

**BIONOMICS OF MYCOPHAGOUS COCCINELLID,
PSYLLOBORA BISOCTONOTATA (MULSANT)
(COLEOPTERA: COCCINELLIDAE)**

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ABSTRACT: In India, *Psyllobora bisoconotata* Mulsant feeds on powdery mildew in natural condition. Here, we report the biology of *P. bisoconotata*. The natural presence of this beetle in Indian Agricultural Research Institute Campus, New Delhi, India has been documented during the year 2006-2007 on the leaves of *Morus alba* Linn. (Moraceae) and *Dalbergia sissoo* Roxb. (Leguminosae). The bionomics of *P. bisoconotata* are discussed here.

KEY WORDS: *Psyllobora bisoconotata*, mycophagous, *D. sissoo*, *M. alba*, bionomics.

Majority of the ladybird beetles belong to the tribe Psyllborini (Coleoptera: Coccinellidae) feed on the powdery mildews belonging to Erysiphales of Ascomycota worldwide (Ahmad et al., 2003; Krishnakumar & Maheswari, 2002 and 2004; Masatoshi et al., 2000; Sutherland, 2005; Sutherland & Parrella, 2006, 2008; Soylyu et al., 2002; Prasad & Rai, 1988; Bhattacharya et al., 1994; Patankar et al., 2009). Relationships of fungi and beetles are very diverse, sometimes acquiring quite complicated form. An important aspect of relations of beetles and fungi are devices of the former favoring dispersal of the latter. The cosmopolitan genus *Psyllobora* Chevrolat is represented in natural and managed systems in temperate and subtropical regions worldwide, and may be utilized as a native biological control agent of powdery mildew (Cruz et al., 1989; Almeida & Milleo, 1998).

MATERIAL AND METHODS

P. bisoconotata was studied for their bionomics at the Division of Entomology, Indian Agricultural Research Institute, New Delhi in the year 2006-2007. It was observed feeding on the powdery mildew *Phyllactinea corylea* (Pess.) infesting the leaves of *Dalbergia sissoo* Roxb. (Leguminosae) (Plate I - Figs. A, B) and *Morus alba* Linn. (Moraceae) (Plate I - Figs. C, D) in their grubs and adult stages. In the months of December and January (2006-2007), their populations were found to be abundant as the disease was also found in an epidemic proportion almost infecting every leaf and observed in their under surfaces (Plate I - Figs. A to D). The lady bird beetles were reared in the laboratory and observed for their feeding behaviour and bionomics (Table 1). In the field observations *P. bisoconotata* was photographed using a Sony DSC R1 10.3 mega pixel and the measurement taken using camera Cannon PowerShot 5.0 mega pixel attached with microscope Leica ES2.

BIONOMICS

Adults: Body convex, oval, and cream or yellowish in colour basally, each marked with eight black spots, with males and females measures 2.88×2.11 mm and 3.22×2.42 mm, respectively. Seen distributed on all parts of the plants in certain parts when occupied only the leaves with powdery mildew especially on the lower surface. On an average adults were found to be between 5 and 12 per plant with the later instars grubs being more abundant on the older/matured leaves which are often heavily infested with the fungi. The longevity of adults was noticed 26.00 days of male and 27.65 days of female on an average (Plate I – Figs. B, D; Plate II – Figs. E, O, P).

Eggs: The eggs were observed to be laid in batches with mean 5.54 on the under and upper surfaces of leaves of *M. alba* and *D. sissoo*. Small leaves with freshly powdery mildew infested leaves were preferred over others. Freshly laid eggs are elongate, oval, white, shining and firmly glued to each other and the eggs measured 0.81×0.40 mm each, with a range of the hatching percentage was observed to be 100%. The eggs became blackish gray before hatching and the incubation period was 2.5 days on an average (Plate II – Figs. F, G).

Grubs: Under normal conditions the number of grubs found varied between 12 and 25 with a mean of 19. **I Instar** - Blackish grey with black dots and hairs on the whole body measured 0.99×0.38 mm and its head capsule measured an average of 0.28×0.29 mm. This instar was poor in feeding and with in 48 hours the first moulting was observed. Development period of first instar was 5 days on an average (Plate II – Figs. H, I). **II Instar** - Blackish grey with black dots and hairs on the whole body and grubs were more elongate flattened and measured 1.46×0.44 mm with their head capsule measuring 0.28×0.29 mm. Development period of second instar was 5.50 days on an average (Plate II - Fig. J). **III Instar** - As the growth of the grubs continued with the third instars their colour become much darker with their head shield becoming more prominent; these measured between 3.384×0.759 with their head capsule of the size of 0.98×0.99 mm. Development period of third instar was 7.50 days on an average (Plate II - Fig. K). **IV Instar** - The third instar moulted into the fourth instar, which was almost similar to the third but 4.71×1.08 mm in its size and 1.15×1.20 mm as regards head capsule, and lasting for about 72 hrs. Development period of fourth instar was 10.0 days on an average (Plate II, Figs. L, M).

Pupa: As and when these grubs were fully grown these moulted into pupae which were blackish grey with dark spots and hairs all over the body, and two yellow spots on the fourth segment of abdomen dorsally. Pupae measured 2.99×1.77 mm and pupal period lasted for about 16.50 days on an average (Plate II, Fig. N).

DISCUSSION

It was observed that both adults and grubs feed on the powdery mildews and many other saprophytic fungi found on the phyllosphere namely *Alternaria* sp, *Cladosporium* sp. and *Curvularia* sp. (Patankar et al., 2009). It was observed that all these fungi are equally fed. The first instar caused very small specks and had a very poor feeding capacity while all the other instars upto the 4th were actively feeding (Plate II - Figs. I to M). Maximum feeding rates were observed in the 3rd and 4th instars as these fed large patches of the powdery mildew infestations.

Before pupation there was cessation of feeding and the pupa was found to be exarate type, found attached with leaf surfaces. As far as feeding potential is concerned, the instars can be ranked as follows: third, fourth, adults, second and first with third instar being the most voracious and with terrific feeding rates. Adults were seen on all parts of the plants while the grubs were more aggregated on the leaves affected with powdery mildew. They were found on the lower surface of the leaves during the period of bright sun. Population of adults ranged from 5-12 per plant. The later instars and adults were also more prevalent on older and heavy infested leaves. In view of their feeding behaviour and potential the *Psyllobora bisoconotata* is being universally exploited for the biological control these of destructive fungi (Cruz et al., 1989; Almeida & Milleo, 1998).

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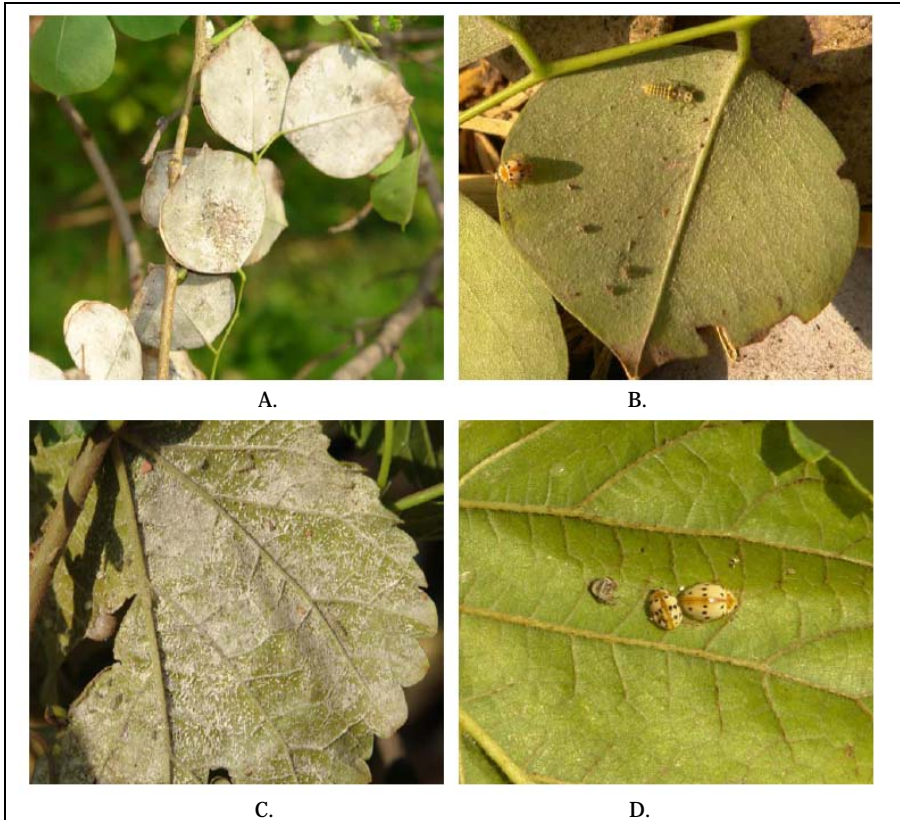


Plate I. *Psyllobora bisoconotata* Mulsant: A. Fungal infested leaves of *D. sissoo*, B. Grubs and adult feeding on fungus, C. Fungal infested leaves of *M. alba* and grubs feeding on fungus, D. Adults on leaf of *M. alba*.

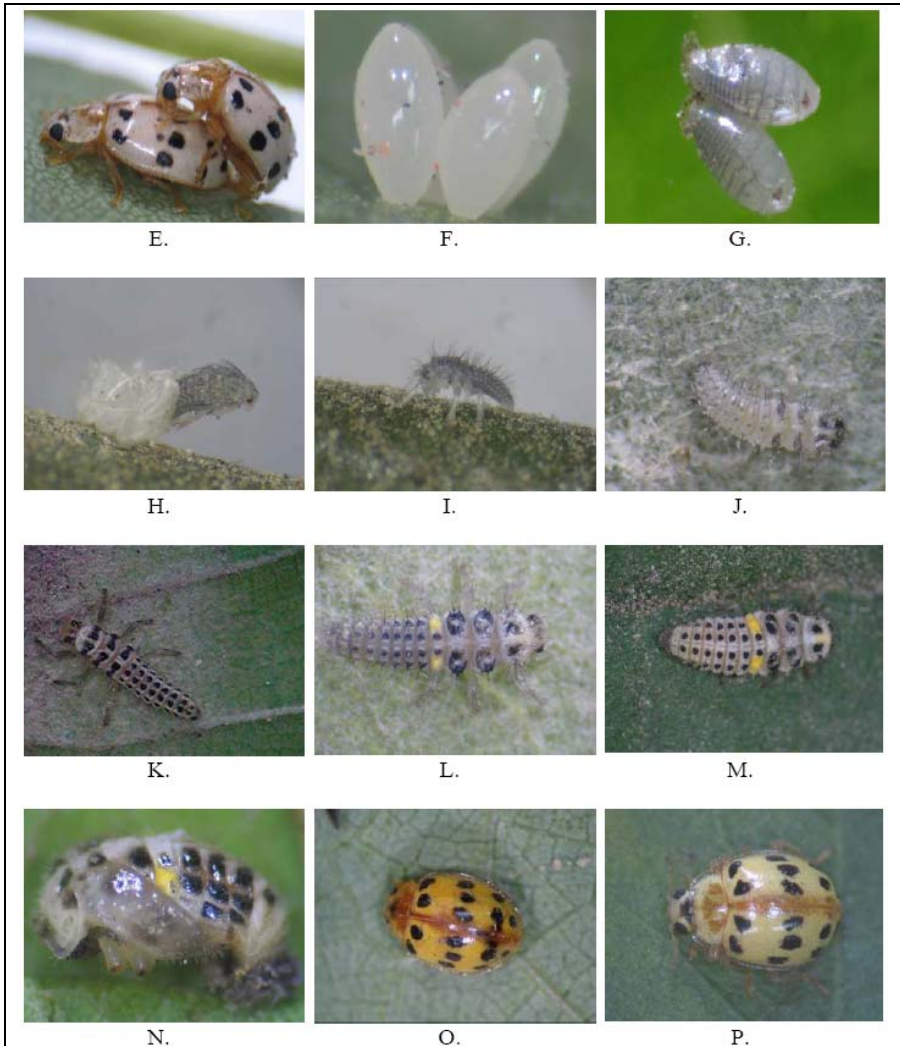


Plate II. *Psyllobora bisoctonotata* Mulsant: E. Mating, F. Eggs, G. Mature eggs, H. First instar emerging out, I. First instar feeds on fungus, J. Second instar, K. Third instar, L. Fourth instar, M. Prepupal stage, N. Pupa, O. Male, P. Female.

Table 1. Measurements and Development period of *Psyllobora bisoetnotata* Mulsant

| MEASUREMENTS | | | | | | |
|---------------------------------|--------------------------|---------------------------|---|--|---|--------------------|
| Life stages | Length (Mean) (mm) | Breadth (Mean) (mm) | Length head capsule (Mean) (mm) | Breadth head capsule (Mean) (mm) | Development period (days) | |
| | | | | | Eggs /leaf Hatching % | 5.54 ± 2.71 100 |
| Eggs (n=100) | 0.81 ± 0.03 | 0.40 ± 0.02 | | | Incubation period (n= 35) | 2.50 ± 1.29 |
| Ist instar (n= 30) | 0.99 ± 0.07 | 0.38 ± 0.02 | 0.28 ± 0.01 | 0.29 ± 5.64 | I instar (n=51) | 5.00 ± 1.00 |
| IInd instar (n= 24) | 1.46 ± 0.11 | 0.44 ± 0.03 | 0.28 ± 0.01 | 0.29 ± 0.01 | II instar (n=35) | 5.50 ± 1.29 |
| IIIrd instar (n=100) | 3.38 ± 0.39 | 0.75 ± 0.00 | 0.98 ± 0.12 | 0.99 ± 0.13 | III instar (n=31) | 7.50 ± 0.70 |
| IVth instar (n=100) | 4.71 ± 0.52 | 1.08 ± 0.16 | 1.15 ± 0.10 | 1.20 ± 0.10 | IV instar (n=50) | 10.00 ± 1.58 |
| Pupae (n=48) | 2.99 ± 0.14 | 1.77 ± 0.10 | | | Pupal period (n=38) | 16.50 ± 3.02 |
| Adults ♂(n=90) | 2.88 ± 0.16 | 2.11 ± 0.12 | | | Adults ♂ (longevity) (n=76) | 26.00 ± 2.73 |
| Adults ♀(n=80) | 3.22 ± 0.17 | 2.42 ± 0.11 | | | Adult ♀ (longevity) (n = 61) | 27.65 ± 1.50 |