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Record of Nuclear Polyhedrosis Virus of Cabbage Diamondback Moth, *Plutella xylostella* (Linnaeus)[1]

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The occurrence of granulosis virus in *Plutella xylostella* was first recorded in Japan (Asayama and Osaki, 1970). Though, Nagarkatti and Jayanth (1982) collected two diseased larvae infected with nuclear polyhedrosis virus from Bangalore, no further work was on record regarding this virus in the country. In March, 1987, diseased larvae of diamond back moth were found in a cabbage field at Sriramapura village near Bangalore and on examination, the infected individuals revealed the presence of nuclear polyhedral inclusion bodies (PIB) and further detailed investigations were undertaken.

The laboratory culture of *P. xylostella* was maintained on potted cabbage plants in sterilized glass cages. The NPV isolated from the diseased larvae of *P. xylostella*, collected from the cabbage field was used to study the nature of the disease.

Smears of naturally diseased larvae were examined in the laboratory for the presence of polyhedra under a magnification of 10 x 40 X. Pathogenicity tests were conducted in the second instar larvae fed with the polyhedra extracted from naturally diseased caterpillars in the laboratory. In order to confirm the group to which the virus isolated from *P. xylostella* belonged, the staining technique for polyhedrosis virus as described by Bergold (1963) and Poinar and Thomas (1978) was used. The purified PIB were sent to Indian Agricultural Research Institute, New Delhi for identification.

Naturally diseased, larvae of *P. xylostella* collected from fields were individually triturated with a little quantity of sterile distilled water in a mortar and pestle. The contents were filtered through a double layered muslin cloth and cotton swab to remove the tissue debris. The PIB were purified by differential centrifugation and stored in a glass stoppered conical flask. These stock suspensions were further diluted (1:10) and counts were made using a standard haemocytometer (Neubaur improved double ruling, Germany).

Highly purified PIBs were studied using a Transmission Electron Microscope to know the morphology and size and the electron micrographs were taken at various magnifications and the size of PIBs were calculated (Weakly, 1981).

A batch of 25 *P. xylostella* larvae were selected in each instar and starved for six hours. The starved larvae were artificially infected by feeding leaves contaminated with a high concentration (1.7×10^9 PIBs/ml) of virus suspension mixed with 0.1 per cent Teepol. The symptoms were compared with those observed in naturally infected larvae. Symptoms were also observed in pupae and adults infected through larval infection.

In the present investigation, the larvae of *P. xylostella* showed the characteristic signs and symptoms of NPV. Microscopic examination of tissue smears of these larvae revealed the presence of polyhedral bodies. Pathogenicity tests were positive. Artificially infected larvae turned pale yellowish-green before death and were very much similar to those of naturally infected larvae. The polyhedra stained purple with Giemsa stain confirming that the virus isolated from *P. xylostella* belonged to the group of nuclear polyhedrosis virus. This virus has also been classified under subgroup 'A' of the genus *Baculovirus* (David, 1975). The virus sent for identification got confirmed as NPV.

In the present study, the estimated number of PIB in the naturally infected fourth instar larvae ranged from 0.290×10^9 to 2.810×10^9 with an average of $1.754 \times 10^9 \pm 0.065 \times 10^9$. Bakwad and Pawar (1981) obtained on an average $2.106 \times 10^9 \pm 0.093 \times 10^9$ PIB/larva with a minimum and maximum of 0.775×10^9 and 3.729×10^9 respectively in *A. sabulifera*.

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The electron micrographs revealed that the majority of the polyhedra were tetragonal and a few were hexagonal in shape. The size ranged from 0.67 to 1.16 µm with an average of 0.89± 0.025µm and 76 per cent of the PIB were in the range of 0.71 to 1.00 µm. Such variations has been reported in other insect viruses also (Bergold, 1963). Devanesan and Jacob (1980) reported variations in shape and size of the PIB of NPV of *Parapoynx stagnalis (Nymphula depunctalis)* (Gn.).

In the present study, infected first instar larvae were sluggish with retarded growth, stopped feeding and the ventral side of the larvae become slightly pinkish-white in colour a few hours before death. Similar observations were made by Devanesan and Jacob (1980) with NPV of *P. stagnalis* wherein the larvae became lethargic with less response to tactile stimuli and developed symptoms of anorexia and turned pale three days after the ingestion of the virus. The second instar larvae were sluggish and ceased to feed just a day before death in the present study.

Most of the symptoms of NPV infection in third and fourth instar larvae of *P. xylostella* resembled those described for granulosis virus (GV) of *P. xylostella* (Asayama and Osaki, 1970). In the present study, slight bending in the anterior abdominal segments was the prominent symptom observed in most of the matured larvae, which was not observed by earlier workers in many of the lepidopterous larvae infected with NPV. Though, most of the larvae were found dead at the bottom of the container, some showed a characteristic death posture of hanging head downwards. However, this characteristic hanging down posture of the dead larvae was seldom noticed under the field conditions.

Some of the infected fourth instar larvae pupated; of which some perished and others gave rise to malformed adults. These results are in close agreement with those of Legacion and Gabriel (1978) in *Spodoptera litura* (F.), who observed that some infected individuals surviving the larval stage gave rise to teratological forms i.e., larval - pupal intermediates or adults with malformed wings.

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KEY WORDS : *Plutella xylostella*, NPV, Electron microscopy, symptomatology

REFERENCES

ASAYAMA, T. and OSAKI, N. 1970. A granulosis virus of the diamondback moth *Plutella xylostella*. *J. Invertebr. Pathol.*, 15, 284-286.

BAKWAD, D.G. and PAWAR, V.M. 1981. A new record of nuclear polyhedrosis virus (NPV) of jute semilooper, *Anomis sabulifera* (Guenee). *Indian J. Entomol.*, 43, 39-43.

BERGOLD, G.H. 1963. The nature of nuclear polyhedrosis viruses. In : *Insect Pathology - An Advanced Treatise* (E.A. Steinhaus, ed.). Academic Press, New York, vol. 1, pp. 413-456.

DAVID, W.A.L. 1975. The status of virus pathogenic for insects and mites. *Ann. Rev. Entomol.*, 20, 97-118.

DEVANESAN, S. and JACOB, A. 1980. Studies on a nuclear polyhedrosis of rice caseworm - *Nymphula depunctalis* Guen. (Pyraustidae : Lepidoptera). *Entomon*, 5, 277-284.

LEGACION, D.M. and GABRIEL, B.P. 1978. Dosage mortality study on the NPV of the common cutworm, *Spodoptera litura* (Fabricius) (Lepidoptera : Noctuidae). *Philippine Entomologist*, 3, 109-116.

NAGARKATTI, S. and JAYANTH, K.P. 1982. Population dynamics of major insect pests of cabbage and of their natural enemies in Bangalore district (India). *Proceedings of International Conference of Plant Protection in Tropics*. Malaysian Plant Protection Society, Kaula Lumpur, Malaysia, pp. 325-347.

POINAR, G.O. and THOMAS, G.M. 1978. *Diagnostic manual for identification of insect pathogens*. Plenum Press, New York and London. pp. 84-85.

Weakley, B.S. 1981. *Beginner's Handbook in Biological Transmission Electron Microscopy*. Chruchill Livingstone, London, pp. 251.