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Agricultural Experiment Station
University of Kentucky

THE MEXICAN BEAN BEETLE IN KENTUCKY

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БИБЛИОТЕКА
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The Mexican Bean Beetle in Kentucky

By H. GARMAN

The severe injuries of the Mexican bean beetle (*Epilachna corrupta*) in Kentucky during 1922 and 1923 make desirable an account of the pest as a means of warning our gardeners and truck growers as to this new danger to beans of all sorts grown in the state, and as a vehicle for putting into their possession such information as can be obtained with regard to means of controlling the pest. Its spread during the summer of 1923 was remarkably rapid in the eastern part of the state, the thinly settled mountain counties, contrary to what one would expect, showing a more rapid dispersal than the more thickly settled and closely tilled central counties. It is now scattered over two-thirds of eastern Kentucky, but in isolated spots in the more northern parts of the state. In the southern counties of this end of the state it has become common and generally distributed in some localities. No complaints have thus far reached us from the northern tier of counties, but the recent discovery of the insect in southeastern Ohio, at Gallipolis, in Gallia county, opposite Mason county, Kentucky; at Coalton, Jackson county; at Chilli-cothe, in Ross county; at Portsmouth, Scioto county, opposite Greenup county, Kentucky, shows that its presence may now be expected anywhere in eastern Kentucky on our side of the Ohio river.

While inspecting the nurseries of western Kentucky during July and August of last summer the insect was kept constantly in mind and inquiries were made everywhere in that region as to the presence of the Mexican bean beetle. It was not observed and was not known to gardeners of whom inquiries were made, and we learned of no case of injury from it in the region west of

Louisville. It is not unlikely, however, that the pest occurs there in isolated spots and that its injuries will be noted in 1924. Mr. R. A. Stevenson, of the Department, visited the region about Bowling Green late in the season but found no evidence of its presence there at that time.

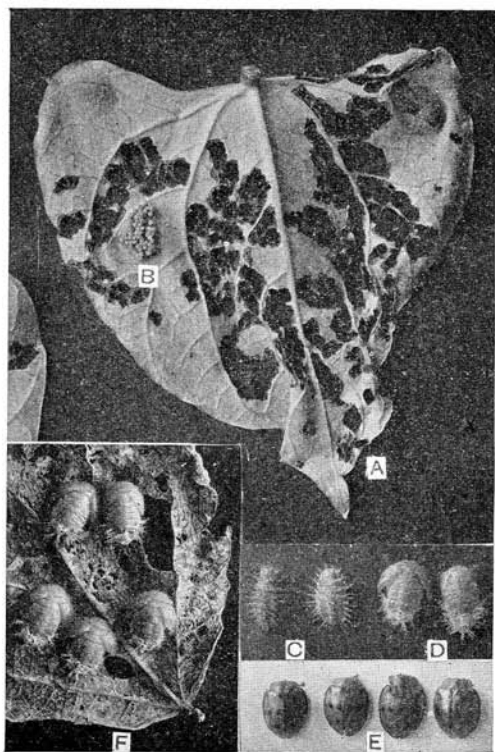


FIG. 1.—A, leaf injured by the Mexican bean beetle; B, a cluster of eggs; C, two larvae; D, two pupae; E, four adults; F, five pupae attached to a bit of leaf. Natural size.

As its name implies, the insect invaded this country from Mexico, appearing first in the southwestern states of Texas, New Mexico, Arizona and southern Utah, and continuing northward into Colorado, where it is now present thruout most of the state. It was observed in the latter state by C. V. Riley in the year

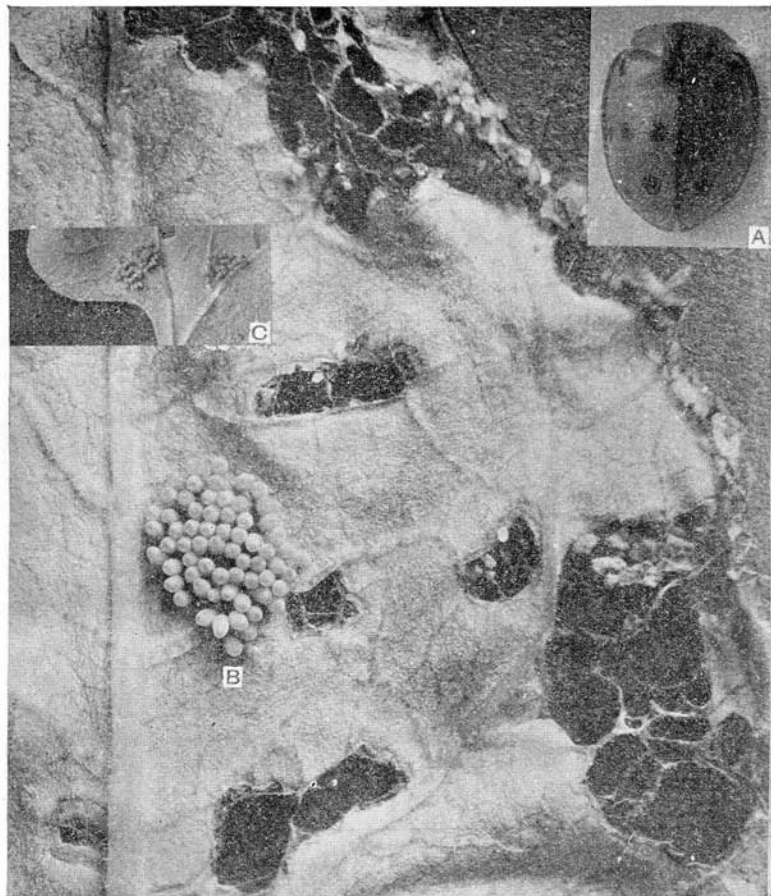


Fig. 2.—A, adult magnified 4 times; B, cluster of eggs magnified 4 times; C, two clusters of eggs, natural size.

1882, and thus appears to be permanently established there. This fact that it has continued its northward spread in the mountains of the west and becomes resident leaves us little hope that it will be suppressed by our cold winters and implies that we must be prepared to deal with the newcomer thruout Kentucky. Our own brief experience with the pest confirms this impression,

tho we have not had a very trying winter since the beetle appeared within our boundary.

In the east the beetle has been present since 1920, when it appeared in a small area of northern Alabama. In 1921 it had appeared in two southern counties (McCreary and Whitley) of Kentucky, after having spread thru most of the eastern third of

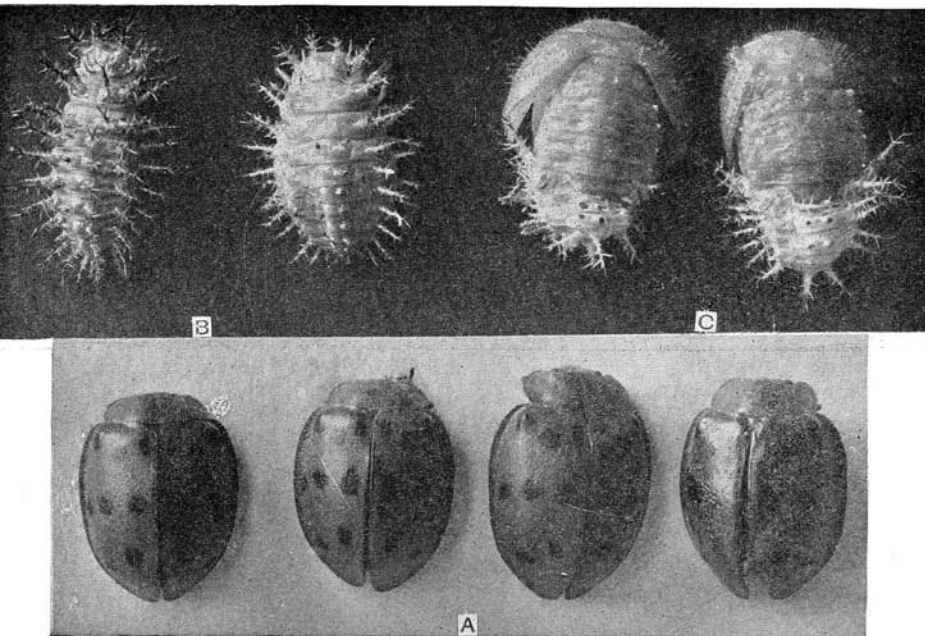


Fig. 3.—A, four beetles; B, 2 larvae; C, 2 pupae. Magnified 4 times.

Tennessee. It is now known to the writer to have appeared during 1923 in the following Kentucky counties:

Adair	Estill	Lee	Perry
Bell	Fayette	Leslie	Powell
Boyle	Harlan	Letcher	Pulaski
Breathitt	Hart	Lincoln	Rockcastle
Casey	Jackson	Madison	Rowan
Clay	Knox	Marshall	Russell
Cumberland	Laurel	Monroe	Taylor
Elliott	Lawrence	Owsley	Whitley

It was sent to the writer from Wayne county in 1922, but was not reported during the summer of 1923. In August, 1923, Mr. Neale F. Howard, of the Bureau of Entomology, observed it at Taylorsville, in Spencer county.

To these localities must be added the following counties in which the insect was observed in 1922 by men scouting for the Bureau of Entomology of the United States Department of Ag-

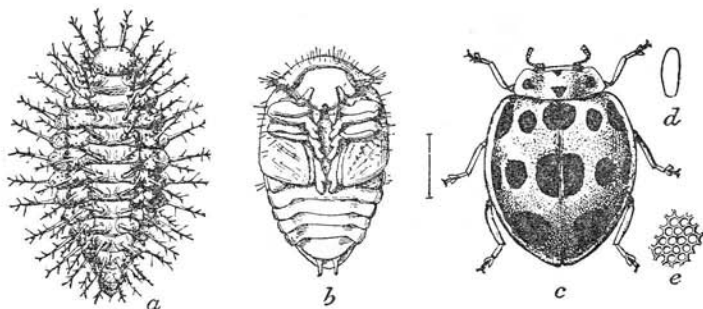


Fig. 5.—The squash lady beetle (*Epilachna borealis*). A, larva; B, pupa; C, adult; D, egg.

riculture, giving a total of 44 Kentucky counties in which the Mexican bean beetle has now appeared.

Allen
Anderson
Barren
Bullitt
Franklin

Metcalfe
Nelson
Simpson
Washington
Woodford

THE ADULT BEETLE

The adult insect is a lady beetle about a quarter of an inch (0.25 to 0.28 inch) long, a trifle less in breadth, the back arched, the head small and withdrawn between two forward-directed extensions of the thorax. Its legs are rather short and, while it runs about quickly, it depends for more extended traveling upon two long, membranous underwings kept concealed most of the time under the thick wing covers.

The general color above is pale brown, whitish when immature, in some individuals with a coppery reflection, the head

and thorax unmarked, the wing covers, with sixteen small, round black dots, arranged six in a zig-zag cross row in front, six in a rather straight series across the middle of the back, and a third series of four about midway between the median row and the hind margins. The wings are yellow, marked with black. The under parts of the body are brown, slightly darker centrally.

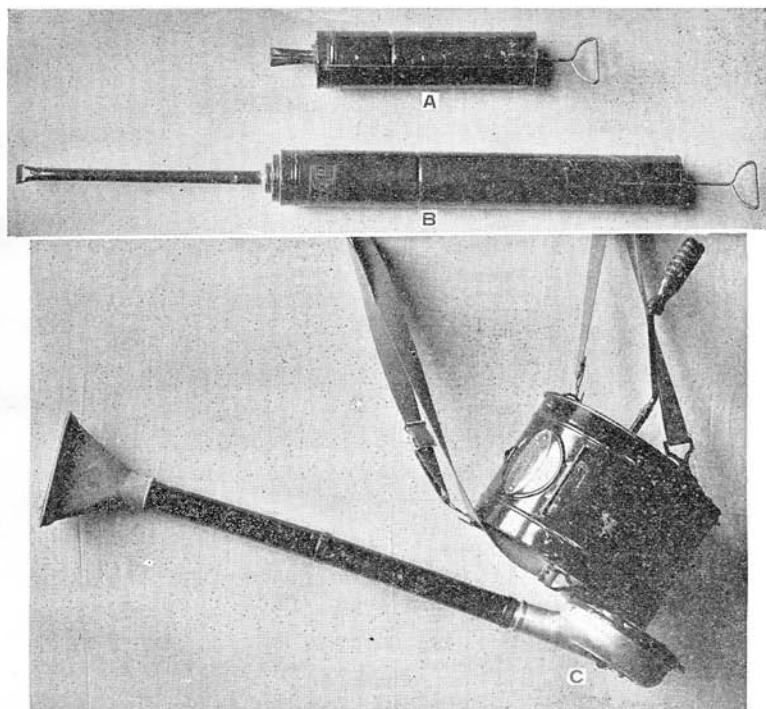


Fig. 6.—Showing different types of hand dusters. A, small duster suitable for city gardens; B, a duster of the same construction but of greater capacity; C, a duster suitable for field work.

There are a number of other spotted lady beetles resembling the Mexican insect in a general way, but none has the spots of this number and arranged exactly the same. Most of the others are beneficial from their habit of devouring plant lice and bark lice. We have one other plant-eating species, however, the native

squash lady beetle (*Epilachna borealis*). It was found in 1922 by Mr. Max Braithwaite, then connected with the Department of Entomology and Botany, doing a good deal of mischief to squashes in the Big Sandy Valley, and has at times been sent to the Station by correspondents with lots of the Mexican bean beetle, a fact implying that it may sometimes be found on beans, tho not known as an enemy of these plants. While some specimens of this squash-infesting insect are no larger than its Mexican relative, larger ones are often considerably more than a quarter of an inch (.33 inch) long, and there are fourteen spots on the back,

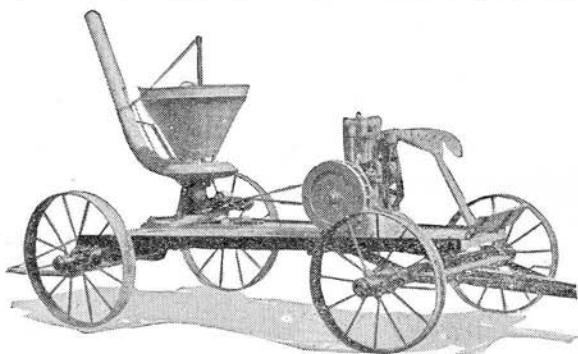


Fig. 7.—A self-mixing machine suitable for dusting beans and other low-growing crops. (By courtesy of the Bean Sprayer Company, Lansing, Michigan.)

those of the hindmost of the three cross rows being larger and only two in number. The thorax, also, is marked with black, with three dots and a large triangular spot, the latter on the hind margin.

A second beetle likely to be mistaken for the Mexican species, more because it injures beans than for any close resemblance, however, is a native species known to entomologists under the scientific name, *Cerotoma trifurcata*. It is not a lady beetle, but belongs to the same family as our common Colorado potato beetle, tho it is much smaller, being only about one-fifth inch long and slender bodied. It is marked on the back with six black spots, the four on the middle of the wing covers, squarish, and an irregular black longitudinal stripe on each wing cover

just within the outer margin. The head is black and the body beneath largely black, the antennae and legs marked with black. This little beetle gnaws holes in the leaves like those made by the adult bean beetle, but it has never proved common enough to cause great loss to gardeners.

LIFE-HISTORY AND EARLY STAGES

The adult beetles of the latest brood conceal themselves like other lady beetles among rubbish for the winter and come out of their hiding places only when spring is well advanced and

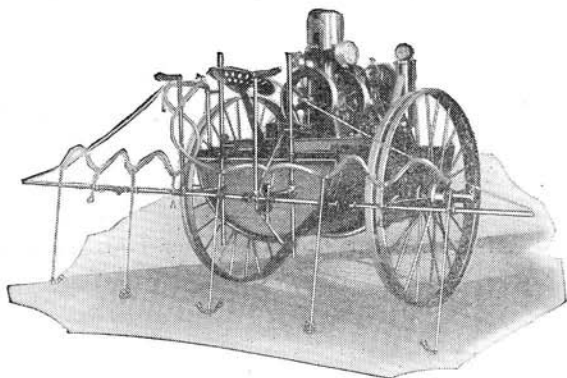


Fig. 8.—A power sprayer for use on low-growing crops. (By courtesy of the Bean Sprayer Company.)

food is to be had. Their time of resuming activity thus ranges with the forwardness of the season, but at this latitude they may be observed at work in gardens in early June, the injury increasing in seriousness toward the latter part of the month and continuing in early July. Later in the season it is not so often reported, but the insects continue active thru the summer and have been sent to the station by correspondents as late as October 3.

The Egg

The eggs are placed in clumps, consisting of a few or as many as fifty, are pale yellow, long-oval, smooth to the eye, and are attached by one end to the under sides of the leaves. The greatest diameter is near the middle, the ends appearing as if

cut off. Examples measure 0.057 inch in length and 0.025 inch in greatest diameter.

The Grub or Larva

A very characteristic little grub hatches from the egg in about six days. It is whitish or yellowish, with a well developed head and biting mouthparts and three pairs of jointed legs attached to the first three body segments, the whole body above bearing brown, branched spines. The color becomes a clear sulfur yellow as the insect grows, and the spines become yellow like the body except at the tips, where they are black. With their branches, the spines give the insect some resemblance to a small cocklebur. They are arranged in both cross and longitudinal rows, the first body segment bearing four and a curved row of minute erect spinules; the following nine segments bear six spines each; the eleventh bears but four spines and a lateral tubercle on each side, while the remaining two divisions bear none of the large spines. Beneath, the abdomen bears small groups of spinules but no spines.

When the grub gets its growth and is ready for the quiescent pupa stage it is about 0.40 inch long, and about 0.12 inch in width at the middle. By this time, if at all numerous on the leaves, it has skeletonized them pretty completely by eating away all of the green substance and leaving only the brown framework. Generally the grubs do not eat entirely thru the leaf, while the adult is more disposed to gnaw right thru, making holes not very different in character from those eaten out by the native beetle, *Cerotoma trifurcata*, already mentioned.

The Pupae

The change to pupae takes place on the leaves, and numerous pupae are often found secured to the under surfaces, each partly enclosed with the spiny skin of the larva, which has been shuffled off toward the rear end until only the hind third of the body is enclosed by it. The skin adheres to the leaf by some

means, probably a gluey substance produced from the region just behind the mouth.

The pupae measures about 0.30 in. in length and 0.22 inch in width across the bases of the wing cases, this being the widest part of the body. The color is yellow, the surface apparently smooth, but under a magnifier is seen to be clothed with minute erect setae, some brown, others brown-tipped. A noticeable series of these little spines follows the margin of the prothorax.

The pupae may be observed, a dozen or more attached to a leaf, about the first of July. Some have been secured June 25. Adult beetles come from them during the early part of July and continue to come forth for a couple of weeks. When fully mature the adults may place eggs for a second generation which becomes adult in late August and in September. Beetles of the second, and some of the first brood, find hiding places in October and November among rubbish and grasses, where they remain over winter. In the spring there are thus beetles of various ages that lay eggs and start the first brood of the season.

The egg stage lasts about a week. The larva or grub stage, during which most of the injury is done, may last about 15 days. The pupae stage lasts about a week. The whole life period from egg to adult thus covers about one month. Adults may live for eight months or more if they hibernate, but those maturing early in the season probably soon die after they have completed the placing of their eggs on the plants.

FOOD PLANTS OF THE MEXICAN BEAN BEETLE

While the insect is partial to garden beans, such as snap beans and pole beans, it will attack other members of the bean family, such as lima beans, and at times cowpeas and even soybeans, tho the writer has not observed any very serious harm done to the two latter. Some other leguminous plants, such as Florida beggar weed, alfalfa and even sweet clover, have been said to suffer injury on some occasions. A few non-leguminous plants have been observed to furnish the beetles a little food at times, but probably will never be in any serious danger from the insect, for it is known that many injurious species gnaw plants

other than those upon which they chiefly subsist without at any time endangering crops.

TREATMENT

The insect has proved a difficult one to combat because its larva feeds on the under sides of the leaves where insecticides cannot readily be applied, and partly because the beans are rather tender plants and very strong solutions and mixtures of poisons are likely to burn the foliage. At one time in the states south of Kentucky, where the beetle was first established, dusting the plants with a mixture consisting of one part by weight of arsenate of lime to eight parts of ordinary builders' hydrated lime was recommended. The mixture was not entirely satisfactory, and of late we have been suggesting a mixture consisting of 1 part of arsenate of lime, 1 part finely ground dusting sulfur and 4 parts of hydrated lime, first suggested by Dr. W. E. Hinds, Entomologist of the Alabama Station. The ingredients should be thoroly mixed, and the applications ought, for best results, to be made with a good duster. For small garden plantings about cities, a piston duster costing about \$1.50 may be used. The large plantings of truck growers and farmers require one of the dusters slung by straps to the shoulders of the operator. Several different types of these latter dusters have been produced, mainly to meet the demand of cotton growers in the south. The cost of those the writer has seen ranged from \$5.00 to \$20.00, the latter price being higher than most bean growers in Kentucky are willing to pay. The dusters serve, however, for the treatment of other crops, such as tobacco.

Applications ought to begin as soon as the insects are observed at work on the beans and should be made weekly in order to get the new growth.

Spraying with arsenate of lead (1½ pounds in 50 gallons of water) can be practised as it is for the tobacco worm. Carefully done, this treatment seems to the writer a better one than dusting. With suitable nozzles and by throwing the spray with some force the under sides of the leaves may be completely covered

with a mixture that when dry will stick longer than a dust and retain its effectiveness as long as it remains on the leaves. The arsenate of lead to be used with sprays is slower in killing than Paris green and arsenate of lime, but if applied early, when the young are recently hatched, will do the work as completely as a stronger preparation, and should do no harm to the plants. One application of this sort will on some kinds of plants remain, largely, thruout a summer season.

Whenever a crop has been rendered worthless by an attack it should not be allowed to stand, but ought to be disposed of, either by burning or by plowing under deep enough to kill the plants and thus deprive the insects of further forage.

In the fall, lurking places for the beetles should be removed. Loose rubbish on land or at the edges may be raked up and burned. Leaves and weeds about a field are safe wintering places for the insects and should be cleared away in the fall so that they will afford the beetles no shelter.

Rotation will help some, as it does for other insect pests, but the beetles are provided with large membranous wings, and probably fly long distances during mild fall weather.

The beetles have other means of dispersal, also. They may be carried about by freight or passenger cars and in automobiles or other vehicles.

THE POSSIBILITY OF QUARANTINE

With these different ways of becoming scattered there does not at present seem to be any possibility of controlling its spread by legislation. Insects that do not fly or do not fly readily, may be retarded in their dissemination by means of this sort, but in the present case there does not seem to be any reasonable expectation of getting help from this source.

SUMMARY

The Mexican bean beetle is a small, brown lady beetle when adult, with sixteen black dots in three rows across its back.

It hibernates among rubbish as an adult.

Its preference is for garden beans, but it will do some mis-

chief to other members of the family, and especially when it is exceptionally common and its preferred food plants have been destroyed.

Beans of all sorts should be watched closely in the early part of the season and sprays or dusts be applied when the first clusters of eggs are being placed on the leaves.

Refuse of infested crops should be destroyed when the eggs, larvae or pupae are still present on the leaves. All lurking places should be removed in the fall to keep the beetles from hibernating about premises.

Dusting with arsenate of lime, 1 lb., sulfur, 1 lb., and hydrated lime 4 lbs., is recommended as a means of checking the injuries.

During the season of 1924 the pest is likely to appear in many new localities in Kentucky. Correspondents observing it will confer a favor by reporting its presence in any locality not already noted by us as invaded in 1922 and 1923.

Figures 1, 2, 3 and 6 are from photographs made by Miss Carrie Lee Hathaway, of the Department.

