Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 4511-4516

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 4511-4516**
Journal homepage: http://www.ijcmas.com

Original Research Article

Studies on Biology of Cucumber Moth, *Diaphania indica* (Saunders) (Lepidoptera: Crambidae) on Bitter Gourd

M. C. Nagaraju, Sushila Nadagouda, A. C. Hosamani and Sujay Hurali

Department of Agricultural Entomology, College of Agriculture, University of Agricultural Sciences, Raichur, Karnataka, India
**Corresponding author*

Keywords

Biology, Cucumber moth, *Diaphania indica*, bitter gourd

A B S T R A C T

Biology of *Diaphania indica* (Saunders) on bitter gourd was studied in detail under laboratory condition at Department of Agricultural Entomology University of Agricultural Sciences, Raichur, Karnataka. The results revealed that the average period of egg, first, second, third, fourth and fifth larval instar were 3.05 ± 0.27, 2.17 ± 0.24, 2.50 ± 0.33, 1.53 ± 0.28, 1.50 ± 0.22 and 1.80 ± 0.46 days, respectively and total larval period was 9.50 ± 0.45 days. The pre-oviposition, and oviposition periods were found to be 1.09 ± 0.15 and 4.35 ± 0.59 days, respectively. The fecundity varied from 220 to 268 with an average of 250.21 ± 16.33 eggs. The average longevity of male and female adults was 28.17 ± 0.78 and 31.22 ±0.94 days, respectively.

Introduction

The cucumber moth, *Diaphania indica* (Saunders) (Lepidoptera: Crambidae), is a polyphagous pest and is particularly serious on cucurbits. Larvae mainly attack leaves, but also infest flowers and fruits, and cause considerable yield loss during outbreak. It is also known as the cotton caterpillar and pumpkin caterpillar (Tripathi and Pandy. 1973; and Clavijo *et al.*, 1995). This pest infests cucumber (*Cucumis sativus* L.), melon (*C. melo* L.), gherkin (*C. sativus* L.), bottle gourd (*Lagenaria siceraria* Molina), bitter gourd (*Momordica charantia* L.), snake gourd (*Trichosanthes anguina* L.), Luffa (*Luffa* aegyptiaca Mill.), little cucumber (*Melothria* spp), cotton (*Gossypium hirsutum* L.), etc. The preferred hosts of the larvae of this pest are cucumber, bitter gourd, little gourd and pointed gourd (Ravi *et al.*, 1998; Capinera, 2001 and Cho *et al.*, 2003). This species is mostly distributed in Pakistan, India, Japan, Pacific Islands, Australia, Africa, and South America (Peter and David, 1991 and Capinera, 2001).On hatching, larvae feed on leaves where they cluster and fold and weave the leaves together. They can also feed on and puncture the skin of young fruit, especially the fruits that touch leaves. The damage by larvae has been reported to be restricted to leaves of pointed gourd which ranged from 25 to 30 per cent while in bitter gourd it was 3 to14 per cent. Segeren (1983) has reported the incidence of *Diaphania nitidalis* (Stoll) and aphids as major pests in bitter gourd crop from Suriname. Various studies are available on the biology of *D. indica* all over the world. The extensive

work on *D. indica* in Karnataka is lacking at present so in order to provide more insights to the biology of *D. indica* the current study was carried out.

Materials and Methods

Studies on the bionomics of cucumber moth, was carried out in the laboratory at Department of Entomology College of Agriculture, University of Agricultural Sciences Raichur.

Initial culture of cucumber moth was collected from the fields such larvae were reared in the laboratory on bitter gourd and were further multiplied in cage under lab condition. Similarly several second, third, and fourth instar larvae of *Diaphania indica* were also collected from field of bitter gourd grown in the MARS Raichur.

The collected larvae were transferred to the cage (20×20×25cm) with a wooden base glass top and four sides wire mesh. Leaves and fruits of bitter gourd were given to the larvae and rearing was continued until emergence of adult moth. This culture was used for the studies on biology.

For this study ten pair of freshly emerged male and female adults were released into a cage containing a black cloth and sugar solution with lid fixed with cloth served as a ovipositional cage. The cloth was observed every day for oviposition. Eggs were laid on the black cloth by the female moth. After ovipostion eggs were transferred, with the help of a camel hair brush and a needle, to a petri-dish supplied with moistened filter paper and the petridish was covered and left in the laboratory until the eggs hatched. The time taken for hatching was recorded by making observation at 12 hours interval. The morphometric characters *viz.*, width and length of twenty eggs were measured.

The period from hatching of larva to pupation was recorded as larval period. The larval rearing container was provided at the bottom with wet blotting paper which protected the eggs from desiccation. Fresh leaf of bitter gourd was provided as a food to the larva and these leaves were changed daily. Observation was made at 12 hours interval to study the number of instars and the size of the larvae and behaviour at every instar. Different instars were identified by the presence of head capsule/cast skin, which was removed soon after moulting. The larvae were allowed to pupate in rearing cages and pupal period was recorded. These pupa were observed for the morphometric characters.

Newly emerged moth were enclosed separately in boxes and fed with honey solution. The sexes were identified by the presence of a tuft of light brown hairs on the tip of the abdomen which are bushier in case of female than that of male. Ten pairs of the adults were selected. Daily observation were made to study the time at which the mating started and the duration of mating.

The mated female were taken and kept in a cage to know the pre-oviposition and oviposition periods. Oviposited cloth was observed for the counting of eggs. This was studied with five pair of moths and continued till the death of the female of the pair.

Results and Discussion

Eggs were laid singly or in small cluster and they were minute and round in shape. Freshly laid eggs were creamy white, which later changed to white before hatching. The incubation period of cucumber moth egg ranged from 2.50 to 3.50 (3.05 ± 0.27) days. The length and breadth of egg ranged from 0.76 to 0.86 and 0.27 to 0.36 mm

respectively with an average of 0.83 ± 0.02 mm and 0.33 ± 0.03 mm length and breadth, respectively.

The larva has five pairs of prolegs on 4th, 6th, 7th, 8th and 9th abdominal segment in addition to three pairs of true thoracic legs. The first instar larval period ranged from 2 to 2.5 days with a mean of 2.17 ± 0.24 days. The average length and breadth of first instar larva was 4.17 ± 0.36 mm and 0.50 ± 0.08 mm with a range of 3.50 to 4.80 mm and 0.40 to 0.60 mm, respectively.

Second instar larva was pale green in colour with minute hairs on abdomen with larval period ranging from 2.00 to 3.00 days (mean of 2.50 ± 0.33 days). The average length and breadth of second instar was 7.07 ± 0.28 and 0.80 ± 0.66 mm with a range of 6.50 to 7.50 mm and 0.70 to 0.90 mm, respectively.

The third instar larva was green in colour with white stripe running along both sides of the body. All legs and pro-legs changed to brownish white from white colour. The third instar larval period ranged from 1.50 to 2.00 days with the mean of 1.53 ± 0.28 days. The average length and breadth of third instar was 10.10 ± 0.27 and 1.39 ± 0.02 mm with a range of 9.30 to 10.60 mm and 1.36 to 1.42 mm, respectively.

The colour of the fourth instar larva changed to dark green from earlier white with two sub dorsal white stripes extending full length of the body. The fourth instar larval period ranged from 1 to 2 days with the mean of 1.50 ± 0.22 days. The average length and breadth of fourth instar larva was 14.91 ± 0.27 and 2.16 ± 0.16 mm with the range of 14.50 to 15.40 mm and 1.98 to 2.60 mm, respectively.

The fifth instar larva was bigger in size and dark green in colour with white stripes running along both sides of the body. The fifth instar larval period ranged from 1.50 to 2.50 days with a mean of 1.80 ± 0.46 days. The average length and breadth of fifth instar was 19.12 ± 0.56 and 3.27 ± 0.11 mm with a range of 18.32 to 20.00 mm and 3.10 to 3.40 mm, respectively.

The pupal period ranged from 9.00 to 10.50 days with a mean of 10.00 ± 0.50 days. The average length and breadth of pupa was 13.38 ± 0.31 and 2.37 ± 0.20 mm with a range of 12.90 to 13.00 mm and 2.30 to 2.90 mm, respectively.

The total larval period ranged from 8.00 to 12.00 days with an average of 9.50 ± 0.45 days. The pre oviposition period ranged from 1.00 to 1.50 days with an average of 1.09 ± 0.1. The oviposition period ranged from 3.50 to 4.50 days with an average of 4.35 ± 0.59.The number of eggs laid per female ranged from 220 to 268 eggs with an average of 250.21 ± 16.33.

Adults has translucent whitish wings with broad dark brown borders. The body is whitish below and brown on top of head and thorax as well as the end of the abdomen.

There was a tuft of light brown hairs on the tip of the abdomen. The sexes were identified by the presence of a tuft of light brown hairs on the tip of the abdomen which are bushier in case of female than that of male. Longevity of adult female was longer which ranged from 8.00 to 9.00 (8.40 ± 0.39) days as compared to male which ranged from 5.00 to 6.00 (5.35 ± 0.34) days. Size of adult female was larger with a length of 14.45 ± 0.21 mm with a range of 14.20 to 14.80 mm and breadth of 3.33±0.24 with a range of 3.10 to 3.80 mm. The adult male cucumber moth length was 13.32 ± 0.27 mm with the range of 12.90 to 13.60 and breadth of 2.91 ± 0.17 with the range of 2.60 to 3.20.

Table.1 Developmental period of *D. indica*

Developmental stages	Range (days)	Mean ± SD (days)
Pre – oviposition	1.00 – 1.50	1.09 ± 0.15
Oviposition	3.50 – 4.50	4.35 ± 0.59
Egg incubation period *	2.50 – 3.50	3.05 ± 0.27
Duration of larval and pupal stage*		
1st instar	2.00 – 2.50	2.17 ± 0.24
2nd instar	2.00 – 3.00	2.50 ± 0.33
3rd instar	1.50 – 2.00	1.53 ± 0.28
4th instar	1.00 – 2.00	1.50 ± 0.22
5th instar	1.50 – 2.50	1.80 ± 0.46
Total	8.00 – 12.00	9.50 ± 0.45
Pupa	9.00 – 10.50	10.00 ± 0.50
Adult longevity (with food)		
Male	5.00 – 6.00	5.35 ± 0.34
Female	8.00 – 9.00	8.40 ± 0.39
Total life cycle		
Male	27.50 – 30.00	28.17 ± 0.78
Female	30.50 – 33.00	31.22 ± 0.94
Fecundity (Number of eggs/female)	220.00– 268.00	250.21 ± 16.33

*N = 20 observation

Table.2 Morphometric measurement of *D. indica*

Growth stages	Length (mm)		Width (mm)	
	Range	Mean ± SD	Range	Mean ± SD
Egg*	0.76 – 0.86	0.83 ± 0.02	0.27 – 0.36	0.33 ± 0.03
Larva*				
1st instar	3.50 – 4.80	4.17 ± 0.36	0.40 – 0.60	0.50 ± 0.08
2nd instar	6.50 – 7.50	7.07 ± 0.28	0.70 – 0.90	0.80 ± 0.06
3rd instar	9.30 – 10.60	10.10 ± 0.27	1.36 – 1.42	1.39 ± 0.02
4th instar	14.50 – 15.40	14.91 ± 0.27	1.98 – 2.60	2.16 ± 0.16
5th instar	18.32 – 20.00	19.12 ± 0.56	3.10 – 3.40	3.27 ± 0.11
Pupa*	12.90 – 13.00	13.38 ± 0.31	2.30 – 2.90	2.37 ± 0.20
Adult*				
Male	12.90 – 13.60	13.32 ± 0.27	2.60 – 3.20	2.91 ± 0.17
Female	14.20 – 14.80	14.45 ± 0.21	3.10 – 3.80	3.33 ± 0.24

*N = 20 observation

Total life cycle of cucumber moth from egg to death of the adult in laboratory condition was 28.17 ± 0.78 in male with range of 27.50 to 30.00 days and in female it was 31.22 ± 0.94 with a range of 30.50 to 33.00 days

The larval period of first, second, third, fourth and fifth instar ranged from 2.00 to 2.50 (2.17 ± 0.24), 2.00 to 3.00 (2.50 ± 0.33), 1.50 to 2.00 (1.53 ± 0.28), 1.00 to 2.00 (1.50 ± 0.22) and 1.50 to 2.50 (1.80 ± 0.46) days respectively and the pupal period

ranged from 9 to 10.50 (10.00 ± 0.50) days. The total larval duration was 8.00 to 12.00 (9.50 ± 0.45) days. The present investigations are in agreement with Hosseeinzade *et al.,* (2014) who reported that the first, second, third, fourth, fifth larval instars and pupal period ranged from 2.25 to 2.50, 2.50 to 3.00, 1.58 to 2.00, 1.00 to 1.75, 2.05 to 2.50 and 8.50 to 10.00 days respectively, whereas larval duration ranged from 9.50 to 12.50 during October to December. The results are also supported by findings of Barma and Jha (2014) who recorded larval period of 8.00 to 12.00 days and pupal period of nine days during September to November.

Pre-oviposition and oviposition period of cucumber moth ranged from 1.00 to 1.50 (1.09 ± 0.15) and 3.50 to 4.50 days respectively, whereas fecundity ranged from 220 to 268 (250.2 ± 16.33) eggs per female. These results are in conformity with Xu and Zhenfen (1988) who recorded pre-oviposition and oviposition period of 0.50 to 1.50 days and 2.00 to 3.00 days respectively, with fecundity of 250 to 267 eggs per female.

Longevity of adult female was longer which ranged from 8.00 to 9.00 (8.40 ± 0.39) days as compared to male which ranged from 5.00 to 6.00 (5.35 ± 0.34) days. With respect to the size of adult female the length was 14.45 ± 0.21 mm and breadth was 3.33 ± 0.24 mm. These results are in agreement with Hosseeinzade *et al.,* (2014) who reported adult longevity of female and male as 8.00 to 10.00 days (8.56 ± 0.06) and 5.00 to 7.00 days (6.35 ± 0.07) respectively. The length of adult female was 14.26 ± 0.35 mm and breadth was 3.17 ± 0.24 mm and developmental period of cucumber moth was 19.50 days. Barma and Jha (2014) recorded total life cycle of 19.91 days under laboratory condition. Korgaonkar *et al.,* (2004) reported that total life cycle of cucumber moth was 23 days and Shin *et al.,* (2002) also reported total life cycle of cucumber moth was 22 days.

References

Barma P and Jha S. Studies on bio-ecology and voracity leaf roller (*Diaphania indica* Saunders (Lepidoptera: Pyralidae) on pointed gourd.2014, *Academic Journal of science.* 9: 2790-2798.

Capinera JL. Handbook of Vegetable Pests. Academic Press. 2001.

Cho DC, Noh JJ and Choe KR.2003, Ovipostion and feeding preference of the cotton caterpillar, *palpptia indica* (Lepidoptera: Pyralidae), in cucurbitaceae. *Korean Journal of Applied Entomology*. 42: 119-124.

Clavijo AJ, Munroe E and Arias C Q. 1995, The genus *Diaphania* Hubner (Lep.: Cramibidae); key to the economically important species. *Agronomia Tropical Maracay*. 45: 347-358.

Ganehiarachchi GASM. Aspects of the *Diaphania indica* (Lepidoptera: Pyralidae).1997, *Journal of National science Counciling Sri Lanka*. 25(4): 203-209.

Hosseinzade S, Izadi I, Namvar P and Samih MA.2014, Biology, temperature thresholds and degree-day requirements for development of the cucumber moth, *Diaphania indica*, under laboratory conditions. *Journal of Insect Science.* 14:1-6.

Korgaonkar S R, Desai BD, Mule RS, Jalgaonkar VN and Naik K. V.2004,Studies on biology of little gourd leaf eating caterpillar, *Diaphania indica* Saunders. *Shashpa*, 11: 75-77.

Peter C and David BV.1991, Biology of *Goniozus sensorius* Gordh (Hym.:

Bethylidae) a parasitoid of the pumpkin caterpillar, *Diaphania indica* (Saunders) (Lep.: Pyralidae). *Insect Science and its Application*. 12: 339-345.

Ravi KC, Puttaswamy CA, Viraktamath B, Mallik T, Ambika PP, Reddy NKK and Verghese A. 1998,Influence of host plants on the development of *Diaphania indica* (Saunders) (Lep.: Pyralidae). In: Proceedings of the First National Symposium on Pest Management.1998.

Segeren PA. 1983,Pest control experiments on cucumber and gherkin in Suriname. De-Surinaanmse-Landbouw-Surinam-Agri.; 3: 65-69.

Shin W, Kim G, Park N, Kim, J and Cho K. 2002,Effect of host plants on the development and reproduction of cotton caterpillar, *Palpita indica* (Saunder). *Korean Journal of Applied Entomology*. 41: 211-216.

Tripathi R and Pandy PA.1973, Non cucurbitaceous food plant of *Diaphania indica*. *Journal of Science and Technology*. 11: 80-83.

Xu WJ and Zhenfen QL.1988, Studies on the biology and ecology of Indian cabbage moth, Diaphania indica *(saunders) (lepidoptera. Pyralidae).* Journal of Zhejiang Agricultural University. *48: 364-376.*