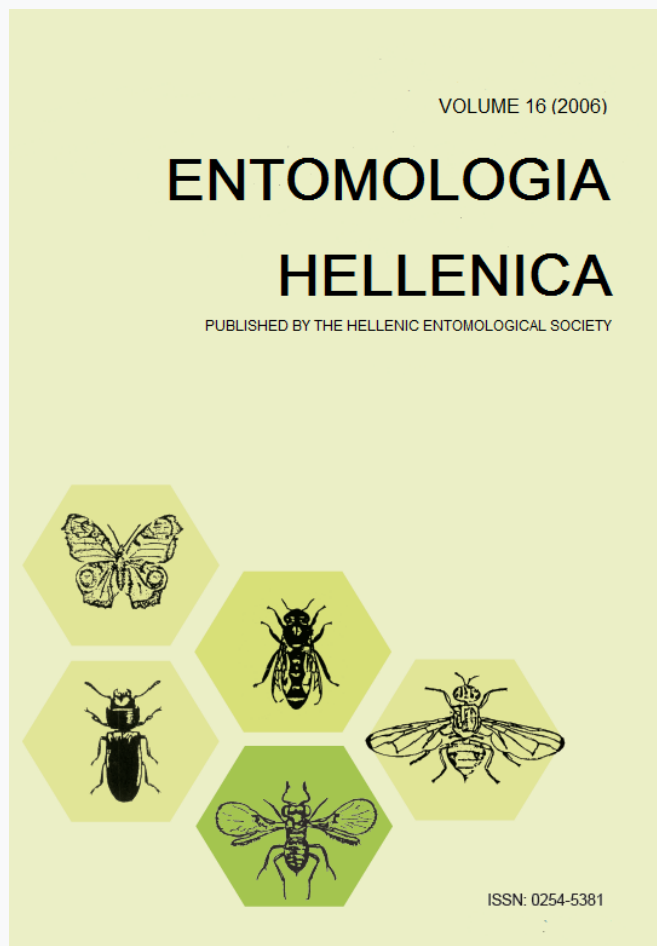


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Καθορισμός του χρόνου επέμβασης εναντίον των ακμαίων *Lasioderma serricorne* της 1ης γενεάς μέσα σε καπναποθήκες με βάση την παρακολούθηση της εξέλιξης των ωοθηκών

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**Definition of timing in the control of the 1st generation
Lasioderma serricorne adults, inside tobacco stores,
based on the development of the oocytes**

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ABSTRACT

The development of the oocytes of pupae, females inside the pupal cell and after emergence of *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae) was studied by dissecting their abdomen. The time of oocytes maturation as well as that of the starting of their oviposition, in combination with the insect's developmental threshold was determined, aiming to time the 1st effective control against the emerging adults of the 1st generation.

Introduction

Lasioderma serricorne (F.) (Coleoptera: Anobiidae) is a cosmopolitan insect infesting and causing considerable damage to a large number of stored products. It is usually present at all times in some stages in tobacco storage warehouses (Sivik et al. 1957; Ryan 1995).

Depending on the climatic conditions the number of generations per year varies from one to three depending on the region (Bovington 1931; Canzanelli 1935). In Northern Greece (Thessaloniki region) the insect has three generations per year (Papadopoulou and Buchelos 2002).

It was found (Papadopoulou 2001) that *L. serricorne* larva exclusively fed on tobacco leaves, at 65% R.H., in absence of light, have a development threshold of 13.8°C.

Coffelt and Burkholder (1972) reported that 4-5d after the development of *L. serricorne* from pupa to adult, the oocytes were already mature and that this coincided with the maximum pheromone release.

Canzanelli (1935) reports that the oviposition starts 2d after copulation, Levinson and Levinson (1987) that it takes place 2-3d after the adult's emergence from the pupal cell while Jones (1991) states that, in the Philipines, oviposition starts 2-5d after the emergence of the adults.

The effective control of the 1st annual flight, helps in reducing the population of the generations to come. The aim of this experiment was to define the oviposition time of the 1st generation adults after their emergence from the pupal cell in order to determine the timing of the effective control measures against them.

Material and methods

Last instar larvae, taken from stored tobacco in the region of Thessaloniki (Macedonia, Greece), were placed in a controlled conditions chamber at 27.5°C and 65% RH. in absence of light. After pupation, the females were separated, based on their external morphology (Halstead 1963) and kept for observation.

Sixty pupae (2-5d after pupation) were observed in order to examine the development of their oocytes; also, 60 females being inside the pupal cell were separated based on their V-shaped apodeme (Papadopoulou & Buchelos 2002) as well as 60 females of 6 and 8d after their emergence from the pupal cell. Pupae and adults were placed in physiological (saline) solution inside Petri dishes; after their abdomens were dissected, the oocytes were examined under stereoscope and microscope. At the end of the observation, one drop of ethyl – alcohol 70% was added. Photographs were taken using the Olympus PMAK IO system apparatus, adapted on the stereomicroscope.

Results

The two ovaries of the female reproductive system of *L. serricornis* are of the polytrophic type, each one consisting of seven elongate cylindrical ovarian tubes with the terminal filaments (Fig. 1) united at one point to serve as the suspensory ligament to the body wall. The ovarian tubes pass, through a pedicel, into an expanded globular calyx wherein the eggs are gathered; an anterior view depicts an open human palm with seven fingers (Fig. 2).

The base of each ovarian tube is temporarily closed by a number of cells serving as a plug, not permitting the eggs to pass into the pedicel and descend to the calyx prematurely.

The observation of the five day-old pupa (Fig. 1) showed that the ovaries were fully developed and the egg follicles present; it was yet that the V-shaped apodeme with the loboid exocrine sex pheromone gland, was also fully developed (Fig. 3a,b). The adults being, before their emergence, about 4d inside the pupal cell, contained egg follicles of different size. Inside the ovaries of the female adults being 6d inside the pupal cell, mature egg follicles as well as

eggs starting to descend towards the calyx were found (Fig. 4). In the case of the eighth day-old females, several mature eggs, ready to be oviposited, were found inside the calyx (Fig. 5a,b).

Discussion

The results of this experiment lead to the following conclusions. Although maturation of the oocytes inside the ovaries begins during the pupal stage, egg follicles appear only at the very end of this stage (Fig. 1). Mature eggs, ready to be laid, appear almost 6d after the presence of the adults inside the pupal cell specifically, on the 6th day the eggs start descending towards the calyx, while on the 8th day the calyx is full of eggs ready to be laid. Thus, oviposition is out of the pupal cell) starts about 8 days after the appearance of the female adults inside the pupal cell when the female left that.

The above findings agree with those of Levinson and Levinson (1987) stating that copulation starts 2-3 days after the adults emerge (from the pupal cell), but not with those of Jones (1991), who had found that oviposition starts 2-5 days after the adults emerge (from the pupal cell).

It can be thus concluded that every control measure against the 1st generation of *L. serricornis* adults, inside tobacco stores, has to be taken when the insect is still inside the pupal cell, before they emerge and copulate. The timing of this activity has to be calculated from the course of the oocytes' development and the developmental threshold of the insect. The present proposition opposes the prevailing perception according to which the control measures against the *L. serricornis* 1st generation inside the tobacco stores, based on surveilling the flight of the adults by means of insect-traps given that both copulation and oviposition occur inside the tobacco bales.



FIG.1. Ovaries of a 5-day old pupa.



FIG. 2. Ovaries of a *L. serricorne* adult inside the pupal cell, before its emergence.

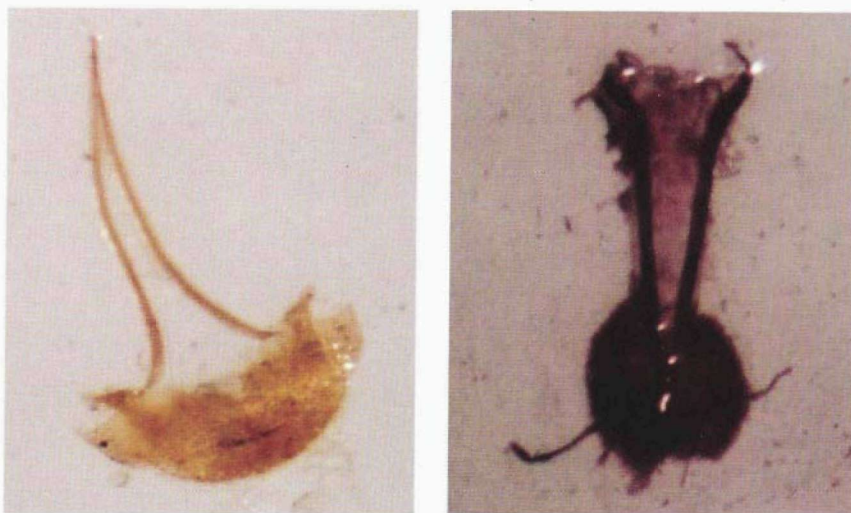


FIG. 3. A) V-shaped apodeme pulled out of the abdomen and the (Past) urosternites B) V-shaped apodeme with the loboid multicellular gland and the pheromone duct around it, after coloration.



FIG. 4. Ovaries of a 6-day old adult.

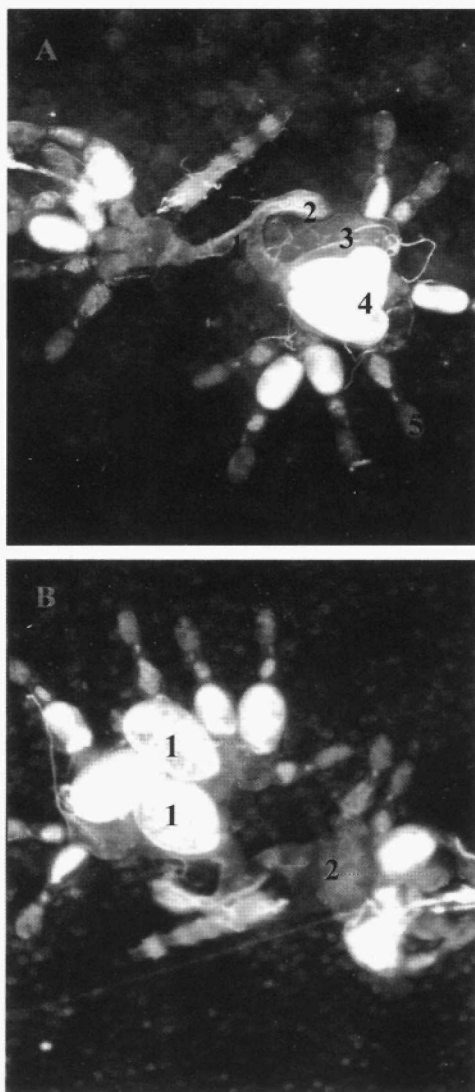


FIG. 5. Ovaries of an 8-day old adult. A) 1. lateral oviduct, 2. common oviduct, 3. Calyx, 4. eggs inside the calyx, 5. oocyte B) 1. mature eggs ready to be laid, 2. calyx.

Fumigants used globally to control *L. serricorne* will be more effective if fumigation takes place as proposed as these insecticides can penetrate the baled

tobacco and reach the pupal cells. The effective control of the 1st generation insects helps in reducing the population of the generations to come, favoring the quality and quantity of stored tobacco and its by-products.

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KEY WORDS: *Lasioderma serricorne*, oocytes, insect's development

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ΠΕΡΙΛΗΨΗ

Στην παρούσα εργασία μελετήθηκε με τη μέθοδο της διάνοιξης της κοιλιακής χώρας, η εξέλιξη των ωοθηκών του *L. serricorne* (F.) (Coleoptera: Anobiidae) των σταδίων της νύμφης του θήλεως και του ακμαίου του ευρισκόμενου στο κελί της νύμφωσης. Ο προσδιορισμός του χρόνου σύζευξης και έναρξης της ωοτοκίας του *L. serricorne* σε συνδυασμό με την ουδό ανάπτυξης, συνετέλεσαν στον καθορισμό του σωστού χρόνου εφαρμογής της πρώτης αποτελεσματικής επέμβασης εναντίον των ακμαίων της 1^{ης} γενεάς.