



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2021; 9(5): 430-432

© 2021 JEZS

Received: 17-06-2021

Accepted: 05-08-2021

N Saikia

Department of Sericulture,
Assam Agricultural University,
Jorhat, Assam, India

RB Dutta

Assistant Professor,
(Entomology) College of
Sericulture, Assam Agricultural
University, Jorhat, Assam, India

D Hatibaruah

Department of Sericulture,
Assam Agricultural University,
Jorhat, Assam, India

Corresponding Author:**N Saikia**

Department of Sericulture,
Assam Agricultural University,
Jorhat, Assam, India

Bionomics of predatory butterfly, apefly (*Spalgis epius*) (Lepidoptera: Lycaenidae) on mealybug, *Paracoccus marginatus* (Hemiptera: Pseudococcidae) in Mulberry

N Saikia, RB Dutta and D Hatibaruah

DOI: <https://doi.org/10.22271/j.ento.2021.v9.i5f.8861>

Abstract

Apefly, *Spalgis epius* (Westwood) (Lepidoptera: Lycaenidae) is a small phytophagous butterfly. The larvae feed on the bugs of Pseudococcidae, Hemiptera. In the present study, the development of immature stages and life cycle of this predatory butterfly was observed on *Paracoccus marginatus* (Williams and Granara de Willink) (Hemiptera: Pseudococcidae) in mulberry under laboratory conditions. The collected eggs have been stored in the laboratory at 40-80% Relative Humidity and 25-30 °C. The eggs had been disk-shaped and greenish-blue in colour, sculptured and each top and bottom compacted with micropylar despair withinside the top and hatched in 3.2 ± 0.15 days. It beneath is going 4 larval instars and the entire larval duration lasts 12.99 ± 0.01 days. The top surface of the larval body turned completely evolved with a wax coating. The mold on the hard dorsal side of the pupa resembled the face of a monkey structure. The prepupal larva reduced in size and the surface of the body turned dull black colour. The duration of the pupal period was recorded as 10.07 ± 0.03 days. The overall duration from egg to adult emergence was observed as 30.64 ± 0.31 days. In adults, the patch is larger in females than that in males. The information of the development and life cycle of *S. epius* on natural/ factitious hosts on numerous crops is advantageous to develop and standardize the mass culturing techniques for exploration of this capability species for predation of mealybugs.

Keywords: Lycaenidae, mass culturing, monkey, predator

Introduction

Butterflies are a taxonomically well-studied group, which have received a reasonable amount of attention throughout the world and around 18,000 species of butterflies are estimated to be there in the world and India alone has recorded 1,501 species (Kehimkar, 2008) [11]. The larva of the Apefly, *Spalgis epius* (Westwood) (Lepidoptera: Lycaenidae, Miletinae) a hemipterophagous butterfly were found feeding on eggs, nymphs and adults of papaya mealybug, *S. epius* is a member of the entirely entomophagous lycaenid subfamily Miletinae, most species of which feed on Hemiptera (Perice *et al.*, 2002) [15]. Several species of mealybugs are serious pests of economically important crops worldwide (Browning 1992 and Franco *et al.*, 2001) [6, 3]. In the Indian region, the larva of *S. epius* has been reported as a possible predator of *Maconellicoccus hirsutus* in mulberry gardens (Gowda *et al.*, 1996; Mani, 1995 and Rahiman and Vijayalakshmi, 1998) [12, 8, 16]. Near the mealybug colony, *Spalgis epius* lays its eggs, after hatching the caterpillar of *Spalgis epius* proceed into the colony to cater on the mealybugs. The caterpillar camouflage itself by covering its back with the skins of mealybug after cater on them. The pupa of *Spalgis epius* has a remarkable similarity to the monkey face structure (Singh, 2011) [17]. Though, the biology of Apefly was studied on the same host on other crops like Cassava (*Manihot esculenta* Crantz), Plumeria (*Plumeria sp.*), papaya (*Carica papaya* L.) and Hibiscus (*Hibiscus rosa Sinensis* L.) (Walker *et al.*, 2006) [21]. An attempt was made to study the life cycle and development of the potential predatory butterfly on mealybug, *Paracoccus marginatus* in mulberry plantations to use the knowledge gained in the mass reproduction of this butterfly for further inquiry.

Materials and Methods

The present study was carried out in the Department of Sericulture, Assam Agricultural University from December 2018 to November 2019.

The mealybug, *Paracoccus marginatus* infected mulberry plants growing in the field of Department of Sericulture, Assam Agricultural University, Regional Sericulture Research Station, Central Silk Board, Jamuguri and Govt. Sericulture Farm, Titabar of Jorhat district were thoroughly surveyed and the *Spalgis epius* was collected by using a camel hairbrush to produce a laboratory culture and allowed to lay eggs on mealybug raised on cocoa fruit. The *Paracoccus marginatus* was identified by its elongate oval body, slightly flattened dorsoventrally covered with mealy wax, not thick enough to hide the yellow body, light yellow legs, no bare areas on the dorsum, and ovisacs on the ventral surface with 15 to 17 lateral wax filaments, the posterior pair of filaments being noticeably longer (Miller and Miller, 2002) [13].

S. epius eggs were collected from the host insect and stored individually in 4.5 cm diameter petri dishes with stages of mealybugs in the current investigation. Every day, the petri dishes were checked for larval eclosion. The caterpillar developed in the petri dishes was daily cleaned and the faecal matter and remains of dead mealybug stages were removed. *S. epius* larvae were fed fresh mealybug stages on a daily basis. The moulting stage of *S. epius* larvae was observed to arrive at the larval stadia, and the growth of the larvae was monitored. The number of larval instars, prepupa, pupal stage, and adult development phase, as well as the number of instars in a life cycle, were all carefully observed. Micrometric techniques were used to measure the egg and each stage of the larva, including the 1st instar, 2nd instar, 3rd instar, 4th instar, prepupa, and pupa. Under laboratory settings, three pairs of mature *S. epius* butterflies were reared in each cage. Three males and three females who emerged in the lab were released into wooden cages measuring 30 x 30 x 30 cm to test their longevity. Three different types of mealybug infested mulberry were hung inside the cage for the butterflies to lay eggs or feed on the mealybugs' honeydew. The mortality of butterflies in the cages was monitored on a daily basis. To feed the butterflies, one-centimetre cotton balls soaked in a 1:1 honey: water solution was strung within the cage. The mealybug culture was kept at 25-30°C and 40-80% relative humidity in the lab. The results of the laboratory tests were statistically analysed using the Standard Error Method (Gomez and Gomez, 1984) [7].

Results and Discussion

The results of the development and life cycle of *S. epius* on Mealybug in mulberry in laboratory condition are furnished below.

Egg

Before hatching as neonate larvae, the egg colour was greenish-blue and then turned whitish. It was disc-shaped, sculpted, and compacted on both the top and bottom, with micropylar despair on the top. The eggs hatched in 3.2±0.15 days under laboratory conditions (Table 1). The findings are consistent with those of Hall *et al.*, (2007) [9], who observed that *S. epius* eggs were disc-shaped, greenish-blue in colour, and sculptured. Minno *et al.*, (2005) [14] discovered that the egg of *Fonseca tarquinius*, a predatory Lycaenidae, was also greenish-white and spherical with faint sculpturing.

First instar Larva

The larval body was creamy white at this stage, with a dark brown head bordered with fine white setae. The larvae in the first stage lived for 2.80±0.15 days (Table 1). The initial instar

stage lasted 2.77±0.01 days. According to Venkatesha *et al.*, (2004) [19], the surface of the larval body of *S. epius* was covered in a white wax covering that was hidden by a mound of mealy bugs. Furthermore, Dinesh and Venkatesha (2012) [5] found a substantial negative association between the population of *S. epius* and temperature, indicating that the population of *S. epius* drops as the temperature rises.

Second instar larva

The larval head turns a dark brown colour, and the body appears grey with white and a white wax covering the mid-dorsal area. The average duration of the 2nd instar larva was 3.47±0.01 days.

Third instar larva

The dorsal line was covered with a thick wax coating. The average duration of the 3rd instar larva was 3.37±0.01 days.

Fourth instar larva

This stage's larva was shorter and had more setae than the third instar. The average duration of the 4th instar larva was 3.38±0.01 days. The size of *S. epius* four larval instars is similar to that of other Lycaenidae species such as *Paralucia pyrodiscus* (Braby, 1990) [2] and *Lycaeides melissa* Samuelis (Herms *et al.*, 1996) [10]. The duration of this stage was found to be 3.80±0.07 days on average.

Pupa

The pupal stage seems to be naked, with a smooth surface. It had the appearance of a monkey's face. Light brown and whitish-grey were found on the dorsal and lateral surfaces. The mould on the pupa's hard dorsal side view resembled a monkey's face. The pupa's dorsal side was found to be clear, with dots of eyes, nose, and cheeks gradually darkening as it developed. According to Hall *et al.*, (2007) [9] the unique monkey-faced pupa of *S. epius* was comparable to that of *Fonseca tarquinius*. Balduf (1939) [1] thought the monkey-faced look of some lycaenid pupa was a form of defence, but he didn't explain why. The findings are consistent with those of Dinesh *et al.*, (2010) [4], who found that the *S. epius* cycle took 23.80±1.50 days to complete, with a mean maximum temperature of 29.00±1.80°C, a mean minimum temperature of 26.50±1.40°C, and a mean relative humidity of 44.40±6.70 per cent. Thangamalar *et al.*, (2010) [18] estimated the combined duration of the *S. epius* larval and pupal phases to be 14.83±0.44 days, while Dinesh *et al.*, (2010) [4] estimated it to be 19.8±1.39 days.

Total period of development

From egg to adult emergence, the average total development period was 33.85±0.33 days (Table 1). The findings are consistent with those of Vinod Kumar *et al.*, (2006) [20], who found that the *S. epius* mean total developmental period from egg to adult was 29.86±0.59 days was also studied in the laboratory condition using the mealybug, *Planococcus citri* reared on pumpkins.

Adult

The adult *S. epius* lacked a tail on its hind wings. A delicate tiny butterfly with a grey underside and several thin vertical wavy patterns. Both sexes have a brown upper forewing with a diffuse or well-defined discal patch near the terminal cell. Male forewings have a sharp apex and straight termen, but female forewings have a round apex and termen. The male

forewing has a prominent little quadrate mark near the cell's end, whereas the female forewing has a bigger quadrate spot. The discal patch on the male marking was tiny in size and had crisp characteristics. The discal patch on the female was a dull white colour and was larger. When the butterfly wings were held against a bright light source, the white patch on the females' wings was more visible.

Table 1: Developmental period of different stages of *Spalgis epius*

Stages	Mean	SEm(±)(Days)
Egg	3.2	±0.15
1 st instar	2.77	± 0.01
2 nd instar	3.47	± 0.01
3 rd instar	3.37	± 0.01
4 th instar	3.38	± 0.01
Total larval period	12.99	± 0.01
Pupa	10.07	± 0.03
Total period of development	33.85	±0.33

5 observations with 3 numbers of larvae per plate

Conclusion

The average total developmental period of *S. epius* on *P. marginatus* in mulberry from egg to adult was 33.85 days, according to the findings. The egg was greenish and sculpted into a disc form. The larva's body was covered in a thick layer of white wax, and the pupa's face resembled that of a monkey. The ability to understand the life cycle of *S. epius* on factitious/natural hosts on various crops would aid in the development and standardisation of mass culturing procedures for the study of this prospective species in biocontrol programmes and Integrated Pest Management.

References

- Balduf WV. The Bionomics of Entomophagous Insects. Part II, Swift, St. Louis 1939.
- Braby MF. The life history and biology of *Paralucia pyrodiscus lucida* Crosby (Lepidoptera: Lycaenidae). Journal of Australian Entomological Society 1990;29:41-50.
- Browning HW. Overview of Biological Control of Homopterous Pests in the Caribbean. The Florida Entomologist 1992;75:440-446.
- Dinesh AS, Venkatesha MG. Effect of temperature on the life history and demographic parameters of *Spalgis epius* (Westwood) (Lepidoptera: Lycaenidae), a candidate biological control agent mealybug (Hemiptera: Pseudococcidae). Biocontrol Science and Technology 2012;22:1351-1361.
- Dinesh AS, Venkatesha MG, Ramakarishna S. Development, life history characteristic and behaviour of mealybug predator, *Spalgis epius* (Westwood) (Lepidoptera: Lycaenidae) on *Planococcus citri* (Risso) (Homoptera: Pseudococcidae). Journal of Pest Science 2010;83:339-345.
- Franco JC, Gross S, Carvalho CJ, Blumberg D, Mendel Z. The Citrus Mealybug in Citrus Groves in Israel, Portugal and California: Fruit Injury and Biological Control as Related to Seasonal Activity. Phytoparasitica 2001;29:86.
- Gomez KA, Gomez AA. Statistical procedures for agriculture research (2nd edition). John Wiley and Sons, New York 1984.
- Gowda DKS, Manjunath D, Datta RK, Kumar P. *Spalgis epius* Westwood (Lepidoptera: Lycaenidae) a potential predator of mulberry mealybug, *Maconellicoccus hirsutus*. Insect Environment 1996;2:87-88.
- Hall DW, Minno M, Butler JF. Harvester butterfly, *Feniseca tarquinius* (Fabricius) (Insecta:Lepidoptera: Lycaenidae: Melitinae). In: University of Florida IFAS extension. Available via 2007. <http://creatures.ifas.ufl.edu>. Accessed 10th June 2018.
- Herms CP, Cullough DG, Miller DL, Bauer LS, Haack, RA. Laboratory rearing of *Lycaeides melissa samuelis* (Lepidoptera: Lycaenidae), an endangered butterfly in Michigan. The Great Lakes Entomologist 1996;29:63-75.
- Kehimkar I. The Book of Indian Butterflies. Bombay Natural History Society, Newyork 2008.
- Mani M. Studies on the natural enemies of oriental mealybug, *Planococcus lilacinus* (CKII.) (Homoptera: Pseudococcidae) in India. Journal of Entomological Research 1995;19:61-70.
- Miller DR, Miller GL. Redescription of *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Coccoidea: Pseudococcidae), including descriptions of the immature stages and adult male. Proceedings of the Entomological Society of Washington 2002;104:1-23.
- Minno MC, Butler JF, Hall DW. Florida butterfly caterpillar and their host plants. University Press of Florida. Gainesville, Florida 2005, 341.
- Perice NE, Braby M, Heath A, Lohman DJ, Mathew J, Rand DB, et al. The ecology and evolution of ant association in the Lycaenidae(Lepidoptera). Annual Review of Entomology 2002;47:733-771.
- Rahiman AP, Vijayalakshmi CK. *Spalgis epius* Westwood (Lepidoptera: Lycaenidae) A potential predator of coffee mealy bugs. Journal of Entomological Research 1998;22:191-192.
- Singh AP. Butterflies of India. Om books International, Uttar Pradesh 2011.
- Thangamar A, Subramanian S, Mahalingam CA. Bionomics of papaya mealybug, *Paracoccus marginatus* and its predator *Spalgis epius* in mulberry ecosystem. Karnataka Journal of Agricultural Science 2010;23:39-41.
- Venkatesha MG, Shashikumar L, Gayathri Devi SS. Protective devices of the Carnivorous butterfly, *Spalgis epius* (Westwood) (Lepidoptera: Lycaenidae). Current Science 2004;87:571-572.
- Vinod Kumar PK, Vasudev V, Seetharama HG, Irulandi S, Sreedharan K. Biology and biometry of the Lycaenid predator, *Spalgis epius*. Journal of Coffee Research 2006;34(1&2):72-104.
- Walker A, Hoy M, Meyerdirk DE. Papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink (Insecta: Hemiptera: Pseudococcidae). Featured Creatures. Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida, Gainesville, FL 2006.