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# EXTERNAL MORPHOLOGY OF THE EGG OF *SPODOPTERA LITTORALIS* (LEP. NOCTUIDAE).

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**RESUM**

En el present article es descriu l'estructura i ornamentació de la superfície del còrion i de l'apareil micropilar, tal com es veu amb el microscopi electrònic d'escandallatge. La regió micropilar presenta al mig un espai circular amb 5 o 6 orificis micropilars disposats perifèricament. D'aquesta zona circular surten radialment unes 10 o 11 estructures en forma de pètal, que originen el típic micròpil en roseta dels lepidòpters.

El còrion està estructurat uniformement en àrees poligonals regulars -pentagonals i hexagonals- d'uns 1.030 $um^2$ de superfície, delimitades per un relleu on es localitzen els aeròpils, que es tròben habitualment en els punts d'intersecció de tres polígons.

**RESUMEN**

En el presente artículo se describe la estructura y ornamentación de la superficie del corion y del aparato micropilar con el microscopio electrónico de barrido. La región micropilar presenta, en su centro, un espacio circular con 5 o 6 orificios micropilares dispuestos perifericamente. De esta zona circular parten radialmente unas 10 o 11 estructuras en forma de pétalo, que dan origen al típico micrópilo "en roseta" de los lepidópteros.

El corion está estructurado uniformemente en áreas poligonales regulares -pentagonales y hexagonales- de unos 1.030 $um^2$ de superficie, delimitadas por un relieve, donde se localizan los ae-

rópilos, situados habitualmente en los puntos de intersección de tres polígonos.

INTRODUCTION

During clutch, the eggs of Spodoptera littoralis, as well as the ones of other lepidoptera, are protected by two envelopes: a thin vitelline membrane externally surrounded by a thick sheath called chorion.

The chorion is an envelope which gives a mechanical protection to the mature germ cell. Moreover, it must allow spermatozoa to penetrate and assure respiration and correct hydratation of the embryo. In a later stage, it must allow an easy eclosion of the larva.

The chorion is made up by secretions produced by the glandular follicular epithelium, localized in the final tract of the oviduct. The structure and ornamentation which characterize the chorion are due to the marks left by cells of this follicular epithelium.

The use of scanning electron microscope in the study of egg surfaces of Lepidoptera (BARBIER & CHAUVIN, 1974 a, b; CHAUVIN & BARBIER, 1972; CHAUVIN et al., 1974; CUMMINGS, 1972; HINTON, 1969; MATHENY & HEINRICHS, 1972; MAZZINI, 1974; RIBES, 1981; SALKELD, 1973; SMITH et al., 1971) has led us to the discovering of a microscopical architectural world of unlikely and capricious structures and figures of great plastic beauty and with a well defined functional meaning. The structure and ornamentation of the chorion and micropylar area in lepidoptera eggs show certain specific variation. It is very useful to be employed as another feature to stablish the filogeny of these organisms.

In the moment of clutch, some substances produced by accessory glands of the genital system are usually added to protector mem

branes. These substances harden in contact with air and give rise to scales or fibers which surround eggs to mantain them clustered.

This paper describes the structure and ornamentation of the chorion and the micropylar area of the egg of lepidoptera Spodoptera littoralis as seen by scanning electron microscopy.

## MATERIALS AND METHODS

Adult specimens of S. littoralis used to obtain egg clutches came from cultures mantained in laboratory. Collected eggs were subjected to the following process some minutes after oviposition.

The eggs were fixed first by immersion in the mixture 2 % paraformaldehyde - 2,5 % glutaraldehyde (KARNOWSKY, 1965) in 0.2 M Sörensen buffer, pH 7.3 at 4ºC for 4 hours. After a careful wash in the same buffer, they were postfixed in 2 % osmium tetroxide for 2 hours.

After a dehydratation with ethanol and using amyl acetate as transference liquid, we applied Anderson's method, the one of the critical point of desiccation. Next, samples were attached to specimen holders and covered with a gold layer 2 nm thick by means of the "sputtering" technique.

Observations were carried out in the Electron Microscopy Service of the University of Barcelona. We used a scanning electron microscope model Cambridge Stereoscan SS-4, working at an acceleration potential varying between 10 - 30 kv, depending on the conditions.

## OBSERVATIONS AND DISCUSSION

The egg of Spodoptera littoralis is spheroidal, measuring 0.4 um in diameter. It shows only one micropylar area, with the typical figure of a marguerite localized on the apical zone (Fig. 2). In the middle of this micropylar area we observe a circular space

measuring 8.4 um in diameter; in its periphery we find 5 or 6 micropylar orifices (the number depends on the eggs) which measure about 1.4 um in diameter (Fig. 3 and 4). In fertile eggs we can observe that the central orifice is obturated.

From the central circular space 10 or 11 petal shaped structures come out radially. As they are close to each one, they give the micropylar area the aspect of a marguerite which measures 69 um in diameter. Each one of these petal shaped structures has a mean area of 408 $um^2$ and shows a cupulate relief on the periphery (Fig. 3 and 4).

The chorion is uniformly built in regular polygonal - pentagonal and hexagonal - areas measuring 1,030 $um^2$ in mean surface, delimited by a relief o,7 um thick and arranged in meridional rows (Fig. 2). Within each polygonal unit we can observe a slighly rugose surface (Fig. 5).

Aeropyles measuring from 0.9 to 1.2 um in diameter are usually placed in the intersection points of three polygons (Fig. 5 and 6). On the posterior hemisphere of the egg the chorion shows a less prominent relief, polygonal areas are slightly insinuated and practically disappear on the basal zone (Fig. 2).

In the clutch of S. littoralis the eggs are surrounded by a great number of long filaments which immobilize them and mantain them clustered (Fig. 1).

The external aspect of the egg of S. littoralis is similar in essence to the one of other lepidoptera (Plodia interpunctella, Europia pudica, Noctua comes). The presence of a micropylar area localized on the apical pole of the egg and showing a rosette figure with more than one micropylar orifice, can be observed in various species of the studied lepidoptera. The arrangement in pentagonal and hexagonal loculus we find in the chorion of S. littoralis reminds us, somehow, of the one of Noctua comes (MAZZINI, 1974).

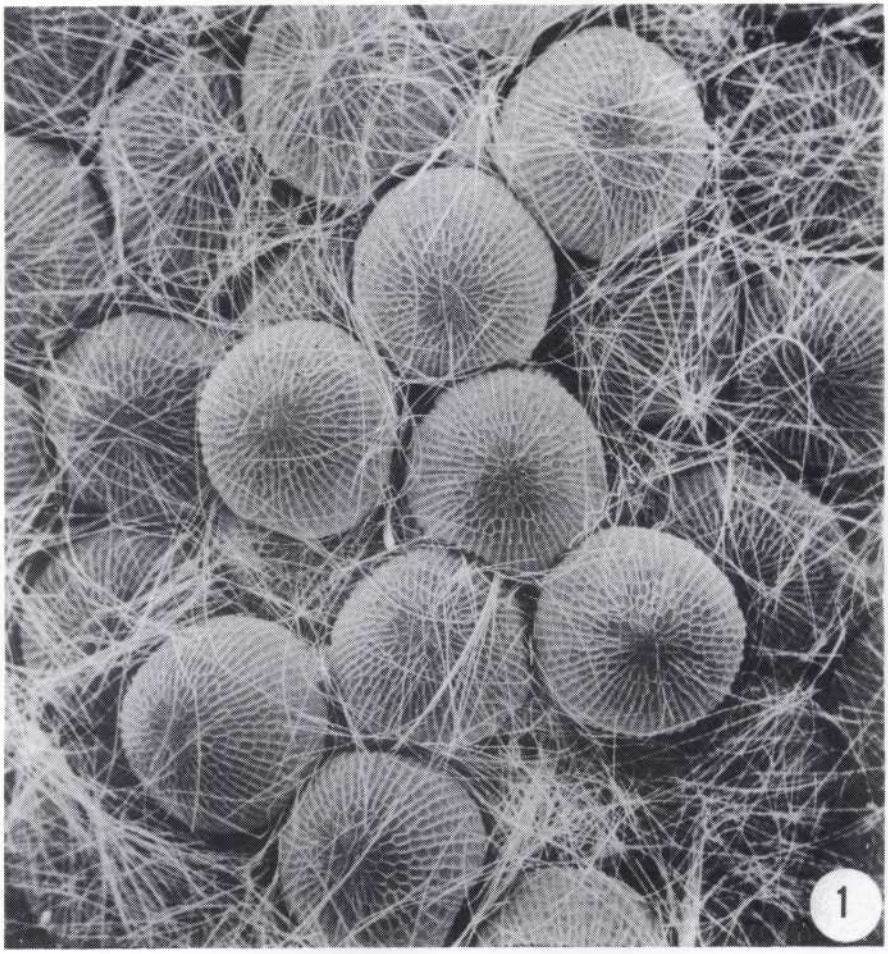


Fig.1. Appearance of a clutch of Spodoptera littoralis (Lepidoptera, Noctuidae) as seen by scanning electron microscopy. x 56.
Aspecte d'una posta d'ous de Spodoptera littoralis (Lepidoptera, Noctuidae) al microscopi electrònic de rastreig. x 56.

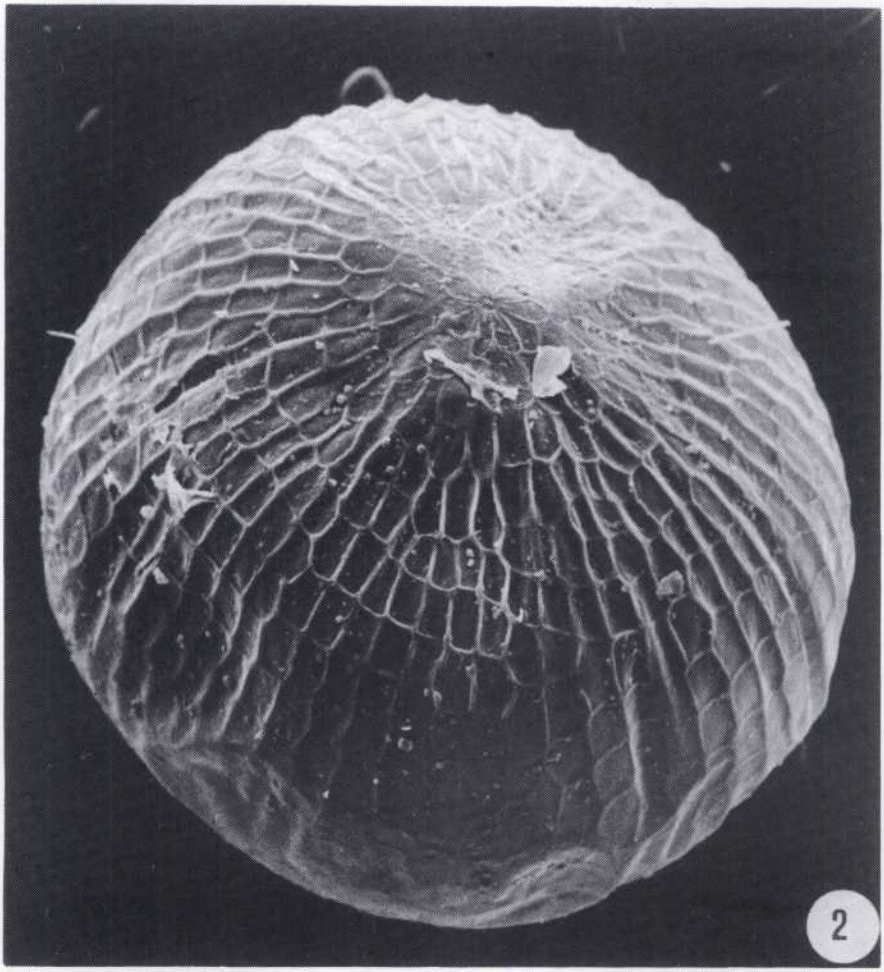


Fig.2. Scanning electron micrograph of an egg of Spodoptera littoralis (Lepidoptera, Noctuidae). x 221.

Imatge al microscopi electrònic de rastreig d'un ou de Spodoptera littoralis (Lepidoptera, Noctuidae). x 221.

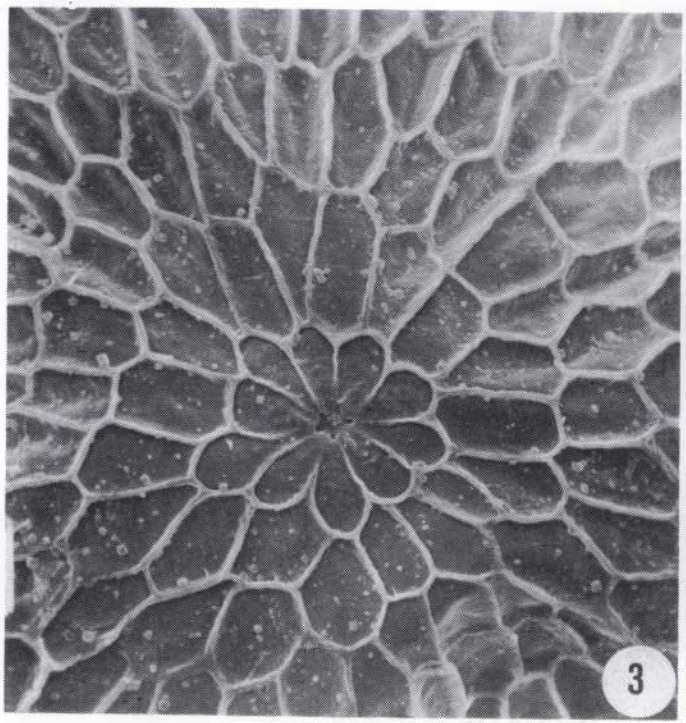



Fig.3. Mycropylar area and chorion around it. x 407.
Area micropilar i el còrion que l'envolta. x 407.

Fig.4. Detail of the micropylar area. x 827.
Detall de l'àrea micropilar. x 827.

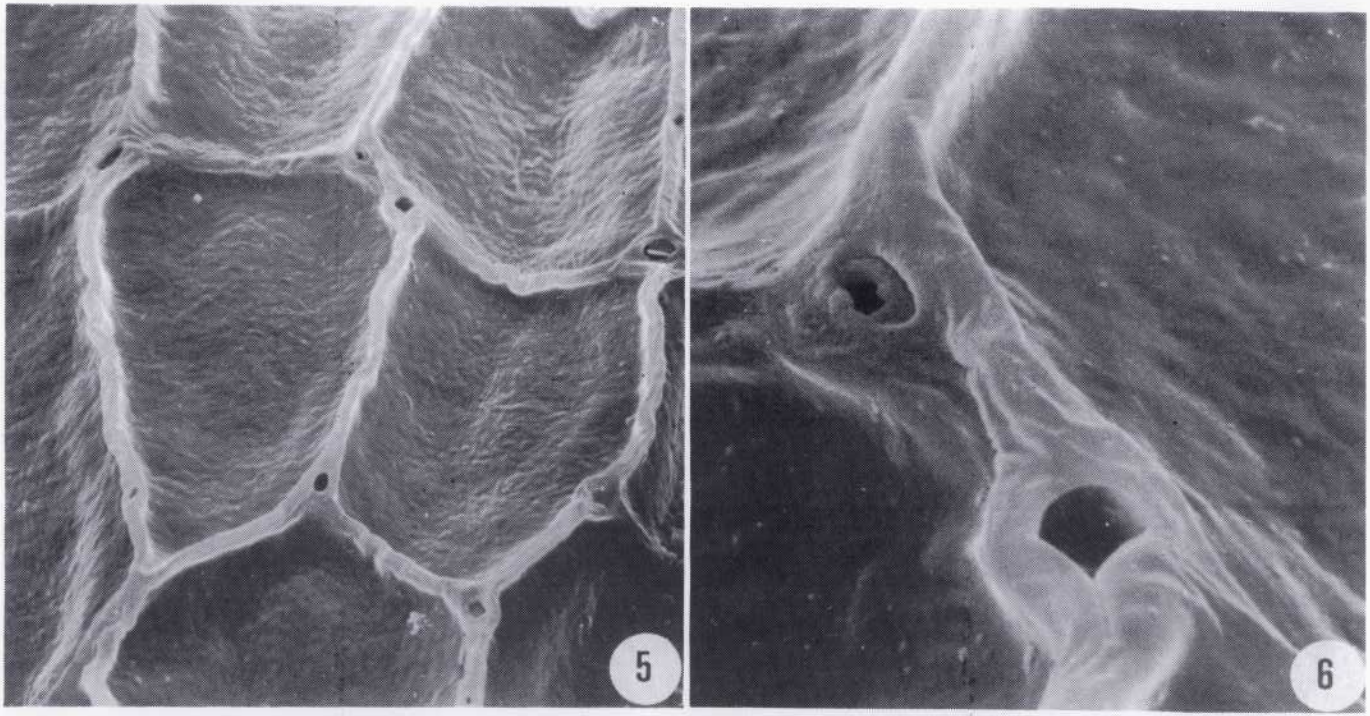


Fig.5. Morphology of chorion on the anterior zone of the egg. x 1.654.
Morfologia del còrion de la regió anterior de l'ou. x 1.654.

Fig.6. Meridional crest with aeropyles, one of them placed in the intersection with a parallel crest. x 8.310.
Cresta meridiana amb aeròpils, un d'ells situat a la intersecció amb una cresta paral.lela. x 8.310.

REFERENCES

ANDERSON, T. F., 1951. Techniques for the preservation of three dimensional structure in preparing specimens for the electron microscope. Trans. N. Y. Acad. Sci. Ser., 13: 130-135.

BARBIER, R., CHAUVIN, G., 1974a. The aquatic egg of Nymphula nymphaeata (Lepidoptera, Pyralidae). On the fine structure of the egg shell. Cell Tissue Res., 149: 473-479.

BARBIER, R., CHAUVIN, G., 1974b. Ultrastructure et rôle des aéropyles et des enveloppes de l'oeuf de Galleria mellonella. J. Insect Physiol., 20: 809-820.

CHAUVIN, G., BARBIER, R., 1972. Perméabilité et ultrastructures des oeufs de deux lépidoptères tineidae: Monopis rusticella et Trichophaga tapetzella. J. Insect Physiol., 18:1447-1462.

CHAUVIN, G., RAHN, R., BARBIER, R., 1974. Comparaison des oeufs des lepidopters Phalera bucephala L. (Ceruridae), Acrolepia assectella Z. et Plutella maculipennis Curt. (Plutellidae): Morphologie et ultrastructures particulieres du chorion au contact du support vegetal. Int. J. Insect. Morph. & Embryol., 3(2): 247-256.

CUMMINGS, M. R., 1972. Formation of the vitelline membrane and chorion in developing oocytes of Ephestia kuhniella. Z. Zellforsh, 127: 175-188.

HINTON, H.E., 1969. Some structures of insects as seen with the scanning electron microscope. Micron., 1: 84-108.

MATHENY, Z. L., HEINRICHS, E.A., 1972. Chorion characteristics of sod webworm eggs. Ann. Entomol. Soc. Amer.,65: 238-246.

MAZZINI, M., 1974. Sulla fine structura del micropilo negli insetti. Redia, 55: 343-372.

RIBES, E., 1981. Morfologia de l'embolcall extern de l'ou de Pharmacis pyrenaicus, Donzel. (Lepid. Hepialidae). II Sessió conjunta d'entomologia. I.C.H.N.- S.C.L. Barcelona, Març 1981: 13.

SALKELD, E. H., 1973. The chorionic architecture and shell structure of Amathes c-nigrum. (Lepidoptera, Noctuidae). Can. Entomol., 105: 1-10.

SMITH, D.S., TELFER, W.H., NEVILLE, A.C., 1971. Fine structure of the chorion of a moth, Hyalophora cecropia. Tissue & Cell, 3 (3): 477-498.

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