

The morphology and sensillae distribution on the posterior surface of clypeo-labrum of *Oxya Chinensis* (Thunberg)

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Abstract: Deals with the morphology and sensillae distribution on the posterior surface of clypeo-labrum of *Oxya chinensis* (Thunberg). Following the method and nomenclature of previous studies with some addition, the posterior surface of mouthpart is divided into 12 areas, and the sensillae are described in the order of area number. The result is that there are 5 hair tracts, 3 kinds of spicules, and 4 kinds of sensillae. The hair tracts and spicules are similar to that of other grasshoppers, only Tract A extended shorter of the length of labrum. Among the 4 kinds of sensillae, only 2 kinds have been reported before.

Key words: clypeo-labrum; morphology; sensillae; *Oxya chinensis* (Thunberg)

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As the front part of mouthpart, the posterior surface of the clypeo-labrum contact with the grasshoppers' food. It takes an important role in the course of food-taking. The formal studies on the sensillae of grasshoppers, such as, *Locusta migratoria* (L.)^[1~3]; *Hypochlora alba* (Dodge)^[4] and some species of the Genus *Melanplus* (Stål), show that there are abundance and variety of sensillae on its posterior surface.^[5] thought that the numbers and distribution of sensillae are concerned with the feeding habits in a variety of orthopteroid families and subfamilies. This paper will describe the morphology and distribution of sensillae on the posterior surface of clypeo-labrum of a rice-leaf-feeding grasshopper, *O. chinensis* (Thunberg). Although in its nymph stage before 3rd instar, this species may take many kinds of herbs as food. after that, they mainly take the rice leaf or the leaf of other grass as food. The feeding habit is between the monophagous and omnivoro-

us. So study the sensillae on the posterior surface of Clypeo-labrum will help us in understanding the feeding habits.

1 Materials and Methods

All the specimens were collected from the rice fields in Chang'an County, Shaanxi Province. The clypeo-labrum was dissected, then fixed in glutaraldehyde 2.5%. After washed by NaOH (10%) and water, the materials were dehydrated in a graded ethanol series (50%, 70%, 80%, 90%, 100%, each 5 min.) and critical-pointed dried in CO₂. After sputter-coated, the materials were observed under HITACHI S-570 Scanning Electron Microscope.

2 Results

Following the nomenclature used for sensillae

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on *Locusta migratoria* (L.)^[2]; *Hypochlora alba* (Dodge)^[4] with some additions, we divide the feature on the posterior surface into two parts; hair tracts and spicules; sensillae. When describe the sensillae, we divide the posterior surface into 12 areas.

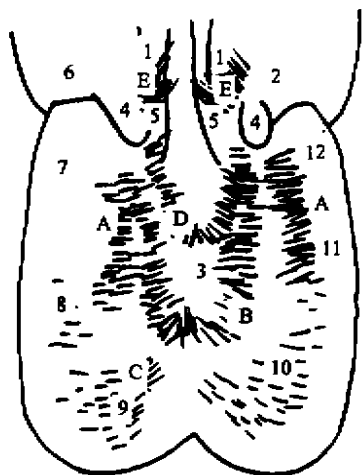


Fig. 1 The Posterior Surface of Clypeo-labrum
A, B, C, D, E are the number of hair tracts,
1~12 are the number of areas.

2.1 Hair Tracts and Spicules

There are 5 hair tracts (A, B, C, D, E) (fig. 1). The length of the hairs is about 30 to 100 μm , and the length vary in each tract. These hairs in grasshopper are hollow and non-innervated, the shafts are thought to be the extension of the cuticular surface. Here we assume to be the same as Cook^[2]. Tract A extend to the half-length of the labrum on both sides, but be sparse on the left side than on the right. This is different from *Locusta migratoria* and *Hypochlora alba*, in which Tract A extend most of the length on the right side. Tract B extend down from the Clypeo-labrum junction, and two sides meet at the 2/3 length of labrum (Fig. 1; Fig. 2, 1), the hairs here are more dense and longer than the other tracts. Tract C only occurs on the left side (Fig. 1; Fig. 2, 1), and is the sparsest of the 5 tracts. The morphology of Tract D resembles to which of Tract B, it occurs inside Tract B. There are a pair of a little hairy tract on the side of middle groove of the Clypeus, the right is bigger than the left, we call that Tract

E.

There are 3 types of spicules. Type 1 (Fig. 2, 2) is present in Area 6 and Area 2. Type 2 (Fig. 2, 3) occurs in rows in the Area 7 and Area 12, these are the smaller spicules. Type 3 (Fig. 2, 4) in the areas 8, 9, 10, 11, this type of spicules occurs scatterly.

2.2 Sensillae (the sensillae will be described in the order of area)

Area 1: this area includes Tract E and its surrounding part, from Fig. 2, 1, we can see that this area is absent of sensillae.

Area 2: this area is just beside Area 1 (Fig. 1), except spicules, there is no sensillae.

Area 3: this area is between tracts B and D. In male, this area is absent of sensillae; but in female, there are some campaniform sensillae in this area Fig. 2, 5. the dome is above the cuticle slightly, the width of pit is about 15 μm .

Area 4: On each side of the middle groove, just above the beginning of tracts B and D, there is a protruding structure, we call that Area 4 (Fig. 1; Fig. 2, 6). This structure can be divided into two layers. The out-layer consisted of hairs long 30 μm to 60 μm , in the inner-layer, there are scattered about 24 dome-shape sensillae. The base of this kind of sensillae is irregular, but the top all in dome shape (Fig. 2, 7). This has be said to be mechanical sensillae in other insects, here we think so. Surrounding the dome-shape sensillae, there are many spicules of Type 2.

Area 5: This area is under Area 1, in the inner side of Area 4 and on the two sides of middle groove of clypeus. In Fig. 2, 8, we can see the sensillae in this area are special. The diameter of pit is about 7 μm , in the pit, there is a cone, and apex of the cone depressed, there is a peg about 3 μm long and 3 μm wide at base.

Area 6 is similar to Area 2.

Area 7, 12 (Fig. 1): This two areas are covered with little spicules and have no sensillae.

Area 8 (Fig. 2, 4), 9, 10, 11 (Fig. 2, 9): The sensillae in all these four areas are basiconic. There are only a few sensillae in Area 8, the

length of sensillae is about $15\ \mu\text{m}$, the basal width is about $3\ \mu\text{m}$. the apex is blunted-rounded. The apex on sensillae in Areas 9,10,11 are all sharp-pointed, the length vary from $30\ \mu\text{m}$ to $60\ \mu\text{m}$, and the basal width is about $5\ \mu\text{m}$; the density of

sensillae in these area vary. Area 10 has the most sensillae; the density of sensillae in areas 9 and 11 is between Area 8 and Area 10. No matter what area is the sensillae in, that is slant, and the apex pointed to the centre of which labrum.



Fig. 2 The Morph and Sensillae Distribution on the Posterior Surface of Clypeo-labrum of *Oxya Chinensis* (Thunberg)

1 posterior surface of clypeo-labrum, A,B,C,D,E are the number of hair tracts, bar=0.5 mm 2 spicules Type 1, bar=5 μm 3 spicules Type 2, bar=5 μm 4 spicules Type 3 and basiconic sensilla, bar=10 μm 5 campaniform sensilla, bar=10 μm 6 Area 4 7 dome-shape sensilla, bar=10 μm 8 sensilla in Area 5, bar=10 μm 9 part of Area 11, bar=10 μm

3 Discussion and Conclusion

Of the four types of sensillae, only basiconic and campaniform sensillae have been reported in *Locusta migratoria*; *Schistocerca gregaria* and *Hypochlora alba*. Following the formal studies, the basiconic sensillae may be mechanoreceptors or chemoreceptors, taking Cook's point, we assumed the campaniform sensillae to be contact chemoreceptors. The dome-shape sensillae in Area 4 have not been reported in grasshoppers, by its position and shape we think that its function must be felling the mechanic character of the food. The sensillae in Area 5 have not been reported also.

As a preliminary study on the morphology and sensillae distribution on posterior surface of the clypeo-labrum of *Oxya chinensis*, most of our attention were payed to the to the feature, as far as the function and detail of fine structure is concerned, our study is superficial. All the functions of sensillae we described are assumed following the reports of other grasshoppers.

From the study, we can draw the following conclusion.

(1) The hair tracts are similar to that of *Locusta migratoria*, *Schistocerca gregaria* and *Hypochlora alba*, but differ from them in; Tract A

only extends half-length of labrum; Tract C is sparse and near Tract B.

(2) The types of sensillae are the same of other grasshoppers, but the difference only is the distribution.

(3) The distributive areas of the sensillae are resemble to other grasshoppers. But the difference is that there are two new kinds of sensillae.

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⑧ 中华稻蝗上唇—唇基区后面的形态学及感受器分布的研究

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摘要:研究了中华稻蝗上唇—唇基区后面的形态及感受器分布。参考以前的研究方法及命名并略做修改,将中华稻蝗上唇—唇基区后面分成12个区域并按照区域的顺序对感受器的类型及分布进行描述。发现:有5种毛簇、3种角质齿、4种感受器;除毛簇A在上唇的右侧延伸较短外,毛簇和角质齿的结构类似于其他蝗虫;在4种感受器中,有两种在其他蝗虫中未见报道。

关键词:中华稻蝗;上唇—唇基区;形态学;感受器