Trichoplusia ni (Urs *et al.*, 1965), rice pests (Rao, 1975; Srivastava and Nair, 1978; Nayak and Srivastava, 1979; Israel and Padmanabhan, 1980), banana leaf beetle (Roy and Pujari, 1979) and sugarcane shoot borer *Chilo infuscatellus* Snell. (Easwaramoorthy and Santhalakshmi, 1988) from India. This communication is the first report of *N. rileyi* on *A. graellsii* and *B. bassiana* on *M. subfaciatus* from India.

ACKNOWLEDGEMENTS

The authors are grateful to Mr. D.L. Shetty and Mr. N. Subbaiah for technical help, to the Director, Indian Institute of Horticultural Research, Bangalore for providing laboratory facilities and to Dr. R.A. Humber, Boyce Thompson Institute, Ithaca, New York, U.S.A. for confirming the identity of the fungal pathogens.

KEY WORDS : *Acontia graellsii, Nomuraea rileyi, Myllocerus subfaciatus, Beauveria bassiana.*

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J. Biol. Control, 2(1),59—61, 1988

Effect of Leaching on the movement of Nuclear polyhedrosis virus of *Heliothis armigera* in soil.

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Studies on some insect polyhedral inclusion viruses have shown that inclusion viruses may persist for long periods in the soil (Jaques, 1964; David and Gardiner, 1976). Polyhedral occlusion bodies (POB) appear to be adsorbed quite firmly onto soil particles (Hukuhara and Namura,1971; Hukuhara and Wada,1972; Narayanan *et al.*, 1987). Leaching is one of the several factors which influence the persistence of an insect virus in soil. The present study reports the effect of leaching on the persistence of nuclear polyhedrosis virus (NPV) of *Heliothis armigera* in a column of black soil in the laboratory, using polyhedra prelabelled with an isotope ^{32}p.

The isotope was obtained from Bhaba Atomic Research Centre (BARC), Trombay, Bombay. A suitable technique of incorporating the labelled ^{32}p into the larval semisynthetic diet (Narayanan, 1979) was developed as follows. "Carrier-free" ^{32}p as orthophosphoric acid having a specific activity of15-20 μci, was applied @ 0.02 ml per diet disc of

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5 mm thick and 10 mm in dia and one late fourth instar larva was allowed for feeding. After 12 h of feeding, the larvae were removed and washed several times with 0.1 M phosphate buffer to remove any external contamination on the body surface of the caterpillars. The larvae were then fed with fresh semisynthetic diet which was surface contaminated with 1.1×10^5 POB/cup of diet. The larvae were reared in the plastic cup until they developed the typical symptoms of the disease.

The polyhedra were extracted from the diseased larvae and purified by differential centrifugation. Any external contamination of ^{32}P was removed from the surface of the polyhedra by washing them several times with 0.1% phosphate buffer. The polyhedra were then suspended in known quantity of distilled water and 0.1 ml of the suspension dried in a planchette was assayed for radio activity with I1031 detector by counting for 10 seconds.

Soil column

The soil column was made up of one hundred plastic plates ($3 \times 70 \times 70$ mm) with a central round hole having an internal diameter of 35 mm. The plates were held vertically one over the other by means of wing-bolt screws in the iron thread stand (Fig. 1). Small amount of vaseline was smeared over the linear surface of each plastic plate to make it leak-proof.

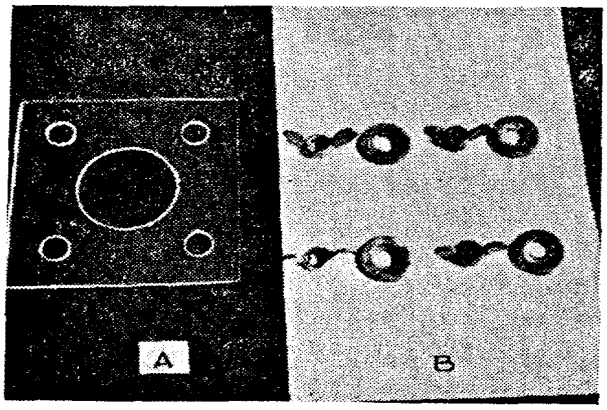

Fig. 1 A. Plastic plate of 3 mm thickness used in the column
B. Wing bolt screws

The column consisted of 500 g of black soil, ground gently in a mortar with a wooden pestle and passed through a 2 mm sieve. This substrate formed a column in the cylinder 250 mm high with a pad of glass wool. This ensured a good drainage from the column. Two millilitre of virus suspension containing 5×10^9 prelabelled polyhedra with a mean specific activity of 3.34 μci was applied to the top column of the substrate and allowed the virus to dry thoroughly for 12 h. A pad of glass wool was placed at the top of the column after virus application to dispense water passing through the column to prevent a direct impact of water on the soil. Water was dispensed continuously on to the top of the column from a 100 ml volumetric flask kept inverted over the column and secured

Fig. 2 Soil column assembly used for virus leaching study

well to a wooden stand (Fig. 2). The column was held in a vertical position and kept under an enamel tray at room temperature. After 18 days, the water from the column was drained for about 1 h. From the top of the column, soil samples were removed at measured depths of 6 mm, dried and the presence or absence of radio activity was detected by a G.M. counter from 1 g of dried soil samples in

planchette with I 1031 detector by counting for 100 seconds. The results were expressed as mean percentage activity at different depths.

When the virus suspension containing 5×10^9 prelabelled polyhedra was applied to the top of the soil column, a considerable part of the polyhedra was retained on the surface of the column at 0.6 cm depth and formed a whitish layer mostly on the top surface of the soil column recording as much as 59.35 per cent radio activity and decreased as the distance from the top increased (Fig. 3). At levels below 10.2 cm, there was no activity at all, thereby showing that the polyhedra were not leached beyond 10.2 cm but were

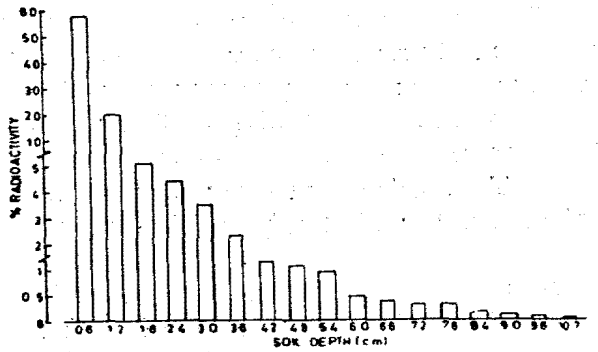

Fig. 3 Effect of leaching on the movement of polyhedra of NPV of *H. armigera* in soil.

retained in the top soil itself. There was no atcivity in the leacheate when sampled at different times. The present finding corroborates earlier observation made by Jagues (1969)in *Trichoplusia ni*NPV in sandy loamsoil. Retention of the virus on the surface soil has considerable practical significance. It has been shown that foliage of cabbage plants grown in the soil treated with the NPV of *T. ni* can be contaminated by soil being splashed onto leaves by rain and other means (Jagues, 1967).

The present study also shows that the virus cannot be removed by percolating water after a rain. It seems, therefore, that much of the virus will persist in the upper layer capable of contaminating the leaves of crop plants and reinfecting the larvae. Natural epizootics could begin in this way which however needs further investigstions. Death of virus-infected larvae in the pupal stage may leave virus deposits in deeper layers of soil which however may be brought to the surface by subsequent cultivation operations.

ACKNOWLEDGEMENT

The Senior author is grateful to Dr. T.L. Subramaniam for helping in Radio isotope work and also to C.S.I.R. for financial assistance.

KEY WORDS: *Heliothis armigera* NPV, leaching soil.

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