

TERMITE DIVERSITY AND ITS EXTENT OF CROP DAMAGE IN VAYALOGAM SOIL SERIES OF TAMIL NADU, INDIA

ABSTRACT

A survey was conducted to study the distribution of termites in Vayalogam soil series, red sandy loam soil in Tamil Nadu, India. Among the termites collected from eleven places in Pudukottai district, Tamil Nadu all under one genera and three species, the predominant species was *Odontotermus wallonensis* (Wasmann) which was noticed in seven locations followed by *O. assmuthi* in three locations and *O. obesus* in one location. Further, an abundance of *O. wallonensis* was high (64.64%) followed by *O. assmuthi* (27.27%) and *O. obesus* (9.90%). The termite, *O. wallonensis* was recorded more in mounds compared to *O. assmuthi* and *O. obesus*, whereas in tree wood logs, three termite species were found. Among the avenue trees, pungan recorded less damage (7.25%) followed by jack trees (10.25%), Polyalthia (15.50%), tamarind (23.50%) and neem and eucalyptus (32.55 and 37.50%). In field crops termite damage was less in maize (5.75%), groundnut (10.25%), and sugarcane (10.25%). The highest damage was recorded in jack fruit at seedling stage (46.50%) cultivated in Vayalogam soil series. The termite attack was not observed in field crops viz., pulses, castor, brinjal and chilli.

Keywords: termites, diversity, red sandy loam soil, damage

1. INTRODUCTION

Termites are one of the most problematic pests and there are over 2800 described species of termites with approximately 185 considered pests (Lewis, 1997). They are abundant in tropical and subtropical environments. Termites economically important pests when they started to destroy the wood and wooden products of human homes, building materials, forests, agricultural crops and other commercial products (Monica *et al.*, 2009). The red loamy soil influences construction of termatorium and fungal comb construction by termites (Tucker *et al.*, 2004). The Vayalogam soil series of Pudukottai district is a red sandy loam soil covering 1.69 lakh hectares. Sharma *et al.*, (2004) reported that termite damage was minimum in clay and black soils, high in sandy loam soils and severe in red soils. The preliminary observations conducted at Agricultural College and Research Institute, Kudumiyamalai showed that field and horticultural crops, tree crops viz., teak, neem, eucalyptus, mango, sapota etc. grown in red sandy loam soil were found to be greatly prone to termite attack. Soil pests have been reported to be a major cause of yield losses in field crops (Wightman *et al.*, 1990). The termite fauna of fifteen species belonging to two families and seven genera were found to attack wheat, cotton, castor, sugarcane and tree crops in and around the crop fields during seedling and maturing stages (Pardeshi *et al.*, 2010). The termites by their foraging behavior enhance soil nitrogen content (Hemachandra *et al.*, 2010). But, termites large colony size, nesting behavior, and feeding preferences, termites can cause considerable damage to artificial structures and commodities. Although termites are excellent decomposers of dead wood and other sources of cellulose, they become a serious problem when they attack standing trees, logs and crops. The termite damage may lead to 100 per cent damage (Rana *et al.*, 2021) and estimated cost to control termites exceeds \$20 billion annually worldwide (Su, 2002). Therefore the present study was to investigate various species of termites in Vayalogam soil series in Pudukottai district, Tamil Nadu and their infestation on different trees and annual crops.

2. MATERIALS AND METHODS

2.1. COLLECTION AND IDENTIFICATION OF TERMITE SPECIES

Survey was undertaken during June 2016 – December 2019 in Vayalagam soil series of Pudukottai district, Tamil Nadu (Red sandy loam soil) at Agricultural College and Research Institute Campus, Farm and villages of Pattipunjai, Usilankollai- Mangadu, Sathankudi- Alangudi, P. Paramannagar, Paramannagar, Mellapullanveeduthi, Kothamangalam, Anna Pannai, Kudumiyamalai, Vyalogam, Visalur, Seranur and Agarpatti in Pudukottai district, Tamil Nadu. Termites were collected from diverse sources such as agricultural lands, litters, fallow lands and roadsides. Earthen mounds, roots and bark of trees cut branches and dead logs were randomly examined for the presence of termites and if present, were collected. Aspirators, plastic containers (50 ml), and forceps were used for collection. Specimens thus collected were transferred to a plastic lid, which had a smooth surface to arrest the fast movement of termites. They were also again collected with fine forceps into glass vials of 3x1cm containing 4 per cent formalin. Each vial was marked with details of the location, habitat and date of collection. Identification of the species was done by studying the soldier castes' characters using keys/descriptions of Chhotani (1997).

2.2. STUDY ON TERMITE INFESTATION IN TREES AND ANNUAL CROPS

During the survey, termite damage on trees and major crops was also assessed. The trees and crops were closely and carefully inspected for signs of termite activity, damages such as earthen sheet, runways and galleries on tree trunks, and damage to seedlings, stems, roots and pods of various crops were recorded and per cent presence was calculated using the formula (Southwood and Henderson, 2000), $d_i = (n_i \times 100) / N$, where, d_i = Percent presence, n_i = No. of individuals of taxa, and, N = Total individuals.

3. RESULTS AND DISCUSSION

3.1. SURVEY ON TERMITE SPECIES IN VAYALOGAM SOIL SERIES

The termites were collected from eleven different locations with Vayalagam soil series. The results revealed that, all of the termites were from the same genera and three species. The most common species found was *Odontotermus wallonensis* (Wasmann), which was found in seven locations. The second most common species was *O. assmuthi*, found in three locations, and the least common was *O. obesus*, found in only one location.(Table 1 and Fig.1). Murthy *et al.*, (2015) reported that among 300 species of termites in India about 12 per cent of species (35 species) were known to damage agricultural crops. Two species, *O. obesus* and *M. obesi* account for almost 80% of total losses in South Asia. The incidence of termites was higher in red sandy loam soil compared to the other soils in Pudukottai district. The result was in accordance with the findings of Varshney (2007), who found that termites are widely distributed in red, sandy loam, lateritic and red loam soils. Further, abundance of *O. wallonensis* was high (64.64%) followed by *O. assmuthi* (27.27%) and *O. obesus* (9.90%) (Fig 2). Also, *O. wallonensis* was found to be more in mounds compared to *O. assmuthi* and *O. obesus*, whereas in the wood log all three termite species were found (Table 2 and Fig 3.). *O. wallonensis* was found economically important termite that constructs earthen mounds above the ground and form subterranean galleries to feed on roots, logs and barks of the trees and grasses (Sushilkumar. 1994). *O. obesus* were found to be the most damaging in the developing and maturing stages of almost all crops (Pardeshi *et al.*, 2010 and Mahapatro and Sreedevi, 2014).

Table 1. Diversity of termite species in Vyalogam soil series

S. No.	Place of Collection	Source of collection	Termite identified
1.	Agricultural College and Research Institute,	Mound	<i>Odontotermus wallonensis</i>

	Kudumiyamalai		(Wasmann)
2.	Pattipunjai	Wood log	<i>O. wallonensis</i>
3.	Usilankollai, Mangadu	Mound	<i>O. wallonensis</i>
4.	Pattipunjai	Mound	<i>O. wallonensis</i>
5.	Sathankudi, Alangudi	Mound	<i>O. wallonensis</i>
6.	P. Paramannagar	Woodlog	<i>O. obesus</i>
7.	Paramannagar	Woodlog	<i>O. assmuthi</i>
8.	Agricultural College and Research Institute, Kudumiyamalai-Farm	Mound	<i>O. wallonensis</i>
9.	Paramannagar	Mound	<i>O. assmuthi</i>
10.	Mellapullanveeduthi	Mound	<i>O. wallonensis</i>
11.	Kothamangalam	Mound	<i>O. assmuthi</i>

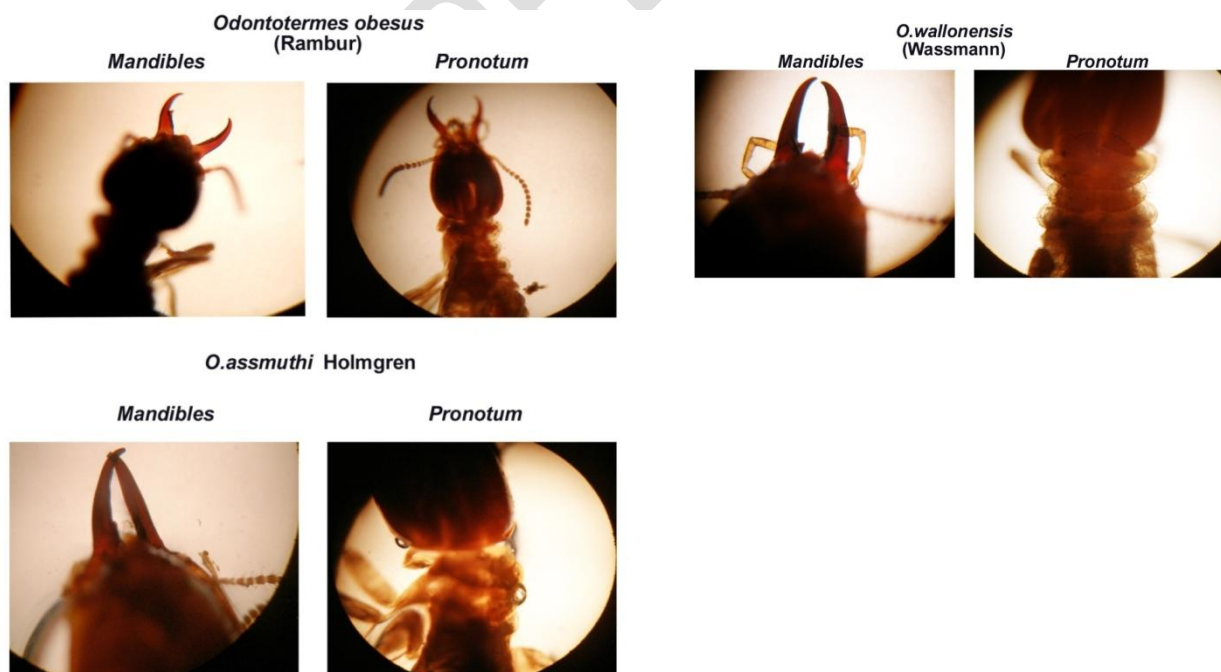


Fig 1. Distribution of different species of termite in Vyalogam soil series

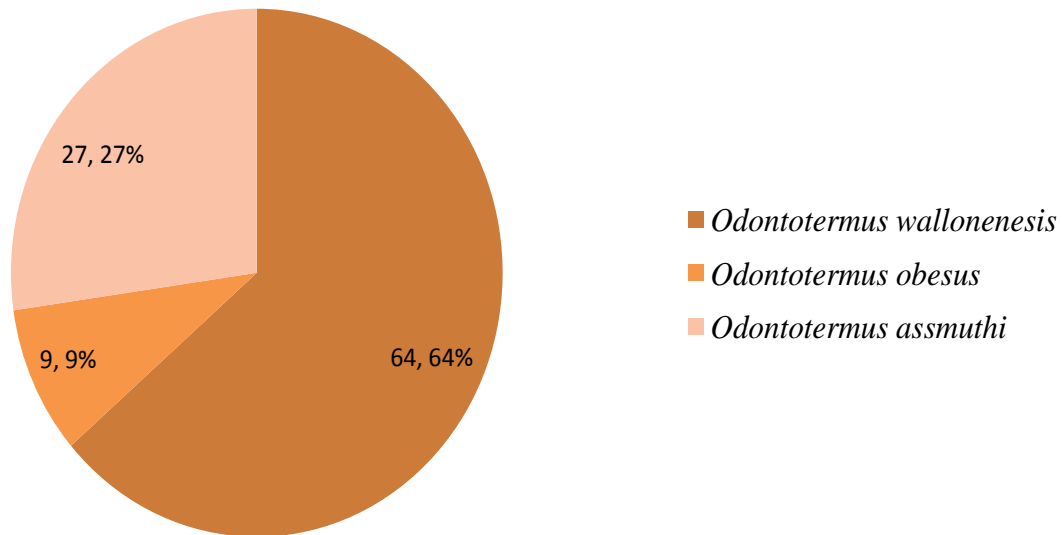


Fig. 2. Frequency distribution of three species recorded in Vyalogam soil series

3.2. ASSESSMENT OF TERMITE DAMAGE IN AVENUE TREES AND MAJOR CROPS

Termite damage was not observed in pulses, brinjal, chilli, and castor from termites. Whereas, minimum damage was recorded in maize (5.75%) followed by pungam (7.25%), groundnut and jack trees (10.25%), sugarcane and polyalthia (15.50%) and tamarind (23.50%). Neem and eucalyptus had the highest termite damage, with 32.55 and 37.50 per cent, respectively (Table 3). But, Paul *et al.*, (2018) observed that losses due to termite attack up to 25-30 per cent, 10-15 per cent and 5-17 per cent in cowpea, moth bean and moong, respectively. Similarly, the severe damage of termites in vegetables like brinjal, chillies, cabbage, capsicum was observed from seedling to harvest stage (Yadav *et al.*, 2015, Bugti *et al.*, 2014 and Paul *et al.*, 2018). In groundnut and sugarcane, the regions with moderate rainfall and red sandy loam soil had higher termite attacks (Paul *et al.*, 2018 and Umeh *et al.*, 1999). In tree species, termite attack was maximum due to poor maintenance and water stress. Mandal *et al.*, (2010) studied the damage potential of termites in different tree crops and reported 100% infestation. The highest damage was recorded in jack at seedling stage (46.50%) cultivated in Vayalogam soil series (red loamy soil) (Table 3). The water stress during the seedling stage leads to more termite damage in young seedlings (Bong *et al.*, 2012).

Table 2 .Occurrence of termite species in different microhabitats in Vyalogam soil series

Termite species	Microhabitats
<i>Odontotermus obesus</i> (Ramb.)	Leaf litters, tree bark, tree logs, fallen tree twigs and woods used for construction.
<i>O. wallonensis</i>	Mounds, crops and crop residues, tree barks and dry twigs

<i>O. assmuthi</i>	Mounds, crops and crop residues, dry cowdungs, tree barks and dry twigs
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Cow dungs



Trees-Dead logs



Mounds



Groundnut

Fig 3 .Occurrence of termite species in different microhabitats

UNDER PEER REVIEW

Table 3. Assessment of termite damage in avenue trees and major crops in Vayalagam soil series

Crops	Stage	Damage (%)
Jack	Seedling	46.50 (42.99)h
	Tree	10.25 (18.67)c
Neem	Tree	32.55 (34.79)f
Eucalyptus	Tree	37.50 (37.76)f
Teak	Tree	15.75 (23.38)d
Pungam	Tree	7.25 (15.62)b
Tamarind	Tree	23.50 (23.18)e
Polyalthia	Tree	15.50 (28.99)d
Sugarcane	Seedling	15.50 (23.19)d
	Maturity	15.25 (22.98)d
Groundnut	Maturity	10.25 (18.67)c
Maize	Maturity	5.75 (13.87)a
Pulses	All	-

Castor	All	-
Brinjal	All	-
Chilli	All	-
SEd		0.243
CD (P=0.05)		0.503

Mean of ten replications

Figures in parentheses are arcsinettransformed values by DMRT (P=0.05).

4. CONCLUSION

The predominant termite species was *Odontotermus wallonensis* (Wasmann) red sandy loam soil. The termite damage was maximum in jack seedlings, pungam, Polyalthia, tamarind, neem and eucalyptus but in field crops it was less in maize, groundnut, and sugarcane.

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