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COMPARATIVE DIVERSITY OF SOIL MITES AND INSECTS FROM TWO DIFFERENT SITES OF KOLKATA WITH THEIR CORRELATION WITH SOIL EDAPHIC FACTORS

Zoology

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ABSTRACT

The survey of soil mites and insects from two sites namely Saltlake campus of Vidyasagar College and Narendrapur campus of Medicinal plant garden during January,2017 to April,2017 reveal the occurrence of a total 26 species of mites under 24 genera, 15 families and 3 orders and the insects belong to 9 species, 9 genera, 9 families and 5 orders, all are being reported here for the 1st time from these two sites.At Saltlake site, the most dominating mites and insects are Mesostigmata and Collembola respectively. The correlation coefficient of soil mites and insects with edaphic factors(soil temperature, moisture and pH) of these two sites are presented.

KEYWORDS

Soil mites, soil insects, edaphic factors, correlation, West Bengal.

Introduction

Soil is defined as a mass of inorganic material that holds inorganic and organic colloids, dead and living plants and animal material, water and gases in balanced proportions. Soil mites and insects constitute 62% of the total soil micro-arthropods.

Soil mites and insects have enormous importance because they help in break down process of soil organic matter to form humus which enriches the soil fertility. Besides, they help in recycling of nutrients, in soil aeration, as indicator species of soil health as well as soil pollution besides in determining post mortem interval in forensic science. Due to this importance, many workers have conducted studies on these soil fauna regarding their diversity relationship with edaphic factors, seasonal occurrence , role of agricultural practices and application of pesticides on soil fauna.

The soil mites and insects fauna of Narendrapur campus of medicinal plant garden and Saltlake campus of Vidyasagar College have so far not been studied and therefore the present study was taken up and the results thereof are included in this paper.

Material and methods

Collection- Soil samples of definite weight were collected at monthly interval from the depth of 5 cm with the help of a shovel from two different sites like Saltlake Campus of Vidyasagar College and Narendrapur campus of Medicinal plant Garden, located in North 24 Parganas and South 24 Parganas districts, respectively. The soil samples were brought in polythene bags taking due care not to disturb the soil texture.

Extraction-The soil samples were subjected to heat desiccation method in Tullgren's apparatus in the laboratory. The extracted mites and insects were sorted out and preserved in 70% alcohol and those were identified and counted to record their relative abundance.

Analysis of edaphic factors-The edaphic factors like soil temperature, soil moisture and soil pH in each month were also recorded using soil thermometer, by oven dry method and by electronic pH meter, respectively.

These data were collected for samples taken in each month from January,2017 to April,2017. The faunal data were correlated with these edaphic factors and was statistically analysed using Microsoft Excel.

Results and discussion

The identification of soil mites revealed that those belonged to 26 species under 24 genera , 15 families and 3 orders as presented in Table -1a.

So far as insects were concerned, the total number of identified species were 9, under 9 genara, 9 families and 5 orders as presented in Table-1b.

TABLE 1(a,b)- Depicts the different species of soil mites and insects which were collected per 100 gm of soil in different months(January,17-April,17),in two different sites , Saltlake campus of Vidyasarag College(SL) and Narendrapur campus of medicinal plant garden(NP), along with the number of specimens of each species. This indicates the comparative abundance of species in two different sites.

Table 1a- List of soil mite specimens from January,17 to April,17

SL NO.	ORDER	FAMILY	GENUS AND SPECIES	JANUARY 2017		FEBRUARY 2017		MARCH 2017		APRIL 2017	
				SL	NP	SL	NP	SL	NP	SL	NP
1	Mesostigmata	Laelapidae	*Hypoaspis vacua*	1	-	-	-	1	-	1	-
2			*Laelaps sp.*	-	1	1	1	1	-	-	-
3			*Cosmolaelaps sp.*	-	-	1	-	-	1	-	1
4			*Androlaelaps sp.*	1	1	-	-	-	-	-	-
5			*Ololaelaps sp.*	-	-	1	1	1	1	-	2
6		Ascidae	*Blattisocius keegani*	1	1	1	1	-	-	-	-
7			*Proctolaelaps sp.*	1	1	-	-	1	1	-	-
8		Gamasidae	*Lasioseius parbalesi*	2	2	-	-	1	-	2	1
9			*Gamasus sp.*	1	-	1	-	1	-	-	-
10		Uropodidae	*Leodinychus sp.*	2	1	-	1	-	-	1	1
11		Rhodacaridae	*Rhodacarus sp.*	2	1	-	1	-	2	-	-
12			*Gamasiphis bengalensis*	1	1	-	1	-	1	-	-
13		Macrochelidae	*Macrocheles glaber*	1	2	1	1	-	2	-	1
14		Parasitidae	*Parasitus consanguineus*	2	-	1	1	-	-	4	1
15			*Parasitus rhizoglyphoids*	1	1	-	-	-	-	2	1

16			*Pergamasus sp.*	1	1	1	1	-	-	-	-
17		Pachylaelapitidae	*Pachylaelis sp.*	-	-	1	1	-	-	1	1
18		Digamaselidae	*Digamasellus sp.*	1	-	1	-	1	-	-	-
19		Veigaiidae	*Veiga sp.*	1	-	1	1	-	-	1	1
20		Ameroseiidae	*Kleemania bengalensis*	1	-	1	-	1	-	-	-
21	Astigmata	Acaridae	*Tyrophagus putrescentiae*	1	1	2	1	1	1	1	1
22			*Tyrophagus longior*	1	1	4	1	1	1	-	1
23			*Caloglyphus berlesei*	1	-	-	-	-	-	1	-
24		Histiomidae	*Histiostoma sp.*	1	1	-	1	1	-	1	1
25	Prostigmata	Cunaxidae	*Neocunaxa sp.*	2	1	1	1	-	-	1	-
26		Tydeidae	*Paratydeus sp.*	1	1	-	1	-	-	-	1
27	Cryptostigmata	Some unidentified Oribitida	*1*	-	1	1	-	1	-	1	

The most dominating mite species belong to the order Mesostigmata followed by Astigmata and Prostigmata. Among the Mesostigmatid mites the most dominating species in both sites were *Parasitus consanguineus , Lasioseius parbrelesi, Macrocheles glaber.* Likewise, for Astigmatid mites, the species were *Tyrophagus longior, Tyrophagus putrscentiae.* For Prostigmatid mites, the species were *Histiostoma* sp. , *Paratydeus* sp.

Table 1b- List of soil insect specimens from Januay,17 to April,17

SL NO.	ORDER	FAMILY	GENUS AND SPECIES	JANUARY 2017		FEBRUARY 2017		MARCH 2017		APRIL 2017	
				SL	NP	SL	NP	SL	NP	SL	NP
1	Collembola	Entomobryidae	*Entomobrya sp.*	12	8	16	17	20	26	27	28
2		Isotomidae	*Isotomurus sp.*	5	5	8	4	10	9	11	10
3		Sminthuridae	*Sminthurides sp.*	5	3	8	6	8	7	8	4
4	Coleoptera	Scarabaeidae	*Holotricha sp.*	3	1	1	-	-	-	1	-
5		Curculionidae	*Myllocerus sp.*	1	-	1	-	-	-	1	-
6	Dermaptera	Anisolabididae	*Euborellia sp.*	2	2	3	2	3	3	2	2
7	Hemiptera	Anthocoridae	*Orius sp.*	-	-	-	-	-	-	1	-
8		Geocoridae	*Geocoris sp.*	-	-	-	-	1	-	1	-
9	Hymenoptera	Formicidae	*Camponotus sp.*	1	2	-	1	1	-	1	-
10	Some Immature larva	3	*2*	2	2	6	4	2	2		

In case of insects, the most dominating order was Collembola represented by the species of *Entomobrya* sp., *Isotomurus* sp. , *Sminthurides* sp., Then order Dermaptera represented by *Euborellia* sp., and Hymenoptera represented by *Camponotus* sp.

Table 2- Correlation Coefficient of Soil Mites and Insects with Soil Edaphic Factors at Saltlake Campus of Vidyasagar College

Months	Mesostigmata	Other Mites*	Collembola	Other Insects**	Mean Soil Temp. (˚c)	Mean % Of Moist.	Mean Soil Ph
JAN,17	20	13	22	7	16.6	29.6	8.2
FEB,17	12	11	32	5	21.8	33.2	8.1
MAR,17	8	8	38	5	22.5	35.5	8.1
APR,17	12	10	46	7	28.1	36.1	8

Other mites*- Astigmata and prostigmata

Other Insects**- Dermaptera , Coleoptera, Hemiptera and Hymenoptera

Table 3 – The Correlation between the Soil Mites and Insects with the Soil Edaphic Values at Saltlake Campus of Vidyasagar College

Column1	Meso-Stig-Mata Mesostigmata	Other Other Mites Themite	C Colle-Mbola Ollembola	Other Other Insects Insect	Mean Soil T Mean Soil Tempe-Rature (˚c)peratu re	Mean Mean % Of Soil Mois-Ture Moisture	Mean Soil Ph Soil Ph
Mesosti-Gmata	1	0.9544	-0.7463	0.6882	-0.6503	-0.8905	0.6488
Other Mite	0.9544	1	-0.7439	0.5547	-0.6092	-0.8808	0.5883
Collem-Bola	-0.7463	-0.7439	1	-0.0570	0.9797	0.9666	-0.9685
Other Insect	0.6882	0.5547	-0.0570	1	0.0245	-0.2940	0

Regarding Table 3, correlation coefficient of Mesostigmata was positively correlated with other insects and mean soil pH but negatively correlated with Collembola, mean soil temperature and mean soil pH.The other mites population had negative correlation with Collembola, mean soil temperature and mean soil moisture but positively correlated with mean soil pH. The Collembolan population was positively correlated with mean soil temperature and mean soil moisture and negatively correlated with mean soil pH. The other insects was positively correlated with mean soil temperature and negatively correlated with mean soil moisture.

Table 4- Correlation Coefficient of Soil Mites and Insects with Soil Edaphic Factors at Narendrapur Campus of Medicinal Plant Garden

Months	Mesosti-Gmata	Other Mites	Collem-Bola	Other Insects	Mean Soil Temp.(˚c)	Mean % Of Soil Moist.	Mean Soil Ph
Jan,17	13	5	16	5	16.8	23.9	6.7
Feb,17	11	5	27	3	22.2	25.4	6.1
Mar,17	8	1	42	4	25.5	26.7	6.5
Apr,17	10	5	42	3	27.3	24.8	6.7

Other mites*- Astigmata and Prostigmata

Other Insects**- Dermaptera , Coleoptera, Hemiptera and Hymenoptera

Table 5- – The Correlation between the Soil Mites and Insects with the Soil Edaphic Values at Narendrapur Campus of Medicinal Plant Garden

Column1	Mesostigmata Meso-Stig-Mata Mites	Other Mites Other Mites	Colle-Mbola Collembola	Other Insects Other Insects	Mean Soil Tempe-Rature (˚c)mean Soil Temperature	Mean % Smean % Of Soil Mois-Ture Moisture	Mean Soil Ph Mean Soil Ph
Mesosti Gmata	1	0.8006	-0.9170	0.4181	-0.8437	-0.9132	0.1132
Other Mites	0.8006	1	-0.5398	-0.1740	-0.3686	-0.8512	0
Collem Bola	-0.9170	-0.5398	1	-0.5844	0.9771	0.6903	0.0744
Other Insects	0.4181	-0.1740	-0.5844	1	-0.7360	-0.3260	0.4923

Regarding to Table- 5, the correlation coefficient of Mesostigmata mite was positive with other mites, other insects and mean soil pH, but

negatively correlated with Collembola, mean soil temperature and mean soil moisture. The Other mites had positive correlation with Mesostigmata and negative correlation with Collembola, other insects, mean soil temperature and mean soil pH. The Collembola population had positive correlation with mean soil temperature, mean soil moisture and mean soil pH and negative correlation with Mesostigmata, other mites and other insects.The other insects population was positively correlated with Mesostigmata and mean soil pH and negatively correlated with mean soil temperature and mean soil moisture.

Some of the published information on this aspects are Bhattacharyya et al.(1996), Chattopadhyay and Hazra (1983) ,Sanyal and Bhaduri (1988) etc. who had thrown some light regarding soil microarthropods and their correlation with edaphic factors. However, the sites where they worked were different sites and therefore the present data could not be compared to those. All the mites and insects species which are reported here have not been published earlier and hence form new records.

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References

1. Bhattacharyya et al.(1996), Chattopadhyay and Hazra (1983) ,Sanyal and Bhaduri (1988)