Indian Journal of Applied Entomology **23**(1) : 1-4 (2009)

BIOLOGY AND FEEDING POTENTIAL OF *MICROMUS TIMIDUS* HAGEN ON SORGHUM APHID, *MELANAPHIS SACCHARI* (ZEHNTNER)

M. VIDYA, S. LINGAPPA, R.K. PATIL AND G.K. RAMGOVINDA

Department of Entomology, University of Agriculture and Sciences, Dharwad, Karnataka – 580 005

ABSTRACT

Biology and feeding potential of *Micromus timidus* Hagen was studied under laboratory conditions on *Melanaphis sacchari* (Zehntner). The predator was observed to pass through three larval instarts. On an average first, second and third instars lasted for 2.00 ± 0.0, 1.06 ± 0.25 and 1.81 ± 0.40 days and consumed 49.81 ± 9.95, 57.69 ± 19.48 and 128.25 ± 28.85 aphids, respectively. The fecundity was recorded as 907.50 ± 342.15 eggs/female. The individual larvae consumed 235.75 ± 33.24 aphid nymphs to complete the larval duration (4.88 ± 0.50 days) and an adult consumed on an average 303.58 ± 101.98 aphid nymphs for a period of 29.05 ± 13.49. The per day consumption of aphids was 50.06 ± 4.85 and 10.45 ± 6.67 aphids by larva and adult, respectively.

Key words: *Micromus timidus,* Biology, Feeding potential, *Micromus* sp.

Hemerobiids are very closely related to chrysopids but unfamiliar to most people. They are widely distributed in tropical and temperate zones (Smith, 1923). They are dependent on plant lice, scale insects, spider mites and insect eggs (Mac Leod & Stange, 2005) for food, which makes them predominately beneficial. These insects are often called "Brown Lacewings" or "Smaller Lacewings". *Micromus timidus* Hagen was found in sugarcane, sorghum and cotton ecosystem during search for aphids in respective crop ecosystem. The larvae were collected and reared on *Melanaphis sacchari* (Zehntner). The reared lots were sent for identification to Texas A and M University. The species was identified as *Micromus timidus* Hagen by Dr. John D. Oswald. This species is restricted to the area of the Indian subcontinent. It is expected to be a plant inhabiting general predator of other small arthropods found on plants. Scanning literature revealed that information on biology and feeding potential on *M. sacchari* is lacking. Hence, the investigation on the biology and feeding potential of brown lacewing, *M. timidus* was undertaken.

MATERIALS AND METHODS

The culture of *M. timidus* required for the study was maintained on *M. sacchari* and the aphids required were maintained on sorghum under field conditions. Freshly laid eggs of *M. timidus* were held individually in glass vials (7.5 × 2.5 cm) closed with cotton plugs and observed daily to note the incubation period. Upon hatching 25 newly hatched larvae were taken individually in glass vial (7.5 × 2.5 cm) and were provided with known number of *M. sacchari* nymphs (50-200 aphids/vial) as food till pupation and each larva was considered as one replicate. At 24 hr interval, the number of nymphs preyed and the larval development of *M. timidus* were recorded. The aphids were replaced daily with known number of nymphs. The observations on larval and pupal periods and the feeding rate of the larva were recorded. The study period of the experiment was December to February 2005-06 in the Biocontrol Laboratory, Department of Entomology, University of Agricultural Sciences, Dharwad.

Adult traits were studied by releasing a pair of freshly emerged adults into plastic containers (12.5 × 6.25 cm) for mating and oviposition. Sexing was done based on size of adult and shape of abdomen (female is larger with bulged abdomen). They were supplied with known numbers of aphids every day and unfed aphids were counted before replacement. Cotton screen (3 × 4 cm) provided as substrate for oviposition. Adults were transferred carefully using a plastic vial (7.5 × 2.5 cm) to fresh container containing food and cotton screen hung along inner wall of container neck for every 24 hr. Number of eggs laid on cotton screen were counted at every change till death of adults. Observations on pre-oviposition period, oviposition period, post-oviposition period, fecundity, adult longevity (male and female) and number of aphids consumed were subjected to statistical analysis.

RESULTS AND DISCUSSION

The incubation period ranged from 3 to 4 days with a mean of 3.19 days. Raychaudhuri *et al.* (1981) noted higher

incubation period of 6-7 days of *Micromus timidus* Hagens on *Lipaphis erysimi* (Kalt). Sato and Takada (2004) observed incubation period as 4.00, 4.00 and 5.1 ± 0.3 days for *Micromus numerosus* Navas, *Micromus angulatus* (Stephens) and *Micromus linearis* (Hagen) on *Aphis craccivora* Koch respectively at 25°C. The total larval period was 4.88 ± 0.50 (4-6 days), when mean duration of first, second and third instar larva of *M. timidus* was 2.0, 1.06 and 1.81 days respectively. For *Micromus posticus* Walker duration was 7-9 days with 2.5, 1.5 and 1.75 days for 1st, 2nd and 3rd instar respectively (Cutright, 1923). The same trend of larval duration was noticed for *M. numerosus* (6.6 ± 1.1 days), *M. angulatus* (5.7 ± 0.6 days) and *M. linearis* (7.6 ± 1.2 days) at 25°C (Sato and Takada, 2004). This indicates that the *Micromus* sp. have a short larval period. The average pupal duration was 6.88 ± 0.34 days (Table-1) Raychaudhuri *et al.* (1981) recorded pupal duration of 6-7 days for *M. timidus* and 6-8 days for *M. posticus* on cabbage aphid, *Brevicoryne brassicae* (Linnaeus) (Cutright, 1923). Total development period from egg to newly emerged adult varied from 13 to 17 days with a mean of 14.87 where it was 16-18 days for *M. posticus* (Cutright, 1923). The duration from egg to egg was 18.00 days with range of 16-21 days (Table-1).

During the course of development the 1st, 2nd and 3rd instar larvae consumed 41-69 (49.81 ± 9.95), 52-120 (57.69 ± 19.48) and 70-158 (128.25 ± 25.85) number of *M. sacchari* nymphs, respectively. The total number of aphids consumed by an individual larva during its development was 205-309 (235.75 ± 33.24) aphids, whereas per day consumption was 50.06 ± 4.85 aphids (Table-1). *Micromus timidus* larva consumed 10-16, 31-40 and 99-123, *L. erysimi* during I, II and III instar, respectively (Raychaudhari *et al.*, 1981) while *M. posticus* consumed 4-16, 3-21 and 3-28 cabbage aphids by I, II and III instar, respectively (Cutright, 1923). The higher feeding rate observed in present study indicates the voracious nature of *M. timidus* on *M. sacchari.*

The per day consumption of I, II and III instar larva respectively was 24.91 ± 4.98, 54.42 ± 8.12 and 70.86 ± 11.19 aphids (Table-1). The first instar larva consumed less number of aphids, which increased with advancement of larval age. Thus the third instar larvae were found to feed voraciously. Similar conclusion was drawn by Raychaudhari *et al.* (1981) and Patro and Behera (2002) for *M. timidus* and *Chrysoperla carnea* (Stephens), respectively.

Table 1: Biology and feeding potential of *M. timidus* on *M. sacchari*

Stages	Duration (Days)	Feeding potential	
		Total	Per day
A. Developmental traits			
Egg	3.19 ± 0.40		
Larva			
I Instar	2.00 ± 0.0	49.81 ± 9.95	24.91 ± 4.98
II Instar	1.06 ± 0.25	57.69 ± 19.48	54.42 ± 8.12
III Instar	1.81 ± 0.40	128.25 ± 25.85	70.86 ± 11.19
Total	4.88 ± 0.50	235.75 ± 33.24	50.06 ± 4.85
Pupa	6.88 ± 0.34		
Developmental Period:			
i. Egg to Adult	14.87 ± 1.24		
ii. Egg to Egg	18.00 ± 1.58		
B. Reproductive traits			
Traits			
Adult longevity:			
i. Male	28.70 ± 14.60		
ii. Female	29.40 ± 13.07		
iii. Mean (♀ & ♂)	29.05 ± 13.49		
Adult Feeding potential		303.58 ± 101.98	10.45 ± 6.67
Larva and adult	33.85 ± 7.99	539.33 ± 62.61	15.93 ± 6.56
Pre-oviposition period	3.13 ± 0.34		
Oviposition period	25.20 ± 12.49		
Post-oviposition period	1.00 ± 1.15		
Fecundity	907.50 ± 342.15*		

* Number per female

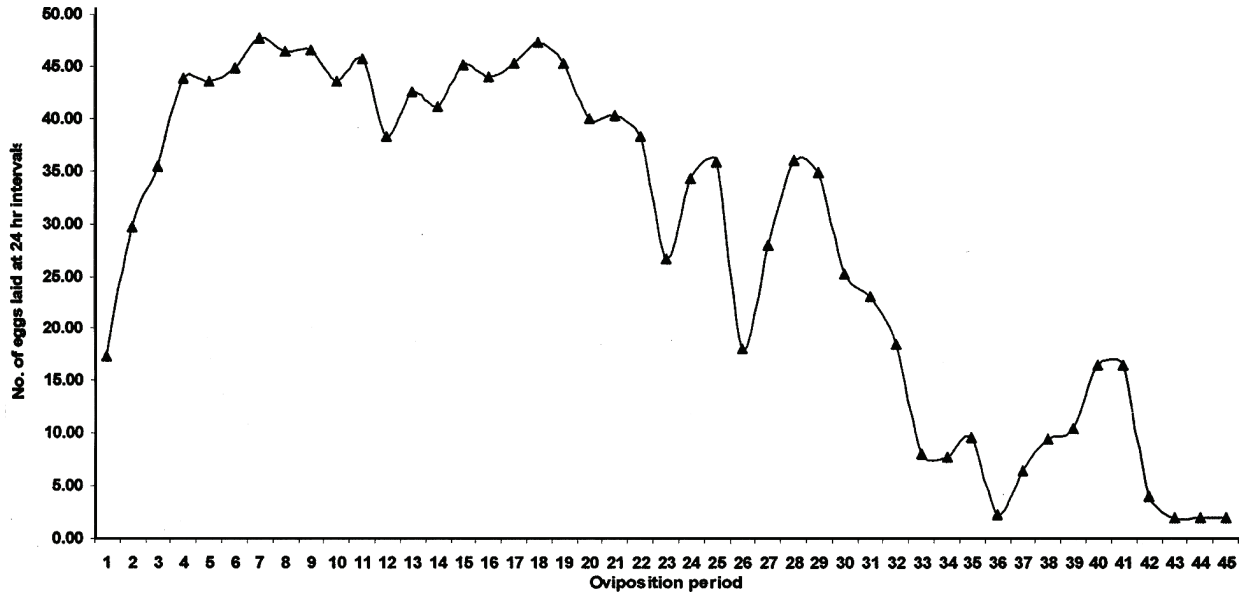

Fig. 1: Fecundity of *M. timidus* on *M. sacchari* at 24 hours intervals

The studies on adult reproductive traits are summarized in Table-1. Where the pre-oviposition period was 3 to 4 days with an average of 3.13 days.

The oviposition period was observed to be ranged from 12 to 45 days with an average of 25.20 days. The average post-oviposition period was 1.00 days. Cutright (1923) reported that the pre-oviposition period lasted for 3 to 4 days and the oviposition period ranged between 2 to 12 days for *M. posticus*. A female laid 907.50 ± 342.15 eggs with a wide range of 514 to 1329 eggs per female. The Figure 1 represents the number of egg laid by *M. timidus* adult at 24 hr intervals during its life span of 29.40 ± 13.07 days. The eggs/day/female increased gradually and reached a maximum of 47.70 on 7th day after which there was decreasing trend. Average eggs laid per day was 28.65 ± 15.94. The brown lacewings have very high reproductive capacity. Females of some French population laid 1,500 to 2,000 eggs (Miermount and Canard, 1975). The maximum number of eggs laid by one female was 1,200, 1, 527 and 1, 099 in *M. angulatus*, *M. numerosus* and *M. linearis* with a mean of 399, 544 and 614 eggs on *A. craccivora*, respectively (Sato and Takada, 2004). For *H. pacificus*, the maximum number of eggs laid by one female was 2, 544 with a mean of 714.8 ± 542.5 eggs (Neuenschwander, 1976).

The adult of *M. timidus* is also predaceous and mean aphid consumption was 303.38 with a range of 203-438 (Table-1). The aphids consumed by adult were more than larva is mainly due to longer adult longevity. A single adult consumed 10.45 ± 6.67 aphids/day during its life span of 29.05 ± 13.49 (Table 1). A single larva and adult during their developmental period consumed 539.33 ± 62.61 aphids with 15.93 ± 6.56 aphids per day. Cutright (1923) reported, *M. posticus* destroyed daily an average ten aphids. But there is no information available on feeding potential of other *Micromus* spp. adults.

ACKNOWLEDGEMENT

The authors are thankful to Government of Karnataka for financial support in the form of project and also to Dr. John D. Oswald, Curator, Texas A & M University, USA for identification of *Micromus timidus*.

REFERENCES

Cutright, C.R. (1923). Life history of *Micromus posticus* Walker. *Jounral of Economic Entomology*, **16**: 448-456.

Mac Leod, E.G. and Stange, L.A. (2005). Brown lacewings (of Florida) (Insecta: Neuroptera: Hemerobiidae). http://creatures.ifas.ufl.edu

Miermount, Y. and Canard, M. (1975). Biologie due predator aphidiphage *Eumicromus angulatus* (Neur: Hemerobiidae): Etudes au laboratoire et obseriation dans le sudouest de la France. *Entomopahga*, **20**: 179-191.

Neuenschwander, P. (1976). Biology of adult *Hemerobius pacificus*. *Environmental Entomology*, **4**: 215-220.

Patro, B. and Behera, M.K. (2002). Biology and feeding potential of *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) on the bean aphid, *Aphis craccivora* Koch. *Journal of Biological Control*, **16**: 77-79.

Raychaudhuri, D.N., Ghosh, D., Poddar, S.C. and Ghosh, S.K. (1981). Notes on an aphidophagous insect, *Micromus timidus* Hagens (Neuroptera: Hemerobiidae). *Science and Culture*, **47**: 223-224.

Sato, T. and Takada, H. (2004). Biological studies on three Micromus species in Japan (Neuroptera: Hemerobiidae) to evaluate their potential as biological control agents against aphids: 1. Thermal effects on development and reproduction. *Journal Applied Entomology and Zoology*, **39**: 417-425.

Smith, R.C. (1923). The life histories and stages of some hemerobiids and allied species (Neuroptera). *Annals of Entomological Society of America*, **16**: 129-151.