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Ootaxonomy and Egg Shell Morphology of Phthirapteran Species Infesting C*oturnix Coturnix* (Linnaeus, 1758) (Phthiraptera: Amblycera: Ischnocera)

[1]Aftab Ahmad and [2]Neelima Gupta
[1]Northern Regional Centre, ZSI, Kaulagarh Road, Dehradun Uttarakhand
[2]Doctor Harisingh Gour Sagar University (a Central University), Sagar, M. P. India

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Corresponding Author:
Neelima Gupta
Doctor Harisingh Gour Sagar University (A Central University), Sagar Madhya Pradesh, India

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Abstract: The morphological features of eggs of three phthirapteran species (*Menacanthus abdominal is* Piaget, 1880, *Cuclotogaster cinereus* Nitzsch, 1866 and *Goniodes astrocephalus* Burn, 1838) of common quail lice, *Coturnix coturnix,* Linnaeus, 1758 were studied through SEM. Differences in shape, size, sculpturing of eggs of each species exhibits difference in microtopography (mention key differences).

INTRODUCTION

Phthirapteran ecto parasites exhibit considerable variation with respect to the egg laying sites, oviposition patterns and egg shell morphology. The eggs of phthirapteran epecies permanently attach to the feathers/ hairs of the hosts and exhibit remarkable and quite polymorphic chorionic structure. Markings present on the eggs of phthirapteran species can act as a useful indicator for the identification of species.

A survey of literature reveals that specific studies on the egg morphology have rarely been made. Certain workers [1-12] have provided information on the egg shell morphology of phthirapteran species. [13-14] pointed out the role of egg morphology as a guide to louse taxonomy and further advocated the use of SEM for this purpose. [20-21] Pointed out the role of egg shell morphology as a guide to louse taxonomy and further suggested the use of SEM of eggs for this purpose.

During the present studies, an attempt has been made to furnish information about the egg shell morphology of three phthirapteran species viz. Infesting common quail, with the help of Scanning Electron Microscopy.

MATERIALS AND METHODS

The nits of each species were obtained from the infested host. The intact eggs were dehydrated in different grades of alcohol. For SEM studies, eggs were fixed in 2.5% gluteraldehyde and passed through 0.2 M phosphate buffer, dehydrated, mounted on double sided glued tape on aluminum stubs, coated with gold palladium alloy in Neo Coater 100-240V and examined under SEM (Neo JCM-6000) at Centre of Excellence laboratory of Mahatma Jyotiba Phule Rohilkhand University, Bareilly, Uttar Pradesh. The samples were then observed under SEM at varying magnifications and selected areas were photographed. Some specimens were treated with Osmium tetra oxide (2%) for achieving better results.

RESULTS AND DISCUSSIONS

Cuclotogaster cinereus Nitzsch, 1866*:* The egg of *C.cinereus* is miniature rice grain like elongated structure (0.45-0.47 mm. in length, and 0.10-0.12mm. in width)

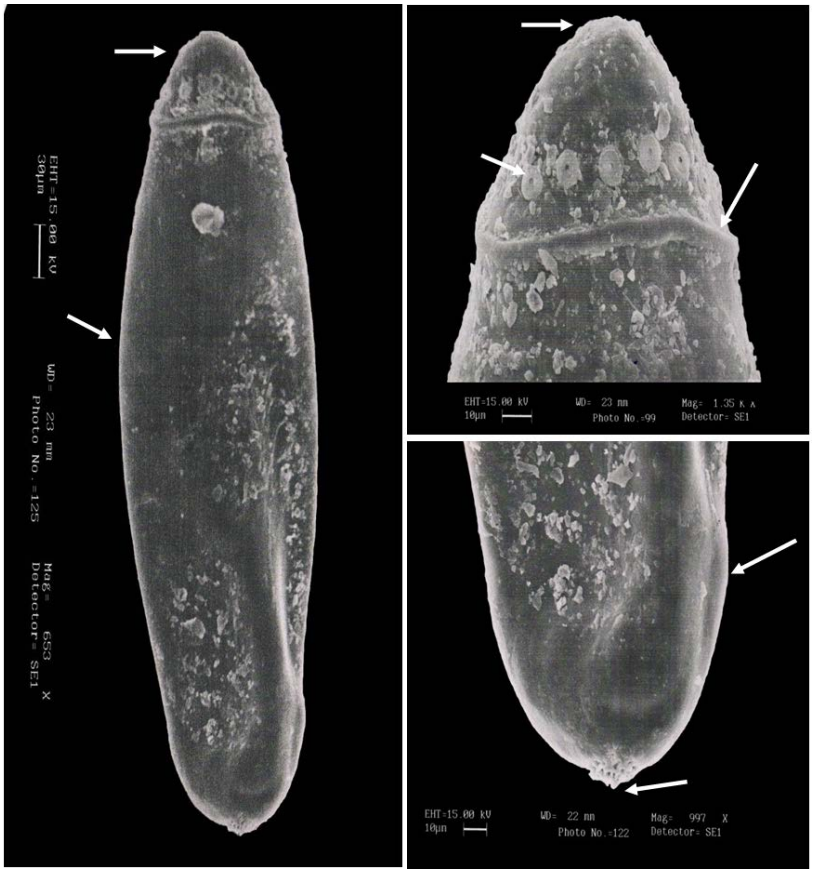

Fig. 1a-c: (a) Entire egg shell of *Cuclotogaster cinereus*, (b) Enlarged view of opercular end of the egg of C. *cinereus* showing the micropyles and (c) Enlarged view of the posterior end of the egg of C. *cinereus* showing the stigma

fig.1a. Anterior end of egg is capped with almost dome shaped operculum (0.05-0.08mm. in diameter) fig.2. 12-14 micropyles (0.01-0.02mm. in diameter) are arranged near the opercular rim of the egg. Each micropyle appears as a typical button shaped structure. The rear end of the egg shell bears a prominent bee hive like stigma/ hydropyle fig.3a. The entire egg chorion of the egg is smoothand does not show any marking or sculpturing/ ornamentations.

Goniodus astrocephalus Burn, 1838: The egg of *G.astrocephalus* is ovoid in shape (0.45-0.48 mm. in length, and 0.15-0.18mm. in width) fig.1. The egg chorion remains smooth (devoid any kind of sculpturing/marking and apophyses). The opercular disc is nearly conical in shape (0.04-0.08 mm. in diameter) and shows feebly defined ridges fig.2a. The opercular disc also bears 13-15 button shaped micropyles which are irregular along the ring (0.01-0.02mm. in diameter). A thick rod like polar thread structure arises from anterior end of the operculum which curves downward towards the operculum thus making a hook like structure. The tip of the polar thread is an oblique disc like structure (0.012 mm. in diameter). The posterior end of the egg exhibits presence of a bee hive like structure called stigma fig.3. The stigma appears to be composed of a hollow chamber.

Menacanthus abdominalis Piaget, 1880: The egg of *M. abdominalis* is ovoid in shape (0.72-0.86mm. in length and 0.23-0.27mm. in width) fig.1. The egg chorion is smooth devoid of sculptures/ornamentations. The operculum is hat shaped structure and lacks polar thread structure (0.11-0.15 mm. in diameter) fig.2. The opercular disc bears faint hexagonal marks. The egg mouth bears 38-40 small filaments like apophyses which are arranged in two rows. Apophyses belonging to the outer row are divided while the inner ones are undivided.

The entire basal portion of the egg remains heavily covered by cementing materials used by lice to glue the egg on the feathers fig.3. Hence, stigma/hydropyle remain concealed in the cementing material. Adult lice in many cases lack significant intergeneric morphological differences and are thus difficult to classify[14]. At the same time, the eggs of different species exhibited fascinating differences when examined through SEM. The phthirapteran eggs exhibit certain distinctive

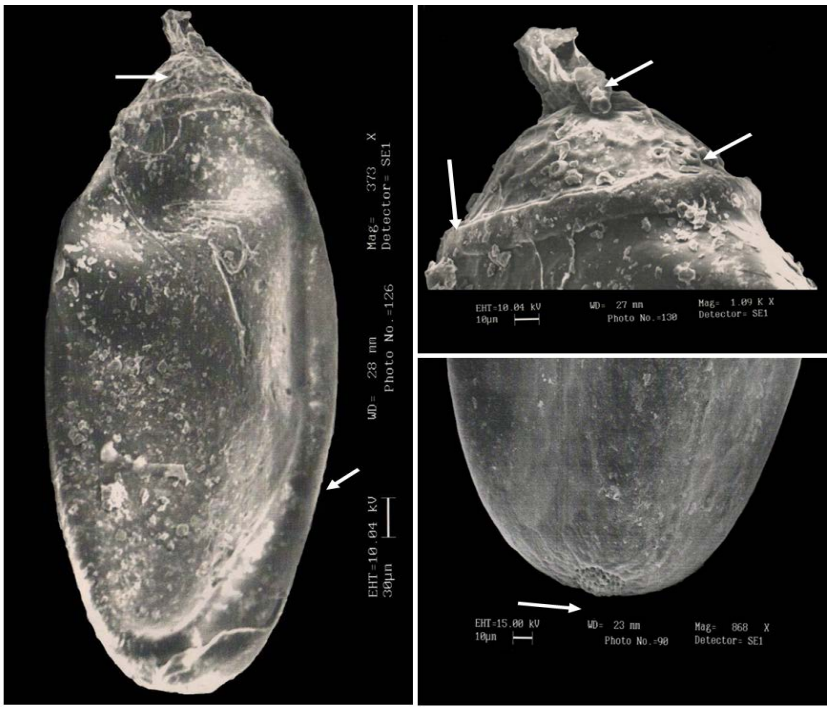

Fig. 2a-c: (a)Entire egg shell of Goniodes astrocephalus, (b) Enlarged anterior end of the egg of G. astrocephalus showing the micropyles and (c) Enlarged view of the posterior end of the egg of G. astrocephalus showing stigma

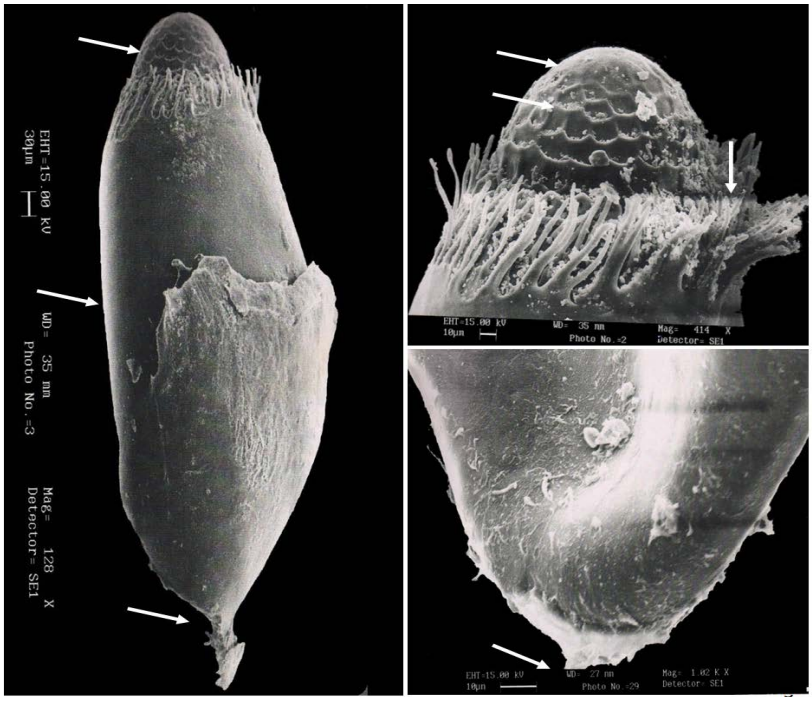

Fig. 3a-c: (a) Entire egg shell of Menacanthus abdominalis, (b) Enlarged anterior end of the egg of M. abdominalis showing the micropyles and (c) Enlarged view of the posterior end of the egg of M. abdominalis showing the stigma

characteristics on or within chorionic shell. A scrutiny of literature also indicates a number of fascinating adaptive differences in the form of sculpturing/ ornamentations on the chorion. The occurrence of polar thread, filament like process (apophyses) on the egg shell, markings/ ornamentations on the egg shells, opercular disc sculpturing/ ornamentations on the opercular disc and the arrangements of the micropyles on the opercular discs are the main points relating to diversity of the eggs[14]. Has categorically pointed out that egg morphology can be used as a guide to louse taxonomy and further advocated the use of SEM of eggs for identification of eggs to genera and where possible to species level. Furthermore, many external features of the eggs are difficult to resolve by the light microscopic studies. However, SEM proved to be an ideal instrument for this purpose revealing the minutest details.

Examined the egg shell morphology of three species of *Lipeurus* (*L.caponis* with granular protuberances; *L. heterographus* having hexagonal pattern; *L.l tropical is* having shell pitted with faint hexagonal markings). Observed that the egg shell of selected species of genus *Menacanthus* differed in location, number and nature of apophyses present on the egg shells. The egg shells of selected species of *Brueelia* differed in the number of micropyles, presence of polar thread.

Review of literature reveals that in case of amblyceran species the differences in the egg morphology of the phthiraptera species appear to be more distinct i.e. poultry shaft louse. Likewise, the differences between chorionic sculpturing of another amblyceran species also have been noted.

However, the differences in the structure of the ischnoceran species are less marked. Two species of genus *Goniocotes* (*G. gallinane* and *G. jirufti*); three species of genus Brueelia (*B. cyclothorax*, *B. amandavae*, *B. saliemi*) and three species of the Genus *Lipeurus* (L. tropicalis, L. caponis and *L. heterographus*) and one species of the gnus *Rallicola* (*R. unguiculatus*) have been studied from this point of view [3,6].

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CONCLUSION

The present report furnishes further information on the nature of egg shell of two ischnoceran species, and one amblyceran species Menacanthus abdominalis Piaget, 1880 infesting common quail, Coturnix coturnix Linnaeus, 1758) with the help of Scanning Electron Microscopy.

The peculiar hexagonal marking/sculpturing on the operculum and filament like apophyses occur along the egg mouth on the eggs of *M. abdominalis* that can be easily differentiated from *C. cinereus* and *G. astrocephalus*. Moreover, a hook like polar thread arises from the opercular disc of the eggs of *G. astrocephalus* and arenot found on the eggs of *C. cinereus*on *M. abdominalis*. The arrangement of micropyles on the operculum can also be easily differentiated in the species i.e. micropyles arrangement near the opercular rim in a row present in the egg of *C. cinereus*while irregular distribution of the micropyles on the operculum of the eggs of *G. astrocephalus*. The micropyles are absent on the operculum of *M. abdominalis*.

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