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Morphological study of pronymph stage of male *Aonidiella orientalis* (Newstead) (Homoptera: Coccoidea: Diaspididae)

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Abstract
Authors have studied morphological features of armoured scale insect, pronymph stage of *Aonidiella orientalis*. It belongs to family Diaspididae, super family Coccoidea, Order Homoptera. It is an important pest of *Mangifera indica, Saraca indica, Musa paradisiaca, Dalbergia sissoo, Psidium guajava, Syzygium cumini, Syzygium jambos, Annona squamosa* and other economical, ornamental and horticultural plants which had been collected in northern India from the twigs, leaves and fruits. The scale of pronymph stage of male *Aonidiella orientalis* is ovoidal in shape and its colour is brown yellowish with black dark spot towards the exuvia. The whole body of pronymph is nearly flattened and its colour is pale pink. Eyes, antennae and wings are in developing in the pronymph stage. Two pairs spiracles are present without trilocular pores. The marginal and submedian setae are distributed on dorsally and ventrally on both right and left side equally.

Keywords: pronymph stage of male *Aonidiella orientalis*, morphological features

1. Introduction
Aonidiella orientalis belongs to family Diaspididae, super family Coccoidea, Order Homoptera. All the insects of this family are known as armoured scales. Armored scales are cosmopolitan found in tropics, subtropics and warmer portions of the temperate zones.
Lellakova-Duskova (1963) [6] described the morphology, metamorphosis and life cycle of scale insect *Quadraspidiotus gigas*. Komosinska (1974a) [5] studied on the morphology of *Mytilaspis conchiformis* forma *conchiformis*. Srivastava (1975) [9] discussed occurrence of the red scale, *Aonidiella orientalis* (Newstead) on roses in Madhya Pradesh., Dutta (1990) [2] observed contribution towards the studies of scale insects of north India. Dutta and Baghel (1991) [3] described on the morphology of mature female, *Aonidiella orientalis* in northern India. Dutta and Singh (2001) [4] studied on the reproduction behaviour in *Aonidiella orientalis* (Newstead). Ojha (2006) [7] described morphological features of mature female scale insect, *Abgrallaspis katorii* (Homoptera: Coccoidea: Diaspididae). Chauhan and Ojha (2018) [1] worked on morphological study of adult male *Aspidiotus tamarindi* (Green) in north India. Ojha and Singh (2019) [8] studied morphological features of first stage of larva (crawler) of *Aonidiella orientalis* in north India.

2. Materials and Methods
The morphological studies were carried out in Zoology Department, Raja Balwant Singh College, Agra chiefly taken from different hosts and several localities of Shikohabad, northern India. Measurement values in millimeters are given frequently together with the description of particular features. All microscopic slides used for measurements were prepared by the method described by Williams and Kosztarab (1970) [10] either from dry material or after a prior fixing in conserving fluid consisting four parts of 95% alcohol and one part of glacial acetic acid.

3. Observations
Scale: The average length and width of the scale (Fig.1) of pronymph stage of male *Aonidiella orientalis* (Newstead) are 0.84mm and 0.42mm. The colour of the scale is brown yellowish with black dark spot towards the exuvia. It is ovoidal in shape. The single first exuvia is pushed back under scale after moulting. The colour of the first exuvia is dark yellow or yellowish red. It is roughly circular in shape.

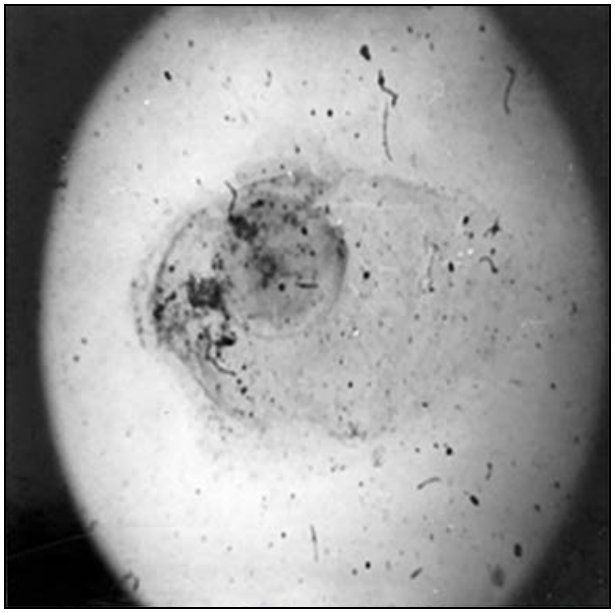

Fig 1: microphotograph or the scaie or pronymph stage of male *Aonidiella orientalls* (Newstead)

Body Shape: The whole body of pronymph (Fig. 2 & 3) is nearly flattened and elongated provided a pair of developing antennae anterior wards and a pair of long developed pygidial spines posterior wards.

Fig 2: Microphotograph of the pronym ph stage of *male Aonidieiia orientalls* (Newstead)

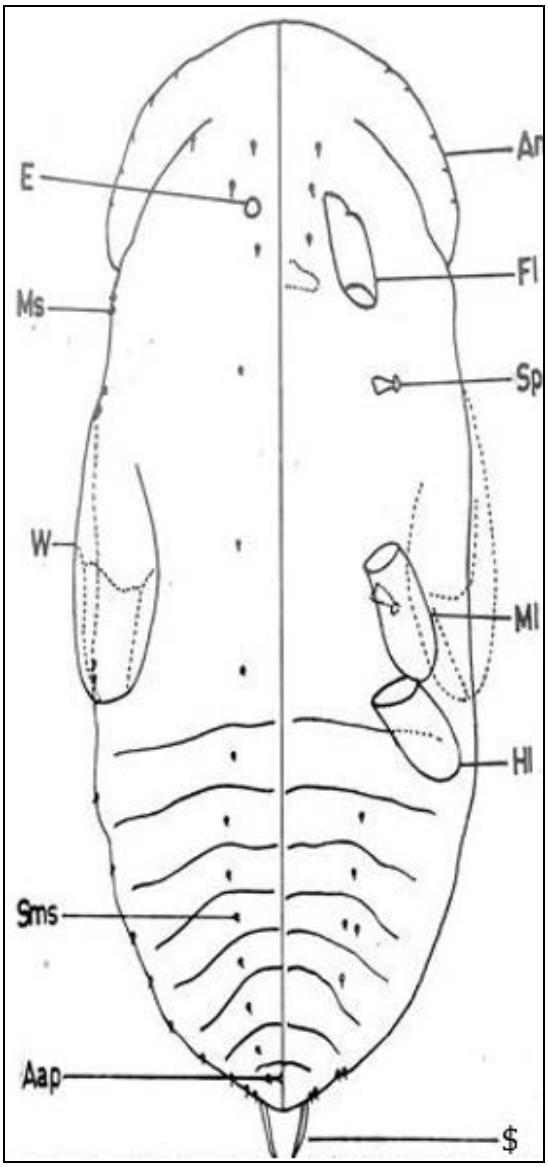

Fig 3: Microphotograph of a diagram showing left dorsal and right ventral side of the body of pronymph stage of male *Aonidielia orientais* aj Newstead)

Colour: The colour of pronymph is pale pink.

Measurement: The average length and width in mesothoracic of 25 specimens are 0.750mm and 0.360mm.

Cuticle: The cuticle of the body is membranous.

Segmentation of the Body: The segmentation of the head and thorax part is not clear, however, meso and metathoracic segments are with some middle demarcation. The abdominal area with fairly well marked segmentation and has VIII segments.

Eyes: The eyes are in developing condition in the pronymph stage.

Antennae: The antennae (Fig.3) are in developing stage reaching nearly the base of the developing anterior legs. The antenna is still remained unsegmented and its average length is 0.160mm.

Wings: The wings (Fig.3) are in developing stage reaching nearly the base of the posterior legs. The vein network is still not developed. Its average length and width are 0.204 mm and 0.063mm.

Mouth Parts: The mouth parts of the pronymph are reduced too, but their remanents are still present.

Legs: The legs (Fig.3) are developing condition without marking different parts. The average length of the three pairs pro, meso and metathoracic legs are 0.080mm, 0.110mm and 0.115mm.

Spiracles: The anterior and posterior pairs of the spiracles (Fig.3) are like that of second stage larva but slightly larger in size and both are without trilocular pores. The average length of anterior and posterior spiracles are 0.0185mm and 0.020mm.

Distribution of Setae: In the pronymph stage of *Aonidiella orientalis* (Newstead) the marginal and submedian setae (Fig.3) are distributed on dorsally and ventrally on both right and left side equally. Dorsally, the marginal and submedian setae are present– one and three in cephalic, six and three in thoracic and nine and eight setae in abdominal part. Ventrally, the marginal and submedian setae are present in abdomen- four, two in each VII and VIII segments, and five, one in each II, III and V and two in IV. Ventral side of the head has three submedian setae only.

3. Results and Discussion

Lellakova-Duskova (1963) [6] described in pronymph of *Quadraspidiotus gigas* three pairs of unevenly long spines are placed between the antenne bases and the last pygidial segment with two very long and strong spines. Komosinska (1974a) [5] described in pronymph of *Mytilaspis conchiformis* forma *conchiformis* one marginal and three submedian head setae like that of pronymph of *Aonidiella orientalis* (Newstead) but in former species the last pygidial segment is without a pair of spine, while, in later species a pair of strong spines are present in the last pygidial segment like that of pronymph of *Quadraspidiotus gigas.* (Lellakova-Duskova, 1963) [6].

4. References

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