

Biology of *Sylepta derogata* (Fabricius, 1775) (Lepidoptera: Crambidae) on *Urena lobata* L.

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Abstract

Sylepta derogata (Fabricius), a defoliating pest in the family Crambidae, is known for its affinity toward Malvaceae hosts. This study investigates the biology of *S. derogata* on *Urena lobata*, a common wild and medicinal plant. Observations on life cycle stages, developmental duration, fecundity, and feeding behavior were made under controlled laboratory conditions. The study revealed that the female moth laid 200-300 eggs. The eggs hatched after an incubation period of 3.55 ± 0.55 days. The first instar larva measured 3.95 ± 0.77 mm in length and 0.28 ± 0.03 mm in width with mean duration of 3.4 ± 0.41 days. The second instar larva measured 9.34 ± 0.96 mm in length and 0.41 ± 0.08 mm in width with duration of 3.7 ± 0.96 days, whereas, the third instar larva measured 15.64 ± 0.12 mm in length and 1.06 ± 0.05 mm in width with longevity of 4.61 ± 0.84 days. The fourth instar larva measured 19.21 ± 0.48 mm in length and 1.29 ± 0.06 mm in width with duration of 3.41 ± 0.46 days, while the fifth instar larva measured 21.54 ± 1.55 mm in length and 1.94 ± 0.04 mm wide with duration of 2.61 ± 0.6 days. The prepupa was 17.10 ± 0.51 mm in length and 1.86 ± 0.06 mm in width with duration of 1.3 ± 0.4 days. The pupa was 16.4 ± 0.51 mm long and 2.52 ± 0.53 mm wide with duration of 8.5 ± 1.23 days. Pre-oviposition, oviposition, and post-oviposition period was recorded 2.65 ± 0.85 , 2 ± 0.01 , and 1.89 ± 0.54 days respectively. Male and female survived for 4.50 ± 0.23 and 5.81 ± 0.21 days respectively. The life cycle was completed in 31.08 ± 5.47 days.

Keywords: *Sylepta derogata*, *Urena lobata* L., India

Introduction

Sylepta derogata, or *Haritalodes derogata*, the cotton leaf roller or okra leaf roller, is a moth of the family Crambidae. It was described by Johan Christian Fabricius in 1775. It is widely distributed in Comoros, the Democratic Republic of the Congo, Ghana, Mali, Réunion, Madagascar, the Seychelles, South Africa, the Gambia, Australia, Fiji, Papua New Guinea, Samoa, the Solomon Islands, the Andaman Islands, Bali, India, Sri Lanka, Malaysia, Myanmar, Singapore, Vietnam, Bangladesh, Burma, China, and Japan (Prins and Prins, 2018; Poltavsky *et al.*, 2018) [3, 12]. *Sylepta derogata* is serious pest of Cotton, Okra and *Hibiscus tiliaceus* (Nilanjan *et al.*, 2017). *S. derogata* Fab. rolls cotton leaves into conical structures and feeds on the edges, causing significant defoliation. The larvae use silk to hold their leaf cones together and to balloon to other leaves. High pest populations significantly reduce cotton production (Di JX *et al.*, 2007) [6]. *S. derogata* is a polyphagous pest that is active from September to November and attacks agricultural crops, ornamental plants and weeds like *Gossypium hirsutum*, *Abelmoschus esculentus*, *Hibiscus rosasinensis*, *Althaca rosea*, *Sida cordifolia*, *Malvastrum tricuspidatum* *Urena lobata* respectively, and other plants of the family Malvaceae. In present study we have recorded it on *Urena lobata*.

Urena lobata L. is an annual weed from the Malvaceae family, known by various local names in different countries, including

Afulut Gad in the Philippines, China pink flowered Burr, Africain Jute, Kongojute in Germen, Bachita in India, Aguaxima in Brazil, Aramina or Cadillo in Spain, Ke hoa dao in Vietnam, and *Urena lopastnaia* in Russia. *Urena lobata*, also known as aramina fiber, Caesar weed Congo jute or hibiscus burr is a shrub in the Malvaceae family widely distributed throughout India. It is used by traditional healers for ailments like arthritis, diabetes, cough, and malaria (Islam and Uddin, 2017; Dinesh Kumar *et al.*, 2020) [8, 4]. It is abundantly grown on roadsides and in agriculture fields in rural and urban areas and widely distributed throughout Saharanpur. This present study investigates the biology of *S. derogata*, focusing on its life cycle and feeding patterns. Very rare information is available about the presence of *S. derogata* on *Urena lobata*.

Materials and Methods

Field survey and study area

A field survey was conducted in Saharanpur, Uttar Pradesh, India from January to December 2022-2024 on agricultural farms, roadside areas, and abandoned lands where Caesar weed *Urena lobata* was grown abundantly. Saharanpur is known for its diverse flora and favorable climatic conditions for pest proliferation. During the field survey *Urena lobata* plants were found infested with lepidopteran insect larvae which were identified as *Sylepta darogata*.

Collection and rearing of *Sylepta derogata*

The collected (fresh leaves of *Urena lobata*) up to adults in glass jars. (25 ± 2 °C and R.H. $70\pm 5.0\%$) in the research laboratory of the Zoology Department, Maharaj Singh College, Saharanpur, U.P., India. During rearing the mouth of the jars was covered with muslin cloth to maintain the proper aeration in the jar. The larvae were fed daily on fresh and soft teak leaves till the pupation of larvae. During rearing, the old and half eaten teak leaves were removed daily to maintain the hygienic environment for the larvae. The larvae were fed up to final instar and waited for pupation. The pupae were picked from jars and identified as male and female by examining the position and distance between anal and genital slits under Dewinter Stereoscopic Zoom Microscope. Male and female pupae were kept in separate rearing jars for the emergence of adults.

For studying biology, four pairs of newly emerged adult males and females of *Sylepta derogata* were picked separately and released in two rearing glass jars for mating and egg laying containing fresh leaves of *U. lobata* and reared in a B.O.D.

incubator (25 ± 2 °C temp.) with relative humidity (RH- $70\pm 5\%$) up to two generations. A cotton swab soaked in 10% honey solution was placed in rearing jar to feed the adults.

Collection and analysis of data

The biological parameters such as the number of eggs, incubation period of eggs, pre oviposition period, duration of larval instars, total larval duration, prepupal period, pupal period, and longevity of adult males and females were recorded periodically. Photographs of the life stages of *S. derogata* were taken with the help of a digital camera and a Dewinter stereo zoom microscope. The mean values with standard deviation of the collected data such as durations of the life stages, fecundity of female and wing span of male and female were calculated using Microsoft Excel software.

Feeding behavior and damage assessment

Larval feeding rates were measured by assessing the leaf area consumed. The damage was categorized based on leaf area loss, and its impact on plant growth was analyzed.



Fig 1: Adult of *Sylepta derogata* (2) Pupae (3) Larva of *Sylepta derogata* (4) Host plant *Urena lobata* (5) Infected and rolled leaves of *Urena lobata*

Table 1: Morphometric observations and duration of the life stages of *Sylepta derogate* on *Urena lobata*

Life stages	Length (in mm)	Width (in mm)	Duration (in days)
Egg	0.45 ± 0.03	0.35 ± 0.03	3.55±0.55
First instar larva	3.95 ± 0.77	0.28 ± 0.03	3.4 ± 0.41
Second instar larva	9.34 ± 0.96	0.41 ± 0.08	3.7 ± 0.96
Third instar larva	15.64 ± 0.12	1.05 ± 0.05	4.61 ± 0.84
Fourth instar larva	19.21 ± 0.48	1.29 ± 0.06	3.41 ± 0.46
Fifth instar larva	21.54 ± 1.55	1.94 ± 0.04	2.61 ± 0.61
Pre pupa	17.10 ± 0.51	1.86 ± 0.06	1.3 ± 0.41
Pupa	16.4 ± 0.51	2.52 ± 0.53	8.5 ± 1.23
Male adults	12.6 ± 0.06	Wing span 25.5±0.13	4.50±0.23
Female adults	13.0±0.04	Wing span 27.4±0.16	5.81±0.21
Pre-oviposition period	-	-	2.65 + 0.85
Oviposition period	-	-	2±0.01
Post-oviposition period	-	-	1.89 ± 0.54
Total duration of larval stages	-	-	17.73±3.27
Total duration of life cycle from egg to adults	-	-	31.08±5.47

Results and Discussion

This study reports the first record of *S. derogata* on *Urena lobata* in Saharanpur Uttar Pradesh. The female moth laid 200-300 eggs singly or in groups on the ventral side of the leaves (Atwal and Dhaliwal, 2013) [1]. The eggs were oblong, minute flat oval, scale like or pale white in colour and laid singly on lower surface adjacent to the midrib. The color of the eggs became brown at the time of hatching (Shakya and Saxena 2016) [14]. The eggs were measured 0.45±0.03 mm in length and 0.35±0.03 mm in width with an incubation period of 3.55±0.55 days. Similarly, Shrivastava and Dhaliwal (2013) [1] and Sontakke (2015) [16]; Gahramanova, 2020 [7]; Navya *et al.* (2025) [9] also observed the 200-300 eggs on the under surface of the cotton, Okra, and *Hibiscus* leaves that hatched in 2-6 and 6 days, which is more or less similar to our findings.

Larvae

There are five larval instars in the life cycle of *S. derogate*. The Initial instars are creamy white. The early larval instars are gregarious and feed together on the ventral side of the leaves, whereas, the mature larvae were solitary and feed alone inside the rolled leaves. The larvae have a brown head, three pairs of thoracic legs and four pairs of prolegs. First instar larva was yellowish in colour having three pairs of thoracic legs and five pairs of abdominal prolegs. The first instar larva measured 3.95 ± 0.77 mm in length and 0.28 ± 0.03 mm in width with mean duration of 3.4 ± 0.41 days. The second instar larva measured 9.34 ± 0.96 mm in length and of 0.41 ± 0.08 mm in width with duration of 3.7 ± 0.96 days, whereas, the third instar larva measured 15.64 ± 0.12 mm in length and 1.06 ± 0.05 mm in width with longevity of 4.61 ± 0.84 days. The fourth instar larva measured 19.21 ± 0.48 mm in length and 1.29 ± 0.06 mm in width with duration of 3.41 ± 0.46 days, while the fifth instar larva measured 21.54 ± 1.55 mm in length and 1.94 ± 0.04 mm in width with duration of 2.61 ± 0.6 days. Total duration of larval period is 17.73±3.27 days. Sontakke *et al.*, (2015) [16] recorded the seven larval instars with a total duration of 9.8±0.24 days on Okra which is different from our results. While, Gahramanova, 2020 [7] and Navya *et al.* (2025) [9]

observed five larval instars with duration of 18.05±3.45 days on cotton and *Hibiscus Rosa sinensis* which are almost similar to our results. The Morphometric observations of the larval instars in our study are almost in accordance to the findings of Karpun (2022) [11] and Navya *et al.* (2025) [9] observed on *Hibiscus syriacus* and *Hibiscus Rosa sinensis*.

Prepupa and pupa

Prepupa is a non-feeding inactive stage in the life cycle of certain insects, occurring between the final feeding larval instar and the pupa. The prepupa of *S. derogata* was measured 17.10 ± 0.51 mm in length and 1.86 ± 0.06 mm in width with duration of 1.3 ± 0.4 days. The duration and morphometric observations of the prepupal stage are almost in accordance with the results of Sontakke *et al.*, (2015) [16], and Navya *et al.* (2025) [9] recorded on Okra and *Hibiscus Rosa sinensis*. At the end of the larval period the final instar larva stop feeding and undergo pupation. The pupation takes place either in rolled leaves or amongst the fallen plant debris in the soil. The pupa is generally reddish brown in colour. Pupation occurred on leaves or within leaf folds. The pupa was 16.4 ± 0.51 mm long and 2.52 ± 0.53 mm wide with duration of 8.5 ± 1.23 days. Similarly, Shrivastava and Dhaliwal (2013) [1]; Sontakke *et al.*, (2015) [16], Gahramanova *et al.*, (2020) [7], and Navya *et al.* (2025) [9] recorded the pupal period as 6-12, 7.60±0.24, 8-10, and 8.8±1.16 days on cotton, Okra, cotton and *Hibiscus Rosa sinensis* respectively.

Adults

Male adults are creamy white with yellowish-white wings having brown wavy markings and black spots on the head and thorax. Females are with light pale brownish-yellow body, olive green to pale brown circular spot, and pale smoky white hind wings with a broad blackish outer margin. The morphological characters of adults well corresponds to the description given by (Atwal and Dhaliwal, 2013; Kumar *et al.*, 2013; Sontakke *et al.* 2015; Karpun, 2022; Navya *et al.*, 2025) [1, 16, 11, 9]. Male and female were 12.6 ± 0.06, 13.0±0.04 mm long with a wing span of 25.5±0.13 and 27.4±0.16 mm respectively.

Similarly, Karpun (2022)^[11] recorded the body length of male and female 12.6 ± 0.05 and 13 ± 0.03 mm respectively with a wingspan of 25.6 ± 0.18 (σ) and 27.4 ± 0.14 (ϕ) mm on *Hibiscus syriacus*. While, Sontakke *et al.*, (2015)^[16] and Navya *et al.* (2025)^[9] observed the body length of adults approximately 12.5 mm, with a wingspan of around 25 mm. Head and thorax region have dotted black marking (Sontakke *et al.* 2015)^[16]. The male and female survived for 3.50 ± 0.23 and 5.30 ± 0.21 days. Sontakke *et al.*, (2015)^[16]; Gahramanova *et al.*, (2020)^[7]; Karpun (2022)^[11], and Navya *et al.* (2025)^[9] recorded the longevity of adults 3-5 (3.40 ± 0.24 σ), 5-6 (5.20 ± 0.20 ϕ), 6, 7-10, and 7 ± 1 days on Okra, cotton, *Hibiscus syriacus*, and *Hibiscus Rosa sinensis* respectively.

Life cycle

Sylepta derogata exhibits complete metamorphosis. There are four developmental stages in the life cycle of *S. derogata* viz. egg, larva, pupa, and adult. In our study, the pupal period was 8.5 ± 1.23 days. The life cycle of *S. derogata* is completed in 31.08 ± 5.47 days. Dhawan *et al.* (1979)^[2] recorded duration of larvae 19.25 days under laboratory conditions in Pakistan, with pupal period of 8-10 days, either within rolled leaves or under plant debris, and a total life cycle period of 31-42 days on cotton plants. Similarly, Dhindsa *et al.* (1980)^[5] observed the of duration of life cycle 32.97 days, whereas, Navya *et al.* (2025)^[9] recorded the pupal period of 8.8 days, with total life cycle duration of 35.05 days on Hibiscus plant, which support our results.

Feeding and Damage

S. derogata larvae fold the leaves into conical trumpets for shelter and feed on the epidermis and parenchyma, which reduces the plant's photosynthetic area. Severe infestations cause leaf yellowing and drying, potentially leading to complete plant desiccation if left untreated (Gahramanova *et al.*, 2020)^[7]; Navya *et al.* (2025)^[9].

Conclusion

The study concludes that *Sylepta derogata* is a polyphagous pest of the plants of family Malvaceae. *U. lobata* is a suitable alternate host for *S. derogata* which support population buildup during off-seasons. *Urena lobata* supports the complete life cycle of *Sylepta derogata* and may serve as a reservoir host in agroecosystems. The study has significant implications for integrated pest management (IPM), as unmanaged *U. lobata* populations near crop fields could act as reservoirs, leading to early-season infestations in cotton crops. Effective management of *U. lobata* around crop fields may help reduce early-season infestations of *S. derogata*. *S. derogata* is first time reported in district Saharanpur.

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