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OCCURRENCE OF TWO ENTOMOFUNGAL-PATHOGENS, *METARHIZIUM ANISOPLIAE* (METSCHNIKOFF) SOROKIN VAR. *MINOR* TULLOCH AND *NOMURAEA RILEYI* (FARLOW) SAMSON, ON *HELIOTHIS ARMIGERA* HUBNER (NOCTUIDAE: LEPIDOPTERA)

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HELIOTHIS ARMIGERA, commonly known as gram caterpillar, is an important polyphagous pest causing serious damage to food and fibre crops. During our field survey on tomato at this Institute, a fungal infected dead grown-up caterpillar of *H. armigera* was collected. The diseased caterpillar was slightly bent and found clinging on to the leaf. It was brought to the laboratory and kept on a moist filter paper in a petri dish for fungal growth and sporulation. Initially, the fungal growth was noticed on the intersegmental region of the body and later the entire body surface was covered with pure white mycelial growth. At the final phase of the growth, the diseased-caterpillar was characterized by dark green fungal spores ramifying the entire body

surface of the insect, as compared to healthy larvae which varied in colour depending upon their growth.

The fungus was isolated on sabouraud dextrose agar medium where it grew well at 25–28°C by producing vigorous growth of the pure white mycelium. Profuse sporulation was noticed on the fifth day after inoculation leaving a dark green coloration on the surface of the medium.

Pathogenicity test was conducted by spraying the aqueous spore suspension of the fungus (1.8×10^9 spores/ml) against all the five different instars of *H. armigera*. It is evident from the results (table 1) that the fungus was highly virulent inflicting 100% mortality to all the instars except in the case of fifth instar where the mortality was 80%, with an incubation period ranging from 2 to 5 days. The infected caterpillars were sluggish and ceased to feed on the third day after inoculation. The body became slightly bent, tough and mummified on the fifth day. Initial growth of the fungus was noticed on the seventh day and on the eighth day the whole body was covered with tuft of pure white mycelial growth with green spores covering the entire body of the caterpillar (figure 1). The fungus was reisolated from such infected caterpillars satisfying the well-known Koch's postulates.

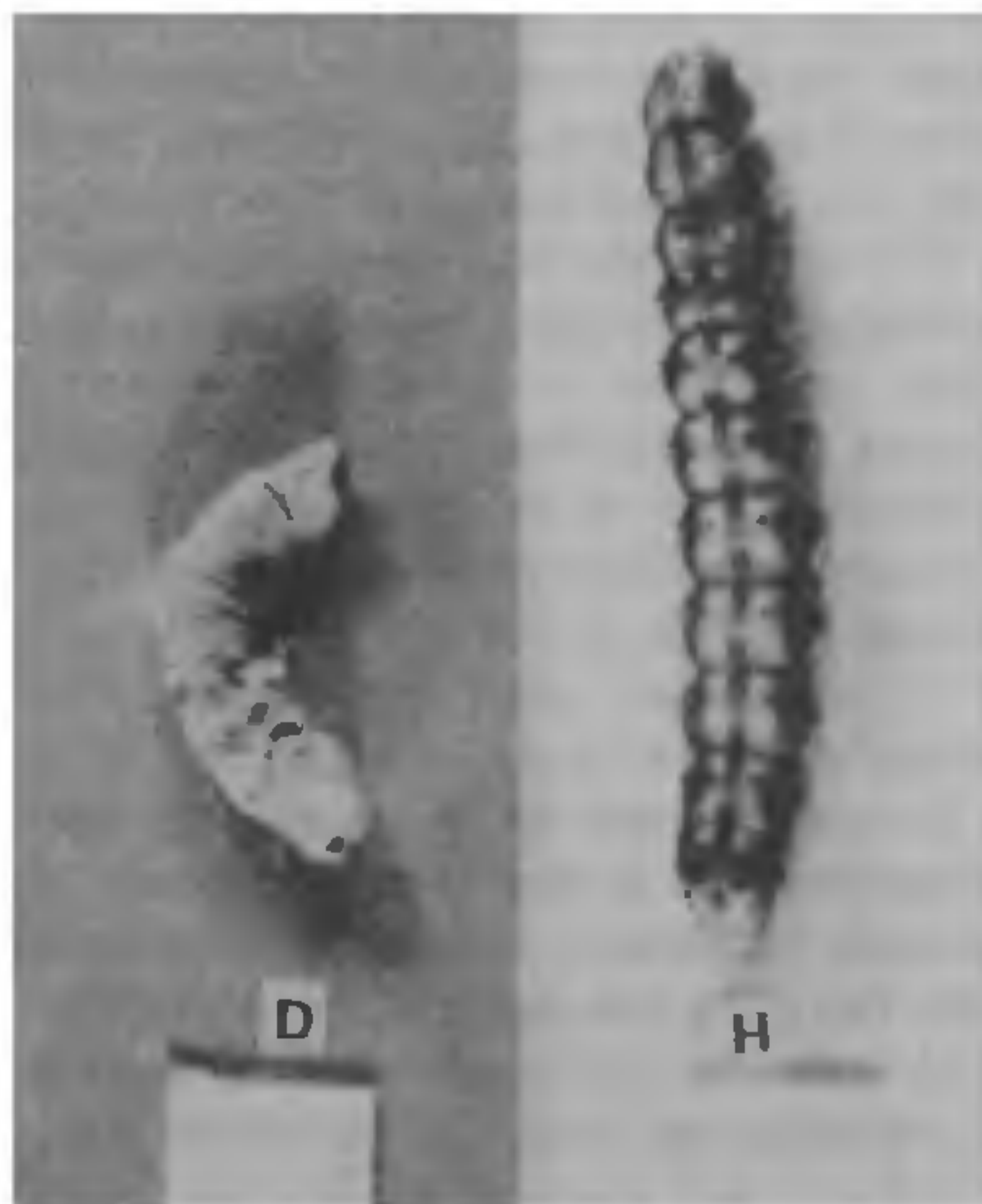


Table 1 Effect of *Metarhizium anisopliae* var. *minor* on *Heliothis armigera*

Instars	% Mortality			Incubation period (days)
	WOF	WF	Total	
I	85	15	100	2-7
II	25	75	100	4-6
III	35	65	100	4-9
IV	55	45	100	6-8
V	55	25	80	5-10

WOF-Without fungal growth; WF-With fungal growth.

Figure 1. Effect of *M. anisopliae* var. *minor* on *H. armigera* [H: Health; D: Diseased. Note the characteristic mummification of the larva].



Figure 2. Effect of *N. rileyi* on *H. armigera*. Note the different stages of infection.

Based on the external morphology and colour, the fungus was identified as *Metarhizium anisopliae*, and our preliminary identification was later confirmed by Dr Humber, Boyce Thompson Institute, as *M. anisopliae* var. *minor*.

Further, during our field survey a fungal infected dead caterpillar of *H. armigera* was collected from field-beans which showed the white fungal out growth ramifying the entire body of the insect. This fungus was isolated and identified as *Nomuraea rileyi* (Humber, personal communication). The fungus was mass multiplied on Sabouraud maltose agar enriched with 1% yeast according to Humber's suggestion. Pathogenicity of this fungus was proved by spraying the fungal spores on the body of the insect and allowing the caterpillar to crawl on the fungal mat grown on petri plates against third instar larvae of *H. armigera*. 100% mortality was achieved with an incubation period of 5–8 days.

The fungus on the initial stage of the development showed white mycelial fungal mat and later light green colour due to the development of spores (figures 2 and 3). When compared to dark green coloured spores of *M. anisopliae*, *N. rileyi* was comparatively lighter green in colour. Unlike that of elongated spores (5–8 μm) of *M. anisopliae*, spores of *N. rileyi* were small and ellipsoidal in shape measuring 3.0–4.5 μm .

Though *Heliothis* sp. was shown as one of the susceptible host in their host range study¹ with *M. anisopliae* var. *major*, isolated from an unidentified grub, this is the first report of the natural occurrence of *M. anisopliae* var. *minor* on *H. armigera* in India. *M. anisopliae* var. *major* infects *oryctes* grub and on



Figure 3. Effect of *N. rileyi* on *H. armigera*. Note the characteristic mummification and the fungal growth on the spiracles and in the intersegmental membrane.

the other hand *M. anisopliae* var. *minor* infects lepidopteran insect pests².

Although *N. rileyi* has been reported to occur on *H. armigera* in cotton from Africa³ and on *Spodoptera litura* in India⁴, this is the first report on the natural occurrence of *N. rileyi* on *H. armigera* in India. Further studies are in progress.

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