

FINE STRUCTURE OF THE EGGSHELL OF *OMMATISSUS BINOTATUS* FIEBER (HOMOPTERA, AUCHENORRHYNCHA, TROPIDUCHIDAE)

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Abstract—The external morphology and fine structure of the eggshell of *Ommatissus binotatus* Fieber (Homoptera: Tropiduchidae) was investigated by light, scanning and transmission electron microscopy. The egg surface has 2 main regions: a specialized area and an unspecialized egg capsule. The specialized area is characterized by a large respiratory plate containing the operculum and a short respiratory horn. The latter consists of an external hollow tube and an internal cone-shaped projection hosting a micropylar canal. The eggshell has 4 layers: the vitelline envelope, a wax layer, the chorion and an outer mucous layer. The chorion has inner, intermediate and outer parts. The functions of the different parts of the eggshell are discussed. Characters useful to define the eggs and the oviposition habit in the family Tropiduchidae were provided. The size and morphology of the egg, plate, respiratory horn and operculum are suggested as useful characters for ootaxonomic analysis.
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INTRODUCTION

The taxonomic and phylogenetic importance of eggshell structure in pterygote insects has been demonstrated in various orders at different levels (see Hinton, 1981 for a review). For each family of the Homoptera Auchenorrhyncha, Cobben (1965) provided characters useful to define the egg morphology and the oviposition habits, emphasizing evolutionary trends and their phylogenetic value. In the Tropiduchidae family, these characters included eggs with an operculum, a respiratory horn containing the micropylar canal, an inner porous layer and oviposition in plant tissue.

However, the eggs of the tropiduchids are still largely unresearched. Little information is available on the external morphology of the eggs of most species and no detailed studies of the fine structure of the eggshell have been done. Alfieri (1934) illustrated the eggs, larval instars IV–V and adults of *Ommatissus lybicus* Bergevin. Hussain (1963) and Gharib (1966) studied the biology of *O. lybicus* and published general data on the eggs, nymphs and adults of this species. Fletcher (1979, 1981) described and illustrated the eggs, nymphal instars and adults of *Kallitambinia australis* Muir. Guglielmino (1997) studied the biology and described and illustrated the egg and post-embryonic development of *Ommatissus binotatus*.

Here we report a study of the external morphology and fine structure of the eggshell of *O. binotatus* with the aim of providing data useful for taxonomic and phylogenetic studies.

MATERIALS AND METHODS

Leaves of *Chamaerops humilis* L. containing eggs of *O. binotatus* were collected in the Vendicari Natural Reserve (Siracusa, Italy) and brought to the laboratory. Dissection in Ringer's solution to remove the eggs was done about 24–48 h after egg-laying. The eggs were processed for light and electron microscope examination.

For scanning electron microscopy (SEM), the eggs were fixed for 3 h in 4% paraformaldehyde–5% glutaraldehyde buffered with sodium cacodylate (0.1 M and pH 7.3), rinsed in the same buffer overnight and post-fixed for 1 h in 1% osmium tetroxide buffered with 0.1 M sodium cacodylate. They were then dehydrated in a graded ethanol series, dried in a Balzers Union CPD 020, sputter-coated with gold in a Balzers MED 010 unit and observed with a JEOL JSM 5200 scanning electron microscope.

For light and transmission electron microscopy (TEM), the eggs were fixed and dehydrated as above, then embedded in Epon resin. Semi-thin and ultra-thin sections were cut with an LKB Nova ultramicrotome. The semi-thin sections were stained with toluidine blue and observed with a Zeiss Axiophot microscope. The ultra-thin sections were stained with uranyl acetate and lead citrate and observed with a JEOL JEM 1200 EX II transmission electron microscope.

RESULTS

The females of *O. binotatus* make holes about 700 µm deep and 300 µm wide with their ovipositor in leaves of the host plant (*C. humilis*) (Fig. 1A–C). The eggs are embedded in the holes with only the tip of the cephalic egg pole exposed (Fig. 1A–C). The eggs are laid in rows along the dehiscent lines on the lower surface of the leaf lamina (Fig. 1A). The material removed from the holes is piled up outside the cavity (Fig. 1A–D).

The egg of *O. binotatus* measures 720–800 µm in length and 280–320 µm in width. It is ellipsoidal in shape with a pointed anterior pole and a rounded posterior pole; the fore side is slightly concave, the opposite side convex.

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