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HISTOPATHOLOGY OF NUCLEAR POLYHEDROSIS WITH SIMULTANEOUS PARASITIZATION IN *CHRYSODEIXIS CHALCYTES* (ESP.) WITH *LITOMASTIX* SP.

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A nuclear polyhedrosis virus (NPV) from *Chrysodeixis* (= *Plusia*) *chalcytes* (Esp.) has been reported earlier[1]. The encyrtid *Litomastix* sp. is an important parasite of *C. chalcytes* which is well established in New Zealand subsequent to its introduction from Australia[2]. This is a polyembryonic species and up to 1000 parasites may emerge from a single larva of *C. chalcytes*[3]. During microscopic examination of smears of NPV-infected larvae of *C. chalcytes*, it was found that several of them were found to carry the larvae of the parasitoid, *Litomastix* sp. This communication deals with the histopathology of nuclear polyhedrosis with simultaneous parasitization of *C. chalcytes* with *Litomastix* sp.

Fourth instar larvae of *C. chalcytes* collected from the weed *Flaveria australasica* (H.L.) were inoculated with the NPV by allowing them to feed on the leaves of *F. australasica* that had been previously dipped in the NPV suspension containing 10^7 polyhedral occlusion bodies (POB)/ml and dried in shade. Four days after infection when the larvae began to show signs of infection, they were killed in hot (60°C) alcoholic Bouin's fixative and bits of larvae fixed for 24 hr in cold alcoholic Bouin's fixative. Simultaneous microscopic examination of smears showed that several larvae had both the virus infection as well as the larvae of the parasitoid *Litomastix* sp. Larvae from control group without virus inoculation were also fixed on the fourth day. The fixed larval bits were washed in 70% alcohol repeatedly for several days until the yellow colour of the picric acid was removed, dehydrated in ethanol-butanol series and embedded in paraffin. Sections cut at 5μ were stained by the modified azan staining technique[4]. Photographs were taken with a Meopta (Czechoslovakia) microscope.

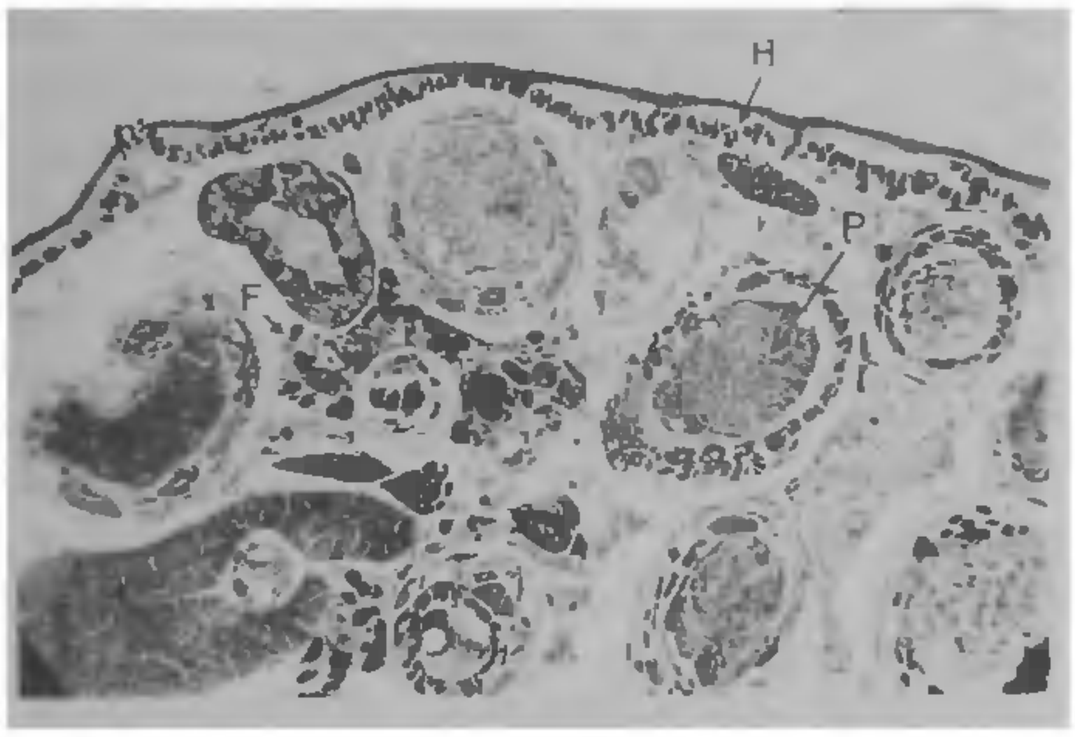

Figure 1. Cross-section of NPV infected larva of *Chrysodeixis chalcytes* showing the larvae of the parasitoid *Litomastix* sp. in the haemocoel. Note the polyhedra in the fat body (F) and hypodermis (H) of host as well as in the gut of the parasitoid (P). Line = 250 mμ.

In the cross-section of certain larvae of *C. chalcytes*, both NPV infection and the parasitoid *Litomastix* were seen (figure 1). POB could be seen in nuclei of hypodermis, fat bodies and trachea of *C. chalcytes*. Because of the parasitization with *Litomastix* sp. the fat body had completely been depleted. The gut of the parasitoids was full of POB. This indicated that the parasitoids had probably devoured the host tissues like the fat bodies after the virus development was completed in the nuclei of the cells. It is therefore evident that the parasitoids had been developing in the host unaffected by the virus infection. Compared with the parasitoids from uninfected larvae, there seemed to be no apparent difference in the anatomy of the parasitoids.

The development of the embryonic and larval stages of the internal gregarious parasite *Glyptapanteles* (= *Apanteles*) *militaris* (Walsh) was not affected by the fat body-infecting typical strain of NPV in the larvae of the armyworm *Pseudaletia unipuncta* (Haw)[5]. Development was however adversely affected by the hypertrophy strain of the NPV. A haemolymph factor from the armyworm infected with the hypertrophy strain of NPV was found to be toxic to *Apanteles militaris* (Walsh)[6]. In the case of the parasites of *Lymantria dispar* (L.), the parasite development was affected only if the larvae died of the virus before the parasite development was completed[7].

In the present studies, normal emergence of *Litomastix* sp. was observed in certain NPV-inoculated larvae suggesting that the NPV infection had not affected the parasite development. These find-

ings suggest that the release of parasites and application of NPV can be done in a compatible manner in the management of the pest. However, further field experiments should be carried out to confirm this.

Joint action of entomopathogenic viruses and parasitic arthropods may be advantageous due to transmission of pathogens by parasites; e.g. *Malacosoma disstria* (Hb.) NPV was transmitted by *Sarcophaga aldrichii* (Paker)[8], *L. dispar* NPV by *Apantelcs melanoscelus* (Ratz)[9], and *Pieris rapae* (L.) granulosis virus by *Apanteles glomeratus* (L.)[10]. Incidence of NPV was positively correlated with the incidence of parasitoids in the population of *L. dispar* indicating mutually advantageous joint action[11].

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A NEW DISEASE ON PAPAYA FRUIT STALK

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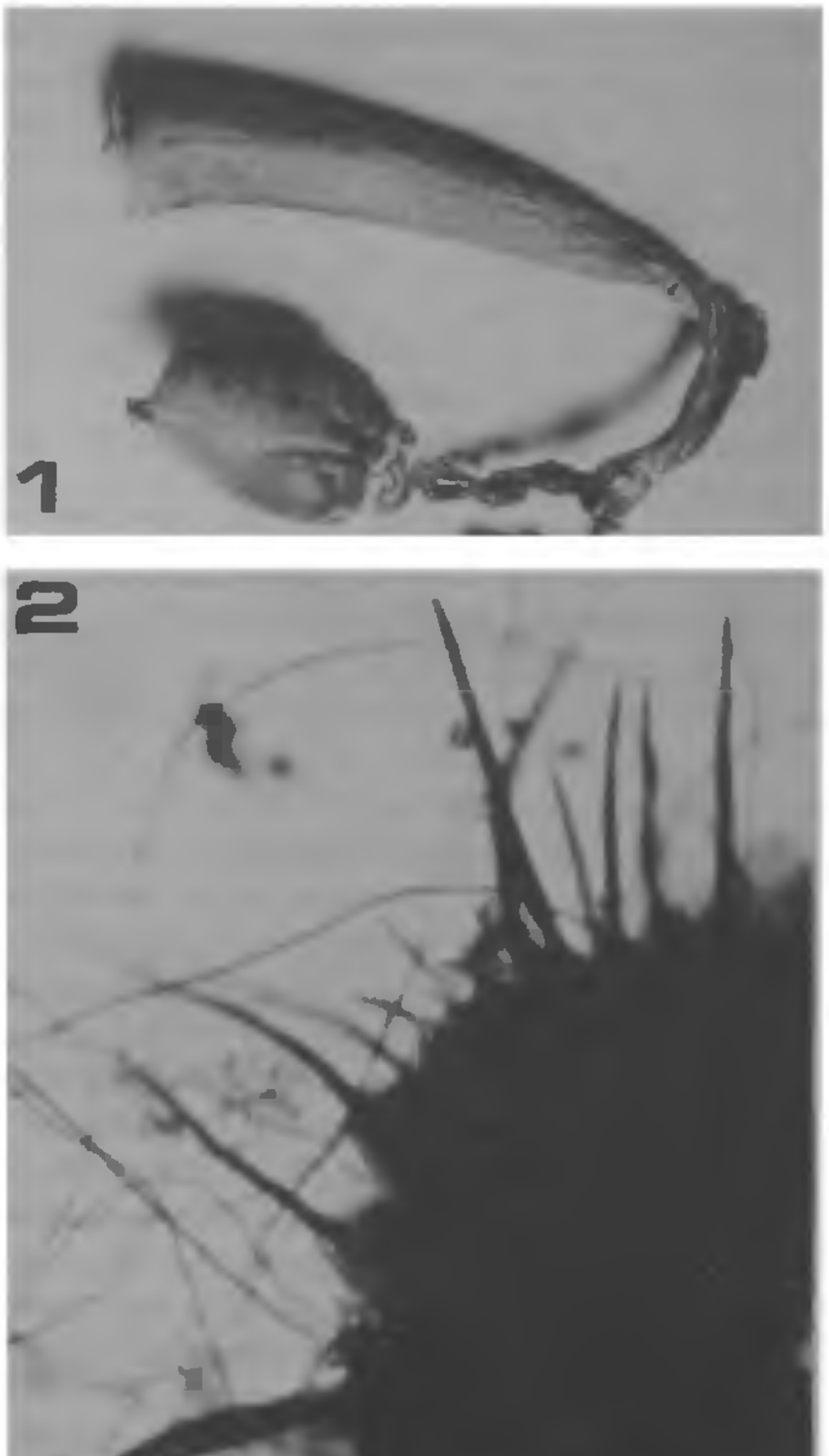
DURING March 1984, a severe disease incidence was observed on the stalk of the papaya (*Carica papaya* L.) fruit of Coorg Honey Dew variety at Burdwan, West Bengal. The infection was noticed on the proximal end of the stalk as blackish streaks which later spread backwards. The affected tissues shrivelled, dried and shreaded leading to dry-rot



Figures 1–3. 1. Infected fruit stalk of *Carica papaya* L. of Coorg Honey Dew variety showing the symptom; **2.** Acervulus of *Colletotrichum circinans* (Berk.) Vogl. showing the setae; **3.** Conidia of *Colletotrichum circinans* (Berk.) Vogl.

(figure 1). As the stalks were unable to hold the fruits at this condition, they were dropped on the