



Survey and Classification of Termite Species of Family Termitidae and their Locations in Nineveh Governorate

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Abstract

The results of the questionnaire for ten agricultural materials specialized in the control of the gnat insect in the center of Mosul, including the advisory office of the College of Agriculture and Forestry / University of Mosul (University of Mosul) in all neighborhoods and regions of the city of Mosul on its right and left sides, Some of these injuries were recent, while others were recorded in previous years and that the degrees of infection or the level of presence of this insect among the neighborhoods of Mosul have Distributed between weak injury (1-3 houses / neighborhood), compensation (4-10 houses / neighborhood), and severe (more than 10 houses / neighborhood) , Where these ranges were developed based on the results of the questionnaire The highest average of infection for the right side of Mosul was for the neighborhoods of July 17, Al-Jawsaq, while the infection was weak in the neighborhoods of Al-Mamoun, Wadi Hajar, Al-Dawasa, Al-Nabi Sheet, Ras Al-Jada, Al-Zanjili, and Old Mosul. As for the areas of the left side, the highest average of infection was In the friendly neighborhoods, flowers, nationalization, Baath, Sumer, unity, charter, police, Arab, Palestine, banks, millions, finance, cultural group, University of Mosul. While the infection was weak in the neighborhoods of Aden, Al-Karamah, Jerusalem, Al-Intisar, Al-Salam, Nabi Younis, Algeria.

The results of the field survey indicate that termites attack many different plants according to the areas included in the study, stalk namely *Platan occidentalis* trees (Mosul forests), stalk *Silybum marianum* bush (Hammam Al-Alil district), stalk sunflower crop *Helianthus annuus* (Bashiqa district), and fruit peel *Cucumis melo* watermelon (Wana district). and the root tomato *Solanum betaceum* (Zummar district).

The results of the diagnosis of termite samples sent to the Museum of Natural History at the University of Baghdad showed that all samples sent to different places where they were collected, the diagnosis proved that they belong to the species *Microcerotermes diversus* Silv. With the exception of sample No. (4) taken from the sunflower plant, *Helianthus annuus*, in the Al-Fadiliyah region of Bashiqa district, where it was of the type *Amitermes villis* Hagen.

Key words: Survey , Classification, *Microcerotermes diversus*, Termitidae

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Introduction

Termites are important economic insects that attack wood and wood products in tropical, subtropical, and temperate regions (Su and Scheffrahn, 2000, and Rouland-Lefevre, 2011). There are more than 2800 described species in the world, belonging to 282 genera around the world (Atspha and Hints, 2018), and approximately 285 species of them are considered pests.

The most recent classification of termites, according to the report (ITIS), is that they fall within the order Blattodea, and it includes 15 subfamilies and 7 families (Grohmann et al., 2010), three of these families are called lower or less developed terrestrial, as they feed only on dry or decomposed wood powder. They are (Mastotermitidae, Kalotermitidae and Hodotermitidae), while the other four families, which are called the upper ground and are the most developed as they can feed on healthy and dry wood, are (Termopsidae, Rhinotermitidae, Serritermitidae, and Termitidae) (Mohammed et al., 2014).

The Termitidae family is the highest in number of species worldwide, comprising approximately 85% of known genera and 70% of known termite species (Ohkuma et al., 2003).

In the Arab world, the number of known species does not exceed 24, 12 of which belong to the Termitidae family (Al-Mallah, 2010). Of the diagnosed species of termites in Iraq, seven species belong to three families (Arab Organization for Agricultural Development, 1976, Al-Alawi, 1987, and Muhammad and Zarzis, 1992), three of which belong to the Termitidae family.

The species *Microcerotermes diversus* silv. is considered one of the important economic insects in most of the governorates of Iraq. In addition to the economic losses, it causes great problems and psychological anxiety for homeowners that cannot be estimated in material values (Al-Jassani, 1996). Termites cause huge losses to agricultural crops, forest trees, and buildings made of wood. The global economic losses of Subterranean termite are estimated at about 22 billion US dollars, including the costs of chemical control and the restoration of damaged buildings (Su, 2003).

Termites live in sects, the number of individuals ranges from hundreds to several million, and some species live below the surface of the soil and at different depths that may sometimes be difficult to reach

(Abe et al., 2000). Ground workers are distinguished by their persistence in searching, as they travel distances of up to 150 feet in search of food (Su and Scheffrahn, 1993). It prefers to spread in moist and dark places, especially under the trunks of trees (Zarjis and Muhammad, 1992).

The subsurface builds its colonies in the soil and searches for food above the surface of the soil, where it attacks buildings through cracks and builds tunnels on the walls that it uses to connect between the colony and the food source (Su et al., 2001). Environmental studies related to the presence of the insect and its feeding activity, as well as the effect of temperature and humidity on this activity, are very important as they are necessary and required for the success of any control program.

In view of the recent history of the presence of the termite and its spread in the Nineveh Governorate, which is apparently linked to the history of the establishment of the Mosul Dam, which dates back to the eighties of the last century, compared to the central and southern governorates of Iraq, and therefore the lack of studies on this insect, especially environmental studies and the extent of its spread in the center of the Mosul district, as well as its sub-districts and sub-districts. Therefore, the current study aims to conduct:

- Surveys of infection in the different areas of Mosul.
- Collecting insect samples from different infestation areas, whether they attack buildings or crops and forest trees for the purpose of classifying them.

Materials and Methods

The study included:

1- Survey operations are carried out in two directions:

A- Surveys of termites that attack residential areas, buildings and government facilities

on the left and right coasts of the city of Mosul, which can be implemented by making a questionnaire paper that includes a number of questions related to the presence and spread of this insect, as well as the extent of the use of available control methods and the most commonly used pesticides and their effectiveness and consideration. Due to the sensitivity of this subject for the people of the city of Mosul, which may make the aforementioned questionnaire not conform to reality and is tainted by many question marks, the use of termite control offices in the city will be used to complete this questionnaire, as well as the termite control team of the Agricultural Consulting Office / College of Agriculture and Forestry, which It will certainly give credibility greatly to this questionnaire.

B- Surveys of termite infestations in the agricultural areas of Nineveh Governorate. To carry out the study, 5 different agricultural or geographical areas were selected in terms of geographical location, topography of the area and the crops grown, which are (Mosul forests, Wanah district, Bashiqa district, Zummar district, Hammam al-Alil district), and assistance was made. In this area, the agricultural divisions of these areas for the purposes of documentation and informatics.

2- Diagnosis and classification:

That is through what was collected of termite samples from different areas (residential and agricultural) during the aforementioned survey operations, where these samples are placed in glass bottles and preserved in 70% alcohol after writing the information for each sample (geographical area, residential, agricultural, Crop type, date) and the diagnosis process was carried out by the competent authorities in this field (Natural History Museum / Baghdad).

Results and Discussion

Termite surveys

1- In residential areas :

The results of the questionnaire showed for ten agricultural offices specialized in termite control in the city center of Mosul, including the Agricultural Consulting Office of the College of Agriculture and Forestry / University of Mosul, which was implemented through a questionnaire paper distributed for this purpose during the study period for the year 2022, the results of which are shown in Table (1), which It indicated the presence of this insect and its attack on residential buildings and government departments (including the University of Mosul) in all neighborhoods and regions of the city of Mosul on its right and left sides, and that the degrees of infection or the level of presence of this insect among the neighborhoods of Mosul were distributed between weak (1-3 houses / neighborhood) and medium infestations (4-10 houses / neighborhood) and severe (more than 10 houses / neighborhood).

It is clear from the table mentioned above that the highest average infection rate for the right side of Mosul was in the 17th of July neighborhoods, Al-Jawsaq, while the infection was weak in the neighborhoods of Al-Mamoun, Wadi Hajar, Al-Dawasa, Al-Nabi Sheet, Ras Al-Jada, Al-Zanjili, and Old Mosul.

As for the areas of the left side, the highest average of infection was in Al-Ahya Al-Siddiq, Al-Zuhur, Tamim, Al-Baath, Sumer, Al-Wahda, Al-Mithaq, Al-Shorta, Al-Arabi, Palestine, Banks, Al-Malawiyyin, Finance, Al-Ghama'a Al-Thaqafiya, University of Mosul. While the infection was weak in the neighborhoods of Aden, Al-Karama, Jerusalem, Al-Intisar, Al-Salam, Nabi Younis, Algeria.

From the foregoing, it is clear that the attack of this insect on residential or urban buildings did not exclude any area of the

Mosul district on its right and left sides, regardless of the level of infection achieved, which requires work to take preventive and remedial measures, especially for healthy buildings from infection, especially if we know that starting procedures to combat this insect It does not require the presence of specific numbers of individuals of this insect (i.e. the critical economic limit) to start these procedures. It is worth noting and noting, and as it appears from the aforementioned results, that there is a discrepancy in the level of infection between the right and left sides of the city of Mosul, where the left neighborhoods excel compared to the right in the severity of the insect infestation. ground as in figure (1), This may be due to several reasons, including the presence of empty and abandoned areas of land between the residential floors at higher rates than in the right neighborhoods, which are often a shelter for waste and the remains of dead trees or used furniture, which is an attractive material for this insect to settle and build its colonies under the soil, as well as The presence of green spaces, whether home and public gardens, or even orchards, close to the left neighborhoods, and the presence of the Mosul Dam lake close to the left side of Mosul is a major reason for the rise in the ground water level and thus the rise or increase in soil moisture, which is the most important factor in attracting these insects for the purposes of reproduction and stability with the availability of food, This was confirmed by the results of the current study on the seasonal activity of workers and its relationship to temperature and relative humidity, as the study showed a positive correlation of the numbers of these workers with relative humidity, as well as what Black and Wood (1989) mentioned that rainfall led to a decrease in soil temperature and an increase in its humidity and humidity Relative, which led to an

increase in the activity of the subsurface ground in the search for food.

Also, the aforementioned factors, wherever they are found and in specific areas of the right and left sides, were a cause of attracting the insect and thus increasing the infestation, and this was confirmed by the results of the questionnaire, where we find, for example, on the right side in particular, an increase in the incidence of the insect in the 17th of July and Al-Jawsaq regions, compared to the rest of the neighborhoods on the right side, which may return To their proximity to the two water sources (Tigris and Al-Khawsir), in addition to the presence of agricultural lands and orchards nearby here and there.

It can be said that the results of this questionnaire and subsequent questionnaires and the extent of their credibility depend on the citizen or the owner of the property and his conviction in reporting or asking for help. Many, according to our knowledge,

surround this matter with secrecy and confidentiality for fear of bad publicity that could befall the house and the people of the house according to their belief. Therefore, based on that, the results mentioned in our study It may not represent only half the truth, but nevertheless it remains a clear indication of the need to pay attention to combating this insect at the level of the district of Mosul, and to pay more attention to preventive measures for uninfected areas or buildings, and to use attractive bait traps as a preliminary measure to predict the presence of the insect in the areas surrounding residential buildings for the purpose of taking the necessary measures to prevent it. From attacking these residential homes.

In conclusion, it must be noted that the current study of the survey, especially for residential areas, is the first of its kind at the level of Nineveh Governorate, and it may be the first at the level of Iraq.

Table (1) results of the questionnaire for termite infection in the residential neighborhoods on both sides of the city of Mosul.

sides of Mosul	neighborhood	degree of injury	
		Term	average
right	Al-Rifai	Weak - medium	Medium
	Al-Mamoun neighborhood	weak	weak
	Wadi Hajar district	Weak - medium	weak
	Al-Tayaran District	Medium - severe	Medium
	Dawasa district	Weak - medium	weak
	Neighborhood of the Prophet Chet	weak	weak
	July 17 neighborhood	Medium - severe	severe
	Ras Aljada district	weak	weak
	Zanjili neighborhood	Weak - medium	weak
	Old Mosul district	Weak - severe	weak
	Al-Najjar district	Weak - medium	Medium
	Al-Jawsaq neighborhood	Medium - severe	severe
	Yarmouk neighborhood	Medium	Medium
	Al-Amel district	Weak - medium	weak
	new Mosul	Weak - medium	Medium
	Altanak district	weak	weak
	agrarian reform	Weak - medium	Medium
	The alrisala district	Weak - medium	Medium
Al-Thawra district	Weak - medium	Medium	

left	Al-Hadba neighborhood	Medium - severe	Medium
	Sugar district	Medium - severe	Medium
	Siddique neighborhood	Medium - severe	severe
	municipalities district	Weak - severe	severe
	Al-Kafaat Al-Thaniya neighborhood	Medium - severe	Medium
	Muthanna district	Weak - severe	Medium
	Flowers neighborhood	Weak - severe	severe
	Rashidieh district	Weak - medium	Medium
	Al-Qadisiyah district	Weak - severe	Medium
	Al-Nour district	Medium - severe	Medium
	Al-Bakr neighborhood	Weak - severe	Medium
	Tameem district	Weak - medium	severe
	Media district	Weak - severe	Medium
	Brotherhood neighborhood	Medium - severe	Medium
	Aden district	Weak - medium	weak
	Karama neighborhood	Weak - medium	weak
	Jerusalem neighborhood	Weak - medium	weak
	Al Samah neighborhood	Weak - medium	Medium
	Baath district	Medium - severe	severe
	Intisar district	Weak - medium	weak
	Domiz district	Medium - severe	Medium
	Sumer neighborhood	Weak - severe	severe
	Salam District	Weak - medium	weak
	Al Wahda district	severe	severe
	Al Mithaq district	Medium - severe	severe
	Neighborhood of the Prophet Yunus	Weak - medium	weak
	Algeria district	Weak - medium	weak
	police district	Weak - severe	severe
	Arab neighborhood	Medium - severe	severe
	Al Faisaliah neighborhood	Weak - medium	Medium
	Post district	Medium - severe	Medium
	University neighborhood	Medium	Medium
Palestine neighborhood	Weak - severe	severe	
Banks district	severe	severe	
Cairo district	Weak - medium	Medium	
Green apartments	Weak - medium	Medium	
Yaramjah neighborhood	Medium	Medium	
Millions neighborhood	Medium - severe	severe	
financial district	severe	severe	
Cultural Group District	severe	severe	
Mohandessin district	Medium	Medium	
University of Al Mosul	Medium - severe	severe	

* Weak injury = 1 - 3 residential homes

Medium injury = 4 - 10 residential homes

Severe injury = more than 10 residential homes

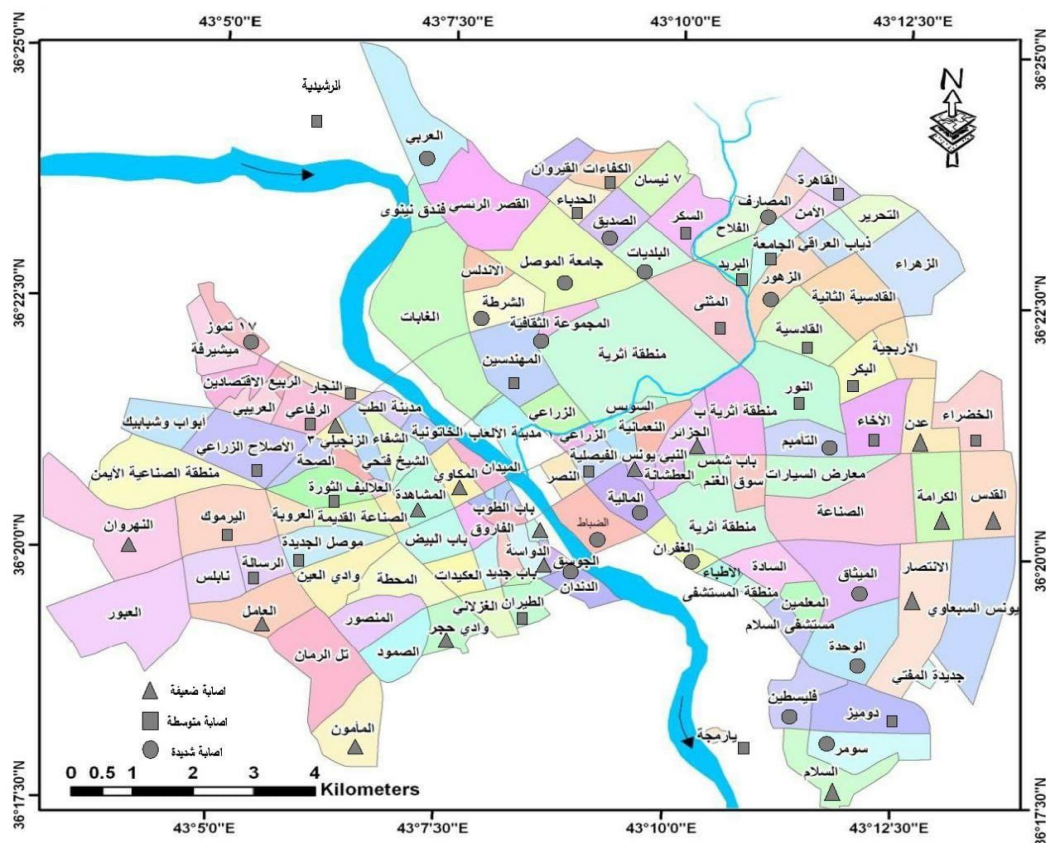


Figure (1) A map of Mosul district with the degrees of termite infestation recorded.

Table (2) Results of the field survey of termites in the agricultural areas of Nineveh Governorate during the year 2022.

agricultural and residential areas	The date of sampling	Plant name	Insect type
Mosul forests	14/6/2022	The carpenter tree	<i>Microcerotermes diversus</i> Silv.
Hammam Al-Alil district	20/6/2022	galgan	<i>Microcerotermes diversus</i> Silv.
hand and he	22/6/2022	watermelon	<i>Microcerotermes diversus</i> Silv.
Bashiqa sub-district	17/6/2022	Sunflower	<i>Amitermes villis</i> Hagen
Zammar district	19/6/2022	tomato	<i>Microcerotermes diversus</i> Silv.
Forestry Department Arboretum	21/6/2022	Robinia tree	<i>Microcerotermes diversus</i> Silv.
Al-Nour district	24/5/2022	inside the house	<i>Microcerotermes diversus</i> Silv.
Wadi Hajar district	2/6/2022	inside the house	<i>Microcerotermes diversus</i> Silv.

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مسح وتصنيف لأنواع حشرة الارضة من عائلة Termitidae واماكن تواجدها في محافظة نينوى

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• تاريخ استلام البحث 21/2/2023 وتاريخ قبوله 13/03/2023

• البحث مستل من اطروحة دكتوراه للباحث الاول .

المستخلص

أظهرت نتائج الاستبيان لعشرة من المكاتب الزراعية المتخصصة في مكافحة حشرة الارضة في مركز مدينة الموصل ومن ضمنها المكتب الاستشاري الزراعي التابع لكلية الزراعة والغابات / جامعة الموصل والتي نفذت من خلال ورقة استبيان وزعت لهذا الغرض خلال فترة الدراسة للعام 2022 الى تواجد هذه الحشرة ومهاجمتها للأبنية السكنية والدوائر الحكومية (ومنها جامعة الموصل) في جميع احياء ومناطق مدينة الموصل بجانبها الايمن والايسر وكانت هذه الاصابات بعضها حديثة والبعض الاخر تم تسجيلها في سنوات سابقة وان درجات الاصابة او مستوى تواجد هذه الحشرة بين احياء الموصل قد توزعت ما بين الاصابة الضعيفة (1-3 دار / حي) والمتوسطة (4-10 دار / حي) والشديدة (اكثر من 10 دار / حي) ، حيث تم وضع هذه المدييات بالاعتماد على نتائج الاستبيان وان اعلى متوسط للإصابة لمناطق الجانب الايمن من الموصل كانت للأحياء 17 تموز ، الجوسق في حين كانت الاصابة ضعيفة في الأحياء المأمون ، وادي حجر ، الدواسة ، النبي شيت ، رأس الجادة ، الزنجيلي ، الموصل القديمة ، اما بالنسبة لمناطق الجانب الايسر فان اعلى متوسط للإصابة كانت في الأحياء الصديق ، الزهور ، التأميم ، البعث ، سومر ، الوحدة ، الميثاق ، الشرطة ، العربي ، فلسطين ، المصارف ، الملايين ، المالية ، المجموعة الثقافية ، جامعة الموصل . في حين كانت الاصابة ضعيفة في الأحياء عدن ، الكرامة ، القدس ، الانتصار ، السلام ، النبي يونس ، الجزائر.

وتشير نتائج المسح الحقل الى مهاجمة حشرة الارضة للعديد من النباتات المختلفة وحسب المناطق المشمولة بالدراسة وهي ساق شجرة الجنار *Platan occidentalis* (غابات الموصل) ، ساق دغل الكلغان *Silybum marianum* (ناحية حمام العليل) ، ساق محصول دوار الشمس *Helianthus annuus* (ناحية بعشيقة) ، قشرة ثمرة البطيخ *Cucumis melo* (ناحية وانه) وجذور الطماطة *Solanum betaceum* (ناحية زمار) .

اظهرت نتائج التشخيص لعينات حشرة الارضة المرسله الى متحف التاريخ الطبيعي في جامعة بغداد الى ان جميع العينات المرسله على اختلاف اماكن جمعها اثبت التشخيص انها تعود للنوع *Microcerotermes diversus* Silv. باستثناء العينة رقم (4) المأخوذة من نبات دوار الشمس *Helianthus annuus* في منطقة الفاضلية التابعة لناحية بعشيقة حيث كانت من النوع *Amitermes villis* Hagen .

الكلمات المفتاحية: مسح ، تصنيف، *Microcerotermes diversus*، Termitidae.