J. Natn. Sci. Coun. Sri Lanka 1997 **25**(4): 203-209

ASPECTS OF THE BIOLOGY OF *DIAPHANIA INDICA* (LEPIDOPTERA : PYRALIDAE)

G.A.S.M. GANEHIARACHCHI
Department of Zoology, University of Kelaniya, Kelaniya

(Received: 19 January 1995;accepted: 5 September 1997)

Abstract: *Diaphania indica* (Saunders) is a major Lepidopteran pest of Cucurbits. Some aspects of the biology and natural enemies of this pest on snake gourd were studied. Larvae of *D. indica* collected from snake gourd vines were reared in the laboratory. Females laid eggs two days after copulation. The average fecundity was observed to be 267 eggs. The incubation period at room temperature was 3-5 days. The larval period was 8-10 days and pupal period 7-9 days. The maximum longevity of the adult moth was 9 days.

Two species of Braconid endoparasites (*Elasmus indicus* and *Apanteles taragamae*) and an unidentified Ichneumonid ectoparasite were found to parasitize larvae of *D.indica* in the field. Due to the high level of parasitism by *Elasmus indicus* (58.5%),the damage by *D. indica* to snake gourd was not severe during the study period.

Key Words: Cucurbitaceae, *Diaphania indica*, pests, Pyralidae, snake gourd, vegetable pests.

INTRODUCTION

Diaphania indica (Saunders) (Lepidoptera: Pyralidae) known as pumpkin caterpillar, is one of the major pests of most Cucurbitaceae all over the world.[1-4] It was also reported to attack soya beans.[5] Host plant preference and seasonal fluctuation of this pest have also been studied.[6]

In Sri Lanka, *D. indica* is one of the major pests of cucurbits some of which are economically important such as snake gourd *(Trichosanthes anguina)* and gherkins *(Cucumis sativus)* (M.B. Dhanapala, pers. comm.). No studies have been reported so far on the biology of this species in Sri Lanka. The present study deals with some aspects of the biology and investigates natural enemies of *D. indica* on snake gourd.

Eggs of *D. indica* are laid singly or in small clusters on the lower surface of snake gourd leaves. On hatching, the larvae feed on the lower surface of leaves which are lacerated and bound together by threads of silk. In severe outbreaks, most of the foliage is destroyed and larvae burrow into the stems. The fruits are sometimes attacked particularly at the proximal end.

METHODS AND MATERIALS

Field studies were carried out on a site located about 1 km from the University of Kelaniya at Dalugama. There were two study periods with two snake gourd varieties, the first study with the short fruit variety (Tinnavelly) and the second study with the long fruit variety (1/8/MED O23). Both these varieties have been recommended by the Department of Agriculture for large scale cultivation.

Studies were made on 4m x 4m plots. Four seeds were sown at each hole and after germination, two seedlings were allowed to grow in each hole. Soil structure in the plot was gravelly. All the holes were manured well with cow dung and compost prior to planting.

Temperature, rainfall and humidity were recorded during these study periods. The plants were trained onto a trellis about 2 m high. The plants were fertilized with N.P.K. fertilizer according to the accepted agricultural practices.[7]

Larvae of *D. indica* which were present in the snake gourd plot that was free of pesticides were collected to be used for laboratory studies. They were reared in aluminium insect cages of 25 cm diameter and 15 cm height (Fig. 1A). Fresh leaves of snake gourd were supplied every morning and evening. Cages were also cleaned twice a day for good hygiene.

Adults on emergence from pupae were sexed using abdominal characters. On careful observations, it could be seen that the female abdomen is comparatively large and fusiform whereas the male abdomen is broad at the thoracic end and tapers towards the distal end. Two males and three females were transferred to a wide mouthed glass bottle 25 cm in height (Fig. 1B) for mating and oviposition. The cut-end of the shoot was covered with moist cotton wool to prevent wilting. Adult moths were fed with a dilute solution of sugar offered on moist cotton wool. Once the females started laying eggs both male and female moths were transferred to another bottle and the eggs in the first bottle were counted. It was observed that the females continued laying eggs for six days with a variable number of eggs being laid each day. Eggs laid by the three females in the second bottle were also counted after transferring moths to a third bottle. This procedure was continued until the females stopped laying eggs and the total number of eggs laid by the three females each day was counted separately.

Damage caused to plants by the pest was observed in the field. Percentage parasitism in the larvae was calculated from parasites emerging in the laboratory from larvae collected in the field.

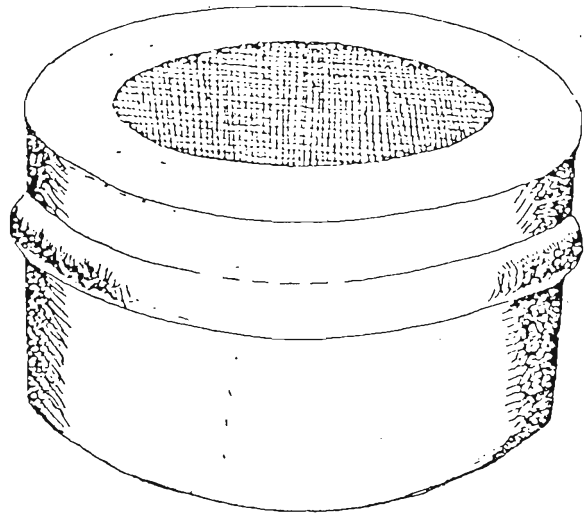

Figure 1 A

Figure 1 B

Figure 1: (A) Aluminium insect rearing cage
(B) Glass bottle used for adult rearing

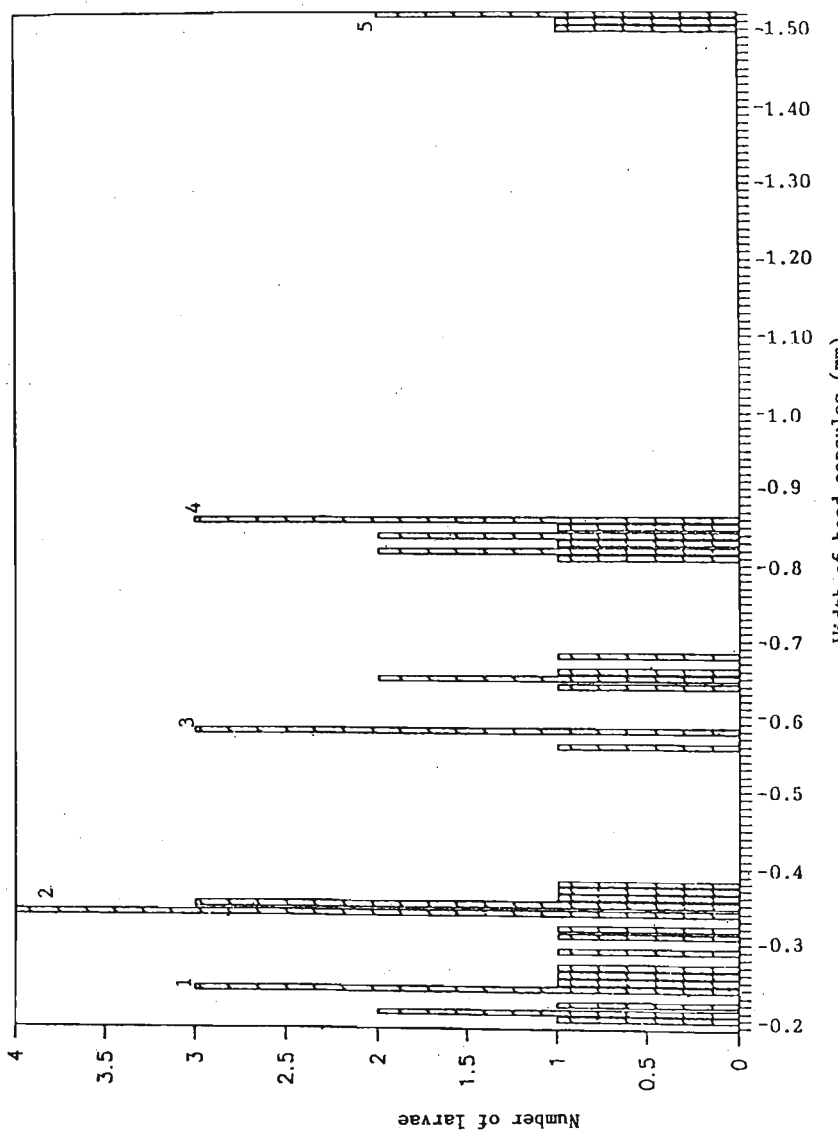

Figure 2: **The frequency distribution of width of head capsule of *D. indica* larvae from hatching to pupation.**

Note that there are five conspicuous peaks (1-5) in the frequency distribution, indicating that there are five instar stages.

RESULTS

Temperature, humidity and rainfall are given in Table 1. The average temperature (± SD) was 27.9°C ± 0.62 and the relative humidity (± SD) was 79.3% ± 5.78. Number of rainy days during the study period ranged from 01-19 days per month and monthly rainfall ranged from 3.2 mm to 115 mm.

Table 1: Average monthly temperature, number of rainy days, rainfall and average humidity during the study period.

Month	Average Temperature (°C)	No of Rainy days (Monthly rainfall)	Average Humidity %
Jan. 1991	26.9	02 (3.2 mm)	73.5
Feb.	27.5	01 (12.3 mm)	73.0
Mar.	27.9	09 (99.4 mm)	78.5
Apr.	28.5	12 (245.0 mm)	80.5
May	28.3	23 (630.0 mm)	88.5
Jun.	28.4	19 (115.0 mm)	82.0

Under these conditions, eggs were laid from 2 days after copulation up to the 8th day. Eggs are very small being approximately 0.5 mm in diameter rounded and yellow in colour. They could be seen with the naked eye. Eggs were laid singly or in small clusters on the lower surface of leaves, leaf buds and young stems. Number of eggs laid by three females placed in the rearing bottle together with two males were counted each day. Results are given in Table 2. Accordingly the average fecundity was found to be 267 eggs.

Table 2: Number of eggs laid by three female moths placed in a glass jar together with two male moths.

Date	No of eggs laid
17.05.1991	112
18.05.1991	431
19.05.1991	109
20.05.1991	67
21.05.1991	51
22.05.1991	32

Incubation period was 3-5 days. The frequency distribution of the width of head capsules of larvae from hatching to pupation gave five conspicuous peaks indicating that there were five larval instars (Fig. 2). This was confirmed by actual observation of the number of moults. The larval period was 8-10 days. Pupation took place within a white silky cocoon and pupae were attached to leaves which were rolled by caterpillars prior to the pupation. The pupa has an average length of 2 cm. The pupal period was 7-9 days and the maximum longevity of the adult moth was 9 days.

In the snake gourd plot, the garden lizard (*Calotes* sp) and the babbler *(Malacocercus striates)* were observed to be the main predators of *D. indica* larvae. Also two endoparasites *Elasmus indicus*[8] and *Apanteles taragamae*[8-10] (Hymenoptera: Braconidae) and an unidentified ectoparasite (Hymenoptera: Ichneumonidae)[8,10] were observed to emerge from larvae of *D. indica*. Percentage parasitism of *D. indica* by the three Hymenopteran parasites is shown in Table 3.

Table 3: Percentage parasitism of larvae of *D. indica* by three Hymenopteran parasites (number of larvae observed = 251).

Parasite	Percentage parasitism
Elasmus indicus	58.5
Apanteles taragamae	6.4
Unidentified ichneumonid	4.0

DISCUSSION

According to the literature *D. indica* is reported to be a major pest of plants belonging to Cucurbitaceae family which are economically important in many parts of the world.[1-4] However due to high degree of parasitism in the study plot especially by *Elasmus indicus* (percentage parasitism 58.5%; see Table 3), the damage to snake gourd by this pest was not severe. Therefore it may be concluded that use of parasitic Hymenopterans might be useful for controlling *D. indica* on economically important plants.

D. indica is one of the major pests of gherkin which is a very popular crop in the dry zone of Sri Lanka as a foreign exchange earning commodity (M.B. Dhanapala, pers. comm.). As such, knowledge about some aspects of the biology of *D. indica* and its natural enemies is important for adopting control measures. The results show that *D. indica* is kept under control by its natural enemies and therefore it remains as a minor pest of snake gourd, but it has the

potential of becoming a serious pest if the natural enemies are eliminated by the excessive use of insecticides.

Acknowledgement

I thank Drs I.V.S. Fernando and U.S. Amarasinghe, Department of Zoology , University of Kelaniya for their guidance.

References

1. Hutson J.C. (1931). Report of insects during 1930. *Leaflet* No. 17. Department of Agriculture, Ceylon.

2. Lever R.J.A.W. (1939). Vegetable garden pests and their control. *Agricultural Journal of Fiji* **10**(1): 11-17.

3. May A.W.S. (1947). Pests of Cucurbit crops. *Queensland Agricultural Journal, Brisbane* **62**: 137-180.

4. Soares B.J. (1945). Squash borers. *Boletin del Ministerio de Agricultura, Buenos Aires* **33**(6): 81-85.

5. Vander G.P. (1935). Diseases and pests of cultivated plants in the Netherland indies. *Mededelingen van het Instituut voor Plantenzeikten* **83**: 80 pp.

6. Ke L.D., Li Z.Q., Xu L.X. & Zheng Q.F. (1990). Host plant preference and seasonal fluctuation of *Diaphania indica* (Saunders). *Acta Entomologica Sinica* **31**(4): 379-386.

7. Anon (1990). Recommendation for crop cultivation: technical guides, (in Sinhala). Department of Agriculture, Sri Lanka.

8. Peter C. & David B.V. (1990). Natural enemies of the pumpkin caterpillar *Diaphania indica* (Lepidoptera: Pyralidae) in Tamil Nadu. *Entomophaga* **37**(1): 3-9.

9. Peter C. & David B.V. (1990). Biology of *Apanteles taragamae* Viereck a parasitoid of *Diaphania indica* (Saunders) (Lepidoptera:Pyralidae). *Insect Science and its Application* **13**(1): 7-17.

10. Peter C. & David B.V. (1990). Population dynamics of pumpkin caterpillar *Diaphania indica* (Saunders) (Lepidoptera: Pyralidae). *Tropical Pest Management* **37**(1): 75-79.