

DEVELOPMENTAL VARIATION OF INSECT ELAPHROTHRIPS PROCER (SCHMUTZ) (THYSANOPTERA: PHLAEOTHRIPIDAE)

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Abstract

Detailed study of insect *Elaphrothrips procer* (Schmutz) was conducted during developmental stages from larva to adult. During developmental stages the morphological variations were observed. The stages larva I, larva II was of longer duration and feeder as their adults do while the prepupa, pupa I and pupa II was resting stages and non feeder. Morphological variations in mouthparts, abdominal segments are also observed. The antennal segment of larva I, larva II, prepupa, pupa I and pupa II shows variation in morphology and number in filament segments. As compared to adult which consist eight segmented antenna, in larval stages antenna was seven segmented while in prepupa antenna was non segmented and horn shaped but in pupa I and pupa II antenna was segmented.

Keywords: *Elaphrothrips procer*, antenna, wing pad, mouthcone.

INTRODUCTION

Thrips enjoy a wide range of distribution, habits and ecological habitat. They occur on the tender, succulent parts of the plants, or under the barks of dead and drying twigs or among decaying leaves of grass, feeding on fungus spores and hypae. Though most of them are phytophagous, very few are predaceous feeding on mites, scales, psocids. Some of them produce and inhibit plant galls. While mycophagous or fungus feeding thrips are more common.

Elaphrothrips procer (Schmutz) (Family- Phlaeothripidae) is a mycophagous thrips and feeds on fungal spores and generally

occurs on the fungus infected dry leaves of *Butea monosperma* plant during humid seasons of the year. They are found within the curved folds of fungal infected dry leaves. They have peculiar, piercing and sucking type of mouth parts with vestigial right mandible. Adults have two pairs of narrow fringed wings with long hairs and abdomen is long elongated with tube like anal segment.

MATERIALS AND METHODS

The thrips were collected from their host plant *Butea monosperma* dry fungal infected leave during the humid periods of the year when they mostly occur near the roadside of highway and field area around Akola region (M.S).

The adult male, female, larvae and eggs were kept in large plastic bowls along with fungus infected dry leaves. Then they transfer to the separate plastic rearing bowl to avoid overcrowding and food limitation. The newly hatched larvae were regularly fed on fungus infected dry leaves of *Butea monosperma*. For protection bowls were covered by muslin cloth. Light 12:12 and temperature ($25 \pm 1^{\circ}\text{C}$) were maintained. Relative humidity maintained at 80% by keeping wet filter paper in the rearing bowl, some time wet cotton plug also used.

Larval, prepupal and pupal stages were dehydrated with ethanol grades (30%, 50%, 70%, 90%, and Absolute) then after cleared in xylol, embedded in DPX for mounting onto slides. In the case of specimens long preserved in 70% alcohol, before mounting to put them in 96% alcohol to which ethyl acetate (1 part of ethyl acetate to 10 volume of water) has been added so as to make the materials soft.

For study of external morphology, slides of whole mounts of larvae and pupae were used.

All observations were made under compound microscope (MLX series Magnus) and stereo zoom microscope (Magnus) for better and detailed study of the sample. Computerised micro measurements were done by using image analysis software (Olympus).

Larva and the adult have similar structure of the antennae, the antennal setae, sensorium and the mouth parts in both adapted for the fungus feeding. The integuments are sclerotized at the head, thorax and abdominal terminal segment IX and X.

RESULTS AND DISCUSSION

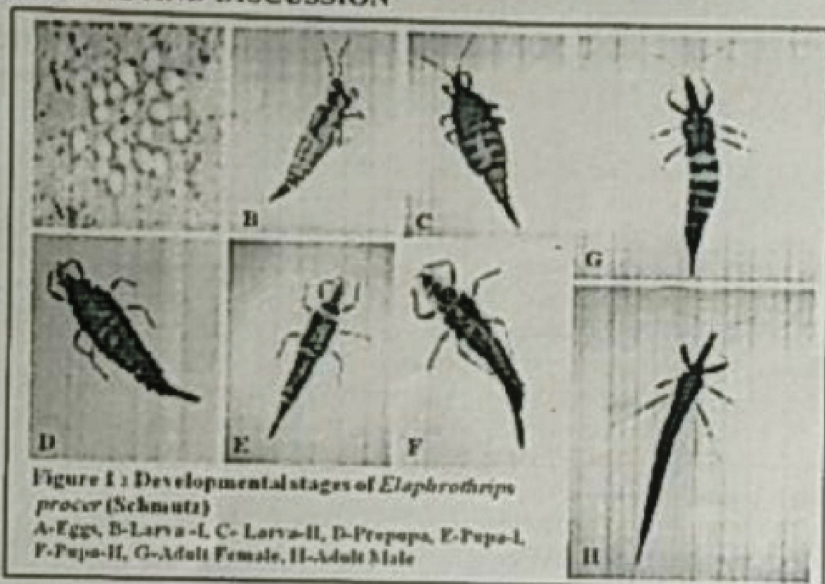


Figure 1: Developmental stages of *Elaphrothrips procer* (Schmütz)
A-Eggs, B-Larva-I, C- Larva-II, D-Prepupa, E-Pupa-I, F-Pupa-II, G-Adult Female, H-Adult Male

Larva I: Body is elongated, red in colour. Body measurement is about $1.85 \pm 0.03 \mu\text{m}$ in length. The head is cylindrical and legs are grey with red pigments. The abdominal terminal segments IX and X are dark in colour (Fig.1B). These larvae are voracious feeders and feeds on the fungus of the leaves. The head capsule along with the mouthcone is relatively large in size and somewhat cylindrical in shape (Fig.3A). The antennae are greyish in colour with total seven segments, the basal single scape, the middle single pedicel and the distal large five jointed filaments flagellum. The scape is the basal segment cylindrical in shape. It is lodged in the head capsule in the antennal socket. It bears three setae. The pedicel is the middle portion of the antenna. It is firmly fuse with the scape. The flagellum is the distal part of the antenna, larger than scape and pedicel. It appears to be divided into five segments but they are not true segments (Fig.2A).

Mouth cone consist the mandible, which is small and stout. The maxillary palp is present and is two segmented. The Thorax is flattened dorso-ventrally and distinct from the head but not differentiated from the abdomen. Each leg is six segmented. The abdomen is eleven

segmented flattened dorsoventrally and tapers towards the posterior end. The segment X is modified into a tube like structure. It has a small ring like unmarked segment XI which bears anal setae.

Larva II: Body is reddish in colour elongate in shape tapering towards the posterior end. The length of body is measures about $3.78 \pm 0.12\text{mm}$ (Fig.1C). The head is cylindrical elongated and mouth cone is rounded. Eyes are small and present on lateral side of the head. Mouthcone contain single mandible which is present on the left side. The mandible of the right side is absent. The maxillary palp is two segmented (Fig. 3B). Antennae are seven segmented. The first antennal segment, the scape is rectangular in shape while the second segment, pedicel is double the length of the scape. It is more long than broad. The third segment is the flagellum, five segmented. The first flagellum segment is longest than other segments (Fig.2B). The Thorax is flattened dorsoventrally and distinct from the head and not differentiated from the abdomen. The abdomen has ten segments with rudiment eleventh segment bearing the whorl of setae. The abdominal segment IX and X is dark in colour.

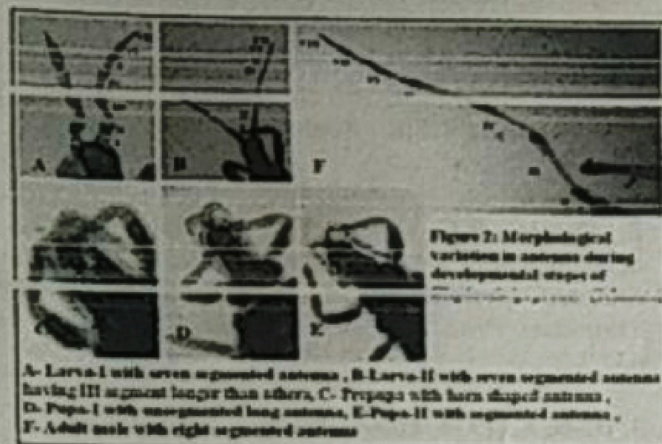


Figure 2: Morphological variation in antennae during developmental stages of *Elaphrothrips procer*.
 A- Larva-I with seven segmented antenna, B- Larva-II with seven segmented antenna having III segment longer than others, C- Prepupa with horn shaped antenna, D- Pupa-I with unsegmented long antenna, E- Pupa-II with segmented antenna, F- Adult male with eight segmented antenna



Figure 3: Mouthparts of Larva-I and Larva-II
 A- Larva-I, B- Larva-II, MP- Mouthparts.

Prepupa: Body is bright red in colour and cylindrical in shape tapering posterior. The body measures about 2.54 ± 0.17 mm in length. The last abdominal segment is slightly darkish. Body is covered with a thin soft integument. The appendages show glassy texture (Fig. 1D). The antenna is short horn-like and unsegmented, situated on the frontolateral side with pairs of long thin setae at the front of each antenna. Antennae are distinctly clear and somewhat transparent (Fig 2C) The mouthparts are indistinct difficult to observe even in preserved condition. The thorax is compressed dorsoventrally and somewhat flattened, distinct from the head and is clearly demarcated. The abdomen is broad anteriorly while tapering towards the posteriorly.

Pupa I: The body is red coloured, cylindrical, elongated in shape broader anteriorly and gradually tapering towards the posterior end. The body length measures about 4.07 ± 0.02 mm. The Head is oblong in shape. Head bears a dark pigmented spot just behind the eyes (Fig. 1E). The antennae lie along the lateral side of the head capsule. Antennae segmentation is not shown (Fig. 2D). The Thorax is a compact structure dorso-ventrally flattened separated from the head but fused intimately with the abdomen. The wings pads extend up to the second abdominal segment. The Abdomen is broad gradually tapering towards the posterior end. The abdominal segments are similar to that of prepupa except in size. The segment X possesses six pairs of setae and with a caudal tuft.

Pupa II: Body is cylindrical more elongated than the prepupa and Pupa I but in shape similar to that of pupa I. The body length is measures about 5.63 ± 0.06 mm in length. Pupa II is similar to prepupa and pupa I except the size (Fig. 1F). The antennae are situated on the lateral sides of the head capsule. Antenna is segmented and elongated. In front of the antenna there are four pairs of elongated setae (Fig. 2E). The thorax is flattened dorsoventrally and separated from the head but fused with the abdomen. The wings pads are broad and present on the mesothorax and metathorax, directed posteriorly on the abdominal segments. The Abdomen segment I is narrow while the segment II is almost double and gradually tapers towards the posterior end. The segment X is tube like bearing pairs of setae at the tip. The XI segment is rudiment.

Thysanoptera are classified within the Hemimetabola, although they do not have typical hemimetabolous stages. Takahashi (1921) and Ananthakrishnan (1969), called the postembryonic development in thrips "remetaboly" since the larval structure appears to become reconstructed in the adult. Metamorphosis is a way so indirect development linked to at least one larval stage that reaches the adult stage through more or less intense transformation processes.

In *Elaphrothrips procer* (Schmutz), the term larva is used in place of nymph, because of the view of the earlier workers that the larvae do not possess external wings-pads (Hinds 1902), Friesner (1920), Fessou (1931), Snodgrass (1954), Davies (1961), Stannard

(1968), Ananthakrishnan (1969), Heming (1973), Moritz, (1997) termed first pupal instar as prepupa or propupa as it represent a very a short transitional stage and indistinctly developed wing pads and relatively smaller than that of the next stage. In the life history of *Elaphrothrips procer* (Schmutz) the prepupal stage has been lie in between the larva II and pupa I. Therefore, the following terminology is used in *Elaphrothrips procer* (Schmutz) i.e. first stage larva I, second larva II, prepupa, pupa I and pupa II similar with *Elaphrothrips greeni* Bagnall (Watane, 1985)

In the larvae of *Bactridothrips brevitubus* the antennae are six segmented (Haga, 1974) while in *Frankliniella fusca* (Heming, 1975) and *Elaphrothrips greeni* the antennae are seven segmented (Watane, 1985). In *Elaphrothrips procer* (Schmutz) the antennae are seven segmented and Prothorax is bilobed due to presence of sclerotization, which are the common features of the thrips, *Haplothrips niger* (Loan and Holdaway 1955); *Bactridothrips brevitubus* (Haga, 1974); *Haplothrips verbasci* (Heming, 1978) and also in *Elaphrothrips greeni* (Watane, 1985). The antennal segments IX, X and XI are indistinct in *Bactridothrips brevitubus* (Haga, 1974), while in *Elaphrothrips greeni* (Watane, 1985) except segment XI, other segment IX and X are distinct. *Elaphrothrips procer* (Schmutz) agree with the characters of abdominal segment present in *Elaphrothrips greeni*. Loan and Holdaway (1955), Haga (1974) and Watane (1985) clearly described that the prepupa bears the horn-like antennae and indistinct wing pads. The pupa II has more elongated antenna and with ill-defined segmentation but more developed wing pads.

CONCLUSION

Elaphrothrips procer (Schmutz) shows an intermediate type of development as the young ones resemble the adults in some characters. They are hemimetabolous type, while remaining three stages tend towards the holometabolous type of development as in the pupal stages. The change from the hemimetabolous type to the holometabolous type is achieved by the interpolation of a transitional prepupal stage. Presence of eight segmented antenna in adult and seven segmented antenna in larva-I and

larva-II while showing intermediate prepupal stages are became the characteristic feature of the Thysanopteran, Phlaeothripidae insects.

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