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Life cycle and biology of *Graphium agamemnon* (Tailed Jay) butterfly (Lepidoptera: Rhopalocera: Papilionidae) on *Polyalthia longifolia*

Priyanka KumarDOI: <https://doi.org/10.22271/j.ento.2021.v9.i3f.8730>**Abstract**

Study of biology and life cycle generation of *Graphium agamemnon* (Tailed Jay) butterfly has been done in Burha, Darrang district of Assam from 2020 to 2021. The leaves of *Polyalthia longifolia* were used in study of larval growth as host. The eggs take 3-4 days to hatch. The larvae go through 5 Instars over a period of 13-21 days and pupae 13-14 days. The total period from egg to adult emergence spans over 27-36 days. The morphological characters (length, width, color etc.) were changing instar to instar and body weight increasing from instar I to instar V. It is treated as "high energy" pollinator promoting cross pollination because of being a fast and strong flier.

Keywords: life cycle, *Graphium agamemnon*, tailed jay, *Polyalthia longifolia*, instar

Introduction

The Indian sub continent bearing a diverse landscape, climate and vegetation which represent 1504 species of butterflies [10, 16]. They are proper ecological indicator, natural pollinator and have close relationship with faunal diversity [10, 3, 7, 8]. Butterflies provide economic and ecological benefits to the human society by virtue of their incontestable beauty and by their ability to accomplish natural sustainability throughout the world. As such the butterflies provide the best rapid indication of habitat quality and also they are sensitive indicators of climate change. But the population of such beneficial flagship insects are declining due to habitat loss and most of them are under the shadow of extinction [12, 17].

Butterflies are dependent on complex feeding relationship with green plants in their life cycle as adults and larvae. The butterflies life cycle is holometabolous, it include egg, larva, pupa and adult stages. All these stages depend on nutrient supplements at different they require and get nutrients from different sources like adult from nectur, larva from plants [5, 6, 1, 11]. Butterflies offer inexhaustible stimulating material for those who are curious in carrying out applied and pure research [18, 19]. However as many experts observed, little was known of early stages of Indian butterflies [19, 4, 13]. Today the life history of 70% Indian butterflies was still unknown. Most of the butterfly remain restricted within their chosen habitat and range for their whole lives [10, 2].

So the current research is aimed on *Graphium agamemnon* (Lepidoptera: Rhopalocera: Papilionidae) life cycle of different stages on *Polyalthia longifolia* as host plant.

Methodology

The present study was carried out at Burha (26°44'02.05" N and 91°78'69.86" E), Darrang district of Assam during the calendar year 2020- 2021. The reproductive activity of Tailed Jay butterfly was at the garden area. Once adult butterflies were located detailed obserpvation were made in order to observe the period of copulation and oviposition. After detecting oviposition the leaf with eggs. Was observe regularly at 7 hour interval for recording the time of hatching. Then collected the freshly emerged larvae and transferred to a clean container [5, 14]. The larvae were supplied daily with quantity of leaves of the host plant i.e; *Polyalthia longifolia*. The faeces and the leftover of the food was cleaned each day (24 hour). The growing lravae were observed regularly to note the change of instar and characters including length, width and weight [5, 14].

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The development of pupa from full grown larva and particulars of pupa including color, shape, size, weight and the time of eclosion were also recorded. Millimeter graph paper was used for taking measurements. The temperature was 26°-30°C with normal indirect sunlight condition. In describing the details of adult characters the butterflies that have emerged from the pupae and those caught in the wild were used.

Results and Discussion

The Tailed Jay (*Graphium agamemnon*) lays eggs in singles in both surfaces of young leaves of *Polyalthia longifolia*. In the present study life cycle of *Graphium agamemnon* was discussed. The study discussed on the *Polyalthia longifolia* plant belong to the family Annonaceae for oviposition and life cycle and biology of *Graphium agamemnon*.

Egg

The eggs are spherical surface, smooth with creamy white at first and later become light yellow 0.90-1.00 (1.00 \pm 0.04) mm in diameter. They hatch 3-4 days after their deposition. The larva use to eat its egg shell after emerging and passed through five instar over a period 27-36 (27.10 \pm 2.65) days. (Fig:- P.K-A)

InstarI

This stage lasts 2-3 days. The size of the larva was 3.40-4.60 (3.94 \pm 0.31) mm long and 1.10-1.40 (2.23 \pm 0.33) mm wide. The body was snuff colored and abdomen is white color and looks pumped up. Black color head 0.3-0.5 (0.50 \pm 0.07) mm wide. Head, abdomen and anal regions shows snuff colored spines. (Table:- 1, Fig:-P.K- B)

InstarII

It lasts 3-4 days. The larva measured 5.10-8.20 (6.89 \pm 1.20) mm in length and 2.10-2.80 (2.48 \pm 0.41) mm in width. The thoracic spines and the anal spines are pale yellowish brown. Head is 1.5-2.0 (1.6 \pm 0.06) mm in diameter. The thorax is wider than other body parts. (Table:-1, Fig:-P.K-C)

InstarIII

This stage for 3-4 days. It grows up 12.60-17.10 (14.10 \pm 4.23) mm long and 2.30-3.70 (3.20 \pm 0.69) mm wide. At this stage posterior abdominal segments will turn from white to pale yellowish color and thoracic and anal spines turn into black color with bluish sheen at distal end. Its head is 1.8-2.2 (1.8 \pm 0.05) mm in diameter. At the end of this stage several dark markings were appear on body. (Table:-1, Fig:-P.K-D)

InstarIV

This stage is around 3_5 days. It is 22.30-26.90 (24.10 \pm 5.06) mm in length and 3.00-6.50 (5.30 \pm 1.20) mm in width. The posterior abdominal segments lost the yellow color. Third thoracic segment becomes orange color. The head turn into light orange green color and its size around 2.4-3.00 (2.70 \pm 0.22). Anterior part of the body is larger than posterior part. Body segmentation is clear with black spots present on the body. (Table:-1, fig:-P.K-E)

InstarV

Instar 5 lasts 4-6 days. It is long instar stage. When fully grown it is green and 29.00-40.10 (35.80 \pm 6.20) mm in length and 5.50-9.00 (7.25 \pm 1.30) mm in width. Its head is 3-4 (3.5 \pm 0.20) mm wide with light orange colored spots. Body segmentation is clear with spine size decreasing. There is no change in other characteristics. (Table:-1, Fig:-P.K-F)

Pupa

The pupal stage is lasts for 13-14 days with length 31.00-38.00 (34.50 \pm 2.23) mm long and 8.00-9.30 (8.20 \pm 0.65) mm in width.(Table:-1). The pupal stage mainly include pre pupa and pupal stage. The pre pupa stage is only for one day. The body length is shortens and yellow marks fading away. Its attaches to the substratum with its entire body and posterior end is pointed. (Fig:-P.K-G)

Adult

The adult *Graphium agamemnon* were black with bright green spots and streaks on wings with their span 85-100 mm and underside was pale brown with black, suffused with lilac or violet grey. Two red spots near base, each edge with a black crescent and a small red tornal spot on underside hindal wing. Male has scent wool in dorsal fold on upper side hind wing. Basal stripes and discal cells and marginal spots all are bright green. Long tail present in females than males. They lives in common at well wooded region with good rainfall. (Fig:-P.K-I)

Feeding behaviour

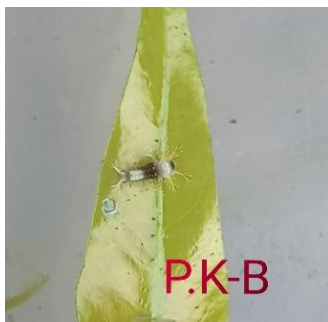
The previous reports on *Graphium agamemnon* says it is an oligophagous depends on variety of plant species fed by it [5, 6]. But in the present study pupa is fed only *Polyalthia longifolia*. The larva consumed their empty egg shell after emerging from egg and later began to feed leaf material. The first three instars ate slowly while the other two instars rapidly. Pupa didn't eat anything. There was a gradual increase in weight gain from instar to instar. (Table:-2)

Table 1: Biological observation of early life stages of *Graphium agamemnon* on *Polyalthia longifolia*

Stage	Length (mm)			Width (mm)			Duration (days)	
	Min	Max	AV. \pm S.D.	Min	Max	AV. \pm S.D.	Range	AV. \pm S.D.
InstarI	3.40	4.60	3.94 \pm 0.31	1.10	1.40	1.23 \pm 0.33	2-3	2.50 \pm 0.44
InstarII	5.10	8.20	6.89 \pm 1.20	2.10	2.80	2.48 \pm 0.41	3-4	3.80 \pm 0.55
InstarIII	12.60	17.10	14.10 \pm 4.23	2.30	3.70	3.20 \pm 0.69	3-4	3.90 \pm 0.52
InstarIV	22.30	26.90	24.10 \pm 5.06	3.00	6.50	5.30 \pm 1.20	3-5	4.20 \pm 0.60
InstarV	29.00	40.10	35.80 \pm 6.20	5.50	9.00	7.25 \pm 1.30	4-5	5.50 \pm 0.65
Total larval period							13-21	18.10 \pm 3.40
Pupa	31.00	38.00	34.50 \pm 2.23	8.00	9.30	8.20 \pm 0.65	13-14	12.50 \pm 3.28

Table 2: Weight of *Graphium agamemnon* at different larval stages

Stages	Weight (gm)		AV. \pm S. D.
	Min	Max	
InstarI	2.10	2.40	2.25 \pm 0.21
InstarII	13.00	13.50	13.10 \pm 0.65
InstarIII	190.00	202.00	196.00 \pm 3.58
InstarIV	220.00	250.00	248.00 \pm 3.80
InstarV	490.00	520.00	502.00 \pm 5.10

**Egg****InstarI****InstarII****InstarIII****InstarIV****InstarV****Pupa****Before hatch****Adult****Host plant: Polyalthia longifolia**

Conclusion

Butterflies are one of the most colorful and attractive group of insects. The present study carried out to study the life cycle of *Graphium agamemnon* (Tailed Jay) on *Polyalthia longifolia*. The present study provides information of characteristics of each instar stages (i.e; length, width, color weight etc.). This study may be profitably utilized in the successful conservation management of this butterfly species either in Parks, Zoos and Butterfly houses or in the field. The present study will help the researchers about the study of butterfly fauna and in situ conservation.

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