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# Life cycle of citrus butterfly (*Papilio demoleus* Linnaeus) and importance of butterflies' conservation in around Barshi from Solapur district (M.S) India

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## Abstract

The life cycle of the Citrus butterfly was studied under laboratory conditions on lemon leaf during the period of years 2023 to 2024. Egg masses are collected from lemon plants reared in laboratory conditions and observed regularly from the hatching to adulthood. Citrus butterfly larvae feed on lemons and curry leaves. The young female egg lays singly on tender twigs, the upper and lower surface of the leaf. The average developmental periods of citrus butterflies on lemon were 3–7 days (egg), 14–19 days (larva), 6–11 days (pupa) and 3–6 days (adult). The total life cycle was completed within 41 days under laboratory conditions. Butterflies are a diverse group of insects belonging to the order Lepidoptera. Butterflies play an important role in pollination. Butterflies' conservation is most important because butterflies have a vital role play in the ecosystem, butterflies and plants depend on each other for life. If the butterfly population declines, then it will directly affect the agriculture field. Butterflies need food in liquid form. There are many reasons for butterfly conservation, including aesthetic value, ecosystem value, educational value, economic value, intrinsic value, and scientific value. This paper deals with documenting the study of the life cycle of the Citrus butterfly from the Shri Shivaji Mahavidyalaya campus in Barshi, tahsil. (M.S) India.

**Keywords:** Citrus butterfly, Lepidoptera, Pollination, Butterflies conservation, life cycle.

## Introduction

According to Jahnvi et al (2018), the citrus sector is the third largest in the world, following the mango and banana industries. According to Scott (1986), citrus crops have great adaptability to various climatic conditions and hence are grown equally in both tropical and subtropical regions as well as some favorable parts of the temperate regions of the world. The butterflies are divided into two superfamilies, viz., Papilionoidea constitutes 11,100 species, and Hesperioidea constitutes 3,650 species in the world (Scott, 1986). It is widely distributed in India (Kunte, 2000). They are very sensitive to environmental factors such as temperature, humidity, rainfall, solar radiation, air temperature, wind speed, and significant availability of larval host plants (Ribeiro and Freitas, 2012; Hill et al., 2002). The life cycle of a butterfly is completed in four stages that are egg, larvae, pupa, and adult.

Forests in tropical regions are being lost at an alarming rate across the world (Achard et al., 2002). Among the anthropogenic causes, deforestation and urbanization are the major determinants of species loss (Marzluff, 2001; McKinney, 2002; Miller and Hobbs, 2002). The goals of this current study are to gather baseline information about the Solapur district's butterfly ecology and the importance of butterfly conservation. Developing knowledge and awareness of conservation among students and people. Awareness of pollination by the butterfly. Protection and conservation of rare species of butterflies through the erection of butterfly gardens in the Solapur district also indirectly conserves plants. Why are butterflies and moths important? So many reasons why butterflies and moths are important are aesthetic value, ecosystem value, educational value, economic value, intrinsic value, and scientific value.

## Materials and Methods

The present study was carried out in laboratory situations in the Department of Zoology, Shivaji Mahavidyalaya, Barshi, in 2023 to 2024. Freshly laid eggs were collected along with plant materials and reared in the laboratory in plastic containers. The egg hatched and fed on the lemon leaves. Twice a day, tender leaves were provided to newly hatched larvae. Observations of the egg period, larval period, pupal period, and adult period. The color and shape of the egg were observed. Larval duration was recorded based on exuviae after each molting. The pupal period was also determined when larvae were stopped feeding and sluggish.

The emergence of adults from pupae was observed till their death. It was reported that the best time for its activity was from June to November, and that the larval populations were highest from October to December.

### Result and discussion

**Eggs period:** The citrus butterfly (*P. demoleus*) egg period was defined as the time between egg laying and hatching, which ranged from 3 to 7 days, with an average of 5 days. The color and shape of the eggs were observed. The freshly laid eggs are pale yellow in color, smooth and spherical. Before hatching, the eggs are a dark brown color.

**Larval period:** The larval period of citrus butterflies has holometabolism and goes through separate stages as egg, larvae, pupae, and adults. In this study, the 1st to 5th instar larvae were studied. These larval stages are described here along with their instar-wise duration.

**First Instar:** An average of 2.5 days was discovered for the first instar larvae, with a duration of 2.0 to 3.0 days. First-instar larvae resemble bird droppings, are less spiky, and are light brown to brownish black in hue with dirty white patterns on the dorsal side of the abdomen.

**Second Instar:** The duration of the first instar larvae was found to be 3.0 to 4.0 days, with an average of 3.5 days. The second instar larva morphologically resembled the first instar larva. Larvae in their second instar are glossy and dark brown, with wide transverse off-white bands running over the front, middle, and posterior regions.

**Third Instar:** The duration of the second instar larvae was found to be 3.0 to 4.0 days, with an average of 3.5 days. Third instar larvae are similar to 2nd instar larvae but differ in size.

**Fourth Instar:** The duration of the first instar larvae was found to be 3.0 to 4.0 days, with an average of 3.5 days. Fourth instar larvae are similar to the 3rd instar larvae but differ in size. The fourth instar larvae were almost black with a little greenish tinge. Earlier, similar to that reported by Jahnavi et al. (2017).

**Fifth Instar:** The duration of the first instar larvae was found to be 3.0 to 4.0 days, with an average of 3.5 days. The fifth instar larvae differed from the previous instar. Fifth instar larvae are light green in color, but after one day this color gradually changed into pure green. Two eye-like spots are present on the second thoracic segment on the fifth instar larvae of the citrus butterfly.

**Total larval period:** The total larval development period of the citrus butterfly (*P. demoleus*) varied from 14 to 19 days, with an average of 16.5 days. Earlier, similar to that reported by Patel et al. (2017).

**Pupal period:** The early pupal period of the citrus butterfly (*P. demoleus*) was found to be 2.0 days on an average of 2.0 days. The early pupa is greenish-brown in color. The pupal period of the citrus butterfly (*P. demoleus*) was found to be 4.0 to 9.0 days, with an average of 6.5 days. Later, pupas are dark brown. With an average of 8.5 days *papilio demoleus*, the citrus butterfly's (*P. demoleus*) pupal ranged from 6.0 to 11 days.

**Adult period:** Adult butterflies have wide wings and were lovely and huge. The fully developed butterfly inside the pupal case emerged; newly emerged adult butterflies wings are weak for 1-2 hr. The wings were dull black, ornamented with yellow markings. The adult period of citrus butterflies (*P. demoleus*) varied from 3.0 to 6.0 days, with an average of 4.5 days.

**Total lifecycle:** In lab settings, the citrus butterfly, L., has an average life cycle of 40.0 days, with a range of 39.0 to 41.0 days, from egg to adult. The total life cycle was completed in 41 days during September in laboratory conditions.

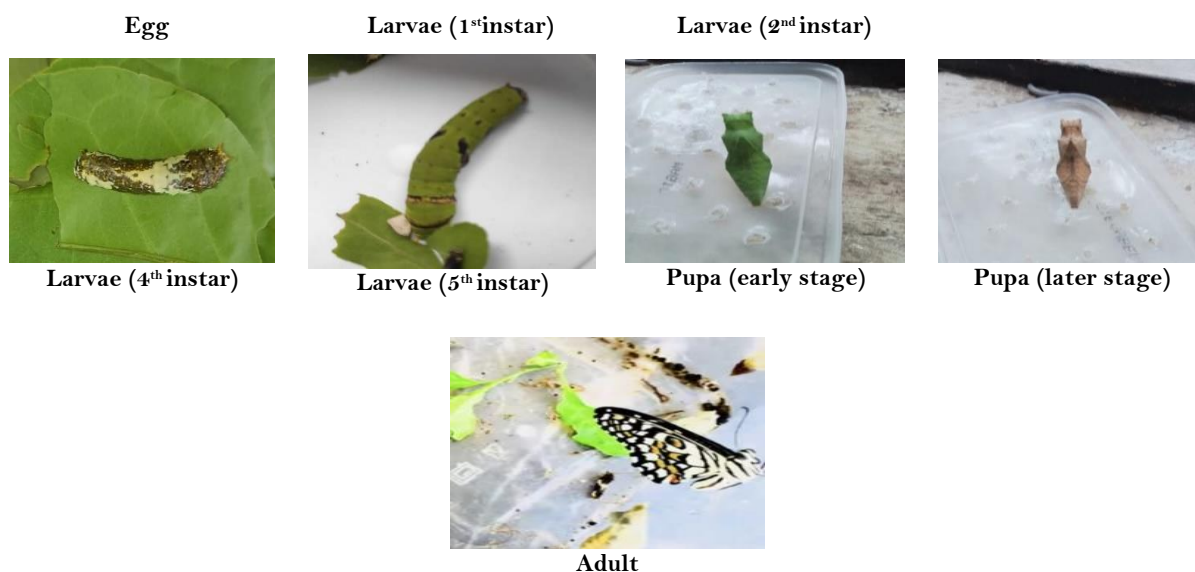
**Table 1:** Duration of different Developmental stages of life cycle of citrus butterfly

Sr.no	Developmental stages of citrus butterfly	Duration in days		
		Minimum	Maximum	Mean
1	Egg Incubation period	3.00	7.00	5.0
2	Larval periods			
	Larvae(1 <sup>st</sup> instar)	2.00	3.00	2.5
	Larvae(2 <sup>nd</sup> instar)	3.00	4.00	3.5
	Larvae(3 <sup>rd</sup> instar)	3.00	4.00	3.5
	Larvae(4 <sup>th</sup> instar)	3.00	4.00	3.5
	Larvae(5 <sup>th</sup> instar)	3.00	4.00	3.5
	Total Larval periods	14.00	19.00	16.5
3	Pupal periods			
	Pupa (early stage)	2.00	2.00	2.00
	Pupa (later stage)	4.00	9.00	6.5
	Total Pupal periods	6.00	11.00	8.5
4	Adult	3.00	6.00	4.5
5	Total life cycle	39.00	41.00	40

**Photographs slide 1:** Life cycle stages of citrus butterfly.



**Larvae (3<sup>rd</sup>instar)**



### Conclusion

Butterflies are one of the most attractive groups of insects. The present study was carried out to study the life cycle of a citrus butterfly, *Papilio demoleus*. In laboratory conditions. The present study provides information on the life span of each instar stage. The present study will help the researchers in the study of butterflies.

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### Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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