

FORAGING ACTIVITY OF *MICROTREMES UNICOLOR* SYNDER AND *ODONTOTERMES LOKANANDI* CHATTERJEE AND THAKUR (TERMITIDAE, ISOPTERA) IN PESHAWAR, PAKISTAN

Abdus Sattar¹, Muhammad Misbah ul Haq^{1*}, Zahoor Salihah¹, and Ruqiya Khatoon²

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Abstract

Microtermes unicolor and *Odontotermes lokanandi* were two major termite species which were observed foraging during the experimental months from April to September, 2006. The maximum population of both species was recorded in August when the temperature was 29.9°C, the relative humidity was 64.5% and the soil temperature was 27.3°C. The minimum population was observed in June for *M. unicolor* and in July for *O. lokanandi*. The result stated that the total population of both species was positively correlated with the relative humidity and the soil temperature, but negatively correlated with atmospheric temperature.

Keywords: *Microtermes unicolor*, *Odontotermes lokanandi*, foraging activity, environmental factors

Introduction

The climate of Peshawar valley, Pakistan, is most favourable for the production of varieties of fruits like peaches, pears, apricots, citrus fruits, guavas, plums, apples and persimmon and cash crops such as sugar cane. These fruit trees and sugar cane are liable to the attack of many insects and pests which inflict colossal losses on both the farming community and the government finances (Salihah *et al.*, 1992).

It was reported that termite was one of the major pest damaging these crops. In some cases

the damage was up to 100 % (Alamzeb *et al.*, 1990; Khan *et al.*, 1990; Salihah *et al.*, 1998)

Microtermes unicolor, *Odontotermes lokanandi*, *Heteromes sp* and *coptotermes sp* are the four very common and damage causing species found in Pakistan. Bhanot *et al.*, (1984) used stakes of Kiker (*Acacia arabica*) for observing foraging activities and it was concluded that *M. unicolor* and *O. lokanandi* were more abundant and frequent foragers. Foraging activity is a very important step in

¹ Nuclear Institute for Food and Agriculture (NIFA), PO Box 446, Peshawar, Pakistan. E-mail: misbah_nifa@yahoo.com

² Pakistan Institute of Nuclear Science and Technology (PINSTECH), Islamabad, Pakistan.

* Corresponding author

population dynamics studies of termites. A number of scientists have studied population dynamics and foraging activity of termites (Lai 1977; Esenther 1980; Nash *et al.*, 1999; Su *et al.*, 2001) using different methods. The simplest qualitative method is to measure foraging activity by presence of termites (Su *et al.*, 1982; Gao *et al.*, 1985; Myles *et al.*, 1994; Rudolph *et al.*, 1994). Number of foragers was estimated by trapping techniques (Jones, 1990), a triple mark-recapture procedure with a baited mean model (Begon, 1979), radiotracer iodine-131 and gold 198 for population studies (Spargg and Paton, 1980; Easey and Holt, 1989).

Foraging activities of termites studied by Abu Shama and Al-Houty (1988) showed its positive correlation with soil moisture content and temperature. Number of termites were estimated low in late fall through early spring and peaked from June to October (Haverty *et al.*, 1999). The termite activities were observed with correlation to temperatures (Fei and Henderison, 2004) and that soil temperatures affected the foraging activity at certain depths.

M. unicolor was the most abundant termite species in Saudi Arabia reported by Badawi *et al.* (1984). The correlation of population of the termite and the environmental factors was studied and found positive with the relative humidity and negative with the temperature (Akther and Sarwar 1995).

The present study described the foraging activity of termites in Peshawar and its correlation with environmental conditions.

Materials and Methods

Foraging activity of subterranean termites, i.e. *M. unicolor* and *O. lokanandi*, was studied from April to August 2006 at Momin Garhi village, Peshawar. The selected site was a bare ground area formerly an orchard destroyed by termites. Stakes of 85 poplar woods (2.5 cm thick \times 4 cm wide \times 28 cm high) were introduced in the soil in a grid pattern (2.4 \times 2.4 m). On fortnightly observation, whenever any stake was found infested, a "NIFA TERMAP" (Salihah *et al.*, 1993) composed of a PVC pipe (8 mm thick \times 15 cm diameter \times 20 cm high), a bundle of 5 poplar

wooden slices (1.3 \times 8 \times 15 cm each) wrapped in blotting paper and a cover of plastic sheet) was installed at that point. NIFA TERMAPS were installed at the end of March 2006 and the 1st observation was taken in May where 7 NIFA TERMAPS were installed and the number increased to 15 by the end of September.

The termite were collected and identified and the total number of each termite species was counted. Experiment was design in RCBD and analysis was done by SPSS. The environmental factors such as atmospheric temperature ($^{\circ}$ C), soil temperature ($^{\circ}$ C) and relative humidity (%) were recorded in order to correlate with the population density.

Results and Discussions

Termite species *M. unicolor* and *O. lokanandi* belonging to family Termitidae were found foraging at the experimental plot.

Table 1 shows the foraging pattern of termite species on different traps number 8, 9, 11, 12, 13, 14, and 15 were under attack from a single a species, i.e. *M. unicolor*. In other traps termite species kept on changing with a lapse of time. In trap number 1, *O. lokanandi* was recorded in the month of April but not from May to August when *M. unicolor* infestation was observed and *O. lokanandi* resumed its infestation again in September. A similar phenomenon was found in traps 2, 3, 4, 5, and 6 where the two species kept on changing their infestation in different experimental months of the year. So, there was almost negligible competition between the two species. Only in traps number 5, 7, and 10 both species were found foraging at the same time, i.e. from April and June in trap 5, from June to July in trap 7, and in the month of August in trap 10.

The frequency of occurrence of both species was recorded (Table 2) and it was observed that *M. unicolor* had a higher presence frequency of 35.55% followed by *O. lokanandi* of 25.55%. *M. unicolor* and *O. lokanandi* were found foraging at 64 and 46 cases respectively out of a total of 180 observations. So, it was revealed that *M. unicolor* was a more common species during the experimental

months.

Table 3 gives a comparison between the two species on the basis of total and mean number of termite individuals per trap during different months and their correlations with different environmental factors. The minimum mean of *M. unicolor* per trap was recorded at 30°C atmospheric temperature, 53.3% relative humidity, and 29.7°C soil temperature in June while its maximum mean per trap was observed in August when the atmospheric temperature

was 29.9°C, relative humidity was 64.5% and soil temperature was 27.3°C. In the case of *O. lokanandi*, the minimum mean per trap was recorded in July at 31.2°C atmospheric temperature, 64.4% relative humidity, and 29.3°C soil temperature while its maximum mean per trap was observed at 29.9°C atmospheric temperature, 64.5% relative humidity, and 27.3°C soil temperature in August. Therefore, August was the month where the infestation of both species was at maximum.

Table 1. Foraging pattern of *M. unicolor* and *O. lokanandi* on bare land formerly used as orchard at Momin Garhi, Peshawar during different experimental months of year 2006

Trap no.	April	May	June	July	August	September
1	O	M	M	M	M	O
2	O	-	O	M	M	M
3	O	O	O	M	M	M
4	O	O	O	M	M	M
5	O+M	O	O	M	O	M
6	O	O	O	M	O	O
7	O	O	M	O+M	O	M
8	-	M	-	M	M	M
9	-	-	-	M	M	M
10	-	-	-	-	O+M	O
11	-	-	-	-	M	M
12	-	-	-	-	M	-
13	-	-	-	-	M	M
14	-	-	-	-	M	M
15	-	-	-	-	M	M

O: *Odontotermes lokanandi*

M: *Microtermes unicolor*

- : No infestation

Table 2. Frequency of occurrence of *M. unicolor* and *O. lokanandi* based on No. of observations on bare land formerly used an orchard at Momin Garhi, Peshawar

Species	Total No. of observations	Positive No. of observations	Frequency of occurrence (%)
<i>M. unicolor</i>	180	64	35.55
<i>O. lokanandi</i>	180	46	25.55

To study the effect of environmental factors on the foraging, total population of both species were correlated with the relative humidity, atmospheric temperature and soil temperature (Table 4). In case of *M. unicolor*, the correlation between relative humidity and the total population was positive ($r = 0.587$) and non-significant while that of the *O. lokanandi* population was negatively ($r = -0.006$) correlated. The correlation between the total population of the two species and the relative humidity was non-significantly positive ($r = 0.519$).

Atmospheric temperature and *M. unicolor* and *O. lokanandi* population possessed the correlation coefficient of $r = 0.088$ and $r = -0.464$ respectively. The total population was negatively ($r = -0.154$) correlated and was non significant. Soil temperature is another very important environmental factor as correlation coefficient was positive ($r = 0.092$) between *M. unicolor* and soil temperature and negative ($r = -0.44$) for *O. lokanandi* but both were non significant.

However, the correlation coefficient of the total population was positive ($r = 0.016$) but very weakly correlated.

The result showed that both species were foraging throughout the experimental months and their population was at maximum in August and September and *M. unicolor* was more abundant than *O. lokanandi*. Haverty (1999) also studied the effect of environmental factors and also observed the variation in the population of termites in different seasons of the year. Fei and Henderison (2004) also supported the present study and also concluded that soil temperature affected the foraging activities.

All the reviewed paper supported the present study that relative humidity, soil temperature and total population of termites were found positive but non significantly correlated while atmospheric temperature had negative but non significant impact on population of termites.

Table3. Total and Mean number of termites per trap in comparison with environmental factors in different experimental months of year 2006

Months	RH (%)	Temperature (°C)		<i>M. unicolor</i> (Number)		<i>O. lokanandi</i> (Number)	
		Soil	Atmosphere	Mean	Total	Mean	Total
April	48.3	21.2	23.2	26.66	400	240.00	3,600
May	50.9	30.2	30.4	58.13	872	201.40	3,021
June	53.3	29.7	30.3	20.00	300	16.80	252
July	64.4	27.3	31.2	279.80	4,197	1.60	24
Aug	64.5	27.3	29.9	1,604.33	24,065	362.53	5,438
Sep	56.9	26.2	27.8	1,521.46	22,822	247.86	3,718

Table4. Correlation between environmental factors and population of termite species

	<i>M. unicolor</i>	<i>O. lokanandi</i>	Total
Relative Humidity	+0.587 ns	-0.006 ns	+0.519 ns
Atmospheric Temp	-0.088 ns	-0.464 ns	-0.154 ns
Soil Temp	+0.092 ns	-0.404 ns	+0.016 ns

ns: Statistically not significant.

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