

**NESTING SYSTEM OF THE SUBTERRANEAN TERMITE
Anacanthotermes ochraceus (HODOTERMITIDAE : ISOPTERA)**

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ABSTRACT

The nesting system of the subterranean termite *Anacanthotermes ochraceus* (Hodotermitidae : Isoptera) was studied at El-Fayoum Governorate, Egypt. A characteristic feature of the presence of the termite nests is the appearance of small conical heaps of coarse soil particles scattered all over the surface of the infested area. Every heap leads to a network of storage chambers, dwelling chambers and connecting galleries (tunnels) all excavated by workers into the soil underneath. Storage chambers are nearly conical in shape with rising roofs, semi-globular bases and flat smooth internal walls. They are used for storing collected food materials and usually occur at depths of 5–30 cm below soil surface. Dwelling chambers are more or less similar in shape to storage chambers but comparatively larger in size. They are often occupied with different aggregated termite castes, sometimes at the depth of 20 cm below soil surface, but mostly at depths of 30-60 cm and occasionally at deeper depths reaching 150 cm. Connecting galleries are cylindrical in shape, with very smooth inner walls. The nest consists of one main longitudinal tunnel with the chambers distributed along its sides, two main nearly parallel longitudinal tunnels connected with transverse tunnels with the chambers distributed along their sides, or a network of longitudinal straight to slightly curved tunnels connected with transverse tunnels joining between randomly scattered storage and dwelling chambers.

Key words: *Anacanthotermes ochraceus* – nesting system

1. INTRODUCTION

Termites are a group of social insects that belong to the order Isoptera. They are important pests in many countries especially in the arid tropics and subtropics (El-Sherif *et al.*, 2009). Kassab *et al.* (1960) and Hafez (1980) reported that there are – at least – 3 species of subterranean termites in Egypt the most common of which is *Anacanthotermes ochraceus* (Burmeister) from the family, Hodotermitidae. This particular species causes considerable damage to rural buildings constructed with mud bricks as its workers tunnel through the walls to reach the straw mixed with the sun-dried mud thus resulting in the collapse of attacked buildings. Termite workers further tunnel into the soil forming different types of complicated nesting systems. As a matter of fact, few authors described the nesting system of *Anacanthotermes ochraceus* (Clement, 1954; Kassab *et al.*, 1960 and Said, 1979) and few studies gave preliminary observations on the nesting systems of other termite species belonging to the genus *Anacanthotermes*, e.g. *A. ahngerianus* (Ghilarov,

1962), *A. turkestaicus* (Krishna and Weesner, 1969) and *A. macrocephalus* (Roonwal, 1970).

This paper contributes to the knowledge on the nesting system of *A. ochraceus* in a badly infested area located at El-Fayoum Governorate, Egypt. It is based on the findings of a previous study conducted at the same area by Abd El-latif (2003) on the delineation of termite colonies.

2. MATERIALS AND METHODS

The study of the nesting system of *A. ochraceus* was carried out at El-Sidia village, Sennoures district, El-Fayoum Governorate, which is long-known to be commonly infested with this particular termite species. A square piece of land measuring 400 square meters (20 x 20 m) was carefully cleaned up of any cellulose materials and devoted for a study on the delineation of termite colonies based on food consumption value, soil translocation value, duration of infestation and date of initial infestation, using P.V.C. traps filled up with clean corrugated cardboard rolls and buried horizontally into the soil to a depth of 30 cm (Abd El-latif,

2003). The former study revealed delineation of 9 colonies one of which is small (1-20 m² territorial area), four are medium (>20 -40 m²) and four are large (> 40 m²). After the termination of the colony-delineation study, which lasted for two complete years, the experimental area was left untouched for another two years to allow the completion of building the nesting systems. Three of the delineated colonies were randomly selected; the 1st was small (at the southern side of the experimental area), the 2nd was medium (at about the center of the experimental area) and the 3rd was large (at the south-eastern side of the experimental area). For every selected colony, the soil at its center-point was carefully dug out horizontally as necessary and vertically to the depth of 150 cm in search of and to follow up the termite nest. Sketches of the nesting systems were hand-drawn to illustrate the existing storage chambers, dwelling chambers and connecting tunnels or foraging galleries (Fig. 1).

3. RESULTS

Frequent field observations indicated that a characteristic feature of *A. ochraceus* nests is the appearance of small conical heaps of coarse soil particles scattered all over the surface of the infested area. Each heap is about 1 cm high with an area of 1 square cm (at the base), and leads to galleries (tunnels) excavated into the soil underneath by the termite workers. Fig. (1) illustrates the different patterns of nesting system for a small colony (right), a medium colony (middle) and a large colony (left). This figure refers to the absence of a standard nesting pattern and emphasizes that every colony acquires a different nesting system. However, the nest is – in general – a network or assemblage of chambers connected to each other by several more or less longitudinal galleries of various lengths excavated into the soil at different levels (depths).

3.1. Storage chambers

Field observations further indicated the occurrence of two distinct types of chambers; storage chambers and dwelling chambers. The storage chamber (Fig. 2A) is nearly conical in shape with a roof rising to 1 – 3 cm at the middle with a semi-globular base of 4 – 5 cm diameter. Its internal walls are flat and smooth. Storage chambers are usually separate from each other but, occasionally, 3 of these chambers may join together to form a relatively large chamber (Fig. 2B). Storage chambers are used for storing collected food materials (e.g. pieces of wood, straw, paper ... etc.) and are usually full of food stuff. As seen in Fig. (1), most of the storage

chambers occur at depths of 5–30 cm below the soil surface.

3.2. Dwelling chambers

The dwelling chamber (Fig. 2C) is more or less similar in shape to the storage chamber but comparatively larger in size. Its roof is 2–3 cm. high at the middle while its globular base measures 4–9 cm. in diameter. Dwelling chambers may take different shapes and sometimes two dwelling chambers may join together (Fig. 2D). As in storage chambers, the walls of the dwelling chambers are also smooth and flat. Dwelling chambers are often occupied with different aggregated termite castes. Few dwelling chambers may be found at a depth of 20 cm. below the soil surface but most of them occur at depths of 30-60 cm. and occasionally at deeper depths reaching 150 cm. (Fig. 1).

3.3. Connecting tunnels

Connecting tunnels (or foraging galleries) are cylindrical in shape, with very smooth inner walls, mainly in the range of 5–9 mm. in diameter and 10-40 cm. in length.

3.4. Nesting pattern

The nest may consist of one main longitudinal tunnel with the chambers distributed along its sides (Fig. 1 right), or of two main nearly parallel longitudinal tunnels connected with transverse tunnels and the chambers distributed along their sides (Fig. 1 middle). A third nesting pattern may appear as a network of more than two longitudinal straight to slightly curved tunnels connected with transverse tunnels joining between randomly scattered storage and dwelling chambers (Fig. 1 left). Whatever the shape or pattern of the nest is, most of the dwelling chambers occur at a depth of 30–60 cm below the soil surface, but few galleries and dwelling chambers may occur at larger depths up to 150 cm. In addition to soil, *A. ochraceus* may excavate nests into mud-brick walls in village houses making hollow irregular holes filled with pieces of straw and wood (Fig. 2E) or occupied with termite individuals (Fig. 2F).

4. DISCUSSION

Current results seem to coincide with the findings of the previous investigations. Clement (1954) mentioned that, in Algeria, *A. ochraceus* makes small halls of uncemented sand about 1 cm in height expelled from the galleries below. The nest consists of an assemblage of chambers excavated at different levels and joined by galleries of various lengths. Chambers are irregular in shape, mainly in the range of 15–20 cm in diameter, and more or less flat. They are most numerous and closer together about 30 cm

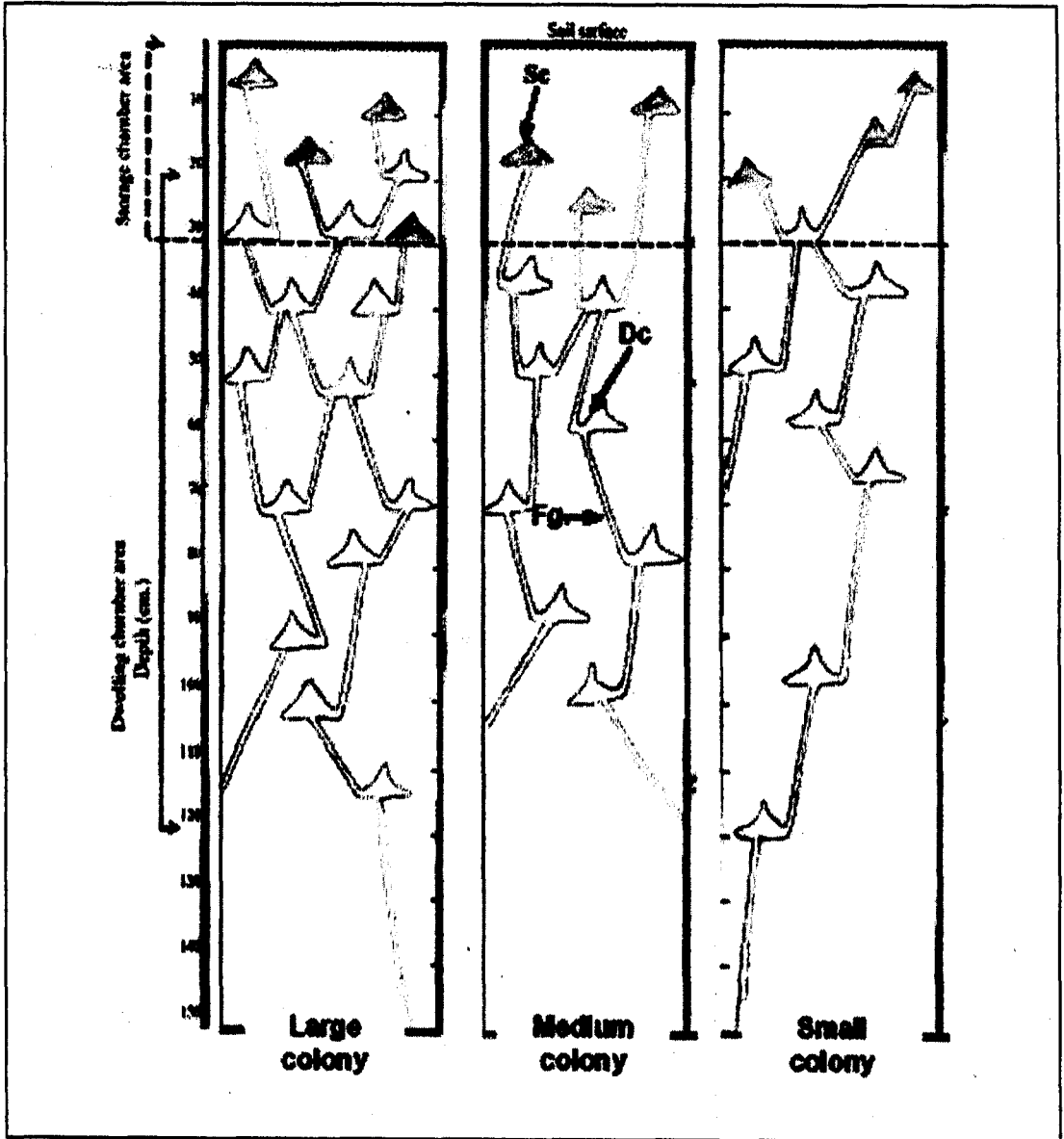


Fig. (1): Longitudinal in the soil showing the different nesting system large, medium and small colonies of *A. ochraceus*.

**Fg: Foraging galleries. Sc: Storage chamber. Dc: Dwelling chamber.
 Shaded areas : storage chamber.
 Blank areas: Dwelling chamber.**

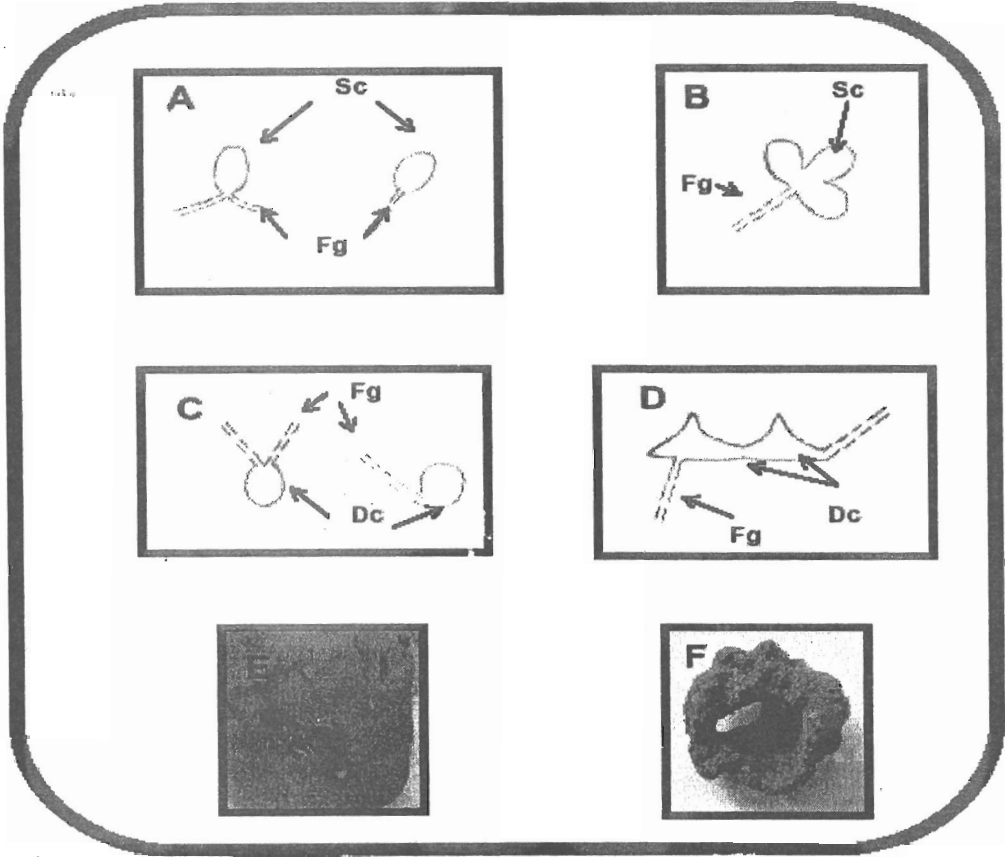


Fig. (2): Storage and dwelling chamber.
Fg: Foraging galleries. **Sc:** Storage chamber. **Dc:** Dwelling chamber.

- A:** Single storage chambers (longitudinal section).
- B:** Three Joined storage chambers (longitudinal section).
- C:** Two Joined dwelling chambers (longitudinal section).
- D:** A storage chamber in a mud brick.
- F:** A dwelling chamber in a mud brick (termite individuals removed).

below the soil surface and become less numerous with longer connecting galleries down to a limit of 150 cm. The upper chambers are used as granaries for the storage of small pieces of vegetation, and the colony occupies the chambers at intermediate depths, while the lower levels are reserved for the summer expansion of the population.

In Egypt, Kassab *et al.*(1960) observed that the subterranean passages of *A. ochraceus* ramify in all directions, and added that the location of the nest is very difficult even when extensive excavation is done. In Egypt too, Said (1979) mentioned that the subterranean nest of *A. ochraceus* is an assemblage of chambers that

belong to three distinct types according to location beneath the soil surface. The upper layer (about 40 cm. below soil surface) contains a large number of flat chambers mainly in the range of 6 – 15 cm in diameter each, with roofs rising to 2 – 4.5 cm in the middle. These chambers are used for storing food. In the layer below (40–110 cm) the chambers become less numerous, globular in shape, and are occupied with workers, nymphs and few soldiers. From 110 to 140 cm below the surface, the chambers are few in number and have low flat horizontal shapes about 15–25 cm in diameter. These chambers form the nursery hives where numerous young nymphs and few numbers of supplementary reproductives occur.

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نظام تكوين العشوش لنوع النمل الأبيض تحت الأرضي *Anacanthotermes ochraceus* من عائلة Hodotermitidae ورتبة متساوية الأجنحة

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ملخص

درس نظام تكوين العشوش لنوع النمل الأبيض تحت الأرضي "فاكانثوترمس أوكريكس" من عائلة "هودوترميثيدي" ورتبة متساوية الأجنحة بمحافظة الفيوم بجمهورية مصر العربية. ويستدل على وجود عشوش هذا النوع من النمل الأبيض بظهور كوكم مخروطية صغيرة من حبيبات التربة الخشنة في مواضع متفرقة من سطح الأرض في الأماكن المصابة. وتؤدي كل كومة إلى شبكة من غرف التخزين و غرف السكن تربط بينها ممرات أو أنفاق تحفرها الشغالات تحت سطح التربة. و تأخذ غرف التخزين شكلا مخروطيا تقريبا ذا سقف مرتفع ، وأرضية نصف كروية، وجدران داخلية ملساء مستوية، وتستعمل هذه الغرف لتخزين الغذاء، وتوجد عادة على عمق 5-30 سم تحت سطح التربة. أما غرف السكن فتشبه في الشكل غرف التخزين ولكن حجمها أكبر نسبيا، وتقلتها مجموعات من الطبقات (الأفراد) المختلفة المكونة لمستعمرة النمل الأبيض وتوجد تلك الغرف على عمق 20 سم تحت سطح التربة أحيانا، إلا أن الغالبية العظمى من الغرف توجد على عمق 30 - 60 سم، وقد يوجد القليل منها على أعماق تزيد عن ذلك وقد تصل إلى 150 سم. وتأخذ الأنفاق أو الممرات الموصلة بين الغرف شكل أنابيب إسطوانية ذات جدران داخلية ملساء جدا. وقد يتكون العش من نفق طولى رئيسى واحد تتوزع على جانبيه الغرف بصورة عشوائية ، أو من نفقين طوليين متوازيين تقريبا تصل بينهما أنفاق عرضية تمتد إلى غرف التغذية وغرف السكن التى تتوزع عشوائيا على جانبي هذين النفقين ، أو من شبكة من الأنفاق الطولية التى يزيد عددها عن نفقين تربط بينهما مجموعة من الأنفاق المستقيمة أو المقوسة قليلا و الممتدة طوليا وعرضيا لتصل إلى كل من غرف التغذية والسكن التى تتوزع بصورة عشوائية.

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