

On the Dormancy and life span of *Lacoptera foveolata* (Boheman 1856), Cassidinae – Insecta – Arthropoda.

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ABSTRACT:

We recorded dormancy in *Lacoptera foveolata*. These beetles appear only during rainy season when they are very active, feed greatly on the fresh leaves of their host plants, lay eggs and complete the life cycle. The current study also reports a new host plant *Ipomoea triloba* for larvae as well as adults of *Lacoptera foveolata*.

Key words: *Lacoptera foveolata*, Chrysomelidae, Coleoptera, *Ipomoea triloba*, host plant.

INTRODUCTION

Tortoise beetles belong to the sub-family Cassidinae, of the family Chrysomelidae. These leaf eating beetles feed on host plant leaving conspicuous feeding marks on the leaf lamina. These beetles have characteristic



Fig.1: Host plant- *Ipomoea triloba*

shape like the shield of a tortoise hence the name. They are often brightly coloured. During the recent survey, *Lacoptera foveolata* (Boheman 1856) was found on a road side climber belonging to family Convolvulaceae, identified as *Ipomoea triloba*, on Pashan NDA road and near Cummins India Ltd. factory, Kothrud, Pune. Previously this beetle was known from Sinhgad (Ranade et al.1998) and Lonavala-Khandala (Ranade et al.1999) near Pune (Ranade et al. 2004). This species was earlier known from Burma (Now Myanmar), (Maulik, 1919, as mentioned by Ranade et al. 2004). According to Ranade et al. (2004), who have also described the life cycle of this species in detail, food plant of this species is *Ipomoea nil*. In the current study, this beetle was found to complete its life cycle on a different host plant, *Ipomoea triloba* (Fig. 1) and therefore this is also a report of a new host plant for the species.

MATERIALS AND METHODS

Larvae as well as adults of *Lacoptera foveolata* feeding on *Ipomoea triloba* plants were collected from different localities in Pune such as Pashan, Kothrud, Pune University etc. as shown in map (Fig. 2). They



Fig.2: Map showing *Lacoptera foveolata* collection sites in Pune City.

were hand picked and kept in a jar with fresh leaves for observation in captivity. To record the observations of adult beetles, a jar was prepared by adding some moist soil at the bottom and fresh *Ipomoea* leaves along with some decaying and dried leaves. The moist soil was added to maintain the moisture inside the jar. The jar was maintained by cleaning it after an interval of six days and adding fresh *Ipomoea* leaves to it regularly.

The *Ipomoea triloba* plant was maintained in a pot in the terrace garden to ensure the supply of fresh leaves. The photographs were taken in the field as well as in the laboratory using Canon Full HD-50x camera.

RESULTS

LIFE CYCLE-

Ootheca- Many oothecae were laid along the midrib of the leaf lamina by the female beetle of the mating pair in captivity (Fig. 3) Oothecae were laid singly,



Fig.3: Mating Pair in captivity

each ootheca was measuring about 2.5mm in length and it was yellowish brown, covered with a thin papery substance, containing a single egg and partly or completely covered with black faecal matter. (Fig. 4)



Fig.4: Oothecae partly covered with faecal matter.

Larval Description-

First instar larva- The freshly hatched larvae of *Lacoptera foveolata* were creamy-white translucent in color with oval, dorso-ventrally flattened body (Fig.5). The larva is widest across the middle, gradually narrows posteriorly. The body is about 1.5 mm in length and



Fig.5: First instar larvae.

0.7 mm in width. It has 16 pairs of lateral scoli and a pair of supra-anal processes on the last abdominal segment. Larva has well sclerotised hypognathous head.

Fifth Instar Larva- The fifth instar larva appeared dark green in colour with oval, dorso-ventrally flattened body (Fig. 6). Antero-dorsal pair of dark black eyes was



Fig.6: 5th instar larvae collected from the field

clearly seen. The larva moved actively with its several lateral processes and scoli. Each larva carried its excreta on the dorsal side of the last abdominal segment on the supra-anal processes. Segmentation was clearly visible on the larval body. They were continuously under observation and were provided with fresh *Ipomoea* leaves regularly. They fed on the leaves by scraping the upper and lower surfaces of the leaf lamina.

Pre-pupal larva- The fifth instar larva stops feeding completely and gets transformed to the pre-pupal larva. The larval colour changes from dark green (Fig. 7A) to brown (Fig. 7B). Its activity lowers down and it settles on a leaf to undergo the metamorphosis.

Metamorphosis & Pupal Description- After about 15 days of feeding, larvae metamorphosed into pupae (Fig. 8A & B). They pupated along the margin of the leaf lamina. The pupae appeared grayish black in colour with transparent puparium. They showed faecal matter



Fig.7: Pre-pupal larva A: on the leaf of host plant in field (Shown by Arrow) & B: Closeup (in captivity)

completely covering the dorsal surface of its body. The pupae had dorso-ventrally flattened body with pointed and triangular anterior end. Lateral pupal processes and

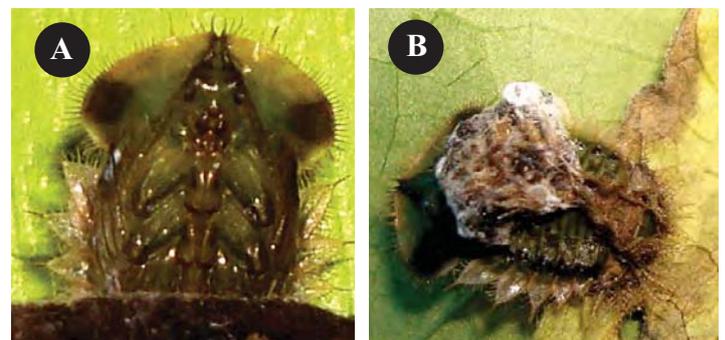


Fig.8: Close up of Pupa A: Dorsal view B: Ventral view

pupal horns can be clearly observed (Fig. 8A). Ventrally the pupae showed a pair of dark black eyes and folded legs (Fig. 8B).

Adult Description- After six days of pupal period both the adults emerged out (Fig. 9). The adults started feeding on fresh *Ipomoea* leaves on the same day. Adult

length was about 5.1 mm. The adults were oval in shape with dark black colour. They had thick rough elytra having elevations and depressions. The elytra also showed puncturations. They fed on leaf lamina by scraping the upper and lower surfaces with oval markings (Fig. 10 A&B).

DORMANCY-

Two fifth instar larvae were collected from *Ipomoea triloba* vegetation, on 27th July 2011. After about 15 days of feeding (10th Aug. 2011), one of the larvae metamorphosed into pupa while the second larva pupated on the next day (11th Aug. 2011). After six days of pupal period both the adults emerged out early in the morning on 17th Aug 2011. The beetles fed on *Ipomoea* leaves till the mid of November month (17th Nov. 2011). After this it was observed that the feeding rate of both the adults was decreasing day by day. At the end of November-2011, they stopped feeding completely, even though provided with fresh leaves. Now they remained motionless under the dried leaves. When disturbed and provided with fresh leaves on 18th March 2012, they fed for sometime and once again went into the phase of inactivity on the same day. The dormancy period which was recorded lasted for five months, from 17th Nov-2011 up to 18th March 2012. After this it was observed that the insects started feeding normally when provided with fresh leaves from 15th April 2012. They fed continuously for a month and half. One of the beetle then died on 27th May 2012, the reason is unknown. The surviving beetle was maintained and it was under observation.

On 25th Aug.2012, two fresh adult specimen of *Lacopterafoveolata* were collected from vegetation on the wired fencing of Cummins India Ltd. factory, Kothrud, Pune. These specimens were introduced with the survived specimen on 1st Sept. 2012, and were kept in the same jar under observation. The old survived specimen was marked by making two white spots on the elytra, so that it could be easily identified from the other two newly introduced specimens (Fig.11). All three specimens were provided with *Ipomoea* leaves, which fed normally but no mating behavior was recorded among the three individuals. Of the two newly introduced beetles, one died on 24th Sept. 2012. The remaining two specimens were observed every day. Once again it was observed that at the end of month of Nov. 2012 these insects stopped feeding gradually day by day though, fresh



Fig.9: Freshly ecded Adult of *Lacoptera foveolata*



Fig.10: A – Adults feeding on the leaves (Shown by arrow) of food plant producing large oval feeding marks resembling the body of adult & B – Typical adult feeding pattern



Fig.11: Two new and one old beetle in active condition. The old beetle was marked by white spots (Shown by arrow) on elytra.

Ipomoea leaves were provided. During this period they remained at one place under the dried leaves without any movement and feeding. It was observed that the dark shiny black colour of their elytra became slightly dull. They were neither moving nor feeding during this period (Fig.12). This indicates that winter season is the period of no activity. On 19th Dec.2012, the two specimens were shifted to two separate jars for observation. The two survived specimens were maintained till 15th May 2013. The specimen collected on 25th Aug. 2012 died on 15th May 2013 which survived for nine months under captive conditions, undergoing one cycle of dormancy. The survived beetle died on 26th May 2013. Both the beetles died with unknown reason although those were provided with fresh *Ipomoea* leaves.

LIFE SPAN- The older survived beetle was maintained under captive condition that was collected as fifth instar larva stage on 27th July 2011, which eclosed on 17th Aug 2011 and died on 26th May 2013. This beetle survived for almost one year, nine months and twenty six days, from 17th Aug 2011 to 26th May 2013. The second beetle, which was collected on 25th August 2012, survived till 15th May 2013 for over nine months.

Three specimens of *Chiridopsis ventralis* were also collected on 7th July 2012 from Mulshi, feeding on *Argyreia hookeri*. These specimens were also tested for the dormancy in the similar way. However, they continued feeding and did not undergo any kind of dormancy. Rather, they died one by one till 19th Dec. 2012, and could not survive through the winter season.

DISCUSSION

Indian Cassidinae beetles are well studied for their host plants (Ghate et al., 2003) from Pune and nearby areas from Maharashtra state. They have also described the feeding behaviour as well as the characteristic feeding marks on the leaf lamina of their host plants. Life cycle stages and bionomy of many of these beetles are also well studied (Rane et al., 2000; Borowiec et al., 2001; Ghate et al., 2004). Studies have also been done on the new locality records and cassidine diversity in Maharashtra state (Ghate & Ranade, 2002).

It is evident from all the previous studies (Ranade et al. 2004) that these beetles appear only during the monsoon when their host plants are abundant. However, it was a mystery that where do these beetles disappear for the rest of the year? Further the question asked was – which stage in lifecycle remains dormant; egg, pupa or adult? This study thus reveals the mystery of their disappearance for the first time. The detail record of adult dormancy suggests the presence of adults in the leaf litter underneath the dried host plants for the remaining dryer parts of the year. The current study holds immense importance as it gives the first concrete evidence for the adult dormancy, at least in *Laccoptera foveolata*. However, detail studies are needed to reveal the facts regarding dormancy process in other Cassidinae beetles.

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Fig.12: Dormant adults (A-new & B-old), note no feeding marks despite of addition of fresh leaves C: Close-up of the old Dormant adult, note the white markings on elytra, dullness of elytra and overall body, retracted antennae and legs as compared with active beetle (Fig. 10).