

Susceptibility of *Heliothis armigera* Hubner to *Vairimorpha* sp.

K. NARAYANAN

Indian Institute of Horticultural Research, Bangalore 560 089

During the course of field surveys on field beans, *Lab-Lab purpureus* (Linn.) Sweet at the Indian Institute of Horticultural Research, Bangalore, a microsporidian was isolated from a few dead caterpillars of *Heliothis armigera* (Hubner). The diseased caterpillars were pale white in colour compared to healthy ones. Tissue examinations revealed numerous mature binucleate spores of *Vairimorpha* sp. Occurrence of *Vairimorpha* sp. in *H. armigera* appears to be the first report in India. Further, the present communication deals with some observations made on the symptomatology and gross pathology of the disease.

The spores collected from the diseased larvae of *H. armigera* were purified by differential centrifugation and the concentration of stock suspension was determined with the help of a haemocytometer. A test was conducted to determine its pathogenicity against different instars of *H. armigera* maintained on semi-synthetic diet (Narayanan, 1979) at $30 \pm 2^\circ\text{C}$. Forty larvae of each instar were inoculated with a dose of 5.5×10^8 spores / 0.1 ml/cup, by diet-surface-contamination technique. The larvae were reared individually. A similar number of larvae of each instar treated similarly but without *Vairimorpha* sp. spores served as control. Diagnosis of the dead larvae was done by microscopic exami-

nation of tissue smears under a phase-contrast microscope for the presence of spores. Observations were recorded on the symptoms, larval and pupal mortality and their development. The data on the pupal development were statistically analysed using 't' test.

The symptoms of *Vairimorpha*-infected *H. armigera* (Hub.) generally resembled those described for *Vairimorpha necatrix* infected lepidopterous larvae (Maddox *et al.*, 1981). In general, caterpillars of all the ages showed loss of appetite accompanied by marked sluggishness and less irritability. Bacterial infection occurred invariably in all the cases of earlier instars, but less frequently in older larvae, from which invariably *Vairimorpha* spores could be reisolated. Occasionally, some of the larvae which ingested the spores in their late stages pupated but with reduction in their normal size and weight and gave rise to dwarf adults. Those adults which escaped death in the larval and pupal stages, showed large number of spores both in meconium and body smears, indicating the probability of vertical transmission of the pathogen. The *Vairimorpha* sp. isolated from *H. armigera* was also found to infect *H. zea* (V. M. Brooks, personal communication).

It is evident from the results of the test conducted (Table 1), that first three

instars recorded 100% mortality whereas only 87% mortality was recorded in the case of the fourth instar. The fifth instar was comparatively less susceptible (10% mortality), and mortality was noticed in the pre-pupal and pupal stages only. The incubation period ranged from 6-7 days in the case of first instar which increased to 9-15 days in the case of fifth instar.

Table 1. Effect of *Vairimorpha* sp. on different larval instars of *H. armigera*

Larval Instar	Mortality %	Incubation period (Range in days)
I	100	5-7
II	100	6-8
III	100	6-10
IV	87	8-12
V	10	9-35

It is well known in most of the species of lepidoptera susceptible to *V. necatrix*, death occurring within 6 days after massive spore ingestion is due to bacterial septicaemia, probably arising from gut bacteria, invading the haemocoel following damage to the gut wall by the polar filaments of hatching microsporidian spores and death that occurs after 6 days results from true microsporidiosis (Fuxa, 1981). The debilitating effect of *Vairimorpha* sp. in *H. armigera* was well pronounced as evidenced by

the retarded pupal development by way of reduced size and weight when compared to healthy pupae (Table 2).

Table 2. Effect of *Vairimorpha* sp. on pupal development of *H. armigera*

Pupal	Healthy	Diseased	t' value* (P=0.05)
Length (mm)	1.94	1.59	21.27
Width (mm)	0.60	0.39	10.60
Weight (mg)	357.00	189.00	19.71

* significant

ACKNOWLEDGEMENT

The author is grateful to Dr. V. M. Brooks, North Carolina State University, U. S. A. for identification of the pathogen and to the Director, IIHR, for the facilities provided and to Mr. D. L. Shetti for his technical help.

Key words : *Vairimorpha* sp. *Heliothis armigera*, susceptibility.

REFERENCES

- Fuxa, J. R. 1961. Susceptibility of lepidopterous pests to two types of mortality caused by the microsporidium *Vairimorpha necatrix*. *J. Econ. Entomol.*, 74, 99-102.
- Maddox, J. V., Brooks, W. H. and Fuxa, J. R. 1981. *Vairimorpha necatrix*, a pathogen of agricultural pests - potential for pest control. In: Microbial control of pests and plant diseases. Burges, H. D. (Ed.), PP 587-594, Academic Press, New York.
- Narayanan, K. 1979. Studies on the nuclear polyhedrosis virus of gram pod borer, *Heliothis armigera* (Hubner) (Noctuidae: Lepidoptera), Ph.D. Thesis, Tamil Nadu Agric. Univ., Coimbatore (Unpublished), pp. 204.