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Development of *Junonia iphita* cramer (Nyphalidae: Lepidoptera) on new larval food plant *Asystasia gangetica* (L.) T. anderson

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Abstract
Selection of food plants for the immature stages by the adult females is a well-known fact in butterflies and other group of insects. The present study reports new larval food plant of Junonia iphita Cramer (Nymhalidae Lepidoptera). The eggs and neonate larvae were recorded on Asystasia gangetica (L.) T. Anderson. It belongs to the plant family Acanthaceae. It is usually called as creeping floxglove. The life cycle of Chocolate pansy was also studied under field and controlled conditions. It requires 21 to 32 days for completion of life cycle.

Keywords: nymphalidae, butterfly, India, west coast, western ghats, chocolate pansy, acanthaceae

Introduction
Butterflies are flying jewels of nature. They are very diverse and has a great role the ecosystem maintenance. Butterflies are widely used as model insects in various studies related to evolution, ethology, insect - plant interactions and distribution (Settele & Kühn, 2009; Rayalu *et al*,, 2013) [14, 15, 12]. Butterflies are among the most studied group of insects in relation to the selection of larval food plants and egg laying patterns and behavior. In relation to the larval food plant selection, considerable amount of database is available on the butterflies and their behavior. These studies have been carried out in almost all geographic regions of the world. (Wilkund, 1984; Kelly & Debinski, 1998; Settele *et al*., 2009; Curtis *et al*., 2015; Nitin *et al*., 2018; Robinson *et al*., 2001; Rayalu *et al*., 2013, Hill *et al*., 2018) [14, 15, 13, 12, 5, 2, 8].
J. iphita Cramer is widely studied butterfly with respect to its life cycle, distribution and primary and secondary larval food plants (Rayalu *et al*., 2013) [12]. The immature forms of *Junonia iphita* Cramer feed on the foliage of *H. costata, H. auriculata, Justicia micrantha, J. neesi, J. procumbens, J. sphaerosperma, Lepidagathis formosensis, Strobilanthes, S. formosanus* and *S. Callosus* (Robinson *et al*., 2001) [13]. The larvae of *J. iphita* are also reported on the foliage of *S. callosus* and *H. Auriculata* (Kasambe, 2020) [4]. Nitin *et al.,* (2018) [8] reported several larval food plants for the species, namely *Barleria cristata, Dipteracanthus prostratus, Ruellia elegans, R. simplex, R. tuberosa, R. tweediana, Achimenes grandiflora* and *Strobilanthes ciliata.* Kasambe (2020) [4] reported Eranthemum roseum (Family Acanthaceae) as a new larval food plant of *J.iphita* Cramer. In this view, the present study reports new larval food plant of *J. iphita* Cramer with a note on the life cycle.

Material and Methods
The present study was carried out in Vengurla Maharashtra during the calendar year 2020. Vengurla (15.8514° N, 73.6389° E) is located on the west coast of India in the State of Maharashtra. The observations on occurrence of butterflies and their developmental stages were carried out in the field. The life cycle was also studied under laboratory conditions. Rearing method and observations were followed according to Rayalu *et al* (2013) [12]. The identification of the butterfly is made with the help of available literature (Kehimkar, 2008).

Results
J. iphita Cramer is a species of butterfly belongs to the family Nymphalidae of order Lepidoptera. In the present study, the observations were carried on the selection of host plant by adult female of *J. iphita* Cramer and also on the development of immature forms.

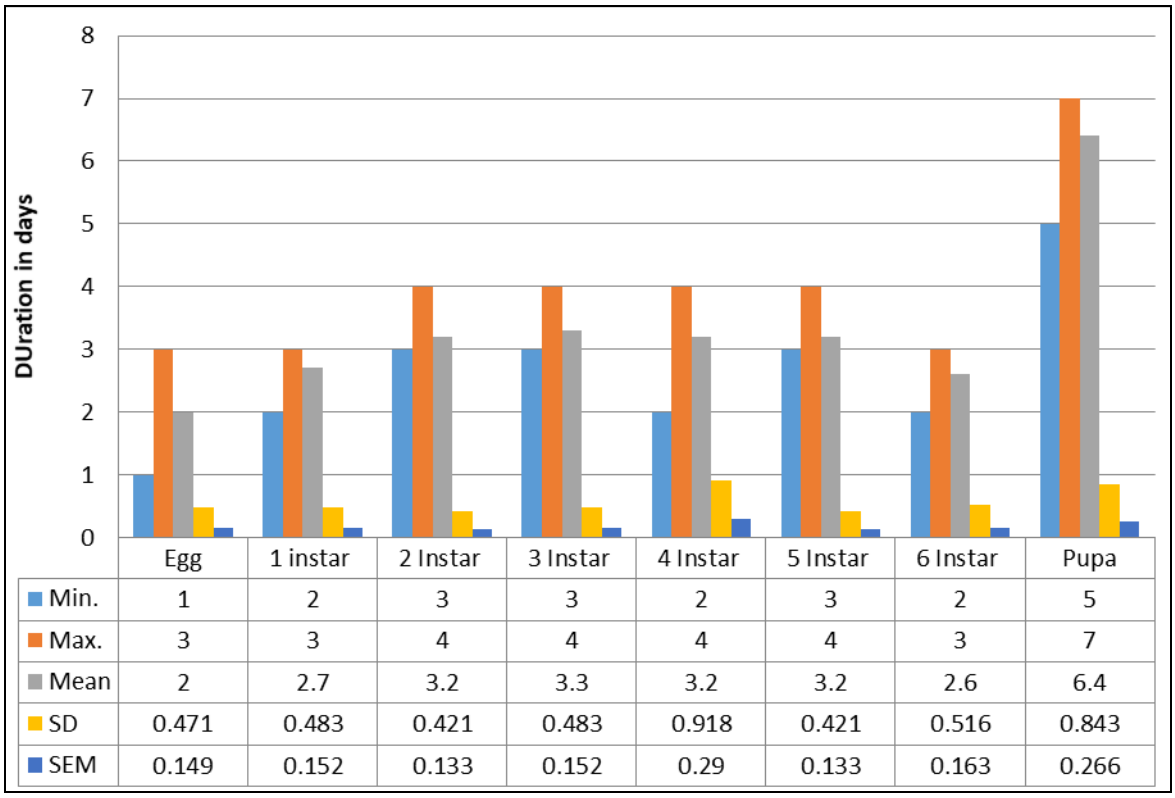
1. **Egg laying:** The female laid eggs on young and fresh leaves or shoots of the plant. The eggs were creamy, spherical with longitudinal ridges and shining. Measured 0.85-1.00 mm in height.
2. **Larval and Pupal Development. (Plate 1)**

The neonate larva measured 2.00 mm in length. It grew to 2.30 - 3.00 mm in length and 1.00 mm in width. The second instar measures 3.50 - 4.50 mm in length and 1.00 mm in width. The length of third instar was recorded 5.30 - 6.50 mm and 1.10 mm in width. The fourth larval instar measures 7.00 - 10.50 mm in length and 1.30 -

1.60 mm in width. The fifth instar grows up to 29.00 - 37.50 mm in length and 4.50 - 5.50 mm in width. The last sixth instar larva measures 30.00 to 37 mm in length and 5.00 to 6.00 mm in width.

The details of duration required for completion of life is given in fig. 1. From the figure, it appears that 21 to 32 days are required for the completion of life cycle for *J. iphita* Cramer in the present study area. In adults, the wing span is about 5–6 cm and the female can be told apart from the male by white markings on the oblique line on the underside of the hindwing. The wavy lines on the underside of the wings vary from wet- to dry-season forms. Individuals maintain a territory and are usually found close to the ground level and often bask in the sun.

Larval Food Plants: Observation on the egg laring and larval feeding reveals that the female lay the eggs on the tender leaves of *Asystasia gangetica* (L.) T.Anderson (Family Acanthaceae). It is commonly known as Creeping Foxglov. From the literature survey of earlier studies, it appears that the host recorded in the present study is a new larval food plant for *J. iphita* Cramer.



	Egg	1 instar	2 Instar	3 Instar	4 Instar	5 Instar	6 Instar	Pupa
Min.	1	2	3	3	2	3	2	5
Max.	3	3	4	4	4	4	3	7
Mean	2	2.7	3.2	3.3	3.2	3.2	2.6	6.4
SD	0.471	0.483	0.421	0.483	0.918	0.421	0.516	0.843
SEM	0.149	0.152	0.133	0.152	0.29	0.133	0.163	0.266

Figures mean of 10 samples, SD- Standard Deviation, SEM- Standard Error Mean

Fig 1: Duration of Different stages required for completion of life cycle

Plate 1: Life cycle of *Junonia ipitha* cramer on new larval food plant

Discussion

Rayalu *et al* (2013) reported that total development time from egg laying to adult eclosion was 26 ± 1.87 days at about 28 ± 2 0 C. This study carried at Vishakha Pattanam, Andhra Pradesh at East Coast of India. In the present study on life cycle of *J. iphita* Cramer at Sawantwadi, Maharashtra West Coast of India requires 21 to 32 days. This pattern of development and time required for the completion of life cycle is in line with the expectations of short life cycles in tropical butterflies (Owen, 1971). The temperature is factor which influences the larval instar duration and the overall developmental period (Mathavan & Pandian, 1975, Palanichamy *et al* 1982, Pathak & Pizvi, 2003, Braby, 2003), the duration of life cycle may differ from our observations depending on the prevailing temperatures and other abiotic factors. With these developmental records, the observations on the larval food plant revealed that adult female laid eggs on the foliage of the tender leaves of *Asystasia gangetica* (L.) T. Anderson (Family Acanthaceae). It is new larval food plant record from this region of Sawantwadi, West Coast of Maharashtra. Earlier, eggs and immature stages of *J. iphita* Cramer have been reported on variety of plants. The foliage of these plants is a food source for the caterpillars of *J. iphita* Cramer. The earlier reported larval food plants are of *S. Callosus, H. Auriculata, Barleria cristata, Dipteracanthus prostratus, Ruellia elegans, R. simplex, R. tuberosa, R. tweediana, Achimenes grandiflora* and *Strobilanthes ciliate, Eranthemum roseum* (Family Acanthaceae) as a new larval food plant of *J. iphita* Cramer (Robinson, 2001, Rayalu *et al*, 2013; Nitin, *et al*, 2018; Kasambe, 2020) [8, 13, 4].

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