



Biology of anthocorid predator, *Blaptostethus pallescens* Poppius (Heteroptera: Anthocoridae)

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ABSTRACT: Biology of anthocorid predator *Blaptostethus pallescens* Poppius was studied on eggs of alternate host *Corcyra cephalonica* (Stainton). Eggs of *B. pallescens*, thrust within the plant tissue, hatched after a mean incubation period of 5.78 days. Nymphs, when reared on UV sterilized eggs of *C. cephalonica* under ambient conditions, developed normally with five instars, each having a mean duration of 2.63, 1.92, 2.01, 2.50 and 5.10 days, respectively. Females laid eggs after a pre-oviposition period of 4.2 days. Average fecundity of bugs was 134.04 eggs. Mean longevity of females was found to be higher (52.03 days) than that of males (40.18 days). © 2020 Association for Advancement of Entomology

KEYWORDS: Bug, *Blaptostethus pallescens*, *Corcyra cephalonica*, life history

Minute pirate bugs belonging to the family Anthocoridae are found in all zoogeographical regions of the world and are perceived as potential biocontrol agents of arthropod pests. They are predacious on small lepidopteran larvae, mites, aphids, thrips, psocids, and storage pests. Natural populations of anthocorid bugs have been successful in maintaining the pest infestations to a low level and hence, remain the most sought-after natural enemies for pest management across several countries like France, the United Kingdom, the Netherlands and Germany (Ballal and Yamada, 2016).

The anthocorid bug, *Blaptostethus pallescens* Poppius (Hemiptera: Anthocoridae) has been reported as a promising biocontrol agent of spider mites (Ballal *et al.*, 2009) and other arthropods of significance, especially under protected cultivation.

This makes them an attractive proposition for pest management in polyhouses of Kerala, with over 600 polyhouses growing high value crops like salad cucumber and capsicum. However, information regarding the biology of the bug under Kerala conditions is non-existent. Hence a study was conducted to investigate the biology of *B. pallescens* on eggs of factitious host, *Corcyra cephalonica* as a preliminary step for assessing its potential against soft bodied insects.

The biology of the anthocorid bug was studied at 28 ± 2 °C and 70% RH in the AICRP on BCCP, College of Horticulture, Vellanikkara during September - December, 2018. The culture of *B. pallescens* was obtained from National Bureau of Agricultural Insect Resources, Bengaluru and were multiplied on eggs of rice meal moth (*C. cephalonica*) as per the procedure described by Ballal *et al.* (2003).

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Adults of uniform age were provided with pieces of bean pods as ovipositional substrate. The bean pods with eggs laid on them were collected after 24 h and were transferred to a separate plastic box with tissue paper lining and observed daily for hatching. Freshly emerged nymphs (0-24 h old) were transferred singly into individual glass vials of 5 ml capacity using a fine camel hair brush. Nymphs were provided with an adequate supply of UV sterilized *C. cephalonica* eggs. A thin piece of paper strip was provided inside each glass vial to facilitate movement of the nymph. A total of 115 nymphs were maintained in this fashion. The vials were observed daily under stereo microscope (30X) till adulthood to record total developmental period. Newly emerged 0-24h old male and female bugs were formed into 50 pairs. Each pair was then transferred to 35 ml test tubes (10 cm height x 9 cm diameter) and were given UV sterilized rice meal moth eggs as feed and sections of bean pods for oviposition. The bean pods were replaced daily. The number of eggs laid each day were counted under stereo microscope (30X). Longevity of males and females were also recorded.

Duration of life stages of *B. pallelescens*

Life cycle of *B. pallelescens* constituted of three different developmental stages namely, egg, nymph and adult. Duration of different developmental stages of *B. pallelescens* recorded during the study is presented in table 1.

Eggs were bottle shaped and inserted singly into the tissue of bean pods with only the operculum visible outside. In a few instances, eggs were also laid among the cotton strands. Newly laid eggs were creamy white but later turned pink. Mean incubation period was found to be 5.782 ± 0.131 days. The nymphs emerged through the operculum, which opened like a lid.

Nymphal stage consisted of five instars.

The first instar nymphs, upon hatching, were pale to slightly pink in colour with dark red eyes. The duration of first instar ranged from 2 to 5 days, with an average of 2.636 ± 0.057 days.

The second instar nymphs were uniformly pink in colour. The duration of second instar ranged from

1 to 3 days, with an average of 1.926 ± 0.041 days. Second instar nymphs had the shortest stadium.

The third instar nymphs were uniform reddish and were darker in colour than the second instar. Wing pads were visible. Duration of third instar ranged from 1 to 3 days with an average of 2.018 ± 0.022 days.

The dark reddish brown fourth instar nymphs had well developed wing pads. Duration of fourth instar ranged from 2 to 5 days with an average of 2.500 ± 0.060 days.

The fifth instar nymphs were reddish black in colour with well-developed wing pads. They had the longest duration that ranged from 4 to 7 days with a mean value of 5.102 ± 0.051 days.

Fifth instar nymphs moulted to adults. Adults were black in colour with functional wings. Sexual dimorphism was evident in *B. pallelescens*. Females were larger in size than males and had broader abdomen with ventral copulatory tubes. The abdomen was narrow with a slight kink towards the left side in case of males. Mean longevity of females at 52.03 ± 1.336 days, was greater than that of males with a corresponding value 40.18 ± 1.163 days.

The findings of the present investigations on duration of developmental stages are in agreement with those of similar studies previously reported. Sobhy *et al.* (2014), for instance, had reported a mean incubation period of 5.53 days at 25 °C. However, Ballal *et al.* (2003) had observed the mean incubation period of *B. pallelescens* to be 4.5 when reared on *C. cephalonica* eggs. The higher mean incubation period observed in the present study could have been due to differences in ambient conditions under which the study was conducted. Observations by Sobhy *et al.* (2014), who reported that the developmental time of *B. pallelescens* was significantly shorter at higher temperatures supports the above conclusion.

Shorter incubation period for *B. pallelescens* eggs has also been reported on other hosts such as *Sitotroga cerealella* (4.6 days) by Gupta *et al.* (2018) and on *Oligonychus coffeae* (4.4 days) by Srikumar *et al.* (2017).

Table 1. Duration of life stages of *Blaptostethus pallescens* on *Corcyra cephalonica* eggs

Life stage	Mean days \pm SE	Range
Egg*	5.782 \pm 0.131	4-15
Nymph**		
First instar	2.636 \pm 0.057	2-5
Second instar	1.926 \pm 0.041	1-3
Third instar	2.018 \pm 0.022	1-3
Fourth instar	2.500 \pm 0.060	2-5
Fifth instar	5.102 \pm 0.051	4-7
Total nymphal period	13.46 \pm 0.104	13-23
Adult***		
Male	40.18 \pm 1.163	25-63
Female	52.03 \pm 1.336	34-70

* Mean of 234 observations **Mean of 115 observations ***Mean of 50 observations

The mean larval duration of 13.46 observed in the present study broadly agreed with those of previous reports. Tawfik and El- Husseini (1971), who reared *B. pallescens* on different prey like lepidopterous larvae, aphids and mites, reported that the bug had five nymphal instars with duration of 2-6, 2-3, 2-3, 2-4 and 4-6 days. However there are reports on longer nymphal period. Devi (2012) also recorded mean nymphal duration of *B. pallescens* to be 18.3 days, while, Ballal *et al.* (2003) had reported a shorter duration of 16.3 days on eggs of *Corcyra cephalonica*.

The mean adult longevity of 40.18 and 52.03 days for males and females respectively, are identical to the average longevity of 42.4 and 58.2 days for males and females respectively, reported by Ballal *et al.* (2003), who also reared the bugs on eggs of *C. cephalonica*. Several studies have also reported adult longevity values that vary from the above findings, albeit on different hosts. Thus, Gupta *et al.* (2018) reported a mean longevity of 47.4 and 31.25 days respectively for females and males of *B. pallescens* on *Sitotroga cerealella*. Srikumar *et al.* (2017), however, reported a much lower longevity of 33.57 and 28.01 days for females and males of the bug respectively when reared on

tea mite, *O. coffeae*. It is apparent that the above variations could be due to the differences in the hosts on which the bugs were reared.

Reproductive biology of *Blaptostethus pallescens*

Post mating, females laid eggs after a mean pre-oviposition period of 4.2 ± 0.164 days. Egg laying continued for an average of 39.42 ± 1.029 days and was followed by a mean post oviposition period of 8.64 ± 0.807 days. Number of eggs laid per day ranged from 0 to 15.

The adults readily mated when paired. Female bugs laid eggs after a mean pre-oviposition period of 4.2 days which was identical to the 4.1 days was reported by Devi (2012) as well as the 4.05 days at 25 °C by Sobhy *et al.* (2014).

After the pre oviposition period, egg laying continued for an average of 39.42 ± 1.029 days. Oviposition period was followed by a mean post oviposition period of 8.64 ± 0.807 days.

The observations on oviposition and post oviposition periods of *B. pallescens* females showed wide variation with the previous reports. Both values were greater than the oviposition period of 20.92

(at 25 °C) days and post oviposition period of 4.45 reported by Sobhy *et al.* (2014) as well as the 12.0 and 1.7 days respectively, reported by Devi (2012).

Fecundity

Adult females of *B. pallescens*, on an average, laid 134.04 eggs within a range of 99-211 in its lifetime. This is comparable with the mean production of 143 nymphs reported by Ballal *et al.* (2003) as well as 136 nymphs reported by Srikumar *et al.* (2017). However, a number of studies have reported substantially lower fecundity when the bug was reared on different hosts. For instance, Tawfik and El- Husseini (1971) recorded considerable variation in fecundity, with values of 78, 13.2 and 5.7 eggs when the bugs were fed with lepidopteran larvae, aphids and mites respectively. Devi (2012) recorded an average fecundity of 53.0 eggs on *C. cephalonica* while Gupta *et al.* (2018) noted that a female bug on an average laid 91.25 eggs when reared on another lepidopteran, *S. cerealella*. El- Basha (2016) observed that the mean fecundity of *B. pallescens* varied significantly based on the crop on which the host (*T. urticae*) was reared. Total lifetime fecundities observed on bean, brinjal, pepper and cucumber were 70.0, 54.3, 48.0 and 22.9 eggs respectively.

Sex ratio

B. pallescens exhibited a female biased sex ratio of 1.276: 1. Several authors like Tawfik and El-Husseini (1971), Ballal *et al.* (2003), and Srikumar *et al.* (2017) have reported identical female: male ratio of 1.2: 1. Devi (2012) recorded a sex ratio of 1.1:1 while Gupta *et al.* (2018) documented a ratio of 1.44:1 and 1.5:1 when reared on *Sitotroga cerealella* and *Corcyra cephalonica* eggs respectively. The findings of present study broadly agree with the previous reports.

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