

Connecticut Agricultural Experiment Station  
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## Control of the Mexican Bean Beetle

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The Mexican bean beetle<sup>1</sup> first appeared in Connecticut in 1929, and in 1931 was present in all parts of the state. In the latter year



FIGURE 5.  
Adult, twice natural size.



FIGURE 6.  
Egg-mass, twice natural size.

it caused serious injury in southern Connecticut, and in 1932 it was found in large numbers throughout the state. This circular is issued to summarize the report contained in Bulletin 332 and to present some additional information obtained in 1932.

The adult insect (Figure 5) is a lady beetle about a quarter of an inch long and lemon yellow in color when newly emerged, with eight small black spots on each wing cover. As the beetles grow older the color deepens to a dark straw or buff, and over-wintering adults are dark copper-colored. The eggs (Figure 6) are yellow and are usually deposited on the under surface of the bean leaves in masses of 40 to 60 each. The young larvae are light yellow and are covered with numerous spines, which are dark at the tips. Newly-hatched larvae are about one-sixteenth of an inch long, and during their feeding period grow to a length of about one-third of

<sup>1</sup>*Epilachna corrupta* Mulsant.

an inch (Figure 7). The pupa (Figure 8) is of about the same size as the adult, and is usually yellow. The old larval skin remains attached to the posterior end of the pupal abdomen.

The over-wintering adults appeared in bean fields during the last week in May, 1932, in southern Connecticut, and emergence from hibernation was completed about June 16. First generation eggs were found from June 6 until early in July. First generation adults appeared July 18, and second generation eggs were deposited during the last week of July. The second generation larvae were found from August 6 until September. Second generation adults emerged during the latter half of September.



FIGURE 7.

Fully grown larva, twice natural size.



FIGURE 8.

Pupa, twice natural size.

The winter of 1931-32 was apparently very favorable to hibernation of this insect, and a very large population survived. String beans were again the preferred food plant, although lima beans were seriously injured in all parts of the state.

#### Cultural Practices

In Bulletin 332 attention was called to the effect of some cultural practices on bean beetle control. In 1932 some of these cultural practices were investigated and striking results obtained. The experiments have covered one season only and hence no complete report can be given at this time. However, certain facts deserve immediate attention.

#### Rate of Planting

Thin planting has been advocated in order to obtain early maturity and to simplify dusting and spraying operations. In our experiments in 1932 beans were spaced 2, 4, 6 and 8 inches apart in the row. These were planted May 23 and were heavily attacked by first generation larvae. All plots received similar treatment as to fertilization, cultivation, and spraying. The spray material applied was the recommended dilution of 3 pounds magnesium arsenate and 2 pounds casein-lime in 100 gallons of water.

Twice as many gallons were used in spraying the beans spaced

2 inches apart as in spraying those spaced 4, 6 and 8 inches apart. The two sprays were applied June 25 and July 11. None was necessary for over-wintering adults because very few appeared at any one time. The June 25 application was made when half the egg-masses had hatched. The July 11 application was made principally because the damage on beans planted 2 inches apart was very severe. The pods were forming at this time, and a large arsenical residue remained on them at picking time. The application was timed too late for the best results.

Bean beetle injury was more severe on the plants spaced 2 and 4 inches apart than on those spaced 6 and 8 inches apart. On Bountiful beans there were four times as many egg-masses per row on the 2 inch spacing as on the 4 inch spacing, and eight times as many on the 2 inch as on the 8 inch spacing. The 2 and 4 inch plots which were not sprayed were entirely defoliated by the time the last picking was made. The 6 and 8 inch unsprayed plots were only moderately damaged at this time.

The pods were picked July 18, 22 and 28. The results are given in Table I.

TABLE I. YIELD AFFECTED BY SPACING—BOUNTIFUL BEANS

Treatment	Spacing in inches	Number beans per plant	Number beans per pound	Total yield	Percentage of clean beans <sup>1</sup>
Sprayed	2	12	127	59 lbs. 4 oz.	63
	4	20	118	56 " 4 "	93
	6	27	108	54 " 4 "	95
	8	32	95	52 " 5 "	93
Unsprayed	2	8	135	40 " 7 "	18
	4	18	120	47 " 0 "	23
	6	25	109	51 " 2 "	75
	8	31	100	52 " 13 "	72

<sup>1</sup> Second picking only.

The highest total yield in the sprayed plots was obtained with 2 inch spacing. However, on this spacing the yield per plant and percentage of clean beans were least and the size of pods smallest. Figures 9 and 10 show the size and quality of the pods. The 4, 6 and 8 inch spacings were satisfactory particularly because of the large percentage of clean beans. In the unsprayed series the total yield, yield per plant and size of pods actually increased with increased spacing. This is true because of the heavier bean beetle injury to foliage on 2 and 4 inch spacings. It is also noticeable that the 6 and 8 inch *unsprayed* plots produced a larger percentage of clean beans than the 2 inch *sprayed* plot. This experiment was also made on Black Valentine beans with substantially the same results.

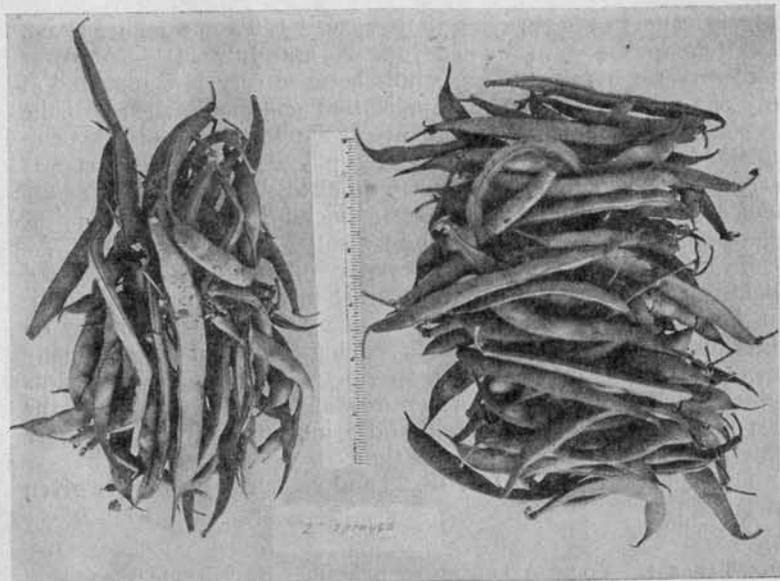


FIGURE 9. Sample of pods from sprayed plants 2 inches apart. Injured pods at left, clean pods at right.

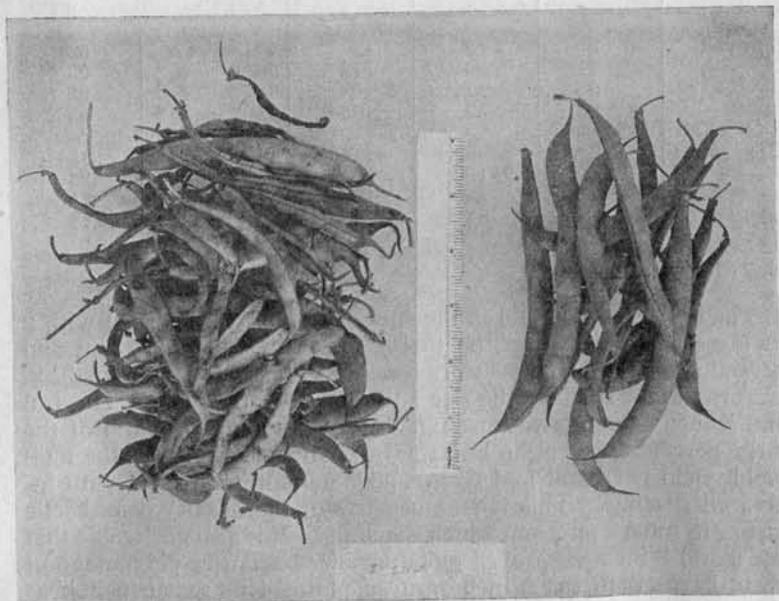


FIGURE 10. Sample of pods from unsprayed plants 2 inches apart. Injured pods at left, clean pods at right.

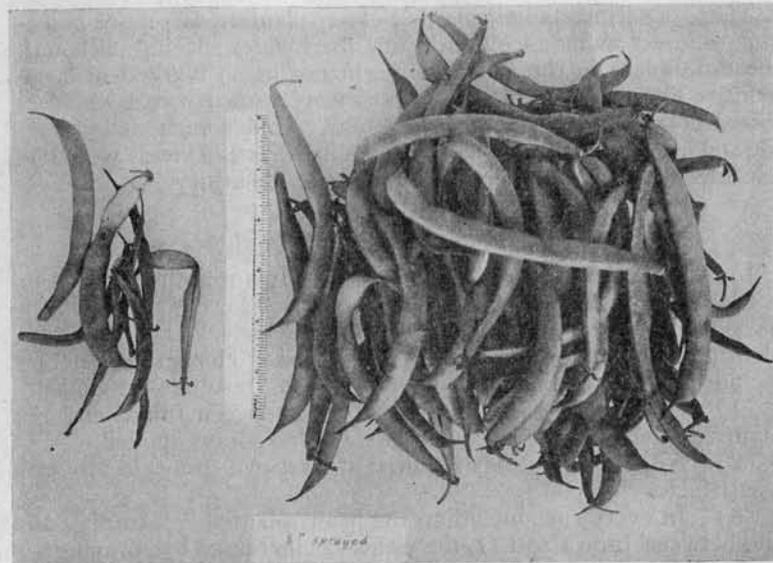


FIGURE 11. Sample of pods from sprayed plants 8 inches apart. Injured pods at left, clean pods at right.

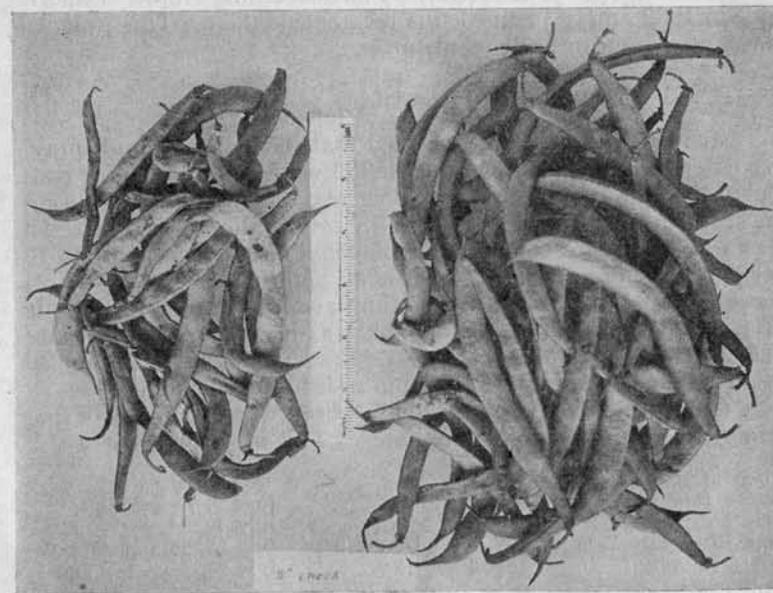


FIGURE 12. Sample of pods from unsprayed plants 8 inches apart. Injured pods at left, clean pods at right.

These experiments indicate that closer planting was more favorable to insect abundance and injury than wider spacing, although the differences in the spacings might not be so marked in large fields. The soil on which the beans were grown was a well-fertilized upland loam, neutral in reaction. Under more or less fertile soil conditions variations in results in regard to yields would be expected, but this should not affect bean beetle injury.

#### Dates of Planting

In order to determine relation of time of planting beans to bean beetle injury and need of spraying, plantings were made every 10 days from May 2 until July 21, 1932, inclusive. Half of each planting was sprayed and half left unsprayed. The data will not be included in this publication, but the following results were evident.

- (1) Beans planted before May 15 and between June 1 and 11, matured a fair crop of saleable beans with no sprays applied.
- (2) All other plantings required at least two sprays to produce a satisfactory crop.
- (3) In every case including the beans planted before May 15, and between June 1 and 11, the yield was increased by spraying.

#### Destruction of Infested Plants

Destruction of infested plants by plowing under or burning has been recommended to reduce injury on succeeding crops. Experience in 1932 amply justified this recommendation. This practice is essential in bean beetle control.

#### Insecticides

Tests made during 1932 indicated that the materials and spraying dates recommended in Bulletin 332 were satisfactory for control of the bean beetle. Several other materials were tested during the season and one of them was highly satisfactory. This material was a dust mixture composed of monohydrated copper sulfate 19 per cent, calcium arsenate 17 per cent, and lime 64 per cent.<sup>1</sup> It was superior in control to magnesium arsenate diluted at the rate of 1 pound to 5 pounds of lime, but was slightly more expensive than the magnesium arsenate dust. Insecticides must be applied to the under surface of the leaves in order to be effective.

A tentative insecticide schedule has been worked out for string beans according to the planting dates. This is as follows.

Date of planting	Spraying dates	Dusting dates
Before June 1	June 7 and 21	June 7, 14 and 21
June 1 to 15	July 1	July 1 and 8
June 15 to July 5	July 29 and Aug. 9	July 23, 29 and Aug. 9
July 5 to Aug. 1	Aug. 5 and 15	July 23, Aug. 1, 8 and 15

<sup>1</sup>Various modifications of this formula are on the market under copyrighted trade names. Any one of these products with an analysis approximating the one given should be satisfactory.

Lima and pole beans require applications about June 15 and 25, July 20 and 30, and August 9.

In this schedule the June 7 application is suggested to lessen injury from over-wintering adults. The June 21 and July 1 applications are made at the time first generation larvae are hatching and feeding. The July 29 and the August 5 and 15 applications are made to control second generation larvae.

#### Schedule Depends on Field Observations

Market gardeners should become familiar with all stages of the Mexican bean beetle, and base their spraying or dusting schedule on observations made in the fields. If the over-wintering adults appear in large numbers a spray or dust application should be made to protect the vines. When one-half of the egg-masses have hatched, treatments for larval control are necessary. The second generation continues over such a long period of time that two or three applications for larval control are necessary. At any time when large numbers of very small larvae appear it is best to spray or dust. It is not satisfactory to delay treatments until the larvae are large.

The adult beetles are very hardy and are not readily poisoned. When they were caged with sprayed foliage only 50 per cent died in 8 days and 80 per cent in 14 days. However, field tests showed that spraying caused a decrease in the number of egg-masses deposited. Three rows of plants sprayed on June 7 and examined June 21, showed 93 egg-masses present, and a similar unsprayed plot had 190 egg-masses present. This reduction in egg deposition is large enough to justify the application of the spray even if no adults are killed.

The arsenical materials should not be applied after the pods form unless the beans are to be washed before marketing. Analyses made during 1932 showed that spraying or dusting after the pods were 4 inches long always left an excessive residue on the pods at picking time. A thorough washing was necessary to remove this residue.

It has been noted that perfect foliage protection is not necessary for bean beetle control. In many cases vines with heavily injured foliage have produced a good crop of beans. This is due to the fact that the beetles were kept under control until the pods were formed.

The feeding marks which are at certain times common on pods from sprayed plants are usually made by adults rather than larvae. This form of injury is especially severe during emergence of the first generation beetles late in July and early in August. It is difficult to prevent this damage. Arsenical materials help to protect the pods, but of course leave an undesirable residue that must be removed by washing. Pyrethrum is the only non-poisonous

material that is practical for use at this time, and it is too expensive for use in truck gardens. Under present conditions it is advisable to rely on insecticidal treatments during early growth of the plants. These applications will keep the plants clean and lessen the need for control after the pods form.

Unsprayed plants may have a large amount of pod injury from larval feeding, but spraying or dusting before the pods form prevents this damage.

### Summary

Our experiments to date may be summarized as follows:

1. The bean beetle was more easily controlled on string beans planted 6 to 8 inches apart in the row.
2. Destruction of the infested plants as soon as the crop was harvested was helpful in controlling the beetle.
3. The following insecticides were satisfactory in preventing damage.

#### Spray

Magnesium arsenate .....	3 lbs.
Casein-lime .....	2 lbs.
Water .....	100 gals.

#### Dust

Monohydrated copper sulfate-calcium arsenate dust (copper-calcium arsenate), no dilution

or

Magnesium arsenate .....	1 lb.
Hydrated lime .....	5 lbs.

or

Barium fluosilicate .....	1 lb.
Hydrated lime .....	5 lbs.

4. Insecticides were effective only when applied to the under surface of the leaves.

5. On early plantings sprays were applied about June 7 and 21 and dusts about June 7, 14, and 21.

6. On mid-season plantings, sprays were applied about July 1 and 29 and dusts about July 1, 8, and 29.

7. On late beans sprays were applied about August 5 and 15 and dusts August 1, 8, and 15.

8. When the beans were sprayed or dusted after the pods formed, it was necessary to wash the pods twice in clean water before marketing.