

Biology of a predatory bug, *Canthecona furcellata* Wolff. (Hemiptera : Pentatomidae) on poplar defoliator, *Clostera fulgurita walker* (Lepidoptera : Notodontidae)

S. N. Ray* and M. A. Khan.

ABSTRACT

The pentatomid bug, *Canthecona furcellata* Wolff. (Hemiptera : Pentatomidae) is predator of many lepidopterous pests. The nymphal period of *C. furcellata* was 14.1 days and the adult longevity of male and female were 16.8 and 24.7 days respectively. The nymphal period and adult longevity of *Canthecona furcellata* is long. So they reduce the population of *Clostera fulgurita walk* (Lepidoptera : Notodontidae) to its regular presence in poplar nurseries and plantations. The fecundity of female bug of *C. furcellata* with on an average is 317.6 eggs per female. The egg laying capacity of its bug is also good for minimizing the population of *C. fulgurita*. The size of eggs, pre-copulation, copulation period, duration of fecundity and sex ratio were also studied.

Key words: *Canthecona furcellata*, *Clostera fulgurita*, biology

INTRODUCTION

The modern concept of insect-pest management is based on ecological principles and involves the integration and synthesis of different components/control tactics into an insect-pest management system. In view of chemical hazards arising out of indiscriminate use of insecticides, investigation and exploitation of natural enemies for the control of identified key pest becomes necessary. Several biotic agents regulate the population of defoliator *Clostera fulgurita* Walker and *C. restitura* in the field (Ganguli *et al.*, 2000; Ray *et al.*, 2002; Sangha and Sohi, 2008). The main aim is to minimize the use of chemicals in plant protection. A variety of techniques have been developed and refined for controlling different insects. Biological control is an important component of IPM affording sustainable control of pests without environmental hazards. *Canthecona furcellata* Wolff. is an important predator on several important insect-pests. The present study was undertaken to determine the duration of nymphal period, adult period and fecundity of the female against the insect population in poplar nurseries and plantations.

MATERIALS AND METHODS

The experiment was conducted in Biological control laboratory, Department of Entomology, G. B. Pant University of Agriculture and Technology, Pantnagar during August to November 2010. Regular culture of *Clostera fulgurita* Walk was maintained in the laboratory in 5 litre glass jars with fresh leaves of poplar. Adult predatory bugs, *Canthecona furcellata* were collected from poplar plants. The bugs were

kept in plastic jars (One litre capacity) and provided with sufficient disease-free larvae of *C. fulgurita* as regular food along with poplar leaves. Jars were covered with sieve cap for aeration. The female bugs laid eggs on the leaves. The eggs were collected from poplar leaves and kept in plastic vials (10 x 4 cm) with sieve cap for hatching. One newly hatched first instar nymph was provided with first instar larvae of *C. fulgurita* in a vial (10 x 4 cm). The experiment was replicated ten times with the larvae of *C. fulgurita* as regular food along with fresh poplar leaves. The food (larvae and leaves) was changed and nymph was transferred into other vial (10 x 4 cm) daily. Observations of moulting were recorded daily to observe the duration of different nymphal instars. The moulting of nymphal instars were clearly observed with moulted nymphal body and exuviae were seen through naked eyes. Nymphs of *C. furcellata* were kept individually in plastic vials (15 x 5 cm) and were provided with sufficient number of defoliators larvae of different instars along with poplar leaves. Individual predatory nymphs of different instars were recorded daily. After 4 to 5 days after the emergence of adults, male and female were kept in 15 x 5 cm plastic vials with sieve cap along with sufficient food (*Clostera* spp. larvae). The female was bigger than male. After copulation the male and female were separated. The female was left for egg laying with sufficient larvae of *Clostera* along with fresh poplar leaves. The male was left for life spent with larvae of poplar defoliators. The newly formed predatory bug adults were utilized for studying pre-copulation, copulation period, pre-oviposition period, oviposition period, fecundity, adult longevity and sex ratio.

RESULTS AND DISCUSSION

Eggs

The eggs of *C. furcellata* wolff were laid on the upper surface of leaves in small patches arranged in 4-8 rows. Unmated female laid eggs singly here and there but hatching could not occur. Freshly laid eggs were vertical, round with spines, milky white in colour and in later stages the upper portion turned silvery in colour. At the time of hatching, eggs were reddish brown in colour. The incubation period varied from 7-9 days with an average being 7.7 days. This is in contrast to the earlier reported incubation period which ranged from 4-8 days in the same species (Ahmad *et al.*, 1996).

Nymphal stages

The newly hatched first instar nymphs emerged from the dorsal surface of the eggs removing the upper lid. First instar nymphs were reddish with yellow colour which slowly turned into black and red. Small nymphs were gregarious in nature. They were found to feed on the first and second instar larvae of *C. fulgurita*. They had three pair of legs. The first instar nymph of *C. furcellata* lasted over a period ranging from 2-3 days with an average of 2.2 days. The second instar nymph was light red in colour. They were found to feed on the first and the second instar of *C. fulgurita* walk. Second instar nymphs were gregarious in nature. The second instar nymphs lasted for a period of 2 to 3 days, with an average of 2.5 days.

Third instar nymphs were bigger and dark reddish in colour. They feed mostly on second and onward instar larvae of *C. fulgurita*. The third instar nymphal period varied from 2-3 days with an average of 2.4 days. Newly moulted fourth instar nymphs were initially light red in colour, later changed to dark red with some white lining on dorsal side. Fourth instar nymphs fed on third and onward instar larvae of *Clostera*. Fourth instar nymph lasted for a period of 2-3 days with an average of 2.1 days. Fourth instar nymphs were solitary in nature. The colour of fifth instar nymph was dark reddish black with some white lining on dorsal side. They are solitary in nature. Fifth instar nymphs fed mostly third and fourth instar larvae of *Clostera*. They have longer duration than other instar nymphs. The nymphal period varied from 4 to 6 days with an average 4.9 days. Ahmad *et al.* (1996) reported that fifth instar nymph ranged from 2 to 5 days, which is more or less similar to these reports. The total nymphal period of *C. furcellata* ranged from 13 to 16 days with an average of 14.1 days.

Adult

Young adults were yellowish in colour and later on changed to dark brown with shining scutellum having lateral yellow spots near the thoracic margin, with the lateral angles of the

pronotum spine (Shrivastava *et al.*, 1987). For predation of the host larvae, adults of *Canthecona* approached the back side of the host larvae and placed their long rostrum inside the dedicated body of the larvae. The male bugs were more active than female. The average ratio of male and female with an average was 1: 0.88. In captivity, the adult longevity of male and female ranged from 10-22 days and 21-26 days with an average of 16.8 and 24.7 days respectively. The period from egg laying to complete life cycle of an adult varied from 32-43 day and 43-50 days with an average of 38.6 and 46.5 days in male and female, respectively. These observations were more or less in accordance with the studies made by Ahmad *et al.* (1996), who reported that complete life cycle to be completed in 58.26 days.

Reproduction

After emergence the predatory bug did not copulate immediately. The pre-copulation period varied from 4-6 days, the mean pre-copulation period being 4.9 days. Male adults responded to the female call and moved slowly with vibrating wings. Male adults climbed over on the female with vibrating wings. Then both sexes remained stationary in opposite direction in end-to-end position. Generally, female mated only once in her life. But, some time mating occurred twice or thrice. The copulation period varied from 9.58 to 13.52 hours with an average of 12.40 hours in laboratory conditions.

The female oviposited after some time of the copulation. The pre-oviposition period varied from 0.92 to 1.06 days, the mean pre-oviposition period was one day. In the field conditions, the eggs were laid on the lower and upper surface of leaves. In laboratory condition, the eggs were laid on paper or leaves or walls of the jars. The eggs were laid in small batches arranged in 4-8 rows. The oviposition period varied from 10 to 19 days with an average being 15.0 days. The egg laying capacity of the female ranged from 130-392 eggs/female during her life with an average being 317.6 eggs/female. These findings are in accordance with the earlier report made by Ahmad *et al.* (1996), who observed that 128-367 eggs were laid by single female. In the present investigation, the number of eggs laid by a single female was higher. This indicates that the fecundity of the female depends upon several environmental factors.

The nymph and adult period of *C. furcellata* was of longer duration. So they can prey upon more larvae, pupae and adults of the host. The predatory bug *C. furcellata* also has more egg laying capacity for building up the population and can easily be reared in the laboratory on the larvae of *Clostera fulgurita* Walk and other insects.

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S. N. Ray*, **M. A. Khan.**

Department of Entomology, G. B. Pant University of Agriculture & Technology, Pantnagar – 263 145, India.

* Present address: Department of Entomology, Bihar Agricultural College, Sabour, Bhagalpur, Bihar – 813 210, India. E-mail: drsnray@rediffmail.com

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