# AN EFFECT OF SUB-LETHAL DOSES OF CRYOLITE ON MEXICAN BEAN BEETLE LARVAE, EPILACHNA VARIVESTIS

GEORGE WENE
Cornell University
Ithaca, New York

Cryolite, sodium fluoaluminate, is one of the many insecticides used for the control of Mexican bean beetle larvae, ***Epilachna varivestris,*** and according to the review by Carter and Busberg (1939) it has been generally satisfactory. Being a stomach poison toxic action follows ingestion of the material by the insect. In laboratory tests described by Wene and Hansberry (1944) it was found that many bean beetle larvae did not eat a lethal quantity of cryolite in the 24-hour period allowed for feeding on treated foliage. These survivors showed a marked retardation in growth and development. A similar observation was recorded by Ellisor and Floyd (1939) who noted that some larvae of *Ascia rapae* having fed on cryolite may refuse to feed for several days and shrink considerably in size.

Cessation of feeding for varying periods after ingestion of sub-lethal doses of cryolite may retard development due to inadequate nutrition, something akin to starvation, or due to physiological effects within the insect. A comparison of the effects from starvation and sub-lethal doses of cryolite on instar development of the Mexican bean beetle was the object of the studies reported in this note.

Micronized natural cryolite containing 90% sodium fluoaluminate was the test material. It was applied as a spray to bean leaves in the manner described by Wene and Hansberry (1944), the deposit being calculated as 0.0313 mg. per square centimeter of leaf surface. While under observation test insects were placed in finger bowl type cages at a temperature of 80° F.

Bean beetle larvae were reared en masse in the greenhouse. Third and fourth instars were selected for testing shortly after ecdysis, divided into the necessary number of lots and given the prescribed treatments as indicated in the table. Following the periods of starvation or exposure to cryolite treated foliage, the larvae were allowed to feed on untreated leaves. The untreated foliage was changed daily in order to insure palatibility. At 24-hour periods mortality and instar growth was recorded. Only those individuals succeeding in developing to the next instar were included in the data.

The data in Table I shows that third instar larvae which have fed continuously on untreated foliage had a mean instar length of 2.6 days. One day of starvation increased the third instar length to 3.4 days whereas the third instar length of the larvae feeding for 24 hours on cryolite treated foliage was 4.8 days. The larvae consumed very little of the cryolite treated leaf indicating that the cryolite may act as a repellant. Larvae after being starved for 24 hours ate a large amount of leaf area. Those larvae which had fed on the cryolite treated leaf did very little feeding in the following 24 hours when placed on untreated bean leaf. This decrease in feeding along with the increase in instar length indicates that sub-lethal doses affects the insects metabolism in some other manner than starvation does. Two days of starvation increased the instar length to 4.3 days. The average third instar length of larvae feeding for 2 days on cryolite before being placed on untreated foliage was 5.8 days.

The effect of sub-lethal doses of cryolite was tried on fourth instar larvae. As shown by the Table, feeding cryolite for one and three day periods lengthened the instar period more than equal periods of starvation did.

Five third instar larvae consumed approximately 80 per cent of the area of a single leaf in a 24-hour period. About the same amount was consumed in the second day of feeding. Five third instar larvae after one day of starvation consumed about 80 per cent of the area of two leaves in a 24-hour period. Five larvae ate less than two per cent of the leaf area of a cryolite treated leaf in a 24-hour period. These five larvae ate about the same amount of untreated foliage in the next 24-hour period. This brings up a point overlooked many times in field control experiments in that the potential injury of the surviving larvae is reduced and that cryolite may be more effective than the mortality records indicate.

TABLE I

THE EFFECTS OF STARVATION AND SUB-LETHAL DOSES OF CRYOLITE ON THE GROWTH OF MEXICAN BEAN BEETLE LARVAE

| Treatment* | Third Instar | | | Fourth Instar | | |
|---|---|---|---|---|---|---|
| | Number Larvae | Per Cent Survival | Mean No. Days of Instar | Number Larvae | Per Cent Survival | Mean No. Days of Instar |
| Fed continuously | 55 | 100.0 | 2.6 | 35 | 97.1 | 5.3 |
| 1 day of starvation | 55 | 100.0 | 3.4 | 34 | 94.1 | 6.5 |
| 1 day of cryolite treated leaves | 93 | 47.3 | 4.8 | 55 | 61.4 | 8.1 |
| 2 days of starvation | 47 | 76.8 | 4.3 | ........ | ........ | ........ |
| 2 days of cryolite treated leaves | 93 | 44.1 | 5.8 | ........ | ........ | ........ |
| 3 days of starvation | ........ | ........ | ........ | 34 | 79.1 | 9.3 |
| 3 days of cryolite treated leaves | ........ | ........ | ........ | 65 | 24.7 | 10.3 |

*After treatment larvae were fed on untreated foliage.

## LITERATURE CITED

**Ellisor, L. O.,** and **E. H. Floyd.** 1939. Further investigations on the control of the velvetbean caterpillar, *Anticarsia gemmenatilis* (Hbm.). Jour. Econ. Ent. **32**: 863–7.

**Carter, R. H.,** and **R. L. Busbey.** 1939. The use of flourine compounds as insecticides, a review with annotated bibliography. U. S. Dept. Agr., Bur. Ent. and Plant Quarantine Mimeograph E-466.

**Wene, George,** and **Roy Hansberry.** 1944. Toxicity of cryolite to Mexican bean beetle larvae. Jour. Econ. Ent. **37**: 656–9.