

In the Laboratory

Bacterial Disease Effective

Against Several Insects

Richard D. Frye

To determine their approximate susceptibility to *Bacillus thuringiensis*, several species of insects have been exposed to the bacterium in the laboratory. Larvae of these species were given food material which had been immersed in a suspension of spores (75 billion spores per 100 ml. of water). Untreated checks for each species included the same number of larvae as the treatments. Treated food and insects were confined in closed containers.

All larvae used in each test were in the same stage of development. All tests were conducted at approximately 82° F. and 45 per cent relative humidity. The environment and equipment were kept as nearly sterile as possible.

Table 1 shows the species of insects and plant material used in the tests.

Results are presented in Table 2. Time to last observed death indicates the length of time from start of test to last observed death of treated lar-

vae, except in the case of American Elm Sawfly. In this instance, no mortality occurred after six days and the test was terminated.

Table 2. Results of susceptibility tests.

Common Name	No. Larvae treated	Time to last observed death (hrs.)	Per Cent Mortality*	
			Treated	Untreated
Sunflower Moth	40	72	92	7
Banded Sunflower Moth	40	72	80	15
Cotoneaster Webworm	10	96	90	0
Fall Webworm	25	60	80	20
Zebra Caterpillar	16	60	100	0
Painted Lady	30	96	90	0
Salt Marsh Caterpillar	30	72	90	0
Imported Currantworm	25	96	88	36
American Elm Sawfly	30	144	0	0
Poplar Leaf Beetle	30	72	83	57

*Rounded to nearest whole number.

Frye is assistant professor, Department of Entomology.

Table 1. Insects and plant materials used in susceptibility tests.

Common Name	Species	Order	Food From
Sunflower moth	<i>Homeosoma electellum</i>	Lepidoptera	Sunflower heads
Banded sunflower moth	<i>Phalonia hospes</i>	Lepidoptera	Sunflower heads
Cotoneaster webworm	<i>Cremona cotoneastri</i>	Lepidoptera	Cotoneaster foliage
Fall webworm	<i>Hyphantria cunea</i>	Lepidoptera	Chokecherry foliage
Zebra caterpillar	<i>Ceramica picta</i>	Lepidoptera	Cabbage foliage
Painted lady	<i>Vanessa cardui</i>	Lepidoptera	Sunflower foliage
Salt-marsh caterpillar	<i>Estigmene acrea</i>	Lepidoptera	Sunflower foliage
Imported currantworm	<i>Nematus ribesii</i>	Hymenoptera	Gooseberry foliage
American elm sawfly	<i>Cimbex americana</i>	Hymenoptera	Willow foliage
Poplar leaf beetle	<i>Lina scripta</i>	Coleoptera	Poplar foliage

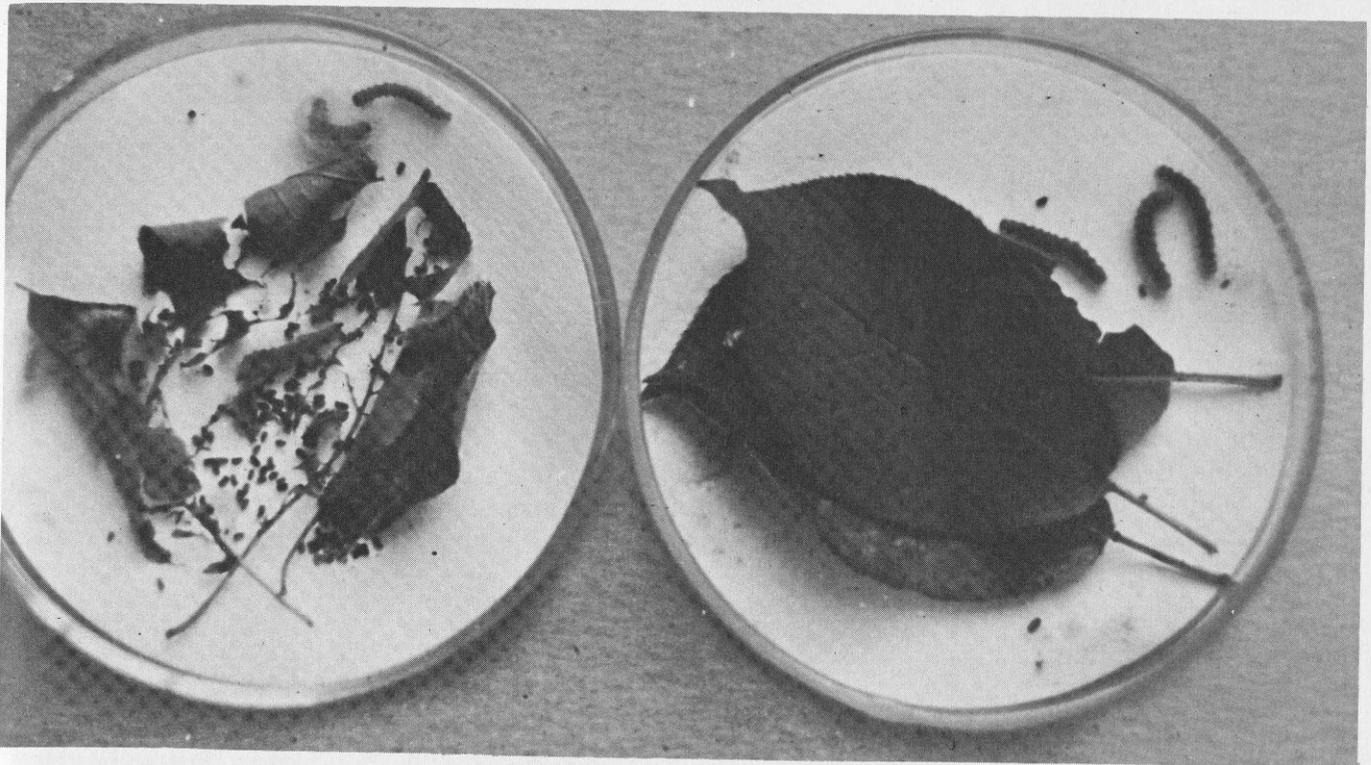


Figure 1. Untreated *Hyphantria cunea*.

Figure 1 is the untreated check. Figure 2 shows the results of bacterial treatment of the fall webworm *H. cunea*. The difference in larval feeding on treated food and untreated food is evident. Very little feeding occurred on the treated food, and several dead larvae can be seen. In the check, several larvae continued development into pupation.

Effectiveness

The reaction of *H. cunea* to treatment was typical of cases where the bacterium was effective.

When evaluating the results shown in Table 2, per cent of mortality in both treated and untreated parts of the tests should be considered. On this basis, *B. thuringiensis* was effective against sunflower moth, banded sunflower moth, cotoneaster webworm, fall webworm, zebra caterpillar, painted lady, and salt-marsh caterpillar.

In the case of fall webworm the results fall somewhere between those Weiser and Veber and Vasiljevic, (as summarized by E. A. Steinhaus, Mimeographed Series No. 4, Insect Pathol., Univ. of California, Berkeley, 1957) whose results varied from a slight to a high degree of susceptibility. Hall found marked susceptibility with salt marsh caterpillar. This was confirmed by E. A. Steinhaus (J. Insect Pathol., 2, 225-229, 1960).

Figure 2. Treated *Hyphantria cunea*.

Not Affected

The test with American Elm Sawfly indicates that larvae of this species are not affected by the bacterium. Similar results were obtained in the field during 1965 when mature larvae were placed on the foliage of willow. The larvae and branches were enclosed in screen sleeve cages. Lindane gave excellent control.

From these tests, it would seem that *B. thuringiensis* is not effective against imported currant-worm or the poplar leaf beetle. Any effect was slight and was masked by considerable mortality in the checks.

No attempt was made to determine the degree of susceptibility. The results are only relative. The tests described were of a preliminary nature. They are of value in that they provide evidence that in several cases further investigation is warranted.

SUMMARY

Susceptibility of the larvae of several insects to the bacterium *Bacillus thuringiensis* varies from 0 to 100 per cent. The degree of susceptibility was not determined, but the tests indicate that the organism is not effective against imported currant-worm or the poplar leaf beetle. Preliminary tests show that further research into insect control through the use of *Bacillus thuringiensis* is warranted.