SUSCEPTIBILITY OF CABBAGE DIAMONDBACK MOTH *PLUTELLA XYLOSTELLA* L. TO THE ENTOMOFUNGAL PATHOGEN *VERTICILLIUM LECANII* (*ZIMMERM.*) VIEGAS

C. GOPALAKRISHNAN
Division of Entomology and Nematology, Biological Control—Insect Pathology, Indian Institute of Horticultural Research, Hessaraghatta, Bangalore 560 089, India

PLUTELLA XYLOSTELLA, commonly called diamondback moth of cabbage, is a serious pest on cruciferous crops like cabbage, cauliflower, knol-khol, radish, etc. The larval stage of the insect causes extensive damage to the leaf primordium especially in cabbage and cauliflower and thereby causes economic loss. A search for entomofungal pathogens of this pest did not yield any pathogen. Hence the susceptibility of the pest to the entomofungal pathogen *Verticillium lecanii* was tested. This pathogen is known to be non-specific, causing diseases in a number of insects of the orders Homoptera, Coleoptera and Lepidoptera. It is also known to infect the coffee green bug *Coccus viridis* (Green) in several countries[1].

The entomofungal pathogen *V. lecanii* isolated from the apple leaf folder *Archips pomivora* was isolated in pure culture on Sabouraud dextrose agar media. Based on the morphological characters of the conidiophore and the conidia the fungus was primarily identified as *V. lecanii* and later confirmed through CMI, London (Herb. IMI Number 327752).

The fungal spore suspension used was prepared from spores isolated from cultures derived originally from a diseased larva of *A. pomivora* collected on apple in Himachal Pradesh, India. The spores were inoculated onto sorghum grains previously soaked in water for 24 h and autoclaved at 15 psi for 30 min, as these grains were found to be suitable for culturing *C. lecanii*[2]. The fungus grew well on sorghum grains by producing clear white mycelial growth at 25 ± 2°C. Profuse sporulation was observed on the fourth day after inoculation. The spores were collected on the tenth day by using sterile distilled water with 0.01% Triton X-100. The spore suspension was filtered through two layers of muslin and the filtrate was centrifuged at 500 rpm for 10 min. The spores were washed three times thoroughly with sterile distilled water and the suspension was made in sterile distilled water containing 0.01% Triton X-100. The concentration of the spore suspension was adjusted to 2.8×10^9 spores/ml using an improved Neubauer haemocytometer. The spore suspension was used within 24 h of harvest of spores.

P. xylostella larvae were collected from a cabbage field. From the size of the head capsule, larvae of different stages (instar I to IV) were identified and sorted. Larvae looking sluggish or suspected to be parasitized by *Apanteles* sp. were discarded and only healthy larvae were used. About 24 I instar, 16 II instar, 32 III instar and 68 IV instar larvae were used.

Cabbage leaves were washed thoroughly in running water and then in sterile distilled water. One leaf was placed in each of several plastic containers (12.5 × 10.0 cm) containing moist Whatman filter paper No. 41 to provide humidity. To prevent desiccation of the leaves, the petiole was covered with a moist cotton swab. The larvae, grouped by instar, were transferred to the containers and sprayed with spore suspension using an atomizer. The containers were covered with brass wire mesh lids to provide aeration. The experiment was carried out under laboratory conditions (25 ± 2°C). Observations were made daily and mortality of the larvae was recorded.

The results are presented in table 1. The fungus (2.8×10^9 spores/ml) caused 100% mortality in young larvae (instars I and II) in 4 days. None of the IV instar larvae treated died in the larval stage, but there was some mortality in the prepupal and pupal stages.

The dead larvae become hard and mummified. White mycelial growth on the body surface between segments (figure 1) was noticed on the fifth day after inoculation and sporulation was observed on the sixth day. Prepupae and pupae from larvae that escaped infection showed mortality on the fourth and fifth day respectively after inoculation.

It is obvious that, though the fungus was originally isolated from *A. pomivora*, it also infects *P. xylostella*. About ten species of sucking pests[3] and the brinjal leaf beetle *Henosepilachna vigintioctopunctata* (Fabr.)[4] were found to be susceptible to *V. lecanii*. *V. lecanii*

Table 1 *Susceptibility of Plutella xylostella to the entomopathogenic fungus Verticillium lecanii*

Instar	No. treated	Days	Mortality (%)
I	24	4	100.00
II	16	4	100.00
III	32	4	37.50
IV	68	4–7	52.94

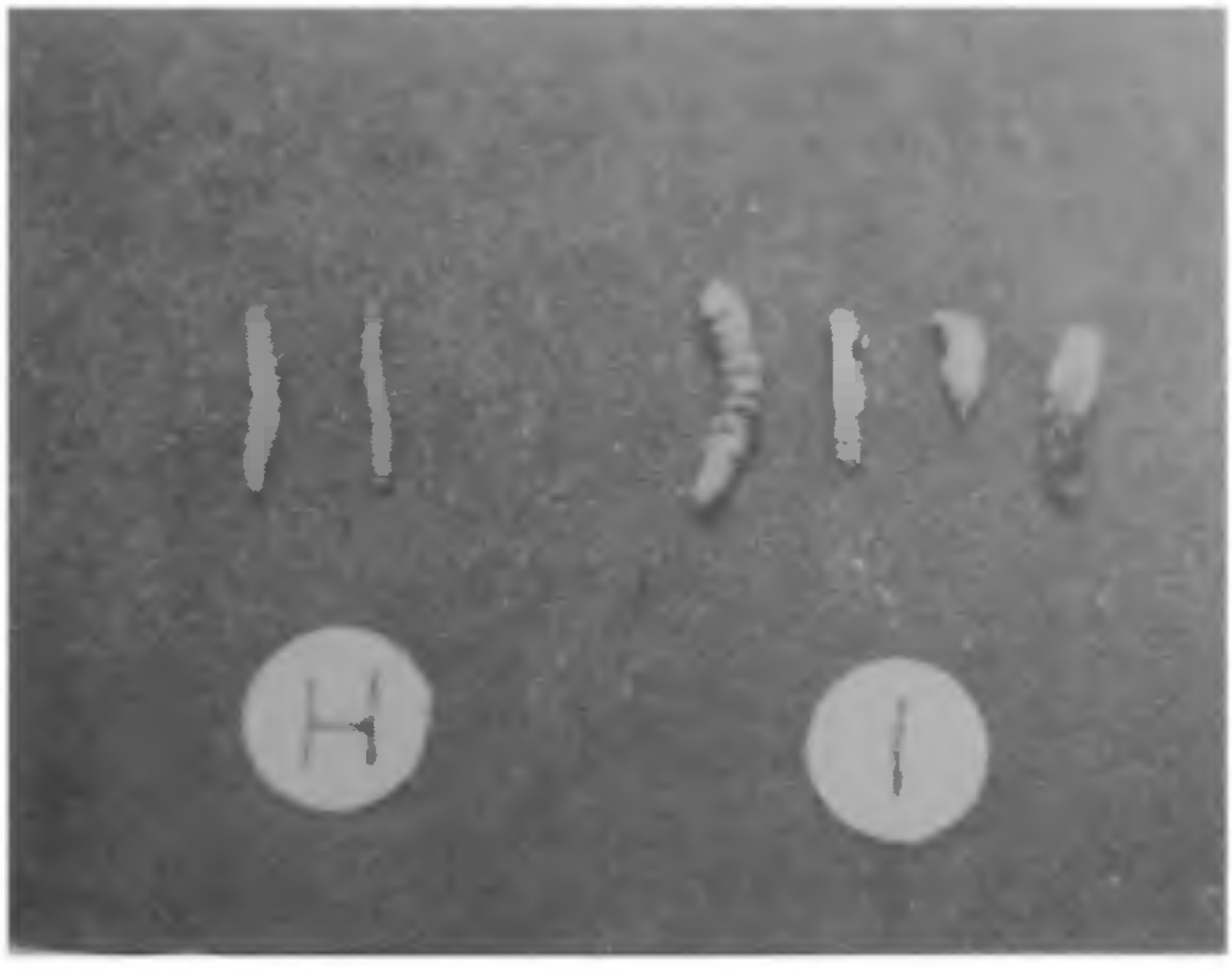

Figure 1. Healthy and *Verticillium lecanii* infected larvae of *Plutella xylostella*.

isolated from soil caused 53% mortality in white grubs *Holotrichia consaginnea* Bianch (I and II instars) in a pot culture study[5]. Thus, under suitable environmental conditions, *V. lecanii* might serve as an effective biocontrol agent against *P. xylostella* on cruciferous crops. Further studies on the efficacy of the fungus on *P. xylostella* on cabbage under glass house and field conditions are in progress.

The author is grateful to Dr B. C. Sutton, Head of Taxanomic and Identification Services, IMI, London, for confirming the identity of the fungus, and to Mr D. L. Shetty and Mr N. Subbaiah for technical help. The author also thanks Dr K. Narayanan for a critical review of the manuscript.

17 December 1988

1. Gustafsson, M., In: *Microblal Control of Insects and Mites*, (eds) H. D. Burges and M. W. Hussey, Academic Press, London, 1971, pp. 375–84.
2. Easwaramoorthy, S. and Jayaraj, S., *J. Invertebr. Pathol.*, 1977, **29**, 399.
3. Easwaramoorthy, S. and Jayaraj, S., *Madras Agric. J.*, 1979, **66**, 409.
4. Santharam, G., Easwaramoorthy, S. and Jayaraj, S., *Curr. Sci.*, 1978, **47**, 477.
5. Gour, H. N. and Dabi, R. K., *Curr. Sci.*, 1988, **57**, 620.

A NEW FRUIT ROT OF *CITRUS RETICULATA* BLANCO

N. L. VYAS
ICAR Research Complex for N.E.H. Region, Mizoram Centre, Kolasib 796 081, India

DURING surveys conducted in January–February 1986, a new fungal fruit rot of orange (*Citrus reticulata* Blanco) was observed in the orange orchards of Kolasib town of Mizoram state. In the initial stage of infection, the fruit developed minute depressions and one to several circular ash-grey spots. On ripening and subsequently, the spots turned into bigger lesions. The infected fruit coat shrivelled and gave a dry rot appearance. Black pycnidial bodies developed on these lesions (figure 1).

Microscopic examination of the isolated fungus revealed that it is *Phoma citri* (culture no. MZ. ICAR–PP–27). Whitish, greenish-dark to black colonies appeared on PDA slants. So far in Mizoram, no record of this fruit rot disease has been made on orange fruits and the presently reported host is a new record for Mizoram and India[1].

The pathogenicity test was carried out successfully by inoculating the isolate grown on PDA slants into orange fruits by Granger and Horne's method[2] and also by spraying the conidial suspension of the