SEM STUDIES ON THE MICROTOPOGRAPHY OF EGGS OF POULTRY SHRAFT LOUSE, *MENOPON GALLINAE* (PHTHIRAPTERA: AMBLYCERA)

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SEM studies have been performed to record the microtopography of eggs of poultry shaft louse, *Menopon gallinaceae*. The egg mouth is bordered by two rows of apophyses. The apophyses belonging to inner row have been found quite porous and spongy. The polar thread is made up of several fine strands. The egg stigma remains indistinct.

INTRODUCTION

As early as, in 1870 Richter indicated that "Eggs of insects have long been favourite objects for the microscope... among the little bird parasites (Mallophaga) are to be found the most extraordinary and apparently fantastic structures". Since then, several workers furnished information on the morphological features of the eggs of certain species (Pfleger, 1929; Hohorst, 1939; Eichler, 1954, 63; Blagovestchensky, 1955; Balter, 1968a, b; Foster, 1969; Eichler *et al*., 1974 and Saxena *et al*., 1993). Apart from these, few workers have occasionally supplemented drawings and photographs of few eggs, while dealing with biological aspects of avian lice. A close look on literature reveals that the mallophagan eggs are polymorphous and their external form is quite variable. Certain external features of eggs are often difficult to resolve by light microscopy and SEM studies may provide detailed information relating to their microtopography. Balter (1968a, b) has already made valuable contribution in the field. Light microscopie studies on the morphological features of eggs of poultry shaft louse, *Menopon gallinaceae* have already been made (Saxena *et al*., 1993). Present report furnishes further information based of SEM studies on the same.

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MATERIALS AND METHODS

The fresh eggs of *M. gallinae* were collected from the feathers of host and from *in vitro* stock. These eggs were fixed in 0.1M cacodylate buffer solution and post-fixation in Osmitol tetraoxide (pH 7.2±0.1) in 0.1M cacodylate buffer at 4°C, for 1-2 hours. The fixed samples of eggs were dehydrated in different grades of ethanol and mixtures of ethanol with isoamyl acetate and then dried in Buz's Union Critical point drier, by gradual replacement of isoamyl acetate with liquid CO₂ at 0°C. Critically dried eggs were mounted on clean aluminium stub. The mounted eggs were coated with gold-palladium alloy. The samples were then observed under Scanning Electron Microscope (SEM) at varying magnifications and selected areas have been photographed.

RESULTS

The egg of *M. gallinae* is elongated oval or a brinjal shaped structure. The adhesion of egg occurs at the outer most end of rear pole. The front pole bears disc like operculum. Light microscopic studies (Saxena et al., 1993) indicated the presence of 22-25 tentacle-like equal sized filamentous outgrowths (the so called apophyses) at the egg mouth and the existence of single large opercular strand (the so called polar thread or long apophysis) in the centre of opercular disc. The present studies indicate that the filaments (apophyses) present on the egg mouth are not alike and arranged in two rows (Figs 1 & 2). Those present in outer row are comparatively short, stumpy, variable in size (ranging from minute knob like structures to expanded leaf type, as seen in Fig. 4) and hang outwards. Most of these are distally produced into at least 2 outgrowths. These filaments are clearly sculptured but apparently not porous (unlike the filaments belonging to inner row). Hence, they appear to be somewhat solid structures.

On the other hand, the filaments (apophyses) of inner row are comparatively long, cylindrical (Figs 2 & 3) and directed towards the base of opercular strand. The tips of these filaments are generally bifid (sometime trifid) as seen in Fig. 3. Closer examination indicates that these filaments are distinctly porous in nature (some what "spongy" appearance as seen in Figs 3 & 5).

The opercular strand (the so called "polar thread" or "long apophysis") arising from centre of opercular disc seems to be formed by fusion of many fine strands. This thing may become clear from examination of base of opercular strand (Fig. 3) where fusion is not complete. However, in rest of polar thread, these fine strands are nicely held together by the cementing material and it appears as single solid structure (Figs 1 & 2). The exochorion of the egg is quite smooth and free from any kind of sculpturing or ornamentation (normally visible on other mallophagan egg).

The egg stigma, usually occurring at the rear end (whose fine canals partly or fully bore through the chorion) remained indistinct, as the adhesive surface (at the rear end, Fig. 1) seem to be quite smooth. Similarly, the
micropylar apertures (which enable to entry of sperms and ensure ventilation) also remained invisible. They might have become obscured due to the presence of many filaments (apohyses) at the egg mouth.

Fig. 1 - Egg of *M. gallinae* x 120.
Fig. 2 - Egg of *M. gallinae*, anterior part enlarged X 312.

Fig. 3 - Egg of *M. gallinae*, base of polar thread enlarged and showing apophyses of inner row X 1200.
Fig. 4 - Egg of *M. gallinae*, enlarged view of apophyses belonging to outer layer X 1100.

Fig. 5 - Egg of *M. gallinae*, enlarged view of apophyses belonging to inner layer X 2500.
DISCUSSION

While providing information on microtopography of eggs belonging to six genera of avian lice, Baltar 1968b, noted that the adult lice in many cases lack significant intergeneric morphological features and are thus difficult to classify (presumably due to parallel and convergent evolution). He further stated that the mallophagan eggs exhibit certain distinctive characteristics on or within chorionic shell and recommended the use of SEM studies to resolve significant details of surface microstructures (to explore new ways of classification based on the points of difference). A look on the available literature also indicates the existence of a number of fascinating adaptive differences. Baltar (1968a) has categorically stated that lice egg morphology can be used as a guide to taxonomy and recommended the identification of eggs to genera and, where possible, to species level. Foster (1969) performed light microscopic studies on eggs of 2 amblyceran and one ischnoceran species and indicated the ecological significance of the aspect. Eggs of Mallophaga (Sens. Lat. Phthiraptera) remain permanently attached to feathers/hair of host (at least hatched one's). According to Foster (1969), even the museum study of skins will provide a valuable source of data concerning the egg structure and also the distribution as well as ecology of egg laying in Mallophaga.

The presence of sculpturings/ornamentations on the exochorion or the endochorion of egg, the presence of filaments or anchor like processes (apophyses) on the egg wall and opercular disc are main points relating to diversity of mallophagan eggs. The present studies indicate the presence of at least 2 kinds of filaments (apophyses). Those present in the inner row are quite spongy and peculiar. Generally, such outgrowths of chorion are meant for anchoring the egg, protecting the egg against predatory mites or regulating the moisture content (Hohorst, 1939; Eichler, 1954, 63). According to Hohorst (1939) these apophyses serve to regulate the moisture content and further noted that in M. stramineus, in dry state apophyses are bent upwards. However, as soon as they are moistened, they fold upwards and come close to operculum. Similar possibility in present case can't be ruled out. Furthermore, absence of stigma (which is often supplied with special cell graft of follicle cell) also seems to be interesting feature. However, the micropyles might have remained hidden behind the filaments bordering the egg-mouth. Anyway, the SEM studies on mallophagan egg seem to be quite fascinating. Similar studies on other eggs may bring more information on the subject.

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