



STUDIES ON THE MORPHOLOGY OF PUPA ALEYROLOBUS BARODENSIS, MASK. (HOMOPTERA: ALEYRODIDAE)

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ABSTRACT

A detailed morphological description of pupa Aleyrolobus barodensis, Mask.

Keywords: *Aleyrolobus Barodensis, Morphology, Shikohabad.*

INTRODUCTION

Aleyrolobus barodensis, Mask. is belonging to the family Aleyrodidae and commonly known as sugarcane whitefly. It is important pest of sugarcane, though it also infests Jwar, Bajra, Maize, Wheat, Barley and others crops in various parts of India such as Punjab, U.P., M.P., Bengal and Bihar etc. Both adult and nymph **Aleyrolobus barodensis**, Mask. suck the sap from under surface of the leaves of the sugarcane plants. The damage produced by **Aleyrolobus barodensis**, Mask. directly by sucking and indirectly by stimulating sooty fungus and 20 to 25% damage is caused to the sugarcane crop by this pest.

METHODOLOGY

The investigation work was carried out in zoology department at Narain College Shikohabad from October 2002 to January 2008. Periodical observations on the mating behaviour and egg laying time were done in natural conditions on the plants.

The material including pupa of **Aleyrolobus barodensis**, Mask. was collected from host plants leaves with the help of a sharp horticultural budding knife or shear. The shaved material was kept in tight closed colophone bags to minimize dessication. Specimens for microscopy were removed from host plant leaves and preserved in either 70% alcohol or dry preserved or preserved in conserving fluid.

For counting of the eggs of the gravid female, permanent slides from the collected preserved material containing different stages of lifecycle were prepared with the aid of binocular microscope according to the method described by Williams and Kosztarab (1970) .

OBSERVATIONS

COLOUR : brown colour to black colour. **SHAPE :** The body shape ovoidal (Fig. 1).

MESUREMENT : Average length of body 1.65 to 2.01mm and width 0.55 to 0.58mm. Segmentation of body: body is divided into head, thorax and abdomen.

transparent through which the internal body parts were clearly visible. The margin of the early pupa was regularly crenulated but crenulations become nearly indistinct in later pupa. The average numbers of anterior and posterior submarginal setae of the body of the pupa were 2 to 3 pairs and 1 to 3 pairs (Fig. 2). The outer covering of early pupa was transparent but it would become very darker in late pupa. Due to transparency of outer covering of early pupa the body was clearly distinguishable into head, thorax and abdomen.

HEAD

The average length of the head of the pupa 0.36 to 0.38mm and width 0.41 to 0.44mm.

THORAX

The average length of the thorax of the pupa 0.31 to 0.33mm and width 0.39 to 0.42mm. The thorax of early pupa is three segmented and showed developing wing pads, three pairs leg and tracheal openings. The first segment of thorax is largest, however, the last one is smallest, the range of length and breadth of first segment in middle 0.40 to 0.42mm and 0.44 to 0.46mm, second segment 0.31 to 0.33mm and 0.34 to 0.36mm and the third one 0.25 to 0.26mm and 0.27 to 0.29mm respectively. The three segments of the thorax were clearly separated one another by complete and distinct transverse sutures (Fig.2) first suture is in between head and first thoracic segment has anterior concavity in middle, however the second suture in between first and second thoracic segments has little convex in middle, while, the third suture between second and third thoracic segments is entirely convex anteriorly. The dorsum of first and second thoracic segments separately bears two pairs of submarginal and a pair of submedium setae. The third thoracic segment bears one pair of submarginal setae (Fig. 2).

ABDOMEN

Average length of the abdomen of the pupa 0.76 to 0.78mm and width 0.32 to 0.35mm. The broadest part of the abdomen is in fourth and fifth abdominal segment. The sutures are complete between each abdominal segment; pair of eight abdominal setae is present. Each abdominal segment bears one pair of well developed submedian small disc caudal pore, in some segments pore may be duplicated or approximately missing. Caudal furrow is well developed and reaching up to the margin. Longitudinal molting suture is reaching up to submargin but transverse molting suture is reaching up to third middorsum of the third thoracic segment (Fig. 2) vasiform orifice is roughly triangular and its average length is 0.11mm (Fig. 2). Operculum semicircular in shape and its average length 0.09mm. Ligula is exposed and its average length 0.08mm.

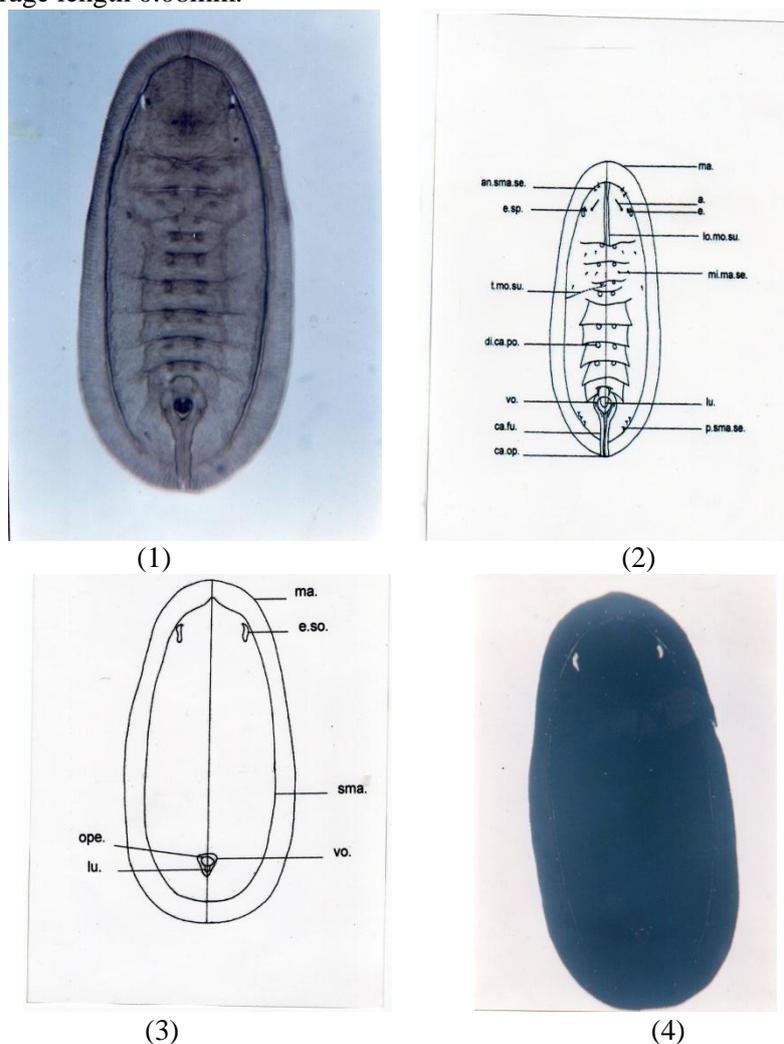


Fig. 1, 2 showing early pupa and 3, 4 showing late pupa of *Aleyrolobus barodensis* Mask.

RESULT AND DISCUSSION

Colour of the pupa of **Aleurocybotus occidus** (Poinar, 1965) was yellowish white like that of **Bemisia gossypiperda** (M. and L.) (Gupta, 1972), **Bemisia tabaci** (Gennadius) (Patel and Srivastava, 1989) and **Bemisia argentifolli** (Tsai and Wang, 1996), however, the color of the pupa of **Dialeurodes citri** (Ashmead) (Benmessaoud, 1991) and (Zanic et al., 2000) was pale yellow with an orange or yellowish area in the middle, however, in my species the color of the pupa of **Aleyrolobus barodensis**, Mask. is darker brown but later on before the molting it becomes convex and black color.

Patel and Srivastava (1989) reported the shape of the body of the pupa of **Bemisia tabaci** (Gennadius) elliptical, however, Benmessaoud (1991) and Zanic et al. (2000) noted the shape of the body of the pupa of **Dialeurodes citri** (Ashmead) subelliptical or broadly oval, while, Ko et al. (2001) described the shape of the body of the pupa of **Agrostaleyrodes arcanus** elongated, while, author noted the shape of of the body of the pupa of **Aleyrolobus barodensis**, Mask. ovoidal.

The range of length of the body of the pupa of **Bemisia gossypiperda** (M. and L.) (Husain and Trehan, 1933) 0.6 to 0.8 mm and width 0.4 to 0.6 mm, however, the average length of the body of the pupa of **Singhiella melanolepis** (Young-Fa and Ko, 2007) was 1.35mm and 1.05mm width, however, the range of length of the body of the pupa of my species **Aleyrolobus barodensis**, Mask. is 1.65 to 2.01mm and width is 0.55 to 0.58mm.

Aleurothrixus floccous (Rose and Bach, 1994) the margin of the pupa was irregularly crenulated like that of **Agrostaleyrodes arcanus** (Ko et al., 2001), while, in **Lipaleyrodes emiliae** (Chen and Ko, 2006) and **Singhiella melanolepis** (Young-Fa and Ko, 2007) the margin of pupa were crenulated and more or less smooth, or with faint crenulations marked by short ridges, about 24 ridges per 100 μ m, however, in my species **Aleyrolobus barodensis**, Mask. the margin of the pupa regularly crenulated but crenulations become nearly indistinctly in later pupa.

Dozier (1934) investigated having tracheal pores on dorsum and prominent marginal setae in the pupa, while, Patel and Srivastava (1989) reported a pair of caudal setae in the pupa of **Bemisia tabaci** (Gennadius), however, Russell (2000) presented details of dorsal setae, defined tracheal pores, notched vasiform orifice and concealed ligula in the pupa of **Corbettia**, while, Chen and Ko (2006) reported pairs of anterior and posterior marginal setae, evident, anterior 10 μ m long, posterior 25 μ m long and dorsum with 2 pairs of dorsal setae, cephalic setae, caudal setae submarginal, 101 μ m long, 52 μ m long, a pair of subapical setae, a pair of ventral abdominal setae in the pupa of **Lipaleyrodes emiliae**, while, Young-Fa and Ko (2007) worked out marginal setae pointed on anterior and posterior margins, each anterior setae 0.02mm long and each posterior setae 0.045mm long. Twelve pairs of submarginal setae of nearly uniform length 0.05 mm, sixth submarginal setae usually in line with other submarginal setae and not inset medially to nearly above middle leg, twelfth pairs of submarginal setae not inset on caudal ridges, cephalic setae 0.025mm long, distinctly forward of mouthpart, first abdominal setae present, eighth abdominal setae lateral of vasiform orifice, more or less in line with anterior margin and caudal setae slightly anterior to margin, 0.5mm long in the pupa of **Singhiella melanolepis**, however, Ko and Dubey (2007) reported anterior, posterior marginal setae, paired cephalic, meso-meta thoracic and eight abdominal and first abdominal setae in the pupa of **Aleurocyperus humus**, while, author noted 2 to 3 pairs and 1 to 3 pairs anterior and posterior submarginal setae, 2 pairs of submarginal setae in first and second thoracic segments, a pair of submedian setae and a pair of eighth abdominal setae present in pupa of **Aleyrolobus barodensis**, Mask.

In the pupa of **Agrostaleyrodes arcanus** (Ko et al., 2001) longitudinal molting suture was conspicuously ridged, reaching margin, transverse molting suture terminating midway on dorsal disc, subtending an angle of 100°, cephalothoracic suture indistinct and promidthoracic and mesothoracic sutures were short, turned slightly forward, reaching subdorsal area, however, in the pupa of **Singhiella melanolepis** (Young-Fa and Ko, 2007) longitudinal molting suture was more or less straight, reaching up to margin and transverse molting suture was reaching a point just above of slightly beyond lateral margins of hind legs, end of suture with distinct raised areas of clusters of papillae, slightly posterior relative to middle of suture, while, in the pupa of **Aleurocyperus humus** (Ko and Dubey, 2007) longitudinal molting suture was ill-defined but present, transverse molting suture reaching submedian area. This genus is similar to the pupa of **Aleuropteridis** (Mound, 1961) and **Aleuromarginatus** (Corbett, 1935), however, in my species the pupa of **Aleyrolobus barodensis**, Mask. longitudinal molting suture is reaching up to the submargin and transverse molting suture is reaching up to third mid dorsum of the third thoracic segment, sutures are complete between each abdominal segment.

Hill (1971) noted ligular head lobular, dorsum with submargin row of papillae in the pupa of **Trialeurodes vaporariorum** (Westwood) as reported in this species by numerous author Liu and Oetting (1993), Hargreaves (1995) and Liu (1998), however, Helaly et al. (1972) and Paul and Mary (1997) reported ligula head simple, dorsum submargin without row of papillae in the pupa of **Aleyrodes proletella**, while, Rose and Bach (1994) described the vasiform orifice was subcordate, hardly longer than breadth, sides slightly convex in the pupa of **Aleurothrixus floccosus**, however, Sundararaj and David (1998) presented vasiform orifice subcircular, wider than long, 45 to 50 μ m long and 50 to 55 μ m wide; operculum subtrapezoidal, 35 to 37.5 μ m long and 37.5 to 40 μ m width, the tip of the ligula appears to protrude below the caudal margin of the operculum in the pupa of **Rabdostigma mahableshwarensis**, while, Ko et al. (2001) reported vasiform orifice subtriangular, 60 to 65 μ m long, 50 to 52 μ m wide teeth or ribs posteriorly absent, without rim or median tubercle. Operculum trapezoidal, the range of length and width was 50 to 55 μ m and 40 to 45 μ m respectively, filling about half of vasiform orifice, apical part parallel, ligula short, about as long as vasiform orifice in the pupa of **Agrostaleyrodes arcanus**, however, Chen and Ko (2006) described vasiform orifice triangular to trapezoidal, posterior margin poorly defined, with lateral teeth on both sides, a little longer than wide at 70*63 μ m, operculum semicircular, 1.41 times as wide as long at 36*51 μ m, truncate at hind margin, occupying about half of orifice, ligula exposed, 74 μ m long, almost included with in vasiform orifice except for the slightly tapering, spinulose apex that is exposed in the pupa of **Lipaleyrodes emiliae**, while, Young-Fa and Ko (2007) noticed vasiform orifice more or less trapezoidal to almost circular, the average length and width was 0.06mm and 0.055mm, middle of posterior margin not broken, often with loose tale-like structures in notched area, inner margin often with faint ridges radiating in to orifice, operculum equal in size to orifice and similar in shape, nearly filling orifice, usually without posterior part distinctly narrowed, ligula exposed, without setae, almost included except a small part of posterior and exposed outside in the pupa of **Singhiella melanolepis**, however, author reported vasiform orifice is triangular and the range of length 0.10 to 0.11mm, operculum is semicircular in shape and the range of length 0.08 to 0.09mm, ligula is exposed and the range of length 0.07 to 0.08mm in the pupa of **Aleyrolobus barodensis**, Mask.

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