

# New York State Agricultural Experiment Station

Geneva, N. Y.

## THE MEXICAN BEAN BEETLE

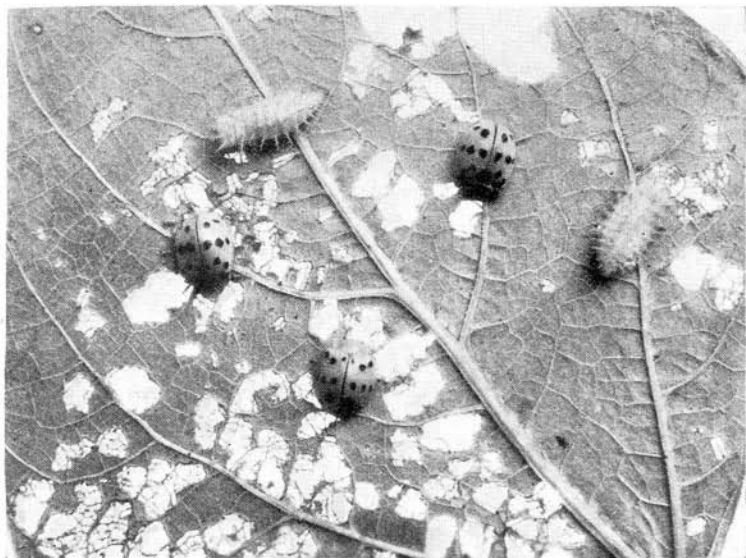


FIG. 1.—ADULTS AND LARVAE OF MEXICAN BEAN BEETLE  
FEEDING ON UNDER SIDE OF BEAN LEAF.

Note the eight black dots on each wing cover of the  
adults, and the "fuzzy" appearance of the larvae.



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The Mexican bean beetle, a new and serious pest of beans, has reached New York State.

It favors garden bush and pole beans, including navy or pea, kidney, and lima beans, as food. In the absence of these plants it attacks cowpeas and soybeans.

There are four stages in its development, namely, egg, larva, pupa, and beetle.

The beetle is nearly hemispherical, one-fourth of an inch long and about one-fifth of an inch wide, and of a copper to orange color. Each wing cover is marked with eight black spots.

The eggs of the beetle are orange colored, placed in clusters of 40 to 60 on the under side of the leaves. The larvae are yellow or orange colored. The upper part of the body is covered with branched spines. The pupa is inactive, of a yellow color, and attached to the under surface of a leaf or other object.

Both the beetles and larvae feed upon the bean plant. They feed from the under sides of the foliage and give the leaf a lace-like appearance.

The bean plant is very susceptible to arsenical injury, and only certain insecticides can safely be used to control the bean beetle.

Magnesium arsenate or calcium arsenate and lime, in a liquid or dust form, are recommended as remedies. The insecticides should be applied as directed and always to the under surface of the leaves.

The first treatment should be made as soon as the eggs become numerous and after that treatments should follow at intervals of 7 to 14 days, depending on the degree of infestation, amount of rain, and rate of growth of the plants.

# THE MEXICAN BEAN BEETLE

RODNEY CECIL\*

The Mexican bean beetle, a serious pest of beans, was first found in New York on August 4, 1927, near North Collins and Gowanda in Erie County. A later survey in 1927 showed the pest to be present in Chautauqua, Cattaraugus, Erie, Allegany, Wyoming, Livingston, and Steuben Counties.



FIG. 2.—CHARACTERISTIC LACE-LIKE TYPE OF BEAN BEETLE FEEDING.

The native home of this insect is probably Mexico, and it has been established in the southwestern part of the United States for at least 75 years. It was first found in the eastern United States at Birmingham and Blocton, Alabama, in 1920. Since becoming established in Alabama, it has spread rapidly in a northeasterly direction until, in 1927, it was discovered as far north as Canada. (See map of distribution.)

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## FOOD PLANTS AND NATURE OF DAMAGE

The Mexican bean beetle is primarily a pest of the common bean. It prefers to feed on the common garden varieties of bush, pole, navy or pea, kidney, and lima beans. If these are destroyed or if they are not present, the insect will feed on cowpeas, soybeans, alfalfa, sweet clover, and a wild plant known as "beggar-weed" or "ticktrefoil."

The beetle or adult and the larva, or immature stage, are the injurious forms (Fig. 1). When numerous they feed on all parts of the bean plant. Injury caused by this pest is easily recognized owing to the peculiar method of feeding of the insect. The larva feeds entirely from the under surface of the leaves and eats away the epidermis in strips, leaving the midribs, veins, and usually the upper epidermis and very narrow strips of the lower epidermis untouched. This gives the foliage of the injured plants a lace-like appearance not likely to be mistaken for the work of any other insect.

The adult beetle also feeds from the under surface of the foliage, but frequently cuts thru the upper surface, leaving small lace-like patches in the leaves. (See Fig. 2.)

## HABITS AND DESCRIPTION OF THE INSECT

The Mexican bean beetle passes thru four distinct stages of development, namely, the egg, larva, pupa, and adult or beetle (Fig. 4.)

The eggs are yellowish orange colored, elliptical in shape, about one-twentieth of an inch long and about half as wide. They are deposited on end in masses of 40 to 60, on the lower surface of the bean leaf and resemble the egg masses of the common potato beetle.

The young of the bean beetle, just after hatching, is about one-twentieth of an inch in length and varies from yellow to orange in color. The mature larva is about one-third of an inch in length and about one-half as wide as long. The upper surface of the body of the larva is covered with branched spines. These spines give it a "fuzzy" appearance. When full grown the larva attaches itself to the under surface of a leaf so that it is protected from the sun. In this position it changes to an inactive, orange-colored pupa.

The beetle is nearly hemispherical, one-fourth of an inch long and about one-fifth of an inch wide. It ranges in color from copper to orange. Each of the two wing covers bears eight black spots, making 16 in all on the back of the insect. When the beetle first emerges from the pupal stage, it is light yellow in color and without spots.

The spots soon appear, however, and the beetle, in a short time, assumes its copper or orange color.

This insect hibernates or passes the winter in the adult stage in protected places under leaves, preferably in woodland on well drained hillsides or along fence rows. In the spring the beetles leave their winter quarters and fly to the bean fields. After feeding for 10 to 15 days or longer the females begin depositing their eggs. The eggs hatch in a few days. The larvae feed greedily, and as the foliage is destroyed they spread to other plants. Mature beetles were found in the southwestern corner of New York on August 4, 1927, and eggs and young larvae on August 18. From these records the indications are that there will be two broods of this bean pest in New York, at least in its more southern portions.

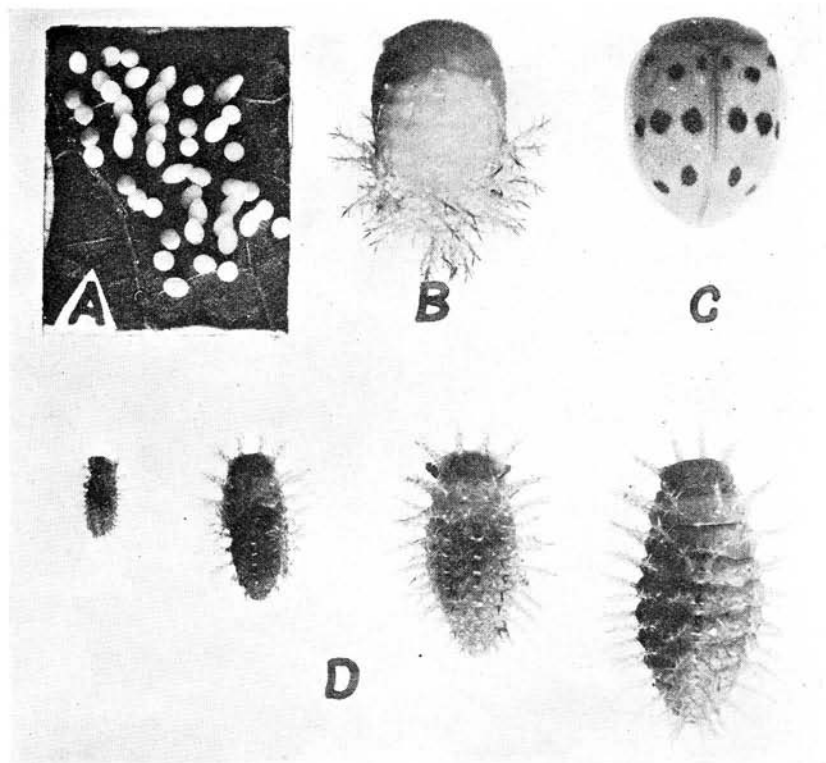


FIG. 4.—LIFE STAGES OF THE MEXICAN BEAN BEETLE.  
A, egg mass. B, pupa. C, adult. D, four larval stages.

## CONTROL MEASURES

### CULTURAL AND MECHANICAL MEASURES

When the Mexican bean beetle first reaches a new territory, it is often found only on a few plants or over a small area in a field. In such cases the best practice is to pull and destroy the infested plants and thus destroy all immature insects which may be on them.

Fields containing beans which have been severely injured or from which the crop has been harvested should not be abandoned but should be plowed. Such treatment of the infested fields destroys many of the immature forms which otherwise would reach maturity and thus produce an increase in the infestation the following season.

### USE OF INSECTICIDES

The Mexican bean beetle can be best controlled by the use of either magnesium arsenate or a combination of calcium arsenate and lime, applied either in the form of dust or as a spray.

Control experiments were conducted in New York during 1925, 1926, and 1927 by the Bureau of Entomology of the United States Department of Agriculture in cooperation with this Station. These experiments have shown that many of the arsenicals commonly used, such as lead arsenate and paris green, cause severe foliage injury, and also a reduction in yields even when actual burning of the plant foliage is not noticeable.

Green beans harvested from plants that are sprayed or dusted when the crop is in the producing stage should be washed in two changes of clear water before they are marketed or eaten to remove any of the insecticide which may have collected on them.

### SPRAYS

Owing to the susceptibility of bean foliage to arsenical injury, it is necessary that care be taken in preparing the spray material to secure the correct dilution. Magnesium arsenate and calcium arsenate, in the dilutions given below, have been tested in New York for three years in order to determine their effect on bean foliage, and have been found to be safe. Previous work on the control of the Mexican bean beetle in Ohio and other states has shown that these insecticides, when properly applied, are satisfactory remedies. The choice of an insecticide will depend largely upon which one is readily obtainable.

## MAGNESIUM ARSENATE SPRAY

	For large areas	For small areas
Magnesium arsenate	2 pounds	1 ounce (5 level tablespoonfuls)
Water . . . . .	100 gallons	3 gallons

## CALCIUM ARSENATE-LIME SPRAY

	For large areas	For small areas
Calcium arsenate.	1½ pounds	¾ ounce (4 level tablepoonfuls)
Lime, hydrated . .	3 pounds	1½ ounce (7 level tablespoonfuls)
Water . . . . .	100 gallons	3 gallons

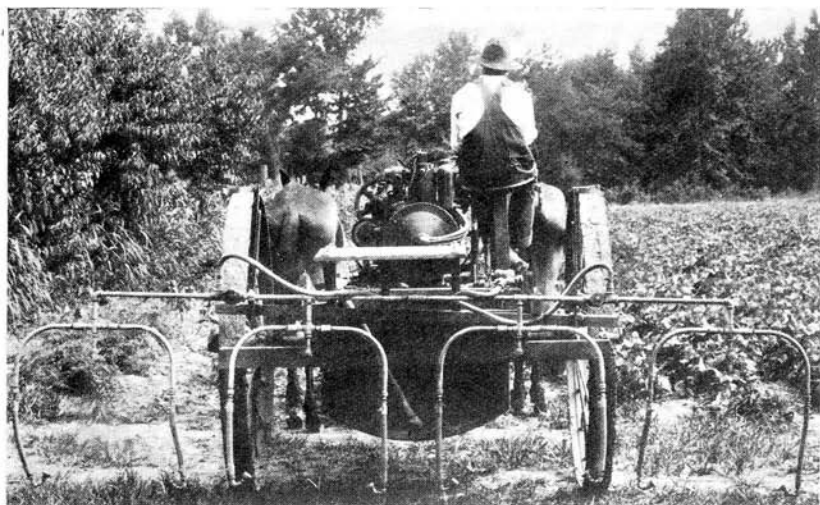


FIG. 5.—POWER SPRAYER USED IN CONTROL OF MEXICAN BEAN BEETLE.  
Note the special spray boom used to apply the spray to the underside of the bean foliage.

## HOW TO APPLY THE POISON IN LIQUID FORM

Since the Mexican bean beetles, both adults and young, feed on the under surfaces of the bean leaves, it is evident that in order to poison this insect the remedy must be applied to the under sides of the bean leaves. Inspection of the under sides of the leaves after treatment will indicate the effectiveness of the spray application. The spray should be applied at the rate of from 90 to 100 gallons per acre. Under normal conditions beans should be sprayed every 10



## CALCIUM ARSENATE AND LIME

Calcium arsenate.....	1 part
Hydrated lime.....	7 parts

Apply at the rate of 15 to 20 pounds to the acre.

## CALCIUM ARSENATE, SULFUR, AND LIME

Calcium arsenate.....	1 part
Sulfur (fine dusting).....	1 part
Hydrated lime.....	4 parts

Apply at the rate of 12 to 15 pounds to the acre.

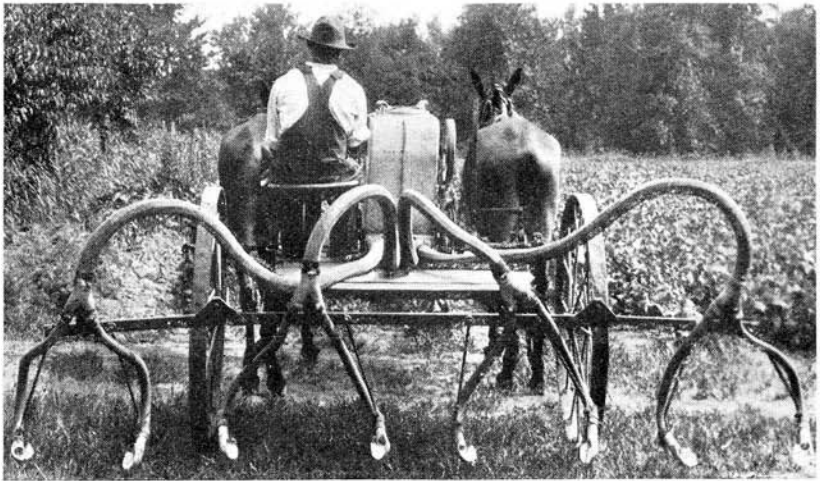


FIG. 7.—POWER DUSTER USED IN CONTROL OF MEXICAN BEAN BEETLE.  
 Note special nozzles that will apply the dust to the underside of the bean leaves.  
 (Photo by N. F. Howard, United States Department of Agriculture,  
 Bureau of Entomology.)

## MAGNESIUM ARSENATE AND LIME

Magnesium arsenate.....	1 part
Hydrated lime.....	5 parts

Apply at the rate of 12 to 15 pounds to the acre.

## HOW TO APPLY THE POISON IN DUST FORM

When the arsenicals are used in a dust form, they must, as in the case of sprays, be applied so as to cover the under surfaces of the

to 14 days, but the interval of time between treatments will vary with the degree of infestation, amount of rain, and rate of growth of the beans.

#### SPRAY MACHINERY

For treating large areas, a horse-drawn traction or power machine equipped with a special four-row spray boom should be used. The spray boom should be constructed similar to the one shown in Fig. 5. With this boom each row of beans receives the spray from three nozzles. One nozzle from above directs the spray downward on the row and a nozzle on each side of the row directs the spray upward to the under surface of the foliage. For best results the insecticide should be applied under a pressure of 150 pounds.

To treat small areas a knapsack type of compressed air sprayer can be used to advantage (Fig. 6). The nozzle here should be placed on a 90 degree elbow at the end of a 30- to 40-inch rod. The rod should be long enough to allow the operator of the sprayer to reach the under sides of the plant from the upright position.



FIG. 6.—TYPE OF HAND SPRAYER SUITABLE FOR GARDEN OR SMALL ACREAGE.  
(Photo by N. F. Howard, United States Department of Agriculture, Bureau of Entomology.)

#### DUSTS

Poison applied as a dust does not furnish as good protection to beans as when applied in a liquid form. Dusting, therefore, should not be resorted to unless the bean beetle infestation is light, or unless local reasons, such as inaccessibility to water or the nature of the bean fields, would make spraying impracticable.

The following dust mixtures are recommended:

bean leaves. The rate of application should be so regulated that between 12 to 15 pounds of the dust mixture is applied to the acre. The interval between treatments will vary from 7 to 14 days, depending upon the degree of infestation, amount of rainfall, and the rate of growth of the beans.

#### DUST MACHINERY

The treatment of large areas of beans requires a horse-drawn traction or power duster that can treat four rows at one time. A good type of this kind of duster is shown in Fig. 7. The boom is so arranged that there are two nozzles for each row. The distributor or discharge pipes are flexible and have scoop-shaped nozzles on the ends of the delivery pipes so that the dust mixture is directed upwards and towards the bean row. This arrangement applies the arsenical to the under surfaces of the bean leaves.



FIG. 8.—BELLOWS TYPE OF HAND DUSTER SUITABLE FOR DUSTING SMALL PLANTINGS.  
(Photo by N. F. Howard, United States Department of Agriculture, Bureau of Entomology.)

For a garden or small acreage, there are several small hand-operated types of dusters on the market that are satisfactory if a nozzle which will turn the dust upwards is used on the distributor pipe (Fig. 8).

#### HOME PREPARATION OF DUST MIXTURES

Dust mixtures may be prepared on the farm. One of the simplest methods of mixing the arsenical and lime is to place it in a steel drum having a removable lid that can be fastened securely.

To mix the dust, the drum should not be more than one-half full of the ingredients to be mixed, and after the lid is closed tightly the drum should be rolled for a total distance of about 500 feet. A more thoro mixture will result if the drum is tipped on end at intervals of 50 feet. Any other method which will mix the ingredients thoroly is satisfactory.

## THE OUTLOOK FOR THE FUTURE

The Mexican bean beetle is now established in the southwestern part of New York and probably will remain permanently. It has been demonstrated that the insect is able to withstand very low temperatures during hibernation, and, therefore, the temperatures which prevail in this State would not affect its successful survival. While the insect has parasites which probably hold it in check in Mexico, no effective parasite has been found in this country.

It is probably safe to say, judging from past performances of the bean beetle, that bean growers will have to combat this pest after it has become well established.

