbers when they are just well up, again when they show the third leaf and the third time just before the plants commence to form runners. The early application can probably best be made with a knapsack sprayer and later ones by any good pump sprayer. The three applications should not cost over \$2.00 per acre.

The Bordeaux mixture is a much better repellent, according to Station tests, than kerosene, turpentine, tobacco dust, cow-manure, burdock infusion, slug shot, bug death or any other known compound. Indeed, all materials of this class, supposed to drive away the beetles by their distasteful odor, proved failures when used alone. Air slaked lime, dusted over the vines, will make them unpalatable to the beetles, but the lime is liable to stunt the plants. It may be used, with care, by those whose crop is not large enough to warrant purchase of a spraying outfit.

All of these appliances or applications, covers, Bordeaux mixture or lime, merely protect the young plants until they are strong enough to stand the injury from the beetles; they do not kill the insects. To do this, trap crops are needed. As the squash is the beetle's favorite food plant, this vegetable should be planted,—in single rows along the margins of small patches, in several rows around large fields—about four days before the cucumbers or melon seeds are sown. When these trap plants are up and the beetles appear about them dust about half the plants with green arsenite, reserving the other half for use if rain or heavy dew makes the poison soluble and kills the vines first treated. The beetles, attracted by their favorite tidbit will feed upon the squash vines and be poisoned by the arsenite. When the cucumbers or melons are up, unless they are protected by covers, spray with Bordeaux, and poison more of the squash vines. When the beetles commence to pair the squashes may be cultivated up, leaving only a few vines for the beetles to feed upon at flowering time, as the insects prefer the squash flowers and will not molest the others.

Beans may be used with some success as a fall catch crop, where wild flowers are not too plentiful. They should be planted on the cucumber or melon fields; and when the beetles leave the old vines to feed upon the fresh bean plants, they should be treated to liberal doses of poison as well.