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Comparative Study of Diversity of Soil Oribatid Mites (Acari: Oribatida) in Two Different Soil Habitats Near Kolkata, West Bengal, India

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Comparative Study of Diversity of Soil Oribatid Mites (Acari: Oribatida) in Two Different Soil Habitats Near Kolkata, West Bengal, India

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Abstract- Soil samples were collected at monthly intervals from two different habitats- a waste disposal site and an agricultural field, near Kolkata, West Bengal. A total of 16 species of oribatid mites of 9 families were recorded from the study sites. The species richness and the abundance of oribatid were maximum in waste disposal site. Whereas, at diversity level, the maximum values for Shannon-Wiener index and Pielou's index of evenness were showed by agricultural field.

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contaminated with organic and inorganic garbage of the township. The other one is a road side Agricultural field of Baruipur (Site II), situated at South 24 Pargana. The soil of this site is contaminated mainly with inorganic agricultural pollutants.

I. INTRODUCTION

Mites have seldom been exploited as bioindicators in soil, however, oribatid mites may prove especially useful indicators (Lebrun and van Straaleen 1995, Stamou and Argyropoulou 1995). Since they have relatively long life cycles, they may prove useful indicators of heavy metal pollution events. The relative proportion of the oribatid mites has been shown to increase in response to heavy metals and to pesticide pollution (Siepel 1995).

A significant feature of biological activity in soil is the conversion of dead organic matter in inorganic nutrients. Mites play a major role in soil humification and regulation of soil fertility. So a little attempt has been made to compare the soil mite diversity and richness in two different soil conditions i.e. heavy metal rich polluted land and inorganic pollutant rich area near Kolkata.

Various workers like Sengupta and Sanyal (1991), Bhattacharya and Chakraborty (1994), Rusek and Marshall (2000), Zaitsev and van Straalen (2001), Skuba and Kafel (2004), Hazra and Bhattacharya (2003), Banerjee (Moitra) et al. (2010), Moitra (2013) studied the ecology of soil microarthropods in polluted or ecologically disturbed areas in different parts of the world.

II. STUDY AREA

For this study 2 different study sites were selected in West Bengal. One is Dhapa solid waste disposal ground (Site I), which was one of the major municipal solid waste dumping site of Salt Lake city and Kolkata, situated at North 24 Pargana. This site is

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Figure 1 : Map of Dhapa Municipal Solid Waste Dumping Ground

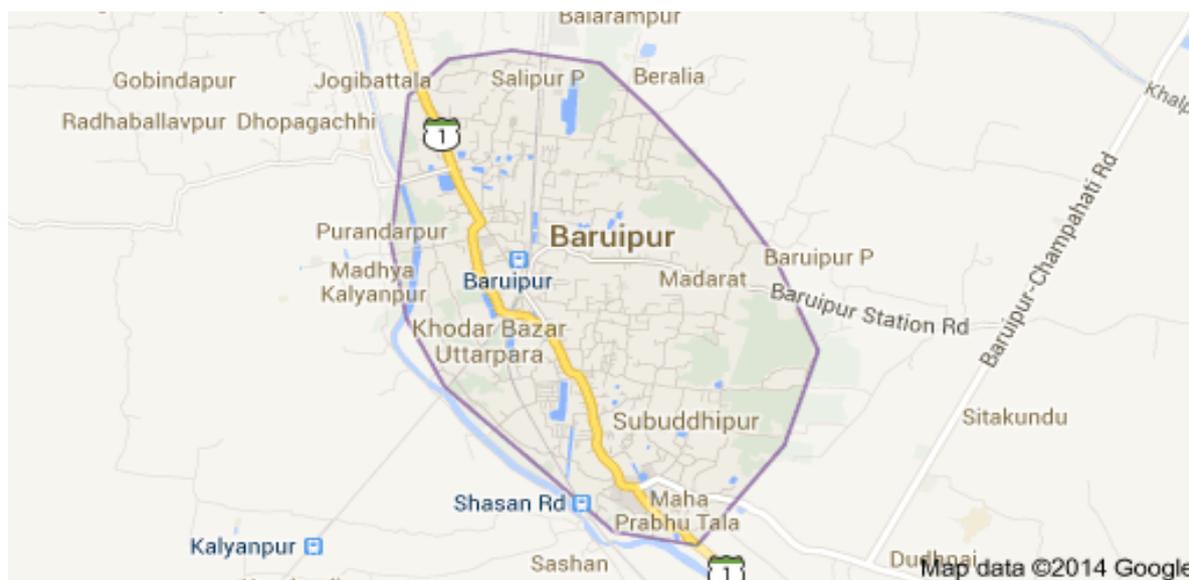


Figure 2 : Baruiपुर Agricultural field

III. MATERIAL AND METHODS

Sampling was done on monthly basis throughout the study period. Four randomly selected plots were selected in each study area and four soil samples were collected from each study area in each month. A total of 24 soil samples were collected from each study area.

The soil samples were collected by shovel from upper 10 cm soil profile and were kept in polythene bags. The samples were extracted by using modified Tullgren funnels and extracted mite specimens were collected in glass tubes containing 70% alcohol.

The oribatid mites were sorted out from the admixture of extracted soil microarthropods and were kept in solution of 90% alcohol and lactic acid (v/v) as

advocated by Balogh (1965). For microscopic observations, Balogh's (1965) method of temporary mounting in lactic acid was followed and for identification, the taxonomic keys proposed by Balogh (1972) were followed. After necessary microscopic observations the specimen were preserved in small glass vials containing 90% alcohol.

IV. RESULTS AND DISCUSSIONS

During the study period a total of 709 specimens were collected among them 482 specimens were collected from Site I and only 227 specimens were collected from Site II. 9 species of oribatid mites under 4 families like Scheloribatidae, Haplozetidae, Galumnidae and Oribatellidae were collected from Site II. Whereas 14 species under 9 families like Scheloribatidae,

Haplozetidae, Oppiidae, Basilobelbidae, Nothridae, Tectocepheidae, Lohmanidae, Oribatellidae and Galumnidae were recorded from Site I (Table 1). Similar study of Moitra (2013) recorded the tea garden as the species rich site than solid waste disposal site.

In Site I, the relative abundance of *Protoribates magnus* (Aoki) was 26.97% and was deserved the status of most abundant oribatid species of the study area. *Protoribates magnus* was followed by *Scheloribates curvialatus* Hammer (24.90%), *Oppia kuehnelti* Balogh (19.71%) and *Scheloribates albialatus* Hammer (9.96%) (Figure 3).

Whereas, in Site II, *Rostrozetes foveolatus* Sellnick (25.11%) deserved the status of most abundant oribatid species and was followed by *Scheloribates albialatus* Hammer (22.91%), *Lamellobates palustris* Hammer (20.70%) and *Scheloribates curvialatus* Hammer (11.89%) (Figure 4). Again, *Rostrozetes foveolatus* Sellnick and *Pilobatella punctata* Grobler were the 2 unique species under the family Haplozetidae,

were not found in Site I and the representatives of the family Lohmanidae were not found in Site II during the study period (Table 1).

Diversity was estimated in terms of Shannon-Wiener index (Shannon and Wiener, 1963), and Pielou's index of evenness (Pielou, 1963) was calculated for the estimation of evenness. The oribatid community in site II was more diverse and showed higher value of Shannon Index (H' : 2.04) and Evenness Index (H_{even} : 0.86) (Table 2). Again the three most diversified and species rich oribatid families of the study sites were Scheloribatidae, Lohmaniidae and Haplozetidae. Among the oribatid family's Scheloribatidae was the most diversified family in both the site may be due to the prevalent status of this species in West Bengal. Shannon index and evenness index of family Scheloribatidae (H' : 1.04, H_{even} : 0.75) in Site II showed higher value than Site I (Table 3).

Table 1 : Species composition of soil oribatid mites of both the study areas

Sl. No.	Species	Site I	Site II
Family: Scheloribatidae			
1.	<i>Scheloribates curvialatus</i> Hammer	++	+
2.	<i>S. albialatus</i> Hammer	+	++
3.	<i>Scheloribates</i> sp.	+	++
4.	<i>S. huancayensis</i> Hammer	+	++
Family: Haplozetidae			
5.	<i>Protoribates magnus</i> Aoki	++	+
6.	<i>Setoxylobates foveolatus</i> Balogh & Mahunka	+	-
7.	<i>Rostrozetes foveolatus</i> Sellnick	-	+
8.	<i>Pilobatella punctata</i> Grobler	-	+
Family: Oppiidae			
9.	<i>Oppia kuehnelti</i> Balogh	++	-
Family: Basilobelbidae			
10.	<i>Basilobelba</i> sp.	+	-
Family: Galumnidae			
11.	<i>Galumna</i> sp.	+	++
Family: Nothridae			
12.	<i>Nothrus</i> sp.	+	-
Family: Tectocepheidae			
13.	<i>Tectocepheus</i> sp.	+	-
Family: Lohmanidae			
14.	<i>Javacarus kuehnelti</i> Balogh	+	-
15.	<i>Annectacarus</i> sp.	+	-
Family: Oribatellidae			
16.	<i>Lamellobates palustris</i> Hammer	+	++

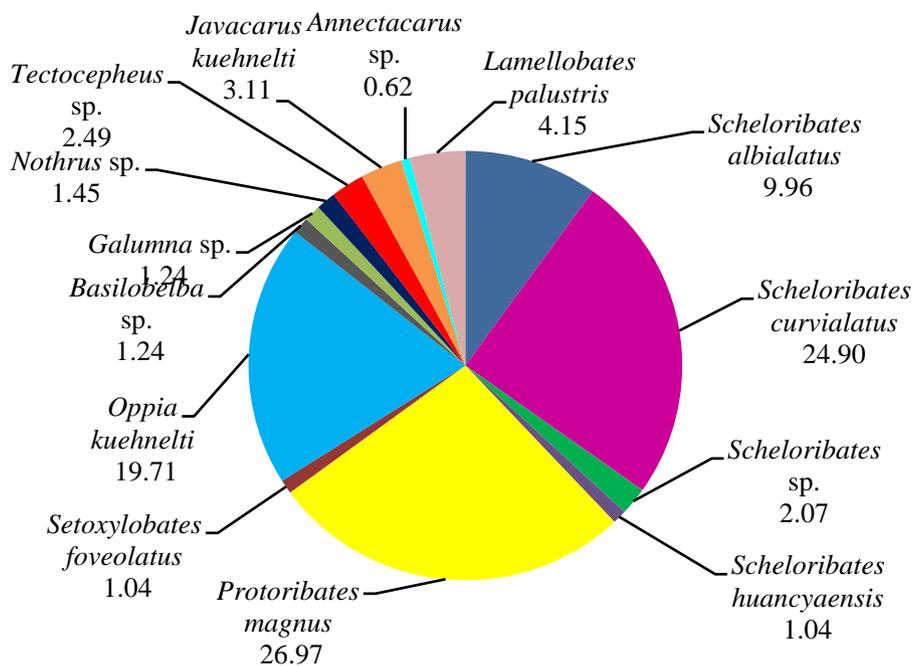


Figure 3 : Relative Abundance (%) of different species of oribatid mites collected from Site I

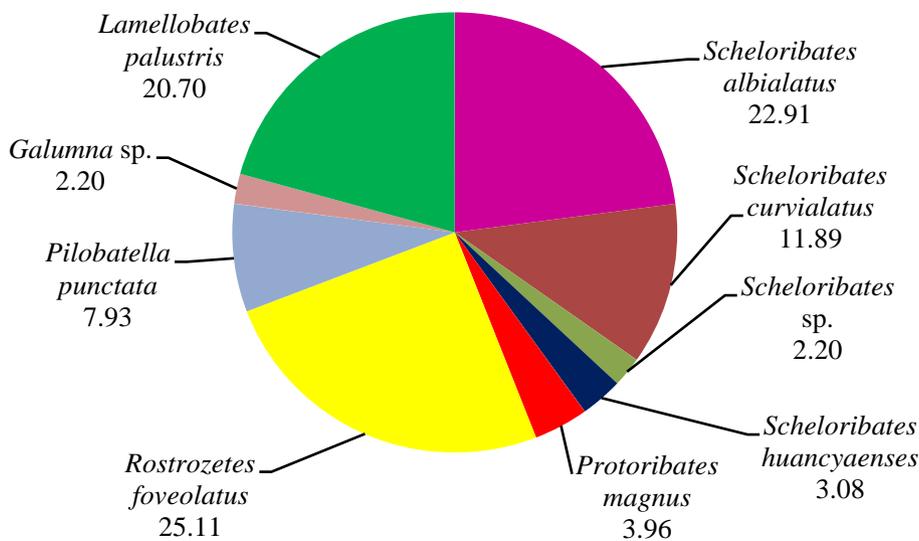


Figure 4 : Relative Abundance (%) of different species of oribatid mites collected from Site II

Table 2 : Diversity Index of oribatid mites in Site I and Site II during the study period

Study area	H'	H _{even}
Site I	1.77	0.42
Site II	2.04	0.86

Table 3 : Diversity Index of different species of oribatid mites in Site I and Site II

Family		Site I	Site II
Scheloribatidae	H'	0.88	1.04
	H _{even}	0.64	0.75

Haplozetidae	H'	0.16	0.83
	H _{even}	0.23	0.76
Lohmanidae	H'	0.45	-
	H _{even}	0.65	-

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