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Research Article

A survey of subterranean Termite (isoptera) Fauna and its population diversity in district Bahawalpur

Muazzam Ali[1*], Nuzhat Sial[1], Shahzad Ashraf[2] and Abul Hasanat[1]

[1]Department of Life Sciences, The Islamia University of Bahawalpur, Pakistan. 63200.
[2]University College of Veterinary and Animal Science, The Islamia University of Bahawalpur, Pakistan. 63200.

*Correspondence Author E-mail: muazzamali80@yahoo.com

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Abstract

A capturing-identification survey was conducted in district Bahawalpur aiming to evaluate the population diversity of subterranean termite fauna of this area. A total six species of termites, Psammotermesrajasthanicus, Coptotermesheimi, Odontotermesobesus, Microtermes unicolor, Microtermesmycophagus and Eramotermesparadoxalis were recorded. Studying Alpha diversity, Simpson and Shannon Indices used to explain different patterns of diversity. Overall values of diversity on Simpson scale were 68% and on Shannon scale was 66%. Maximum diversity was found in August as 64% on Simpson scale and 95% on Shannon scale in September. In the study of Beta diversity, maximum overlapping of species found in Bahawalpur and Adda Mukdi, and minimum in Bahawalpur and Mukdi Adda.

Key words: Termite, Bahawalpur, Simpson scale, Shannon scale, Isoptera

INTRODUCTION

Termites are the dominant arthropod decomposers in lowland tropical and play a Center role in nutrient fluxes. Termite activity, such as mound-building subterranean tunneling and soil feeding, improves soil structure and quality. They feed on dead plant material at different stages of decomposition (Donovan et al., 2001). They live predominantly in tropical regions, where they are by far the most important decomposer animals (Davies et al., 2003). They cause damage to trees, wooden structures, earthen dams, underground electrical cables, wooden buildings, wooden furnishings and items made of paper. They have also an important role in economic entomology, with the cost of damage to the buildings, especially in Asia. In ancient temples have also been attacked (Pearce 1997).There are approximately 2,600 described species of termites with perhaps 500–1,000 species still left to describe(Kambhampati and Eggleton, 2000).

Keeping in view of termite diversity, their pest status in study area was studied through different indices.

Fifty species of termites have been recorded from different ecological zones of Pakistan (Akhtar, 1974), but there is paucity of information regarding their abundance and foraging activity in different climatic regions of Pakistan. Based on this consideration, termite population density and termite diversity in district Bahawalpur was with the help of several diversity indices, studied for comparison with other ecological zones of Pakistan.

MATERIAL AND METHOD

District Bahawalpur lies from 29°23' to 30°-22' north latitudes and 71°-39' east longitudes. Its climate is extremely hot and dry in summer and cold and dry in winter. The summer season starts in April and continues up to October. The hottest months are May, June and July, whereas the coldest months are December, January and February. Weather

conditions reach to its extreme in bot summer and winter. The average temperature in summer is 33° C (91 °F) and 18 C° (64 °F) in winter. The average rainfall is 20 to 25 cm/ year.
Seven localities (Bahawalpur, Bahawalnager, Ahmadpur, Hasilpur, Tailwala, Yazman,and Mukdi Adda) were studied. Hand picking method was used to collect termites. The colonies collected from different localities were given field names and preserved in 80% alcohol for laboratory studies.The taxonomic terms and keys used in present study are explained by Ahmad (1955), Roonwal (1962) and Akhtar (1975).

Data analysis

Diversity indices describe species abundance relationships in communities. Diversity is composed of two components: (1) richness (the total number of species) and (2) evenness (how the abundance data are distributed among the species). To calculate α-diversity Simpsons index: $D=\Sigma pi^2$ and Shannon's indices of diversity and evenness: $H=-\sum$ (Pi In Pi) were used. Other than that, Hill's indices (N0= no. of species, N1 = eH, N2 = 1/D, Evenness: N2-1/N1-1) also worked. To calculate β-diversity Sorensen Similarity index (β= 2C/ S1+S2) used.

RESULTS AND DISCUSSION

A total of 3684 specimens of termites belonging to two families and six species captured from all the seven study sites during the study period in 2010 (Table 1). Cropped and wood logged area found to be most populated because termites are wood and litter feeders.

In the present study, family Rhinotermidae is represented by 2 genera and 2 species. They constitute 33% of total species. It originated in Oriental region and is now cosmopolitan in distribution. It is found in all zoogeographic regions, except Nearctic. *Coptotermesheimi* under this family is very common in India and Pakistan. *Psammotermesrajasthanicus* is comparatively rare.

Family Termitidae in Bahawalpur, represented by 3 genera and 4 species. They constitute 66% of total 6 species found. It further subdivided in two Sub families Macrotermitinae and Termitinae. The Macrotermitinae is represented by genus *Odontotermes* and Microtermes*. Odontotermes species* are more common in relatively humid areas. Microtermes prefer dry conditions, especially *Microtermesmycophagus* declared by Akhtar and Sarwar(1993) as a typical desert termite of Pakistan, and found dominant in present study. The genus *Eramotermes* occurring both in wet and arid conditions is represented by 1 spp. *E. paradoxalis*.

The present study revealed the diversity on Simpson scale as 68% and on Shannon scale as 66% (Table 3). Maximum diversity in the month of August as 64% on Simpson scale and 89% on Shannon scale (Table 2). This was due heavy rain falls in Moon Soon. Maximum richness was found in the months of May, June, July August and October. Maximum evenness found in the month of September. Akhtar and Sarwar(1997) reported four species in wheat fields of Bahawalpur (*M. mycophagus, M. obesi, O. guptai*and *E. paradoxalis*)foraging in wheat crop. Akhtar and Sarwar (2003) reported five species i.e. *M. mycophagus, M. obesi, O. guptai, O. spp,* and*E. Paradoxalis* from cotton fields of Bahawalpur. Termite diversity in cotton fields was 48% on Simpson scale and 60% on Shannon scale. Manzoor et al., (2010) reported total twelve termite species from the forests of Punjab. Maximum overlapping of species found in Bahawalpur and Adda Mukdi, and minimum in Bahawalpur and Mukdi Adda as .87 on Sorenson Index.

Table 1. Abundance of Termites Families collected from different sites

Family/Species	Abundance
Rhinotermitidae	
Psamotermesrajasthanicus	59
Coptotermesheimi	353
Termitidae	
Odontotermesobesus	835
Microtermes unicolor	661
Microtermesmycophagus	1773
Eramotermesparadoxalis	3
Total	3684

Table 2. Monthly variation in Diversity indices

Month and spp. Name	Pi	∑Pi²	∑Pi(lnPi)	E
April				
Coptotermesheimi	0.14	0.0206	0.2753	**0.8568**
Odontotermesobesus	0.2694	0.0726	0.3533	
Microtermesmycophagus	0.5871	0.345	0.3127	
	D=	**0.4382**	**0.9413**	
	1-D=	**0.5618**		
May				
Coptotermesheimi	0.1798	0.03232	0.3085	**0.764**
Odontotermesobesus	0.44	0.1937	0.3612	
Microtermesuniocular	0.00375	0.000014	0.0209	
Microtermesmycophagus	0.3764	0.14168	0.3678	
	D=	**0.367714**	**1.0584**	
	1-D=	**0.6323**		
June				
Coptotermesheimi	0.0713	0.00507	0.1883	**0.779**
Odontotermesobesus	0.06068	0.0037	0.17	
Microtermesuniocular	0.475	0.2255	0.354	
Microtermesmycophagus	0.3945	0.1556	0.367	
	D=	**0.38987**	**1.0793**	
	1-D=	**0.6101**		
July				
Coptotermesheimi	0.11	0.0121	0.243	**0.7411**
Odontotermesobesus	0.073	0.00533	0.191	
Microtermesuniocular	0.175	0.0306	0.305	
Microtermesmycophagus	0.635	0.4031	0.2884	
	D=	**0.4205**	**1.0274**	
	1-D=	**0.5795**		
August				
Coptotermesheimi	0.08308	0.0069	0.2067	**0.892**
Odontotermesobesus	0.463	0.2413	0.357	
Microtermesuniocular	0.214	0.0458	0.3299	
Microtermes mycophagus	0.2404	0.058	0.343	
	D=	**0.352**	**1.2366**	
	1-D=	**0.648**		
September				
Psamotermesrajastanicus	0.2056	0.0423	0.3252	**0.9574**
Microtermesuniocular	0.345	0.1189	0.3672	
Microtermesmycophagus	0.4495	0.20203	0.3594	
	D=	**0.36323**	**1.0518**	
	1-D=	**0.637**		
October				
Coptotermesheimi	0.0226	0.00051	0.08565	**0.575**
Odontotermesobesus	0.1353	0.0183	0.2706	
Microtermesuniocular	0.8195	0.6717	0.6631	
Eramotermesparadoxilus	0.0226	0.00051	0.08665	
	D=	**0.69102**	**1.106**	
	1-D=	**0.309**		
November				
Microtermesuniocular	0.0042	0.000018	0.0232	**0.0392**
Microtermesmycophagus	0.996	0.992	0.004	
	D=	**0.992018**	**0.0272**	
	1-D=	**0.008**		

Table 3: Simpson and Shannon Indices of the whole data

Species	no. of ind	Pi	Pi²(Simpson)	Σ(PilnPi)(Shannon)
Psamotermesrajasthanicus	59	0.0601	0.00361	0.169
Coptotermesheimi	353	0.09582	0.00918	0.2247
Odontotermesobesus	835	0.27	0.0713	0.354
Microtermes unicolor	661	0.01794	0.00032	0.0721
Microtermesmycophagus	1772	0.4812	0.2315	0.35219
Eramotermesparadoxilus	3	0.00081	0.000000656	0.0058
	3683	**D=**	**.3176**	1.178
		1-D=	**.6824**	
		H=	**1.178**	

E= H/ InS ,
Where S= no. of total species= 6
1.178/1.792=.66
Table. Hills indices in different months

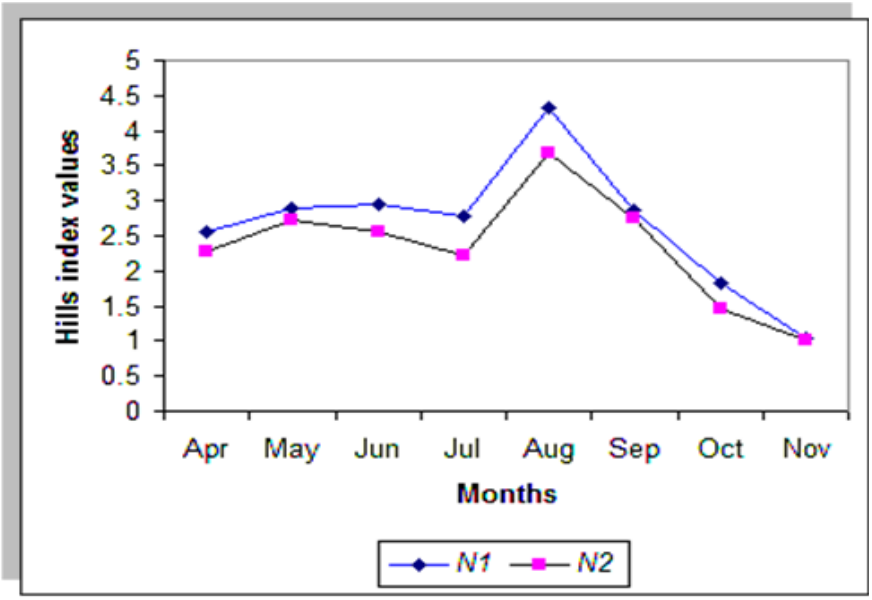

Figure 1. Month wise Richness values of termites

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