

SOME OBSERVATIONS ON TERMITE POPULATION

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Abstract

In order to attract termites and monitor their population for study of their ecological behaviour, field experiments were laid out at various locations at Peshawar and Islamabad in the sub-mountainous zone and at Lahore and Changa Manga in the Indus Basin Plains. Experimental sites were selected after confirming the termite activity areas.

At Peshawar population monitoring trials revealed that colonies of *Heterotermes indicola* (Wasmann) (Rhinotermitidae) and *Odontotermes obesus* (Rambur) (Termitidae) are present at the Pakistan Forest Institute and each monitored colony comprised of 1989 to 2219 workers and soldiers at one spot. At another spot at Pakistan Forest Institute, Peshawar 3-distinct colonies of *Odontotermes lokanadi* were monitored comprising 4500 workers and soldiers each. At spot 3 at Pakistan Forest Institute campus, two colonies of *Odontotermes obesus* (Rambur) (Termitidae) were monitored from which a total of 11,126 workers and soldiers were collected.

At Islamabad one termite colony of *Odontotermes hori* (Roonwal) and (Chhotani) gave a total of 3806 workers and soldiers during the monitoring period. Similarly at Rawalpindi a colony of *Odontotermes lokanandi* (Chatterjee) and (Thakur) (Termitidae) gave a population of 14,050 termites. At Islamic Research Centre, Lahore a colony of *Odontotermes obesus* (Rambur) gave a population of 15,408 termites throughout the trial period.

Introduction

Having known about the importance of termites with regard to living trees, wood in use and storage, further probe into their population

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and ecological behaviour was considered very essential. To bring to light the exact role played by different species of termites, the factors influencing their occurrence and for population density required for working out various methods of protection of losses caused by them.

In recent years, work has been conducted on the termite caste determination (Wilson 1971, Luscher 1977), but understanding of the ecological importance of various caste forms has progressed much more slowly (Brain 1978, Oster and Wilson 1978). Quantitative information about seasonal variations in caste proportions within a colony is essential for such understanding. Previous studies have been restricted to the family Termitidae or Kalotermitidae (Banerjee, 1966, Bodot 196, Sands 1965, Sen-serma and Mishra 1969, 1972). Present studies have been initiated with the objective of gaining knowledge of the caste strength of various termite species in different ecological zones in different time periods of the year.

Materials and Methods

For locating the termite colonies and spots with heavy termite populations, various places in the sub-mountainous zone i.e. Peshawar, Islamabad, Kala Chitta (Attock) and in the Indus Basin Plains such as Lahore and Changa Manga were surveyed. Areas with sufficient termite activity were marked in these localities. In order to attract, monitor and study the ecological behaviour of termite populations, field experiments were laid out in all the above locations in January 1986 by installation of semul wood blocks of 15x15x2.5cm size in pits of 30x30 cm with various depth of 45, 60 and 75 cm at the interval of 13 metres each to attract the termites. At the bottom of each pit a semul wood block was placed and the pits were covered with tin plates in order to avoid filling of the pits with soil and for convenience in collection of termites from the pit at the time of observation. The following experiments were laid out for monitoring the termite population.

1. Another monitoring site was established in the residential area of the Pakistan Forest Institute, Peshawar where 10 pits were laid in a line at one meter spacing in September, 1988.
2. At the Horticulture Nursery of the Environmental Directorate of Capital Development Authority Islamabad, experiment on the termite population study was laid out during February, 1986. A total of 6 wooden blocks of *Bombax ceiba* (Semul) of 15 x 15 x 2.5 cm was installed in the earthen pits of 30 x 30 x 45 cm size at the termite activity site around the store house. The layout map was prepared for convenience in locating the blocks for further observations. The same type of experiment was also laid out at Barani Agriculture College, Murree Road, Rawalpindi, where 7 blocks were installed and the layout map was prepared.
3. At the Barani Agriculture College, Rawalpindi, 5 pits were established in the fenced area of meteorological observatory and 5 pits were laid 180 m away near the workshop, population data are given in table 5.
4. At the Islamic Research Centre, Punjab University, Lahore 10 pits were established in March, 1987 in a line near the boundary wall at regular interval of one meter from each other. Population collection was not at regular intervals, however the data collected are given in table 6.

Results and Discussion

Heterotermes indicola (Wasmann) workers and soldiers collected from pit 1, 2, 5 and 10 were 1689, 2219, 2637 and 196, respectively. (Table 1). Since these pits were spaced at more than 130 meters, therefore 3 different colonies of termites appeared.

From the other 5 pits i.e. 3,4,6, 7 and 8 workers and soldiers of *Odontotermes obesus* (Rambur) were recovered. The placement of pits indicated that workers and soldiers recovered from pits 3,4 and 5 belonged to one colony and those attracted in pits 6, 7 and 8 to separate

colonies of termites being more than 190 m apart from pits 3,4,5. Pit 9 did not attract any termite. Unfortunately the pits were disturbed by the school children and the monitoring site was abandoned after six months in December, 1986.

The recovery of termites from pits 3, 5 and 6 were still in progress when the experiment was disturbed but termite workers and soldiers had stopped coming to pits 1,2,7 and 8 which indicated the total population of each colony to be 1689, 2219, 2155 and 1907 respectively (Table 1).

The workers and soldiers collected from each pit during the period of about two years (1987 and 1988) indicated that there were 3 distinct colonies of *Heterotermes indicola* Wassmann (Rhinotermitidae). Since the pits were located in a line at a regular interval of 1.5 m, workers and soldiers of one colony restricted their activity to pits 1 to 5 and those of the other two worked on pits 7 and 9. Pits 6 and 8 were left as buffers because no termite was found from these pits (Table 2).

It may be seen from the population data of termites that placement of colony 1 is between pits 2, 3 and 4 and colony 2 is near pit 7 where most of the workers were attracted. A relatively smaller or newer colony seems to be placed near pit 9 from where only 1507 termites were monitored from February to August, 1987. It may also be noted that major part of termite population was attracted between February and September, 1987 after which 114 nymphs from pit 3 were collected and nothing from other pits at least for 9 months upto June, 1988.

This observation clearly indicated that most of the termite population from these three colonies exhausted, that is why nymphs were seen foraging in pit 3 because there were no workers left in the colony.

Perusal of the population data between April, 1988 and December, 1989 showed that new termite colonies established in that area from where 4,500 and 205 workers and soldiers were monitored in April, July and November, 1988 in pits 9 and 10, respectively. Similarly one or two new colonies appeared to have been established in pits 1 to 5.

A total of 11,126 termite workers and soldiers of *Odontotermes obesus* Rambur (Termitidae, Isoptera) was collected from 10 pits placed 1 meter apart during a period of 15 months. No termites were found in these pits in December, 1988, January, February, August, 1989 and again in November and December, 1989. The total recovery of termites and placement of pits indicated that there were two termite colonies one near the pit 1 and the other near pit 6 from which maximum collection had been made. The workers and soldiers from these two colonies also visited the other monitoring pits.

In the Horticulture Nursery of the Environmental Directorate of Capital Development Authority, Islamabad the population data and placement of pits showed that there was one termite colony of *O.obesus* near pit 1 in the Western aspect of the building from where a total of 3806 workers/soldiers were collected. Another colony existed near pit 2 on the northern aspect of the building where 4810 termites were monitored. There appeared to be another colony near the walls of the building where pits 3 and 4 were placed. Some termites also drifted from the same colony to pits 5 to 6 where only 140 & 311 termites were collected as compared to 1703 & 2273 from pits No.3 & 4, respectively. There was another colony of *O. horai* near pit No.3 of which 91 & 45 termites were collected during September, 1987 & August, 1988.

From the pit 6 near workshop only 478 termites could be collected after which the pits were disturbed and abandoned.

In the observatory, the pits, having been in fenced area, remained intact throughout the trial period. As the data revealed, maximum population of 14030 termites was collected from pit 5 which showed the location of the colony. In the remaining four pits, 2283, 3104, 3068, 852 termites of *Odontotermes lokanandi* (Chatterjee & Thakur) were collected.

During November 1985 shisham plantation at Islamabad was surveyed for termite population. A colony alongwith a queen and king was dug out and brought to the laboratory at Peshawar for population

counting. There were 41116 members in the whole colony collected, comprising of 25127 workers and 15989 soldiers.

Table 1. Number of Termite Workers and Soldiers Recovered at Pakistan Forest Institute, Peshawar.

Observation Month	Pit Number									
	1*	2*	3**	4**	5*	6*	7**	8**	9	10*
July, 1986	-	-	50	-	-	270	425	-	-	-
Aug., 1986	-	-	490	207	-	193	480	307	-	196
Oct., 1986	933	971	137	-	1083	657	-	-	-	-
Nov., 1986	756	1248	9000	-	1450	1850	1250	1600	-	-
Dec., 1986	-	-	798	-	104	2912	-	-	-	-
Total	1689	2219	10475	207	2637	5882	2155	1907	-	196

* = *Heterotermes indicola* (Wasmann) Rhinotermitidae)

** = *Odontotermes obesus* (Rambur) (Termitidae).

The population data in the above table showed that populations of workers/soldiers of *Odontotermes obesus* (Rambur) were recovered in total number from pits 5, 6, 4, 9, 7, 10, 8, 3 and 2 in the descending order.

The placement of maximum population in pits 4, 5 and 6 indicate the location of populous termite colony near these pits. A high population of 1820 workers and soldiers trapped in pit 9 surrounded by 277 in pit 8 and 303 in pit 10 showed the presence of another colony near pit 9.

Similar trials laid out at Zoology Department, Punjab University, Lahore and Changa Manga could not be continued due to lack of protection.

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Similar trials laid out at Zoology Department, Punjab University, Lahore and Changa Manga could not be continued due to lack of protection.

Table 2. Number of Termite Workers and Soldiers Recovered at Watershed Management Observatory PFI, Peshawar

Observation	Pit Numbers									
	1	2	3	4	5	6	7	8	9	10
Feb., 1987	-	4219	2636	4024	-	-	3252	-	-	-
March, 1987	-	-	323	448	147	-	258	-	-	-
April, 1987	150	-	231	-	195	-	-	-	-	-
May, 1987	-	395	100	-	-	-	135	-	-	-
June, 1987	593	219	415	-	92	-	-	-	871	-
August, 1987	186	-	-	-	402	-	713	-	636	-
Sept., 1987	-	-	-	535	-	-	-	-	-	-
Nov., 1987	-	-	114 Nymphs	-	-	-	-	-	-	-
Total	929	4833	3819	5007	836	-	4358	-	1507	-
Jan., 1988	-	-	-	-	-	-	-	-	-	-
March, 1988	-	-	-	-	-	-	-	-	-	-
April, 1988	-	-	-	-	-	-	-	-	4	-
May - June 1988	-	-	-	-	-	-	-	-	-	-
July, 1988	-	-	-	-	-	-	-	-	500	-
Aug., 1988	-	-	-	-	-	-	-	-	-	-
Oct., 1988	-	-	-	-	-	-	-	-	-	-
Nov., 1988	-	-	-	-	-	-	-	-	-	205
Dec to Feb. 1989	-	206	-	-	-	-	-	-	-	-
March, 1989	30	445	-	-	545	-	-	-	-	-
April, 1989	-	335	-	210	-	-	-	-	-	-
May, 1989	-	-	509	-	328	-	-	-	-	-
June, 1989	-	-	-	-	-	-	-	-	-	-
July, 1989	-	-	-	-	-	-	-	-	-	-
Aug., 1989	-	-	-	-	-	-	-	-	-	-
Sep., 1989	315	-	-	495	-	-	-	-	-	-
Oct., 1989	230	-	-	291	-	-	-	116	-	-
Nov to Dec., 1989	-	-	-	-	-	-	-	-	-	-
Total	575	986	509	996	873	-	4358	116	504	205
G. Total	1504	5819	4328	6003	1709	-	4358	116	2011	205

Table 3: Number of Termite Workers and Soldiers Recovered at D-10 House, PFI, Peshawar Campus.

Observation	Pit Numbers										
	1	2	3	4	5	6	7	8	9	10	Total
Oct., 1988	788	306	254	1025	8	750	500	-	-	-	3631
Nov., 1988	508	-	-	10	15	20	-	-	200	152	905
Dec., 1988	-	-	-	-	-	-	-	-	-	-	-
Jan., 1989	-	-	-	-	-	-	-	-	-	-	-
Feb., 1989	-	-	-	-	-	-	-	-	-	-	-
Mar., 1989	415	-	-	-	-	-	-	-	-	-	415
Apr., 1989	-	400	300	-	-	630	-	-	-	20	1350
May, 1989	-	135	65	-	215	307	-	-	-	-	722
June, 1989	-	200	100	-	400	421	-	-	-	-	1121
July, 1989	-	590	-	-	-	-	-	44	-	-	634
Aug., 1989	-	-	-	-	-	-	-	-	-	-	-
Sep., 1989	495	-	-	235	-	55	95	53	-	-	933
Oct., 1988	372	130	-	110	396	-	-	-	-	407	1415
Nov., 1989	-	-	-	-	-	-	-	-	-	-	-
Dec., 1989	-	-	-	-	-	-	-	-	-	-	-
Total	2578	1761	719	1380	1034	2183	585	97	200	579	11126

Table 4. Number of Termite Workers and Soldiers Recovered at the CDA Nursery, Islamabad.

Observation	Pit Numbers						
	1	2	3	4	5	6	Total
April, 1986	-	-	-	-	140	-	140
June, 1986	300	-	-	-	-	311	611
Oct., 1986	1000	1000	203	-	-	-	2203
Dec., 1986	2000	1040	-	-	-	-	3040
April, 1987	-	-	-	375	-	-	375
June, 1987	-	-	-	-	-	-	-
Sept., 1987	-	-	91*	-	-	-	91*
Nov., 1987	-	-	1500	1208	-	-	2708
Dec., 1987	-	-	-	-	-	-	-
Jan., 1988	-	-	-	-	-	-	-
Feb., 1988	506	360	-	-	-	-	866
April, 1988	-	-	-	-	-	-	-
Aug., 1988*	-	-	45*	690	-	-	690
Nov., 1988	-	-	-	-	-	-	-
May, 1988	-	2410	-	-	-	-	2410
Total	3806	4810	1703	2273	140	311	13043

* = *Odontotermes horai* (Roonwal and Chhotani)

Table 5. Number of Termite Workers and Soldiers Recovered at the Barani College, Rawalpindi.

Observation	Pit Numbers						
	1	2	3	4	5	6	Total
Month							
April, 1986	-	-	-	100	18	-	118
June, 1986	-	-	60	70	51	-	181
Oct., 1986	-	1962	-	-	-	-*	1962
April, 1987	-	-	3008	-	-	478	3486
June, 1987	23	27	36	-	-	-	86
Sept., 1987	-	1400	-	55	-	-	1455
Nov., 1987	-	-	-	-	5050	-	5050
Jan., 1988	-	-	-	-	5009	-	5009
Feb., 1988	-	-	-	-	2890	-	2890
March, 1988	-	-	-	-	272	-	272
April, 1988	-	-	-	-	402	-	402
Aug., 1988	-	-	-	610	-	-	610
Sept., 1988	290	-	-	2	66	-	358
Nov., 1988	1170	-	-	-	-	-	1170
Feb., 1989	572	-	-	-	-	-	572
Aug., 1989	228	-	-	-	272	-	500
Sept., 1989	-	6	-	-	-	-	6
Dec., 1989	-	240	-	15	-	-	255
Total	2283	3635	3104	852	14030	478	24382

Table 6: Number of Termite Workers and Soldiers Recovered at the Islamic Research Centre, Punjab University, Lahore.

Observations	Pit Numbers									
	2	3	4	5	6	7	8	9	10	Total
Month										
April, 1987	-	-	1000	-	-	-	-	-	-	1000
June, 1987	45	-	800	550	-	-	-	950	303	2648
Jan., 1988	-	50	-	-	-	-	-	-	-	50
May, 1988	-	18	-	13	-	-	-	400	-	431
Oct., 1988	-	-	-	1500	22	255	-	470	-	2247
Dec., 1988	-	-	-	-	1575	530	-	-	-	2105
Feb., 1989	-	-	350	-	-	-	-	-	-	350
June, 1989	-	-	-	3550	2750	-	277	-	-	6577
Total	45	68	2150	5613	4347	785	277	1820	303	15408

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Sep.,1989	495	-	-	235	-	55	95	53	-	-	933
Oct., 1988	372	130	-	110	396	-	-	-	-	407	1415
Nov.,1989	-	-	-	-	-	-	-	-	-	-	-
Dec.,1989	-	-	-	-	-	-	-	-	-	-	-
Total	2578	1761	719	1380	1034	2183	585	97	200	579	11126

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Observation	Pit Numbers						Total
	1	2	3	4	5	6	
Month							
April, 1986		-	-	-	140	-	140
June, 1986	300	-	-	-	-	311	611
Oct., 1986	1000	1000	203	-	-	-	2203
Dec., 1986	2000	1040	-	-	-	-	3040
April, 1987	-	-	-	375	-	-	375
June, 1987	-	-	-	-	-	-	-
Sept., 1987	-	-	91*	-	-	-	91*
Nov., 1987	-	-	1500	1208	-	-	2708
Dec., 1987	-	-	-	-	-	-	-
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Sept., 1987	-	1400	-	55	-	-	1455
Nov., 1987	-	-	-	-	5050	-	5050
Jan., 1988	-	-	-	-	5009	-	5009
Feb., 1988	-	-	-	-	2890	-	2890
March, 1988	-	-	-	-	272	-	272
April, 1988	-	-	-	-	402	-	402
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Total	45	68	2150	5613	4347	785	277	1820	303	15408

Conclusion

These studies revealed the quantitative position of different castes in the termite colonies. Distribution of various species alongwith their activities in different time period of the year in various ecological zones was also noted in these studies.

Acknowledgement

The financial assistance of the USDA under their PL-480 programme for the studies are acknowledged with thanks. Thanks are also due to M. Ismail Chaudhary the ex-Director Entomology for his guidance in Conducting these studies.

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