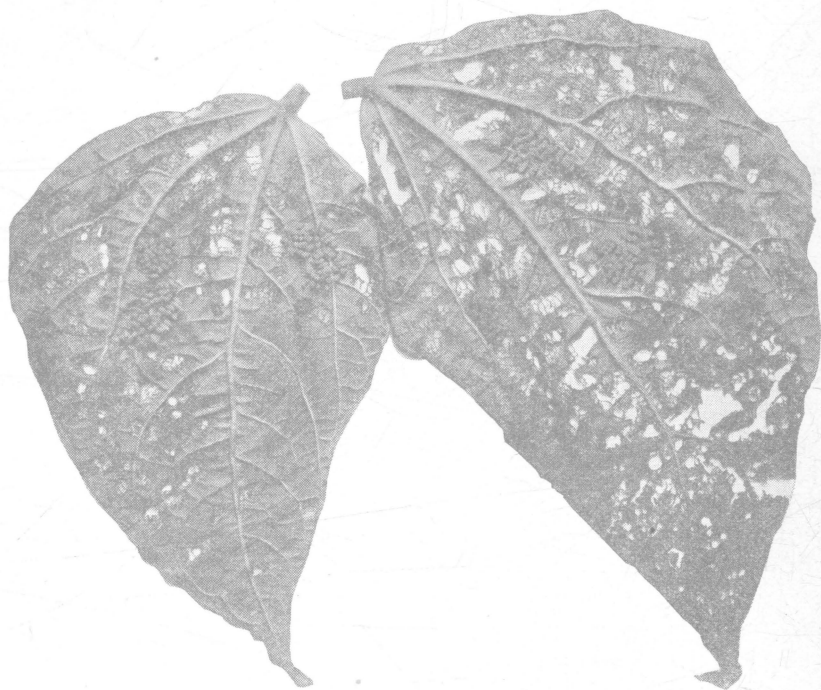


The Mexican Bean Beetle

A New Pest of Garden Beans in Ohio



Bean leaves with feeding marks and eggs of the insect

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Summary

The Mexican Bean Beetle is a new insect pest of beans that has recently entered Ohio.

It promises to be a permanent and serious pest of all varieties of garden beans.

The insect has four stages in its development, that is: beetle, egg, larva, and pupa.

The beetle is nearly hemispherical, about $\frac{1}{4}$ -inch long, copper colored and has black spots on the back. It lives over winter in protected places, such as in fallen leaves and crop remnants.

The egg is yellow and is deposited in clusters on the under side of the leaf.

The larva, or grub, is yellow or orange and covered with short spines. It feeds in largest numbers during June and July but is more or less present until frost.

The pupa is yellow or orange and is attached to the leaf.

The beetles and grubs feed on the under side of the leaf. They eat out parallel cavities of leaf tissue through to the upper surface, leaving a lace-like appearance of the leaf. There are two generations of the insect in Ohio.

Damage first occurred to garden beans in southern Ohio in 1924. In some places the entire crop was destroyed.

Injury can be avoided by applying a dust or spray to the under sides of the bean leaves. Calcium arsenate or magnesium arsenate is the preferred insecticide to use. This must be diluted and applied with hydrated lime according to the directions given in this bulletin.

Arsenate of lead is liable to injure the foliage if used as a spray for killing bean beetles. When mixed with hydrated lime and applied as a dust, it was effective and gave no serious foliage injury during tests made in Ohio in 1924.

The arsenical must be applied with a duster or sprayer suitable for the work and equipped to direct the material against the under sides of the leaves.

Four applications at 10-day or 2-week intervals will protect bush varieties of beans until the crop is harvested. Pole varieties may require more applications.

The insect will probably spread and increase in numbers sufficient to compel spraying or dusting of the foliage to be done if beans are to be grown suitable for home or market use.

The insecticide should be applied as soon as the pest appears and before damage occurs.

The Mexican Bean Beetle

A new insect, the Mexican Bean Beetle, (*Epilachna corrupta* Muls), has recently entered Ohio and promises seriously to damage garden beans. The native home of this insect is in Mexico, but it was discovered in 1920 to have become established in central Alabama. From there the pest has spread northward to Ohio, the beetle being carried with the wind during flight. It was found in Ohio in 1923 and seriously damaged beans in 12 southern Ohio counties during the summer of 1924. The insect is now spread well over the state and promises to be a serious and permanent pest of beans.

WHAT IT IS

While called "Mexican Bean Beetle," the insect has three other stages in its life history, all of which are easily recognized by the gardener. The following is a brief description of each of the four stages:

The Beetle.—The term, beetle, refers to the adult insect. It is the beetle stage in which the insect flies. It much resembles a large ladybug, to which family the beetle belongs. It is nearly hemispherical, about $\frac{1}{4}$ -inch long, copper colored and with eight black spots on each wing cover.

There are two generations each year in Ohio, a large early one from June to August and a smaller late one during the fall. The beetles pass the winter in rubbish in field or waste land and fly to the bean patches in late May and early June. From eggs deposited by these beetles during June and July, the larvae, or grubs, hatch to feed upon the crop. Some of these mature into beetles during August, and larvae of a second generation are present during the late summer and autumn. Many of these second generation larvae hatch too late to reach maturity and are killed by the first frost.

The Egg.—The egg is yellow, oblong, easily seen on the leaf, and is deposited by the female beetle in clusters of from 40 to 60 on the under sides of the bean leaves. During the course of its life one female will lay about 300 eggs (though 494 have been recorded for one beetle). They are deposited in several clusters and are found on the plant in greater or less numbers from June until November.

NOTE—The facts given in this bulletin are based largely upon data submitted to the author by the Ohio Agricultural Experiment Station and the Bureau of Entomology of the U. S. Department of Agriculture. Mr. A. E. Miller, of the Ohio Experiment Station, carried on observations and control experiments in Ross county during 1924. The work for the U. S. Bureau of Entomology in 1924 was done in Ohio by D. M. DeLong and S. F. Potts. Acknowledgment is due these men for making available the results of their experiments. Use has also been freely made of published data of the U. S. Department of Agriculture contained in Farmers' Bulletin No. 1407, based on experiments made in Alabama under the direction of N. F. Howard.

The Larva.—Small spine-covered yellow larvae, or grubs, hatch from the egg clusters and at first feed in a group on the under side of the leaf. As they develop in size, they scatter over the nearby plants, feeding always on the under side of the foliage. They are easily recognized by their yellow or orange color and their spiny covering or “fuzzy” appearance. A larva grows rapidly, the skin is shed three times during its period of growth. When about 1/3-inch long it is full grown and crawls to the under side of a lower leaf and changes to the pupa.

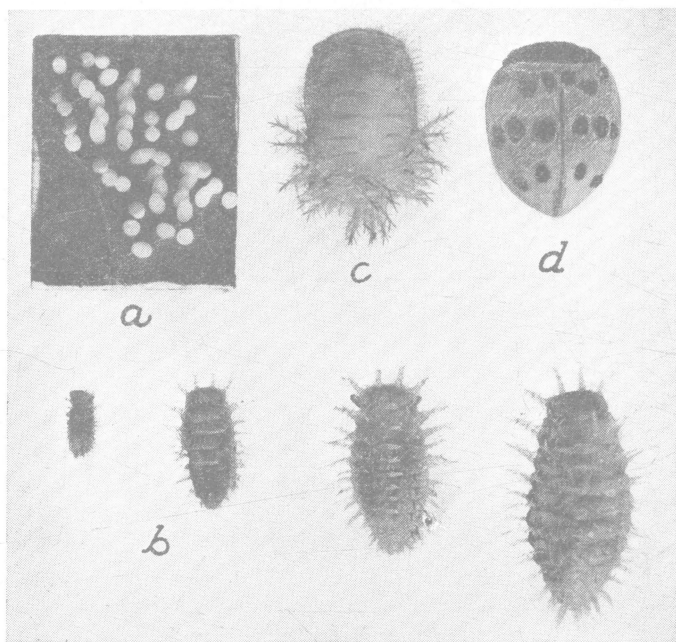


Fig. 1.—Stages in the life history of the Mexican bean beetle: (a) Eggs on leaf; (b) larvae during four stages of growth; (c) pupa; (d) adult or beetle. (*U. S. Dept. Agr.*)

The Pupa.—After fastening the rear of the body to a leaf, the grub contracts, sheds its skin again and becomes more nearly hemispherical. The color remains yellow or orange and the spines are present on the posterior part of the body. In this stage it cannot move about and is capable of but little body movement. Within this apparently lifeless object, the body segments, legs, wings and antennae of the beetle are being formed and from which it emerges in about 7 days with perfectly developed wings for flight and power of rapid multiplication.

WHAT IT DOES

The beetles and grubs feed mainly upon the under side of the bean leaves. The beetles eat off small areas, frequently cutting through to the upper surface and causing a transparent or lace-like appearance of the leaf. The grubs in feeding eat out short narrow parallel strips

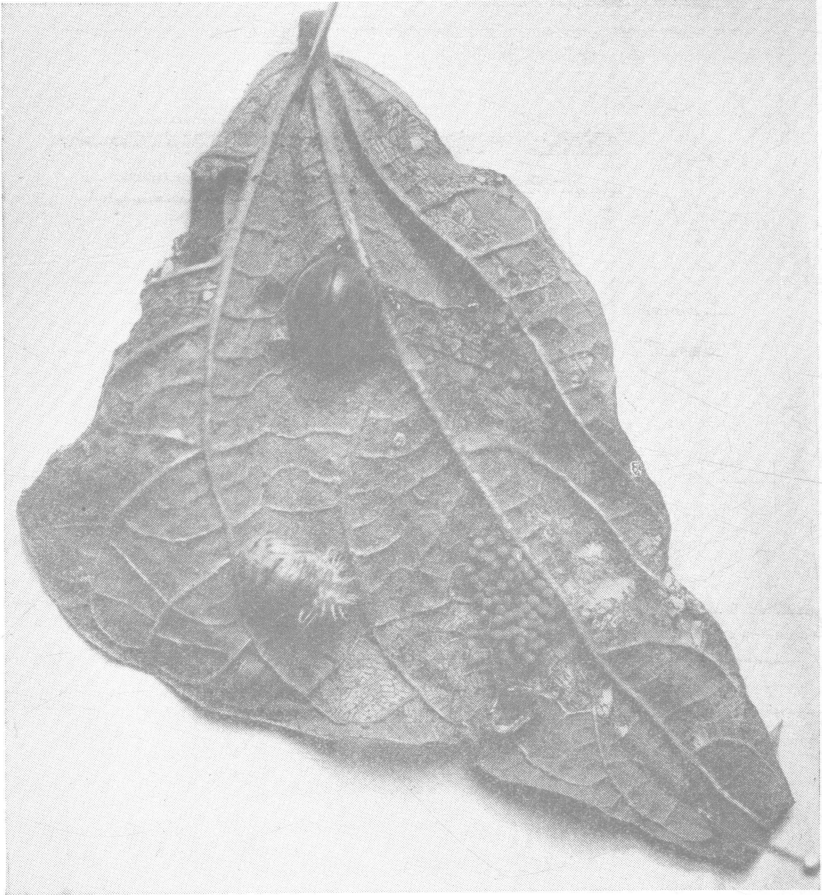


Fig. 2.—Bean leaf with feeding marks, eggs, pupa, and beetle

of leaf tissue leaving still narrower strips between the removed portion. This results in the removal of nearly all of the green coloring matter. Deprived of this, the leaf is left white or grey but maintains for a time its position on the stem. Soon it turns brown or drops off. Such a condition is frequently brought about upon most of the plants in a field or garden, when the insect becomes very abundant. In the absence of foliage the beetles will attack the green pods or even

the stems. In some southern Ohio counties during the summer of 1924 fields were observed where large areas were planted for canning factories and a total loss of the crop occurred due to the bean beetle injury.

FOOD PLANTS

The insect prefers as food common garden beans of all varieties. These suffer seriously under its attack. Pole beans are attacked as



Fig. 3.—Field of beans in Pike County, Ohio, destroyed by the Mexican bean beetle in 1924.

readily as bush varieties. It is also able to survive on some other legumes. The author confined the beetles with soy beans and cowpeas and they fed on these leaves but much less voraciously than when confined with varieties of bush or pole beans. In the southern states, where the insect has been present several years, commercial damage has not occurred to soy beans or cowpeas. Until the insect has demonstrated its ability to cause commercial damage to soy beans as a field crop in the north, there need be little cause for alarm, or any reduction in soy bean acreage considered.

In fields of southern Ohio, where beans were badly damaged or destroyed by the insect, it fed to some extent on wild cucumber, spanish needle and common bindweed. It has not been determined if the insect could thrive on these plants in the absence of beans.

OUTLOOK FOR THE FUTURE

The Mexican Bean Beetle is already well distributed throughout Ohio and is apparently here to stay. Its presence will probably result in immediate heavy damage to growing beans in the southern half of Ohio and within a short time the entire state will probably experience damage. Several repetitions of total loss of the crop on the same farm have occurred in the southern states after the insect became well established. One year of such loss has occurred on some



Fig. 4. — Small bellows duster suitable for home garden use. (U. S. Dept. Agr.)



Fig. 5.—Knapsack bellows type of duster for truck garden and small field use. (U. S. Dept. Agr.)

farms in southern Ohio. There is little promise of natural control through parasitic insect enemies, for effective parasites have not yet been found.

It is probably safe to say that where the insect is well established beans can no longer be profitably raised in average years either on a commercial scale or for home use, without the application of an arsenical insecticide to protect the foliage. An effective control is now known and the grower can protect his crop successfully by the application of a properly mixed arsenical in the amount recommended.

HOW TO CONTROL IT

The secret of success in control lies in applying the correct arsenical as a *dust* or a *spray* to the *under side* of the bean foliage. It is absolutely necessary to apply the poison *from beneath*. The first

application should be made early in June, as soon as the beetles and eggs are found on the plants. The application should be repeated at intervals of 10 days or 2 weeks (10 days or less under heavy infestation) to keep the leaves coated and supply the poison to the new growth. Usually four applications of the insecticide will protect bush varieties until the crop of green beans is harvested. More applications will be necessary on longer maturing pole varieties. Thorough washing removes the arsenic and leaves the green pods suitable for table or canning use.

WHAT TO USE

Experiments with insecticides on bean foliage show that some of the commonly used arsenicals will damage the foliage. Arsenate of lead, which is the standard arsenical for fruit and garden crops in Ohio, is frequently injurious to the bean foliage when applied as a spray at sufficient strength to kill the bean beetle. Paris green cannot be used for the same reason. The experiments in Ohio and Alabama have shown that there are two arsenicals which can be applied in strengths that will kill the insect and not be injurious to the bean leaves. These are calcium arsenate and magnesium arsenate. Both are sold as a white powder and can be diluted and applied as a dust or in water as a spray. Calcium arsenate must be applied with hydrated lime in order to prevent burning of the foliage.

Magnesium arsenate has given slightly better results in the south, but as yet is not handled widely by the retail trade in Ohio. Calcium arsenate is now usually obtainable from local dealers. Both can be ordered in advance and do not deteriorate if kept dry. Only high grade arsenicals with a minimum amount of water soluble arsenic should be used.

The following are the correct proportions for mixing the arsenicals. They have been tested and found weak enough to cause no damage to the foliage and yet kill the insect. Stronger mixtures should not be used or serious foliage injury may result.

If you apply a dust, use—

Calcium arsenate..... .1 part (by weight)
 Hydrated lime.....9 parts (by weight)
 Rate of application, from 15 to 20 pounds per acre

or

Magnesium arsenate..... .1 part (by weight)
 Hydrated lime..... 5 parts (by weight)
 Rate of application, from 12 to 15 pounds per acre



Fig. 6.—Compressed air sprayer is suitable for spraying beans in the small garden. (*U. S. Dept. Agr.*)



Fig. 7.—Spraying beans in small field with wheelbarrow sprayer mounted on slide and drawn by horse. (*U. S. Dept. Agr.*)

Mix the two thoroughly in a tight container by rolling or shaking it vigorously for several minutes. Have some loose stones or a wire screen fixed in the mixer to serve as a breaker and to facilitate the mixing. In large quantities an old barrel churn, steel drum, or a keg serves as a good mixing container. Not more than the recommended amount should be applied per acre.

If you apply a spray, use—

	For large areas	For small areas
Calcium arsenate	1½ lbs.	¾ oz.
Hydrated lime	3 lbs.	1½ oz.
Water	100 gals.	3 gals.

or

Magnesium arsenate	2 lbs.	1 oz.
Water	100 gals.	3 gals.

One ounce of these materials is approximately three heaping teaspoons.

Mix the poison with a small amount of water and add to the spray tank while stirring or agitating. Apply at the rate of 100 gallons to the acre. The leaves should be uniformly moistened but not soaked.

For those who cannot secure the above arsenicals when needed, arsenate of lead has given satisfactory control during one year's tests in Ohio, when mixed with hydrated lime and applied as a dust. The formula used was

Arsenate of lead	1 part (by weight)
Hydrated lime	9 parts (by weight)

Apply at the rate of 18 pounds per acre.

This dust has caused some foliage injury in the southern states but not in proportion to the beetle injury that would occur on untreated beans. It is recommended with the understanding that some foliage injury may result, but its use is advisable where the safer arsenicals cannot be secured and the injury from the insect promises to be severe.

Arsenate of lead used as a spray has damaged the bean foliage in Ohio and is not recommended.

HOW TO APPLY THE ARSENICAL

Experiments to date indicate that dusting is the more practical method to use in bean fields where the crop is grown on a commercial scale. It can be done more rapidly, with less labor and usually with less expensive machinery than would be required for spraying. Fields

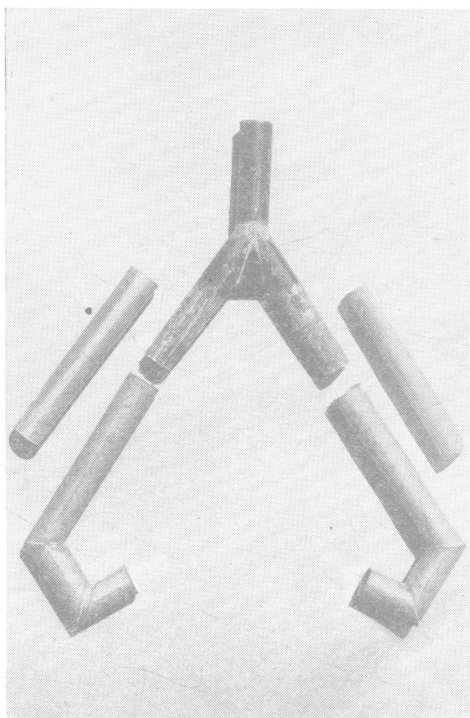


Fig. 8.—The arrangement of delivery tubes for dusting the lower surface of bean leaves. (*Ohio Exp. Sta.*)

However, it is not so popular with the grower as dusting and not as widely used as a control. For those who are equipped for spraying, this method is very effective and is highly recommended. The same care must be used to deliver the material to the under sides of the leaves. This requires spray rods or boom constructed with suitably placed $\frac{1}{4}$ -inch vertical pipes, elbows and angle nozzles to direct the spray upward against the under side of the foliage. For traction or power sprayer fitted with fixed booms, the rows must be of proper width and uniformly spaced.

For general use in the home garden, a good knapsack or bucket pump sprayer is serviceable (see fig. 9). This tool is needed for many other garden insects and diseases, and can be equipped with an extension rod fitted at the delivery end with an elbow and 45-degree angle nozzle (see fig. 10). Hand picking of the beetles and egg clusters is too laborious and inefficient when the insects become abundant.

up to 5 acres can be handled with a knapsack bellows or fan type of duster costing about \$25 (see fig. 5). Special attachments can be fitted to the end of the delivery spout to drive the dust upward against the lower surface of the leaves (see fig. 8).

For areas larger than 5 acres, a traction or power duster would be advisable.

Small home garden patches can be dusted with a hand duster of the small bellows or air-pump type (see fig. 4).

Dust should not be applied by shaking from a sack, as this will not give satisfactory results. The dust should be applied when there is little or no wind blowing.

In the tests made by the U. S. Bureau of Entomology in Alabama, spraying gave better control than dusting.

OTHER PRACTICAL AIDS IN CONTROL

In fighting the Mexican Bean Beetle, every effort should be made to grow a vigorous, quickly growing crop. Well tilled and well fertilized soil is essential. The quicker the crop can be brought to maturity, the fewer the insecticide applications necessary. For this reason pole beans, because of their slower growth, will require more insecticide applications than bush varieties. In Ohio, not much en-

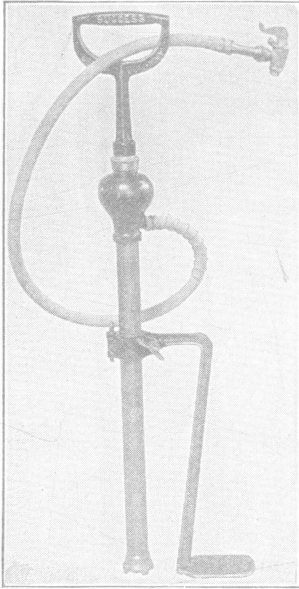


Fig. 9.—Common type of bucket sprayer suitable for small garden.

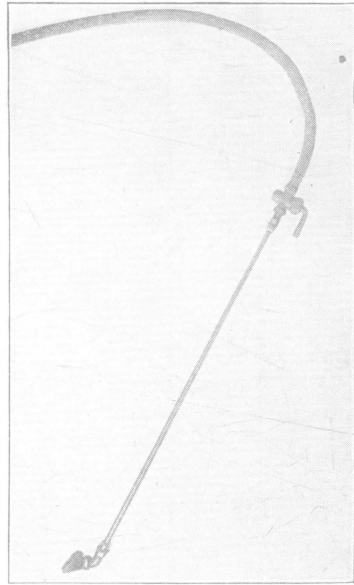


Fig. 10.—Extension rod fitted with cut-off and angle nozzle for spraying under side of leaves.

couragement can be given for planting the crop at any certain time to avoid the insect. Burning or plowing under of the infested plants immediately after the crop is removed is a valuable aid. It kills the pupae which are still attached to the injured plants and thus prevents the emergence of the following generation of beetles. Destroying these plants at this time, in September or October, reduces the number of beetles for hibernation and destroys their ideal wintering quarters.

When, in addition to following these practices, the grower is equipped with the proper tool to apply either the dust or spray to the under sides of the bean foliage, he need not greatly fear the ravages of the Mexican Bean Beetle. Until then, he is at its mercy, and will probably find the growing of beans troublesome and uncertain in the presence of the pest.