

Reduction in Excretion in *Achaea janata* Larvae due to *Bacillus thuringiensis* and Calcium arsenate Treatments

K.L. SRIVASTAVA

Division of Entomology

Indian Agricultural Research Institute

New Delhi - 110 012

Bacillus thuringiensis has been reported to cause mortality in the castor semilooper, *Achaea janata* Linn. larvae (Govindrajan *et al.*, 1976 and Srivastava, 1983). In ten day old larvae of *A. janata*, Srivastava and Chatteraj (1986) observed inhibition of feeding initially, when released on castor leaves treated with *B. thuringiensis*. Ignoffo *et al.* (1964) reported reduction in number of faecal pellets in *B. thuringiensis* treated larvae of cotton leaf worm, *Alabama argillacea* (Hubner). Morris (1963) reported quantitative reduction of faeces in some forest pests treated with *B. thuringiensis*. The present study deals with the effect of *B. thuringiensis* products viz., E-61, Bactospeine and Dipel on the

amount of frass excreted by the larvae of *A. janata*. Since the action of *B. thuringiensis* was similar to that of stomach poison (Cookery, 1971), a comparison has been made with calcium arsenate.

A. janata larvae were reared according to methods described by Srivastava and Chatteraj (1986). Ten day old larvae were used in the experiment. *B. thuringiensis* products (IU) tested were (a) E- 61, (1000 International units/mg of product, *Anagasta kuhniella*) Pasteur. Institute, Paris, France (b) Bactospeine (2000 IU/mg *A.k.*) Voltas (India) Ltd., Bombay, India and (c) Dipel (16000 IU/mg *T. ni*) Abbot's Laboratories, New Delhi, India. Calcium arsenate was obtained

Table 1. Effect of calcium arsenate and *B. thuringiensis* on the quantum of faeces excreted by the larvae of *A. janata*

Time (h)	Weight (mg) / larva					Mean
	Calcium arsenate	<i>Bacillus thuringiensis</i>			Control	
		E 61	Bactospeine	Dipel		
0 - 4	27.88 (5.32)	15.82 (3.98)	13.05 (3.66)	12.37 (3.57)	31.76 (5.66)	20.17 (4.43)
4 -20	1.83 (1.52)	1.80 (1.51)	1.62 (2.14)	1.99 (2.18)	97.65 (9.88)	20.97 (3.44)
20 - 24	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	35.48 (5.97)	7.09 (1.75)
24 - 44	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	132.13 (11.46)	26.42 (2.85)
Mean	7.42 (2.06)	4.40 (1.72)	3.66 (1.80)	3.59 (1.78)	74.25 (8.24)	

Figures in parentheses are transformed values $\sqrt{X + 0.5}$

C.D. (P = 0.01)

Treatment	0.52
Period	0.47
Interaction	0.39

from Chemical de universe, New Delhi. The dilutions were prepared and administered as per the method outlined by Srivastava (1983). A total number of 30 larvae in three replications were used in each experiment. Faeces were collected on clean butter paper and weighed immediately after collection. Wet faeces was weighed on monopan balance at intervals of 4, 20, 24 and 44 h. The data were subjected to analysis of variance.

The data indicated that the quantity of faecal pellets excreted by insects exposed to the treatments were significantly less than in untreated control (Table 1). At 4 h, there was no significant difference between the *B. thuringiensis* treatments but they recorded lower levels than in calcium arsenate. However, there was no significant difference between *B. thuringiensis* and calcium arsenate at 20, 24, and 44 h post treatment. Morris (1963, 1972) reported that the faecal matter collected from *B. thuringiensis* -treated larvae of some forest pests were lesser than in control. Ignoffo *et al.* (1964), using the number of faecal pellets as one of the criteria to determine the extent of larval feeding, reported that the larvae of *A. argillacea* exposed to untreated leaves produced at least ten times and in some cases thirty times the number of pellets per larva as compared to those treated with *B. thuringiensis*. In the present study, during the 4 h period, the larvae produced 15.82, 13.05, 12.37 mg of faecal matter in E-61, Bactospeine and Dipel respectively and 31.76 mg in untreated control. The overall mean defaecation upto 44 h, were 4.40, 3.66 and 3.59 mg respectively, in E-61, Bactospeine and Dipel but it was 74.25 mg in untreated control. This showed that there was poor feeding by *A. janata* larvae in *B. thuringiensis* treatments. This reduction in faecal pellets, according to Morris (1963) was due to the fact that the larvae in treatments fed rather poorly. Srivastava (1988) recorded that the ten day old larvae of *A. janata* fed 1.00, 1.06 and 0.88 cm^2 of leaf area in E-61, Bactospeine and Dipel respectively in 4 h whereas it fed 5.15 cm^2 area in untreated control. After 4h., there was no feeding in different treatments but larvae in control fed nor-

mally. Thus, it may be surmised that in *A. janata*, the poor defecation in *B. thuringiensis* was due to poor feeding by the larvae. According to Heimpel and Angus (1963), *B. thuringiensis* toxins damaged the epithelial cells of midgut of *Bombyx mori* resulting in aperistalsis and inhibition of feeding.

KEY WORDS : *Achaea janata*, *Bacillus thuringiensis*, calcium arsenate, excretion

REFERENCES

- Cooksey, K.E. 1971. The Protein crystal toxin of *Bacillus thuringiensis* : Biochemistry and Mode of Action. In ; " Microbial control of Insects and Mites " (H.D.Burges and N.W.Hussey, eds.), pp. 861, Academic Press, New York.
- GOVINDRAJAN, R., JAYARAJ, S. and NARAYANAN, K. 1976. Studies on the effect of *Bacillus thuringiensis* Berliner on the castor semilooper, *Achaea janata*. *Z. Angew. Ent.*, **80**, 191-200.
- HEIMPEL, A.M. and ANGUS, T.A. 1963. Diseases caused by certain sporeforming bacteria. In *Insect Pathology - an advanced treatise* "vol. II. (E.A. Steinhaus ed). Academic Press Inc." New York, pp. 21-73.
- IGNOFFO, C.M., McGARR, R.L. and MARTIN, D.F. 1964. Control of *Alabama argillacea* (Hubner) with *Bacillus thuringiensis* Berliner. *J. Insect Pathol.*, **6**, 411-416.
- MORRIS, O.N. 1963. Pathogenicity of three commercial preparations of *Bacillus thuringiensis* Berliner for some forest insects. *J. Insect Pathol.*, **5**, 361-367.
- MORRIS, O.N. 1972. Susceptibility of some forest insects to mixtures of commercial *Bacillus thuringiensis* and chemical insecticide and sensitivity of the pathogen to the insecticide. *Can. Ent.*, **104**, 1419-1425.
- SRIVASTAVA, K.L. 1983. Comparative toxicological studies on the effects of bacterial insecticide and calcium arsenate on castor semilooper, *Achaea janata* Linn. D.Phil Thesis, University of Allahabad, Allahabad, India.
- SRIVASTAVA, K.L. 1988. Consumption of leaves by *Achaea janata* in *Bacillus thuringiensis* and calcium arsenate treatments. *J. Environ. Biol.*, **9**, 387-393.
- SRIVASTAVA, K.L. and CHATTORAJ, A.N. 1986. Effect of *Bacillus thuringiensis* and calcium arsenate on the initiation of feeding by the larvae of *Achaea janata* Linn. *J. Ent. Res.*, **10**, 99-102.