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A comparative study of antennal microstructure in two species of damselflies *Rhodischnura nursei* and *Lestes elatus*

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Abstract
Scanning electron microscopic (SEM) studies of the antenna of *Rhodischnura nursei* (Morton) (Coenagrionidae) and *Lestes elatus* (Selys) (Lestidae) was investigated comparatively. The antenna of both the species (adult) revealed the presence of various mechano- and chemosensory sensilla. Moreover, the microstructural variations among them were compared, to know the species specificity. The antennal scape of *R. nursei* comprised of sensilla trichoidea ST-I, ST-II, sensilla trichoidea curvata (STC) and sensilla basiconica (SB). Whereas, the scape of *L. elatus* bears ST-I, ST-II, STC, SB-I and SB- II. In *R. nursei*, the pedicel comprised of ST-I, ST-II and microtrichia MT-I, MT-II, whereas, ST and MT are present in *L. elatus.* Subsequently, the flagellum of *R. nursei* comprised of MTP-I, MTP-II, MTP-III, while, MTP-I, MTP-II, MTP-III, and MTP-IV were observed in *L. elatus.* Therefore, the presence of various mechano- and chemosensilla in these damselflies may play a decisive role in olfaction, ability to perceive temperature, humidity or air speed that has been discussed.

Keywords: Antennal sensilla, chemoreceptor, damselflies, mechanoreceptor, sensory organ

1. Introduction
The antennae represent the main sensory organs which provide information about surrounding environment [1]. These involve complex sensory arrays with different types of sensilla which process a range of inputs in different modalities. They also vary markedly in appearance, despite a common underlying architecture [1]. The gross external morphology of sensory sensilla is given by the outer cuticular element and follows the same basic structure. An outer hair, peg or other stimulus conducting structure is attached to a socket or protrudes through an opening (invagination) in the cuticular surface [2]. Some sensilla found sunken within the antennal lumen, but these still follow a similar general structure.
The sensilla are categorized based on their functional morphologies, for instance, mechanoreceptor and chemoreceptor. In ant species, the chemosensory sensilla also provide information related to mechanical, humidity, temperature, and CO_2 levels in the surrounding area apart from the chemoreception [3, 4]. In most of the insects, the sensation of their external environmental conditions is necessary for their behavioral aspects. In addition, these sensory imputes derived from antennal sensillae are important which involved in host location and discriminatory behaviors [5]. Moreover, it is well accepted that the density, diversity, and ultrastructure of sensillae are explicitly and explicably linked with the behavioral ecology [6]. Polymorphic shapes of sensillae constitute different types, which may have assigned different functions. Basiconic type of sensilla acts as food and CO_2 receptor, however, trichoid sensilla as pheromone receptors, and the coeloconic sensillae as water and ammonia odor receptors [7].
The antennae are primarily the sensory structures of the damselflies, and there are various sensillae accommodated on the antennal surfaces [8]. They may have a tactile function by various mechanosensitive sensilla present on the antenna. The antennal sensilla contain outer cuticular apparatus specialized for chemoreceptive, olfactory, hygro-thermoreceptive and mechanoreceptive functions [2, 9, 10]. Several types of sensilla, including sensilla basiconica (SB), sensilla trichoidea (ST), sensilla trichoidea curvata (STC) and sensilla chaetica (SC), are recognized, with differences in their function [11,12]. The antennal sensilla in Lepidoptera and Hymenopteran insects have been described earlier by various workers [13, 14] while there is poorly known about the sensilla present on the antennae of damselflies.

Therefore, in the present investigation, the two species of damselflies *i.e*. *Rhodischnura* (= *Ischnura*) *nursei* (Morton) (Zygoptera: Coenagrionidae) and *Lestes elatus* (Selys) (Zygoptera: Lestidae) selected and investigated. The SEM studies were undertaken to elucidate the surface microstructure along with morphometric measurements of antennal sensilla of these damselflies and presented comparatively. Moreover, the present study incorporates the possible role of various antennal sensillae along with its comparative measures to explore species specific sensory functions of the antennae among these two species of damselflies.

2. Material and Methods

2.1 Insect sources

The two species of damselflies, *viz.*, Pixie Dartlet, *Rhodischnura nursei* (Morton, 1907) (Zygoptera: Coenagrionidae) and Emerald Spreadwing, *Lestes elatus* (Selys, 1862) (Zygoptera: Lestidae), were collected by traditional net sweeping, method during their hovering activities. A survey was carried out during the month of July-August, from 2012-2014, at the various water reservoir along the central India (21°08'59.4"N 79°04'50.1"E). The collected samples were preserved in 70% alcohol for further studies. The rearing and experimental protocol approved by the Institutional Animal Ethics Committee (Regd. No. 478/01/aCPCSEA) of the RTM Nagpur University, Nagpur prior to the commencement of the study.

2.2 Morphological preparations

For external morphology, freshly preserved specimens treated with 10% KOH (60°C) for 20 min, where we fallowed the method used earlier by Barsagade *et al.* [13] (2013). Dissections were carried out under a stereoscopic binocular microscope (Carl Zeiss Stemi DV4), and the head with antennae was separated. For morphological preparations, the appendages were washed several times with distilled water, dehydrated in ascending grades of alcohol, cleared in xylene and mounted in DPX (Dibutylphthalate polyetrene xylene). These preparations observed and photographs taken at 4× magnification.

2.3 Scanning electron microscopy

For scanning electron microscopic (SEM) study, we employed the method studied earlier by Barsagade *et al.* [13] (2013). The dissected appendages of both the damselflies were washed thoroughly with distilled water and fixed in 10%formalin for 12 hr. Then these were dehydrated in ascending series of alcohol grades, cleared in acetone, and dried at room temperature. After that, these appendages mounted on carbon-coated metallic stubs at different angles followed by gold coating in a Poloron gold coating automatic unit. Specimens observed with a JEOL JSM-6380A SEM at 25–5500X magnification at the Instrumentation Center of Visvesvaraya National Institute of Technology (VNIT), Nagpur, India.

2.4 Statistical Analysis

The morphometric measurements carried out with the help of Digimizer Version 4.6.1 MedCalc image analysis software package. All the measurement data for length and width of antennae as well as sensilla were subjected to arithmetic calculations. The mean, standard deviation and ± standard error was calculated, by using Microsoft Excel 2007 Software package.

3. Results

The light and scanning electron microscopic morphology of cephalic appendages was studied in the damselflies, *Rhodischnura nursei*, and *Lestes elatus* (adult). There are two types of cephalic appendages in the damselflies- the pre-oral appendages were the antennae while the post-oral appendages were the mandibles, maxillae, and labium.

3.1 Structure of the antenna in *R. nursei* and *L. elatus* (General similarities)

A pair of three-segmented antennae was present in *R. nursei* and *L. elatus* on the head in anterolateral position. The damselflies had their large eyes that take up nearly the entire head surface. The antenna was very short, inconspicuous, and filiform type which distinguished in three parts: a basal scape, a pedicel, and a flagellum. These articulated by levator and depressor muscles arising on the anterior tentorial arms and interleaved into the scape.

3.1.1 Scape

The scape, was short and first part of the antenna. It was inserted into a membranous region of the head and pivoted on a single marginal point. The point of insertion known as ‘antennifer,' (antennifer is the pivotal process which supports the antenna base). It was usually larger than the other parts of the antenna. It slightly swelled in the distal part, inthe damselflies, *R. nursei*, and *L. elatus.*

3.1.2 Pedicel

The pedicel was the second single segmented division of the antenna which was short, cylindrical. It was broader towards the flagellum and narrower towards the scape region. The pedicel articulated by the muscles which were arising in the scape from the antennal socket of the head.

3.1.3 Flagellum

The flagellum was the last third segment of the antenna which was single segmented in *R. nursei* and *L. elatus*. Therefore, it looks like a bristle due to a gradual reduction in the size of the segments.

3.2 Comparison between the antenna of *R. nursei* and *L. elatus*

3.2.1. Structure of antenna of *Rhodischnura nursei* (adult)

The antenna of *R. nursei* was divided into three parts as scape, pedicel, and flagellum. The antennae fitted in the socket on each dorsolateral side of frontal carinae. The socket was elliptical in shape, narrow towards the anterior and broader towards the posterior end. The length of the antenna was measured about 1353.84 µm. The diameter of the socket was measured about 364.51 µm while, the thickness of the antennal sclerotic ring is measured about 109.37 µm (Table 1 and 2) (Figs. 1 A, B).

3.3 Scanning electron microscopic (SEM) studies

The SEM studies of the antennae of adult damselflies, *viz. R. nursei* and *L. elatus* revealed the presence of various types of sensillae. These sensilla were present on the scape, pedicel, and flagellum of the antenna in their respective positions. Among, them the flagellum was endowed with densely arranged sensory structures in ventero-lateral position (Fig. 1 C).

3.3.1 Antennal sensilla of *R. nursei*

3.3.1.1 Scape sensilla

The scape of the antenna of the adult, *R. nursei* was measured about 169.23 µm in length and 88.89 µm in width (Table 1). Sensilla trichoidea, Sensilla trichoidea curvata, and sensilla basiconica were found on the scape of the antenna of the adult, *R. nursei* (Fig. 1 D).

i) Sensilla trichoidea

Sensilla trichoidea present on the scape of the antenna of the adult, *R. nursei* were of two types ST-I and ST-II measuring about 179.21 ± 1.1 and 164.8 ± 1.01 µm in length and 5.9 ± 0.1 and 2.7 ± 0.01 µm in width respectively (Fig. 1 E).

ii) Sensilla trichoidea curvata

Sensilla trichoidea curvata (STC) is present on the scape of the antenna of the adult, *R. nursei.* It measured about 197.1 ± 1.15 µm in length and 2.73 ± 0.9 in width. The number of sensilla was very less in number (Fig. 1 E).

iii) Sensilla basiconica

Sensilla basiconica (SB) were smooth on the dorsal and ventral surface. It was long and straight with a tapering end and broad at the base. It measured about 11.5 ± 0.83 µm in length and 1.7 ± 0.71 µm in width. The sensilla basiconica has the shape of thumb with a shaft (Fig. 1 E).

3.3.1.2 Pedicel sensilla

The pedicel of the antenna of the adult, *R. nursei* was measured about323.07 µm in length and 72.72 µm in width. The dorsal and ventral surface of pedicel shows sensilla trichoidea and microtrichia (Fig. 1 F).

i) Sensilla trichoidea

The sensilla trichoidea was long, slender and pointed at the tip. Two types sensilla trichoidea were found on the pedicel of the antenna of the adult, *R. nursei*. These were sensilla trichoidea- I (ST-I) and sensilla trichoidea- II (ST-II). They were similar except in their length. The length of ST-I and ST-II present on the pedicel of the antenna of the adult, *R. nursei* were measured about 164.07 ± 1.01 µm and 132.45 ± 1.00 µm while the width of ST-I and ST-II measurd about 3.09 ± 0.9 µm and 2.75 ± 0.6 µm respectively (Fig. 1 G).

ii) Microtrichia

The microtrichia were the small uncinate structures present on the pedicel of the antenna of the adult, *R. nursei*. They were elongate, blade-like structures overlapping with one another. There were two types of microtrichia I (MT-I) and microtrichia II (MT-II). MT- I measure about 1.7 ± 1.03 µm in length, and 2.7 ± 1.09 in width and MT- II was measuring about 1.2 ± 0.8 µm in length and 2.3 ± 1.07 in width (Fig. 1 H).

3.3.1.3 Flagellum sensilla

The flagellum of the antenna of the adult, *R. nursei* was measured about 784.61 µm in length and 12.09 µm in width. The flagellum consists of microtrichia also. Other types of sensilla were not observed on the flagellum. The microtrichia found to arranged in a plate-like manner.

i) Microtrichial plates

Three types of microtrichial plates were found on the flagellum of the antenna of the adult, *R. nursei.* These classified as MTP- I, MTP- II and MTP- III. The length of MTP- I, MTP- II and MTP- III are found to be 2.00 ± 0.1 µm, 1.3 ± 0.01 µm and 0.2 ± 0.006 µm and width 1.9 ± 0.5 µm, 0.7 ± 0.19 µm and 0.1 ± 0.41 µm respectively (Fig. 1 I-K).

3.2.2 Structure of Antenna of the *Lestes elatus* (adult)

Three segmented antenna was present on the head of the adult *L. elatus.* The length of the antenna was measured about 1157.89 µm. The antenna fitted in the antennal socket. The antennal socket was elliptical in shape, narrow towards the anterior and broader towards the posterior end. The diameter of the socket was measured about 347.14 µm while, the thickness of the antennal sclerotic ring was measured about 238.09 µm (Table 1 and 3) (Figs. 2 A, B).

3.2.3 SEM studies on antennal sensilla of *L. elatus*

3.2.3.1 Scape sensilla

The scape of the antenna of the adult, *L. elatus* was measured about 284.21 µm in length and 75.98 µm in width. Sensilla trichoidea, sensilla trichoidea curvata and sensilla basiconica found on the scape of the antenna of the adult, *L. elatus* (Fig. 2 C).

i) Sensilla trichoidea

Sensilla trichoidea present on the scape of the antenna of the adult, *L. elatus* were of two types ST-I and ST-II measuring about 179.21 ± 1.1 and 164.8 ± 1.01 µm in length and 5.9 ± 0.1 and 2.7 ± 0.01 µm in width respectively. Sensilla trichoidea were the hair-like process which freely movable on the basal membrane (Fig. 2 D).

ii) Sensilla trichoidea curvata

The sensilla trichoidea curvata (STC) was present on the scape of the antenna of the adult, *L. elatus.* It measured about 141.98 ± 1.01 µm in length and 2.53 ± 0.6 in width. This sensillum was similar to that of sensilla trichoidea only possesses a curved apex. These were found very less in number (Fig. 2 E).

iii) Sensilla basiconica

Sensilla basiconica were smooth on the dorsal and ventral surfaces. It reduced to small peg or cone. Two types of sensilla basiconica was found on the scape of the antenna of the adult, *L. elatus*. Sensilla basiconica- I (SB- I) measures about 13.9 ± 0.79 µm in length and 1.6 ± 0.32 µm in width, whereas sensilla basiconica- II (SB- II) measures about 7.98 ± 0.63 in length and 1.1 ± 0.3 in width (Fig. 2 F).

3.2.3.2 Pedicel sensilla

The pedicel of the antenna of the adult, *L. elatus* was measured about421.05 µm in length and 95.26 µm in width. Only one type sensilla trichoidea (ST) and microtrichia (MT) found. Sensilla basiconica was not present on the pedicel. A maximum number of microtrichia observed on the pedicel while the sensilla trichoidea were less in number (Fig. 2 G).

i) Sensilla trichoidea

The sensilla trichoidea were the simple articulated sensory hairs present on the pedicel of the antenna of the adult, *L. elatus*. These distributed on the scape and pedicel of the antenna only. They were made up of the cuticle. The length of ST-I present on the pedicel of the antenna of the adult, *L. elatus* measuring about 139.05 ± 1.1 µm and 2.0 ± 0.6 µm in width (Fig. 2 H).

ii) Microtrichia

Microtrichia was distributed all over the pedicel of the antenna of the adult, *L. elatus.* There was only one type of microtrichia. It measured about 2.9 ± 1.07 µm in length and 2.5 ± 1.05 µm in width (Fig. 2 H).

3.2.3.3 Flagellum sensilla

The flagellum of the antenna of the adult, *L. elatus* was measured about 526.31 µm in length and 42.10 µm in width. The segments of the flagellum reduced to a single segment. The only microtrichia were found on the flagellum which was arranged in a plate-like manner (Fig. 2 I).

i) Microtrichial plates

Microtrichial plates were nothing but the microtrichia which appeared as plates arranged in rows. Three to four types of microtrichial plates found on the flagellum of the antenna of the adult, *L. elatus.* These were classified as MTP- I, MTP- II, MTP- III and MTP- IV. The length of MTP- I, MTP- II and MTP- III are found to be 2.1 ± 0.005 µm, 1.4 ± 0.004 µm, 0.9 ± 0.002 µm, 0.5 ± 0.001 and width 2.3 ± 0.003 µm, 0.9 ± 0.001 µm, 0.6 ± 0.001 µm and 0.4 ± 0.001 µm respectively (Figs. 2 J, K).

4. Discussion

The filiform type of antennae is the characteristics of the Odonates having with large eyes and reduced antennae, where they primarily considered as visually oriented [15-17]. Similarly, the antennae of *Rhodischnura nursei* and *Lestes elatus* were also filiform types and three segmented consists of scape, pedicel, and flagellum. For the identification and classification of sensilla, we employed the classification of earlier workers [18-21] described in the various insect antenna. In *R. nursei* and *L. elatus*, the first antennal segment *i.e.* scape slightly swollen at distal part. The scape of the antenna of *R. nursei* consists of two types of sensilla trichoidea ST-I, ST-II, sensilla trichoidea curvata (STC) and one type of sensilla basiconica SB. However, the scape of the antenna of *L. elatus* revealed the presence of two types of sensilla trichoidea ST-I, ST-II, sensilla trichoidea curvata (STC) and two types of sensilla basiconica SB-I and SB-II. Subsequently, the presence of sensilla trichoidea on the scape of the antenna earlier reported in ant, *Camponotus compressus* [13, 15, 22-24].

The pedicel was the second antennal segment, next to the scape and in *R. nursei* and *L. elatus*, it is short and cylindrical in shape. In *R. nursei*, two types of sensilla are present on the pedicel *i.e.* sensilla trichoidea ST-I, ST-II and microtrichia MT-I, MT-II. Whereas, in *L. elatus* there were only one type of sensilla trichoidea ST and microtrichia MT are present. In Odonata and other insects, the pedicel is well demarked from the scape of the antenna containing various types of sensilla [13, 23, 25].

In the present study, the third segment of the antenna *i.e.* the flagellum in both the species, *R. nursei* and *L. elatus* was single segmented. However, in hymenopteran insects (e.g. ants and bees), the flagellum bears numbers of flagellomeres [13, 26, 27]. The flagellum endowed with three to four types of the plate-like microtrichia (MTP). Similarly, in *R. nursei* there were three types of microtrichial plates: MTP-I, MTP-II, and MTP- III were observed. Whereas, in *L. elatus* the flagellum consists of four types of microtrichial plates MTP-I, MTP-II, MTP- III, MTP-IV. The presence of sensilla basiconica in *R. nursei* and *L. elatus*, which may functionas a chemoreceptor, was also reported in *Epiophlebia superstes* in groups of six at the first flagellar segment [6]. In addition, the antennal sensilla of dragonflies, *Libellula depressa* and *Orthetrum cancellatum* were studied in detail by various workers [28-33]. According to Gewecke and Odendhal [30], the scape and pedicel as important sites for air speed perception and flight control. Subsequently, the presence of coeloconic putative olfactory sensilla in pits at the latero-ventral side of the antenna in several Odonata belonging to the suborders Anisoptera and Zygoptera [31, 33]. Sensilla trichoidea, sensilla trichoidea curvata present on the antenna also observed in carpenter ant, *Camponotus compressus* [13] and *Apis*, *Bombus*, *Xylocopa* [34] (Romani *et al*., 2003). Similarly, these sensilla also observed in the hemipteran bug, *Eurygaster maura* [35] and *Leptocoris augur* [36], which play a mechanoreceptive role. According to Gaino and Rebora [29] sensilla trichoidea on all the antennal segments of the dragonfly, *L. depressa* are mechanosensilla which could function as a current detector and could even have a role in rheotactic orientation. Sensilla trichoidea (ST) and sensilla trichoidea curvata (STC) present on the antennae of *R. nursei* and *L. elatus.* These might be working as mechanoreceptor similar to other insects [10, 16, 37-40]. Moreover, Piersanti *et al*., [41] reported that the olfactory response of the antennal olfactory sensilla in Odonata which are sensitive to prey odor. Similarly, olfaction may be involved in the mating behavior of Odonata [42-43]. However, the presence of styloconic sensilla is in pits, as functional thermo-hygroreceptors on the antennal flagellum of dragonflies also studied earlier [44]. However, the presence of various microtrichia in *R. nursei* and *L. elatus* may serve as a diverse mechanical function as studied earlier in other insects [45]. Subsequently, Barsagade and Gathalkar [46] also studied the mechanoreceptive role of microtrichia in mouthparts of *Canthecona furcellata*. Similarly, the microtrichia may serve as a mechanoreceptor, which may also involve in air speed perception, and hence, the exact role of sensilla in the species of damselflies may be evaluated by the advance studies.

Table 1: Length and width of the antenna of the adult, *R. nursei* and *L. elatus*.

SN	Antennal Structure	Size (µm)	
		R. nursei	***L. elatus***
1.	Antennal socket (D)	364.51	347.14
2.	Sclerotic ring (T)	109.37	238.09
3.	Antenna (TL)	1353.84	1157.89
4.	Scape (L)	169.23	284.21
5.	Pedicel (L)	323.07	421.05
6.	Flagellum (L)	784.61	526.31

D = Diameter, T = Thickness, L = Length, TL = Total Length

Table 2: A comparative account of sensilla presents on the antenna of *R. nursei* and *L. elatus*.

SN	Position	Type of sensilla	*R. nursei*	*L. elatus*
1.	Scape	Sensilla trichoidea - I (ST-I)	+	+
		Sensilla trichoidea - II (ST-II)	+	+
		Sensilla trichoidea curvata (STC)	+	+
		Sensilla basiconica – I (SB-I)	+	+
		Sensilla basiconica – II (SB-II)	-	+
2.	Pedicel	Sensilla trichoidea - I (ST-I)	+	+
		Sensilla trichoidea - II (ST-II)	+	-
		Microtrichia - I (MT- I)	+	+
		Microtrichia - II (MT- II)	+	-
3.	Flagellum	Microtrichial plate - I (MTP- I)	+	+
		Microtrichial plate - II (MTP-II)	+	+
		Microtrichial plate - III (MTP-III)	+	+
		Microtrichial plate - III (MTP-IV)	-	+

Table 3: Length and width of sensilla present on the antenna of *R. nursei* and *L. elatus.*

SN	Position	Type of sensilla	Length		Width	
			R. nursei	*L. elatus*	*R. nursei*	*L. elatus*
1.	Scape	Sensilla trichoidea - I (ST-I)	179.21 ± 1.1	150. 34 ± 1.2	5.9 ± 0.1	3.1 ± 0.8
		Sensilla trichoidea - II (ST-II)	164.8 ± 1.01	137. 67 ± 1.1	2.7 ± 0.01	1.9 ± 0.7
		Sensilla trichoidea curvata (STC)	197.1 ± 1.15	141. 98 ± 1.01	2.73 ± 0.9	2.53 ± 0.6
		Sensilla basiconica – I (SB-I)	11.5 ± 0.83	13. 9 ± 0. 79	1.7 ± 0.71	1.6 ± 0.32
		Sensilla basiconica – II (SB-II)	-	7.98 ± 0.63	-	1.1 ± 0.3
2.	Pedicel	Sensilla trichoidea - I (ST-I)	164.07 ± 1.01	139.05 ± 1.1	3. 09 ± 0.9	2.0 ± 0.6
		Sensilla trichoidea - II (ST-II)	132.45 ± 1	-	2.75 ± 0.6	-
		Microtrichia (MT- I)	1.7 ± 1.0	2.9 ± 1.07	2.7 ± 1.09	2.5 ± 1.05
		Microtrichia (MT- II)	1.2 ± 0.8	-	2.3 ± 1.07	-
3.	Flagellum	Microtrichial plate - I (MTP-I)	2.00 ± 0.1	2.1 ± 0.005	1.9 ± 0.5	2.3 ± 0.003
		Microtrichial plate - II (MTP-II)	1.3 ± 0.006	1.4 ± 0.004	0.7 ± 0.19	0.9 ± 0.001
		Microtrichial plate - III (MTP-III)	0.2 ± 0.01	0.9 ± 0.002	0.1 ± 0.41	0.6 ± 0.001
		Microtrichial plate - III (MTP-IV)	-	0.5 ± 0.001	-	0.4 ± 0.001

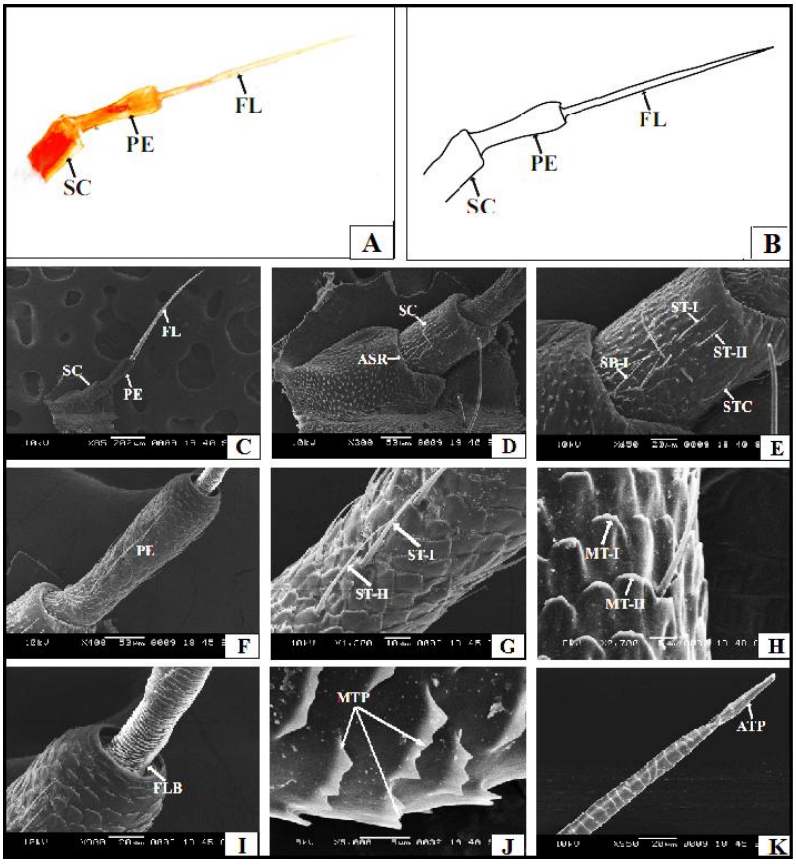

Fig 1: Light and SEM photomicrograph of antenna of adult, *Rhodischnura nursei* showing, A: Antenna (light microscopic view), B: Diagrammatic representation of antenna; C-K: SEM Photomicrograph of antenna showing C: Scape, pedicel and flagellum, D:Antennal sclerotic ring (ASR), E: Magnified view of scape with sensilla trichoidea-I (ST-I), (ST-II), sensilla trichoidea curvata (STC) and sensilla basiconica (SB-I), F: A magnified view of pedicel sensilla, G: Magnified view of pedicel with ST-I and ST-II, H: Magnified view of pedicel with microtrichia (MT-I and MT-II), I: Magnified view of pedicel with flagellum base (FLB), J: Magnified view of flagellum with microtrichial plates (MTP); K: Antenna with antennal tip (ATP).

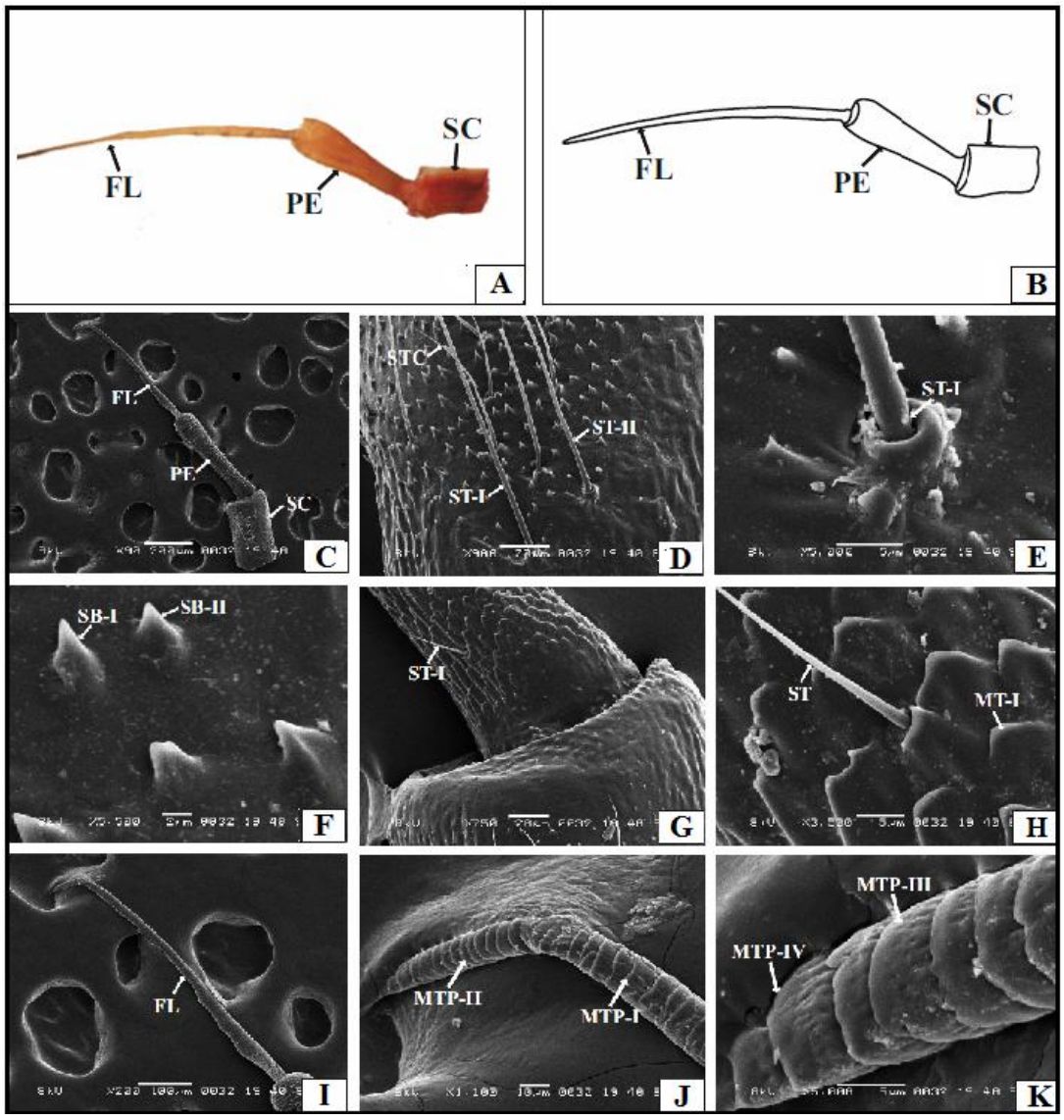

Fig 2: Light and SEM photomicrograph of antenna of adult, *Lestes elatus*, showing A: Antenna (light microscopic view), B: Diagrammatic representation of antenna; C-K: SEM photomicrograph of antenna showing C: Scape, pedicel and flagellum, D: Magnified view of scape with sensilla trichoidea (ST-I and ST-II) and sensilla trichoidea curvata (STC), E: Magnified view of scape with sensilla trichoidea (ST-I), F: Magnified view of scape with sensilla basiconica-I (SB-I) and sensilla basiconica-II (SB-II), G: Pedicel with sensilla trichoidea (ST-I), H: Magnified view of pedicel with microtrichia (MT-I), I: Flagellum (FL), J: Magnified view of flagellum with microtrichial plates (MTP-I, MTP-II), K: Antennal tip with microtrichial plates (MTP-III, MTP-IV).

5. Conclusion

In conclusion, present investigations contribute to the preliminary knowledge of the different sensillum present in two species of damselflies, *R. nursei* and *L. elatus*. Therefore, this information may enable the further understanding of the biology and behavior of *R. nursei* and *L. elatus*.

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