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A Look into the Tiny Flat Plates Sheathing the Flimsy Wings of *Amata Passalis* using Light Microscopy

By Nidhi Soman, Surya A. & Sheeba S.

Abstract- *Amata passalis* is a moth popularlyknown assandal wood defoliator, belonging to the family Erebidae under the order lepidoptera. The framework of this study mainly concentrates on the different types of scale cells present on the varied coloured wing areas. The study has been conducted experimentally by scrapping off different coloured scales to a glass slide and fixing it with xylene and observing it under a light microscope. The dimensions of the scales were also studied by measuring it using micrometry. A total of 68 morphologically distincttypes of scales were studied, which includes 48 scales of the dorsal wing and 20 scales of the ventral wing. Analysis of both the dorsal and ventral wing areas revealed the presence of several white, brown and and grey coloured scales. This moth species posess a wing pattern with black coloured region surfaced by white spots. Black and white scales cannot be extracted separately, as the sclaes seen on the white spotted region are small sized ones. Majority of the scales of the dorsal region were point edgedones and they have a length range of about 110.3μm to 149.7μm and width range of 59.1μm to 78.5μm. While examining the ventral wing it was observed that majority of the scales were heart shaped ones.

Keywords: *flimsy wings, light microscopy, micrometry, moth, flat plates.*

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Nidhi Soman [α], Surya A. [σ] & Sheeba S. [ρ]

Abstract- ***Amata passalis*** **is a moth popularlyknown assandal wood defoliator, belonging to the family Erebidae under the order lepidoptera. The framework of this study mainly concentrates on the different types of scale cells present on the varied coloured wing areas. The study has been conducted experimentally by scrapping off different coloured scales to a glass slide and fixing it with xylene and observing it under a light microscope. The dimensions of the scales were also studied by measuring it using micrometry. A total of 68 morphologically distincttypes of scales were studied, which includes 48 scales of the dorsal wing and 20 scales of the ventral wing. Analysis of both the dorsal and ventral wing areas revealed the presence of several white, brown and and grey coloured scales. This moth species posess a wing pattern with black coloured region surfaced by white spots.Black and white scales cannot be extracted separately, as the sclaes seen on the white spotted region are small sized ones. Majority of the scales of the dorsal region were point edgedones and they have a length range of about110.3µm to149.7µm and width range of 59.1µm to 78.5µm.While examining the ventral wing it was observed that majority of the scales were heart shaped ones. Dimensional analysis revealed that the scales of this area has a length range of about 130µm to 145.7µm and width range of about 55.1 µm to78.8µm.The results of this work unriddled that, even though the moths are not as much attractive as other members of the order Lepidoptera including butterflies, their flimsy wings are sheathed with varietyoftiny flat plates known as 'scales' on its surface, that are wondrously beautiful, irrespective of their sophisticated markings and patterns.**

Keywords: flimsy wings, light microscopy, micrometry, moth, flat plates.

I. Introduction

Moths and butterflies, diagnosed as insects having scales on their wings are grouped together in lepidoptera, an order which forms part of the class insecta, the dominant division of the sub-kingdom Articulata. The awe-inspiring forms and colouration of the moths and butterflies caused them to be attracted by nature lovers. The colouration and patterns of their wings are formed by thousands of microscopic tiny flat plates known as scales sheathing like tiles on a roof. The scales of these insects were coloured and arranged in innumerable patterns from elusive and cryptic to the bright and showy. The wings which are the most prominent attribute of lepidopterans including moths and butterflies are usually covered on both the veins and membranes with two layers of minute socketted scales. The present study untangles the morphology of different types of scale cells overlaying the translucent wings of *Amata passalis* commonly called as sandal wood defoliator belonging to the family Erabidae.

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II. Materials and Methods

The moth species, *Amata passalis* has been collected from botanical garden of Sree Narayana College Campus, Kollam (Plate 1). The scales that are overlaying the wings of moth species were taken as the experimental sample. Several scales have been scrapped off from different coloured regions of the wing separately and placed on a glass slide. A drop of xylene has been added to the samples that occupies the glass slide. After it has been evaporated the samples were studied under light microscope, so that the photographs of each scale can be taken clearly and separately. Microscopic photography was adopted in this study, for taking the photomicrographs of prepared scale samples. Followed by this, the diameters of each scale under study were measured using morphometrics. It is further preceded for result analysis.

III. Results

Amata passalis is a moth belonging to the family Erabidae. It is often known as the defoliator of sandalwood. This moth species posess a wing pattern comprising of black coloured region surfaced by white spots. The forewing and hindwing have a wingspan of about 5cm and 2cm respectively. A total of 68 morphologically distincttypes of scales were studied, which includes 48 scales of the dorsal wing and 20 scales of the ventral wing. Analysis of both the dorsal and ventral wing areas revealed the presence of several white, brown and grey coloured scales (Plate I.1 to I.2). Majority of the scales of the dorsal region were point edged ones while those of the ventral region were heart shaped ones. The dimensional analysis pinpointed that the scales present on the dorsal and ventral wing areas shows variation both in terms of length and width. Analysis of scales on the dorsal wing area revealed that

the dimension ranges from 110.3μm to149.7μm in terms of length and 59.1μm to 78.5μm width. Majority of the scales of the ventral wing has a length range of about 130μm to 145.7μm and width range of about 55.1 μm to 78.8μm.

IV. Discussion

The flimsy wings of the moths and butterflies are clothed in flattened scales which are actually made from modified hairs. It is these finely ridged, hollow and microscopically perforated scales which gives different colouration and patterns to the wings of this insect as they posess colour pigments. The Lepidopteran scale vesiture of the wings serves a variety of functions. Since these Scales are easily detachable, it helps the insects to free their wing if it is caught in a spider's web (Barish, 1999). In addition to this, the scales enable development of vivid or indistinct patterns which help the organisms protect itself by concealment and camouflage, mimicry and warning. The morphology of scales has been studied by Downey and Allyn (1975) and they classified the scales into three groups namely hair like or piliform, blade like or lamellae and other variable form. In the present study only wing scales are focused. Many morphologically distinct scales has been observed during the present study on sandal wood defoliator. Majority of the scales of the dorsal region were point edged ones while those of the ventral region were heart shaped ones. Scales vary in colour, which can be due to structure or pigmentation (Barish,1999).Analysis of both the dorsal and ventral wing areas of *Amata passalis* revealed the presence of several white, brown and and grey coloured scales. The dimensions of the scales ranges from 110.3μm to 149.7μm length and 55.1μm to 78.8μm width. Similar observations were made by Downey and Allyn (1975) and pointed out that the scales observed from the wings of certain butterflies range in size from 30 μm to 80 μm length and 30 μm to 500 μm width. In the present study it was also found that the scales present on the dorsal wing area has the highest dimension in terms of length. But in terms of width, the values are almost similar on both wing areas of this engrossing moth named *Amata passalis.*

V. Conclusion

The results of this work deciphered that, even though the moths are not as much attractive as other members of the order Lepidoptera including butterflies, their flimsy wings are sheathed with varietyoftiny flat plates known as'scales' on its surface, that are wondrously beautiful, irrespective of their elusive and cryptic markings and patterns.

Acknowledgement

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PLATE I

***Amata passalis* (sandle wood defoliator)**

Dorsal wing

ventral wing

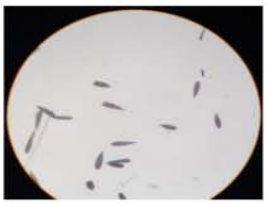


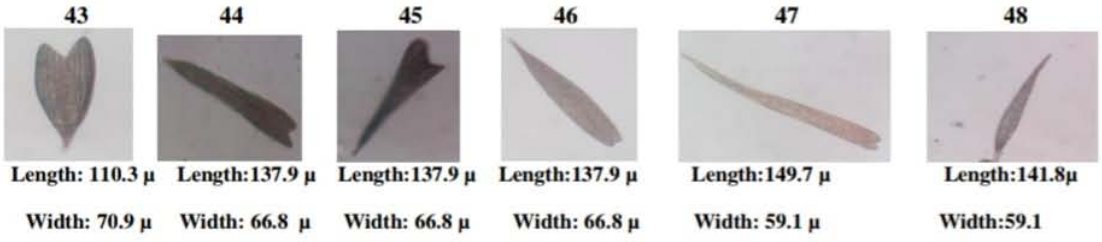
Plate 1: Amata passalis(sandle wood defoliator)

PLATE I.1

DORSAL WING

Plate I.1

PLATE I.2



VENTRAL WING

Plate I.2