

ANATOMY OF THE DIGESTIVE TUBE OF IMAGOS OF *Cornitermes cumulans* AND *Ruptitermes* sp. (ISOPTERA, TERMITIDAE)

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RESUMO

Anatomia do tubo digestivo de imagos de *Cornitermes cumulans* e *Ruptitermes* sp. (Isoptera, Termitidae)

Neste trabalho foi feita uma análise morfológica do tubo digestivo de imagos machos e fêmeas das espécies *Cornitermes cumulans* e *Ruptitermes* sp., ambas pertencentes a subfamília Nasutitermitinae.

Os intestinos destes alados, quando comparados entre si, apresentaram diferenças no desenvolvimento e enrolamento natural. Os tubos digestivos dos alados, em relação ao dos já descritos para operários, mostraram-se menos desenvolvidos, porém o padrão de enrolamento, que está correlacionado ao grupo taxonômico, permanece.

ABSTRACT

A morphologic analysis of the digestive tube of male and female imagos of *Cornitermes cumulans* and *Ruptitermes* sp., both of them of the Nasutitermitinae subfamily, was carried out in this research.

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The digestive tubes of these imagoes, when compared to one another, present differences in development and natural coiling. The guts of these imagoes were less developed than in workers, but the coiling pattern, that is correlated to the taxonomic group, remains.

INTRODUCTION

The digestive tubes of termites reaches a considerable development and usually occupies a large part of the abdomen since these insects feed on material that is difficult to digest. The configuration of the digestive tube of termite workers is correlated both with taxonomic group and feeding habits. Even though the feeding pattern of all individuals in a colony is the same, according to the literature, the nutrition of soldiers and imagoes is indirect since they are fed by workers.

KOVOOR (1969), in a study on *Cornitermes cumulans* workers, reported a considerably developed gizzard with sclerotized armature to be the main morphological characteristic of the digestive tube.

FONTES (1985), in a study on *Ruptitermes wantochiton*, observed several characteristics of the digestive tube such as well-developed salivary glands, a short mixed segment and the first proctodeal segment as a narrow tube of constant diameter. NOIROT & NOIROT-TIMOTHÉE (1969) e GRASSÉ (1982) described a relatively voluminous and asymmetrical crop and a considerably reduced gizzard in workers of the subfamily Apicotermittinae. However, few anatomical descriptions of the digestive tube of termite imagoes are available in the literature.

In view of the above considerations, the objective of the present study was to perform a comparative morphological study of the digestive tube of male and female imagoes of *C. cumulans* and *Ruptitermes* sp. with emphasis on natural coiling.

MATERIAL AND METHODS

Male and female imagoes of the neotropical termites *C. cumulans* and *Ruptitermes* sp. were collected in the Rio Claro region, State of São Paulo.

Whole individuals were fixed in alcoholic Bouin's and 10% formol-calcium and dissected on a Petri dish covered with red-stained paraffin under 70% alcohol. A ventrolongitudinal incision was made in the body of each insect with the aid of

dissecting scissors and of a stereomicroscope. The thoracic and abdominal terga were removed with tweezers and fixed to the paraffin with entomological pins. Fatty tissue was removed with detergent and the digestive tube was isolated and placed on a slide with physiological saline. Drawings of the digestive structures were made with the help of a camera lucida adapted to the stereomicroscope.

RESULTS AND DISCUSSION

The basic structure of the digestive tube and salivary glands of the specimens analyzed was the same, even though males are a little smaller, and quite similar to that reported in the literature for workers of these two subfamilies.

The digestive tube of *C. cumulans* imagoes has a gizzard with a chitinous armature and a considerably differentiated mixed segment with two characteristic small tongues (Figs. 1 and 2). The four Malpighian tubules are inserted 2 by 2 on the same side of the mesenteron-proctodeal junction (Fig. 1C), as also reported for *C. cumulans* workers. This morphology follows the *Syntermes* pattern described by KOVOOR (1969) and FONTES (1987), which is characterized by extensive sclerotization of the gizzard, a developed mixed segment with characteristic small tongues and a strongly armed enteric valve.

The colon is long but the paunch is not as voluminous as in the digestive tube of workers (Figs. 1 and 2). The rectum is more dilated than in *Ruptitermes* even though the entire digestive tube of *Cornitermes* is relatively more developed.

Ruptitermes imagoes present an asymmetrical crop and a reduced gizzard with no chitinous armature (Figs. 3 and 4). The mixed segment, which is short and ends with a beveled edge, is almost imperceptible when compared to that of *Cornitermes*. Four Malpighian tubules are inserted individually on the posterior portion of the mesenteron (Fig. 3C) and three differentiated rounded projections are observed below the first proctodeal segment (Fig. 4C). These projections have also been observed in workers (FONTES, 1985).

Even though the imagoes of these two species are almost of the same size, the digestive tube of *Ruptitermes* sp. imagoes is thinner and a little shorter. The salivary glands of these species are limited to the thorax and do not reach the extensive development found in Apicotermitinae.

The sclerotized gizzard of *Cornitermes cumulans* suggests a rougher diet, as proved for other castes of foraging termites.

The gut of the imagoes of these two species is less developed than that of workers but the coiling pattern, which is correlated with taxonomic group, is the same. Within this pattern, the mesenteron of the two species behaves in the same manner, the only difference between them being observed in the hindgut, in which the paunch of *Cornitermes* is folded over the first proctodeal segment.

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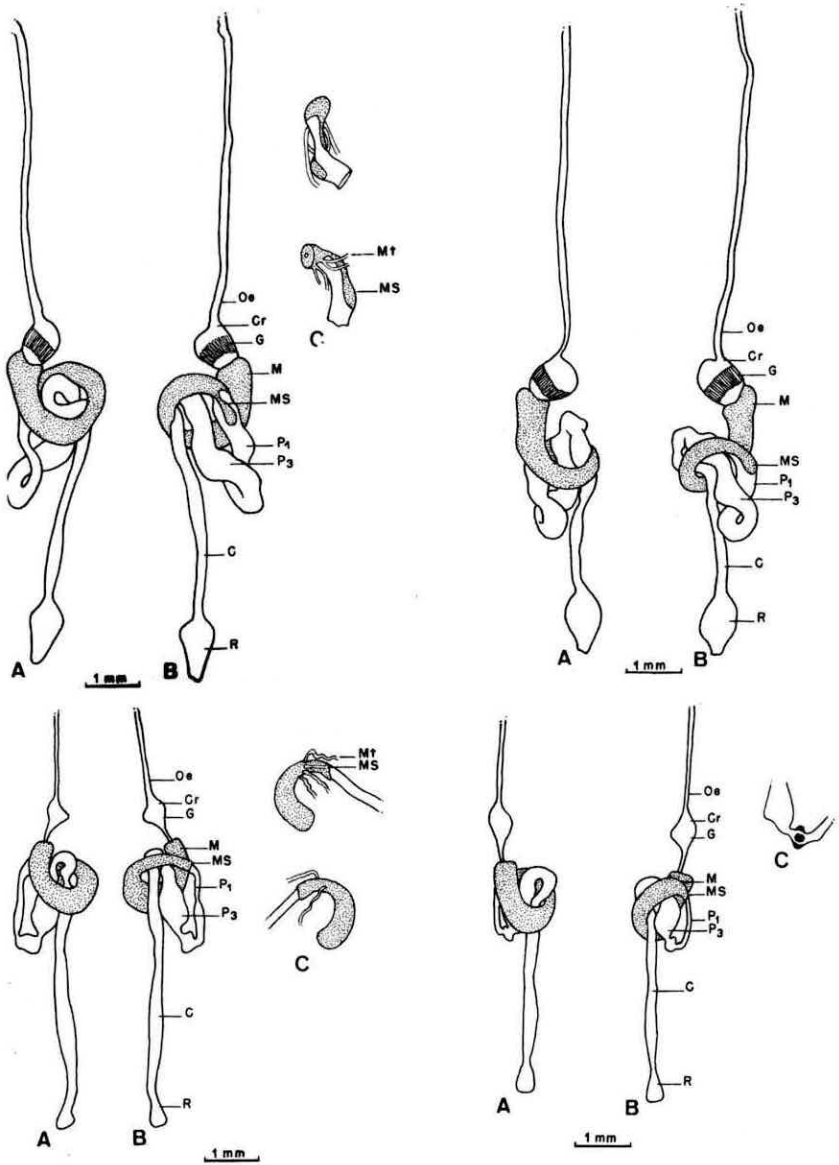


FIGURE 1 - Coiling of the digestive tube in a female imago of *Conitermes cumulans*.

A - Left lateral view

B - Right lateral view

C - Detail of the insertion of the Malpighian tubules.

FIGURE 2 - Coiling of the digestive tube in a male imago of *Conitermes cumulans*.

A - Left lateral view

B - Right lateral view

C - Detail of the insertion of the Malpighian tubules.

FIGURE 3 - Coiling of the digestive tube in a female imago of *Ruptitermes sp.*

A - Left lateral view

B - Right lateral view

C - Detail of the insertion of the Malpighian tubules.

FIGURE 4 - Coiling of the digestive tube in a male imago of *Ruptitermes sp.*

A - Left lateral view

B - Right lateral view

C - Detail of the rounded projections.

Foregut: oesophagus (Oe), crop (Cr), gizzard (G), Midgut or mesenteron (M), mixed segment (MS), Malpighian tubules (Mt). Hindgut: First proctodeal segment (P₁) Fauch (P₃), colon (C), rectum (R).