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Biology of semilooper, *Dichromia orosia* (Cramer) (Lepidoptera: Noctuidae), an Important Pest on *Tylophora indica* Reported from Jammu, J & K State, India

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Abstract: ***The biology of semilooper, Dichromia orosia (Cramer) has been recorded in Jammu on Tylophora indica one of the important medicinal plants in India and is used traditionally to control asthma and allergic reactions. Biology of the pest was studied during 2012-13 at Jammu division of J&K State, though incidence was observed during May to October. The pest completed its life cycle from egg laying to adult eclosion in 20-29 days.***

Keywords: *Dichromia orosia*, Jammu, *Tylophora indica*, dumvel, anntomul

1. Introduction

Tylophora indica [Fig.1 (I)] commonly known as dumvel or antomul, is an important medicinal plant in the family Asclepiadaceae, indigenous to India. There is an increasing demand for plant based medicines to control many of the diseases. It is traditionally used to control asthma and allergic reactions. It is easy available plant and not costly too. It is easy to take and no special monitoring is required. It is a perennial branching climber with long fleshy roots. It grows widely in planes and hilly places of India like Bengal, Assam, Cachar, Orissa, Konkan, Kanara and Southern India. (Mohammed Ali, 2004). A semilooper, *Dichromia orosia* Cramer (Lepidoptera: Noctuidae) was recorded as an important pest on this plant (Devaiah *et al.*, 1983). The pest causes 50-70% defoliation when the incidence is severe. Occurrence of the pest was observed mainly during May-October. The larva feeds on all the parts of the host plant.

2. Material and Methods

The study was conducted during the year 2012-13 in the Jammu University Campus at Jammu division, (J&K) India. For the biology studies, study areas were regularly searched for the reproductive activity of the *Dichromia orosia* was found lying eggs on *Tylophora indica*. After oviposition, the leaves with egg were collected in Petri dishes (15 cm x 2.5 cm depth) and brought to the laboratory. The insects were reared in the laboratory at temperature ranging between 25°C-42°C and relative humidity of 26%-80%. The pieces of the leaves with the egg were then placed in a smaller Petridish (10 cm x 1.5 cm depth) the inside of which was lined with moistened blotter to prevent the leaves from drying. The eggs were then examined at 6h intervals daily for recording time to eclosion. Fresh leaves were supplied daily as food to larvae. The time of each moult was noted. The morphological characters, body measurements of each instar were recorded daily. The prepupal behavior of the final instar, pupal particulars and the time of adult eclosion were also recorded.

3. Results and Discussions

Biology

Adult stage [Fig.1, (a-b)]:
Head greyish brown consist light brown filliform antennae, a black striations present on the brown eyes, proboscis pale brown with long blackish brown labial palps. Thorax dark brownish grey on upperside and underside is pale yellow. Abdomen was yellow on both sides. Fore wing grey thinly scattered with dark brown scales with a large sub-triangular blackish brown patch occupying the medial area, but not reaching the inner margin. Hind wing yellow with apical area and more than half of the outer margin grey. Underside of forewing brownish grey and hindwing lighter but otherwise similar to upper surface. Wing span 28-35 mm.

Egg Stage [Fig.1(c)]:
Eggs were light yellow, spherical around 0.90-1.00 mm in diameter with an average of 0.98±0.04 mm (Table 1) and hatch in about was 3-4 days with an average of 3.20±0.40days (Table 2).

Larval stage [Fig.1, (d-h)]:
Instar I lasted for 2-3 days with an average of 2.80±0.40 days (Table 2). Newly hatched larvae pale yellow. A small protuberance start to appear on the whole body of the larvae. Body was somewhat rectangular in shape, but slightly narrowing posteriorly. Head minute and yellow. Larvae grown to a length of 2.00-7.00 mm with an average of 5.60±1.82 mm and width 0.80-1.00 mm with an average of 0.96±0.08 mm before moult (Table 1). **Instar II** also lasted for 2-3 days with an average of 2.50±0.44 days (Table 2) and attained a length of 7-11 mm with an average of 9.56±1.34 mm and width of 1.00-2.00 mm with an average of 1.79±0.39 mm (Table 1). Head and body yellow with black spots and warts. **Instar III** was yellow with prominent black warts and has longevity of 2-3 days with an average of 2.60±0.37 days (Table 2). The length and width of the body was 11.0-16.0 with an average of 14.3±1.77 mm and 2.00-4.00 mm with an average of 3.56±0.78 mm respectively (Table 1). **Instar IV** lasted for 2-3 days with an average of

2.50±0.31 days (Table 2), its length and width were 16.0-22.0 with an average of 20.4±2.33 mm and 4.00-5.00 mm with an average of 4.78±0.39 mm respectively (Table 1) and looks similar to IIIrd instar in shape and colour except for the size. **Instar V** lasted for 3-4 days with an average of 3.80±0.40 days (Table 2) grown to a length of 22.0-30.0 mm with an average of 27.8±2.99 mm and a width of 5.00-6.00 mm with an average of 5.79±0.39 mm (Table 1). The larvae were dark yellow having dark black warts all over body with setae. There were no changes in other characters from previous instar. The larvae is a semilooper having three pairs of true jointed legs just behind the head and four additional pairs of fleshy legs called 'prolegs', three pairs on the abdominal segments 4th, 5th and 6th and fourth pair on the final abdominal segment. They move with a characteristic "looping" motion. Larvae were pale to dark yellow. The head and somites were having series of small black tubercles from where spines arisen. The total larval period completed between 11-16 days.

Nature of damage [Fig. 1 (k)]:

Feeding behaviour of Larvae: The larvae of *Dichromia orosia* under observation feed on *Tylophora indica* of different levels of maturity and quality. They feed on both type of leaves i.e. soft tender leaves and mature tough leaves. First and second larvae feed on the epidermis of the leaves while third to fifth instar feed on the entire leave tissue. The late instar larvae fed voraciously on the entire leaf tissues leaving major leaf veins. When the population of late instar larvae were high, the climber defoliated completely and giving the appearance as it was grazed by the cattle.

Pupal stage [Fig.1, (i-j)]:
The fifth instar when fully grown stopped feeding, turned brown. The body contracted and larvae settled in a place and spun cocoon with the help of silken threads, plant/leaf debris and excreta. This stage called as prepupal stage which lasts for 1-2 days with an average of 1.30±0.40 days and finally transformed to pupa. It measured 13.0-14.0 mm in length with an average of 13.8±0.40 mm and 6.00-8.00 mm in width at the broadest end with an average of 6.90±0.80 mm (Table 1). The pupae were reddish brown and pupal period lasted for 5-7 days with an average of 5.80±0.74 days (Table 2).

Total growth period: The rate of development period greatly influenced by climatic conditions, temperature influences instar duration and the overall development time. In the laboratory conditions, the total development period from egg laying to adult eclosion on *T. indica* ranged between 20-29 days (Table 2).

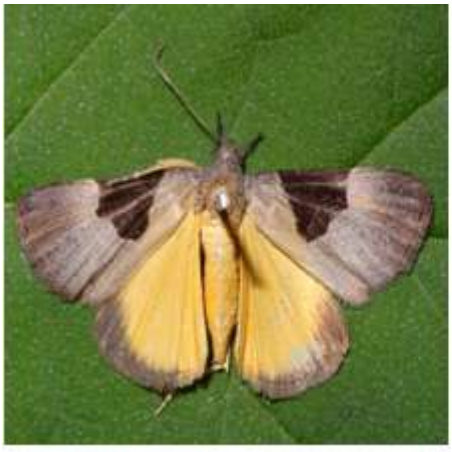
Adult moth its egg, larvae, pupae can be observed in the field from May to October. Adults are moderate to fast flier. *Dichromia orosia* is a moth of the Noctuidae family. It was observed to cause severe defoliation to its host plant. The moth produces five to six generations per year. Present study observed that the larval population of *Dichromia orosia* remained active up to eight months of the year in the area under study with low infestation during monsoon due to mortality of larvae because of heavy rain falls.

Table 1: Morphometric measurements of different stages of *Dichromia orosia*

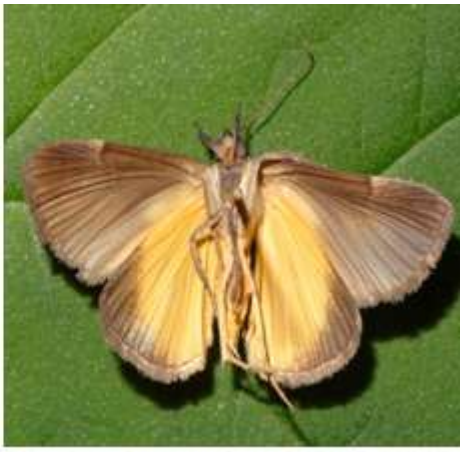
Development changes	Length (mm)		Width (mm)	
	Range	Mean±SD	Range	Mean±SD
Egg	0.90±1.00	0.98±0.04		
First Instar	2.00-7.00	5.60±1.82	0.80-1.00	0.96±0.08
Second Instar	7.00-11.0	9.56±1.34	1.00-2.00	1.79±0.39
Third Instar	11.0-16.0	14.3±1.77	2.00-4.00	3.56±0.78
Fourth Instar	16.0-22.0	20.4±2.33	4.00-5.00	4.78±0.39
Fifth Instar	22.0-30.0	27.8±2.99	5.00-6.00	5.79±0.39
Pupa	13.0-14.0	13.8±0.40	6.00-8.00	6.90±0.80

Table 2: Duration of *Dichromia orosia* development

Development Stages	Duration (Days)	
	Range	Mean ± SD
Egg	3-4	3.20±0.40
First Instar	2-3	2.80±0.40
Second Instar	2-3	2.50±0.44
Third Instar	2-3	2.60±0.37
Fourth Instar	2-3	2.50±0.31
Fifth Instar	3-4	3.80±0.40
Prepupa	1-2	1.30±0.40



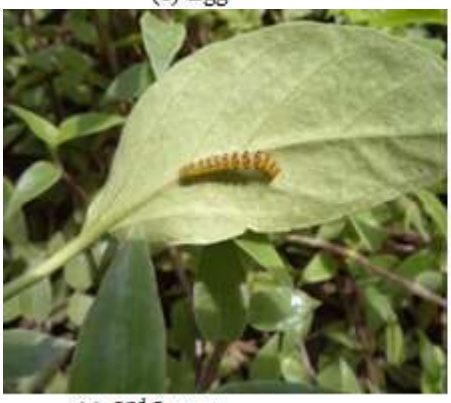
(a) Upperside of *Dichromia orosia*



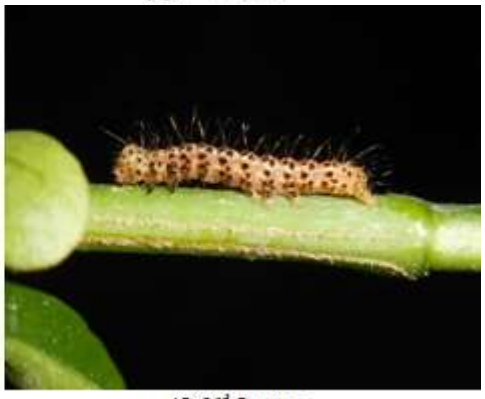
(b) Underside of *Dichromia orosia*

(c) Egg

(d) 1st Instar



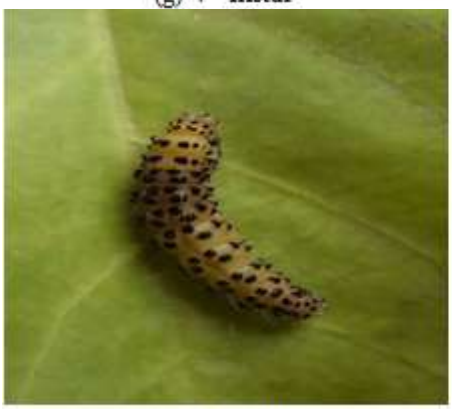
(e) 2nd Instar



(f) 3rd Instar

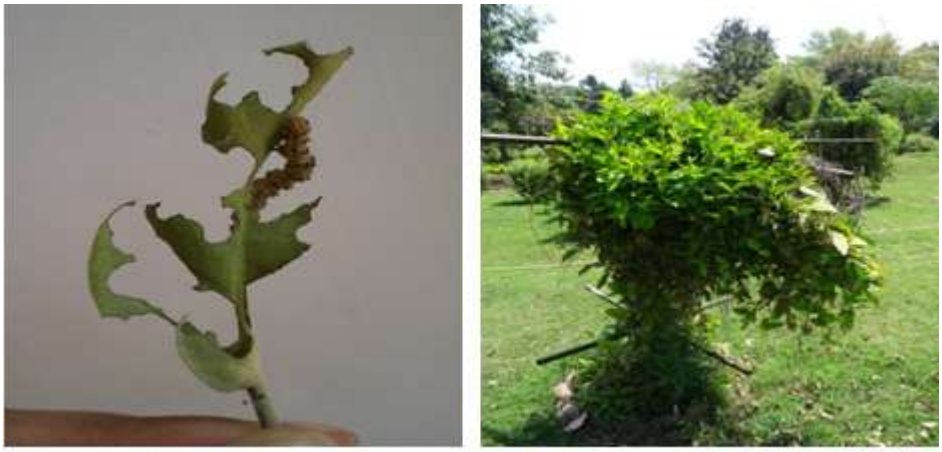
(g) 4th Instar

(h) 5th Instar



(i) Prepupa

(j) Pupa



(k) Damage by larvae (l) Host plant (*Tylophora indica*)

Figure 1: Photographs of the sequential stages in the life history of *Dichromia orosia* (a) Upperside of *Dichromia orosia* (b) Underside of *Dichromia orosia* (c) Egg (d) 1st Instar (e) 2nd Instar (f) 3rd Instar (g) 4th Instar (h) 5th Instar (i) Prepupa (j) Pupa (k) Host plant leaf eaten by larvae (l) Host plant

4. Discussions

Saravanan and Chaudhary (2012) reported both male and female adults were nearly identical except in size. Sridhar and Rani (2010) and Gole and Das (2011) reported some similar observations that the duration of egg stage was 4-5 days. According to Saravanan and Chauudhary (2012) the eggs hatched in 3-4 days with a diameter of 0.75±0.01 mm.

Sridar and Rani (2010) reported a total larval period of 22-31 days, Gole and Das (2011) reported that total larval period ranges from 27-30 days during January-February and 15-18 days during June-July and according to Saravanan and Chaudhary (2012) the larvae passed through five instars in 12.9±0.35 days.

Saravan and Choudhary (2012) reported that pupal stage lasted for about 6-7 days. Sridhar and Rani (2010) reported pupal period of 7-9 days, Gole and Das (2011) reported pupal period is 9-11 days during January-February and 7-10 days during June-July.

Sridhar and Rani (2010) reported adult longevity of 21.5 days. Gole and Das (2011) reported adult longevity is 10-12 days during January-February, and 7-8 days during June-July. Saravanan and Chaudhury (2012) reported the female moths lived longer (19.70±0.42 days) than male moths (15.70±0.68 days).

Sridhar and Rani (2010) reported the total development period was 37.6±0.59 days, Gole and Das (2011), reported life cycle was completed in 41-46 days in January-February and 26-32 days in June-July and Saravanan and Chaudhary (2012) reported that the pest completed its life cycle in 24.53±0.40 days.

In Gujarat, the pest remained active throughout the year and maximum damage was observed during June-August and late December-January (Anonymos 2010). However, in, Bangalore, Sridhar and Rani (2010) observed that occurrence of the pest was observed mainly during August-December, coinciding with the flowering period. *T. indica* is traditionally used as a folk remedy in the treatment of bronchial asthma, bronchitis, rheumatism, allergies, inflammation, dysentery, whooping cough, and diarrhea. The leaves and roots of the plant contain 0.2-0.46 % therapeutically important alkaloids viz. tylophorine, tylophorinine and tylophorinidine. Crude leaf extracts of *Eucalyptus camaldulensis* and *Tylophora indica* were evaluated for their antifeedancy against *Helicoverpa armigera* larvae which is one of the most serious pests creating damage to many economically important crops (Kathuria and Kaushik 2005).

Where as Saravanan and Chaudhary (2012) reported that *Dichromia orosia* (Cramer), a near monophagous pest was observed to cause severe defoliation ti its host plant, anthmool (*Tylophora asthntatica* Wight and Arn.) and active almost round the year.

5. Conclusion

The study reveals that *Dichromia orosia* is a most destructive pest. It completely defoliates the host plant and gives grazed appearance. In the laboratory conditions, the total development period from egg laying to adult eclosion on *T. indica* ranged between 20-29 days. This study will help researcher to uncover the critical areas related to biology of this pest in this part of the Jammu and Kashmir that many researchers were not able to explore.

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