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Short Communication

Influence of soil pH on Collembolan fauna of cultivated fields of East Midnapore, West Bengal – A preliminary report

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Soil pH generally refers to the degree of soil acidity or alkalinity. Soil pH affects the physical, chemical and biological properties and processes, as well as plant growth. Soil microarthropods perform important role for the growth of plants. Soil microarthropods increase soil porosity and soil fertility. The role of soil fauna in decomposition of organic matter is crucial for the functioning of an ecosystem. The distribution of soil fauna generally has limited abilities with the soil pH.However, in India no serious attempts have been made so far for the ecological behavior of soil microarthropods in habiting in cultivated fields in East Midnapore district. Therefore, the present study has been designed to investigate the species composition, distribution and diversity of collembolan population inhabiting different cultivated sites in relation to soil pH and determine its influence statistically on collembolan population.Two cultivated sites, Site-A (Sugar cane plantation field, area: 45 m x 40m) and Site-B (betel plantation field, area: 50 m x 40 m) in the same village of East Midnapore district were selected for sampling. The soils of the sampling plots were greyish black in colour, alluvial in nature with more or less equal proportion of silt and fine sand.For this study each site was divided into three plots and from each plot (measuring 4 sq. m) three soil samples were drawn. A total of 432 (3 x 3 x 24x2) soil samples were drawn from April, 2014 to March, 2016.The soil samples just after collection in the field were kept immediately in sterile polythene packet to avoid desiccation**.** The soil samples, thus, collected were extracted in a high gradient extraction apparatus designed by Macfadyen(1953) with slight modification.

An electric bulb (40 watt) above the funnel was used as heat and light source. A tube containing 70 % alcohol was kept below the funnel to collect the soil microarthropods. The extraction period varied from 48 hrs to 72 hours depending upon the moisture content of the soil samples. The extracted soil arthropods were then sorted out into different groups, under stereoscopic binocular microscope, counted and preserved in separate vials in 70 % alcohol with proper labeling for further study.The pH of the soil was measured by electronic pH meter.

The collembolan fauna obtained from Site-A belonged to 18 species under 16 genera. The species *Salina indica* was the most dominant fauna contributing 25.8% of the total fauna recorded from this site. The species *Isotomurusbatteeatus*represented 22.7%, *Leidocyrtusheterolepis* represented 19.8%, *Cyphoderusjavanus*represented 6.9%, *Entomobrya*sp.represented 4.7%, *Sminthuridesappendiculatus*represented 3.6%, *Yosiiadehraduni*arepresented 3.1%, *Seiraindica* represented 2.4%, *Isotomiella minor* represented 2.3% and *Homidia*sp. Represented 1.9%. The other species in this site were numerically low and highly irregular in distribution pattern (Table 1). The percentage representation of total Collembola was observed to be maximum during August in each year. A partial increase in population in December as obtained in this site might be due to prevalence of winter maxima resulting from increased population of some species of collembolan.

The Collembolan fauna encountered from Site-Bwas much less than site A and belonged to 9 species under 8 genera. The *Lepidocyrtus*sp was the most dominant and it was 50.2% of total fauna recorded from this site. The species *Isotumurus*sp contributed 24.0%, *Isotomella minor* contributed 11.4% and *Cryptopygus thermophilus* contributed 3.1%. Populations of other species from this site were numerically low and highly irregular in distribution pattern (Table 1).

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Table 1: Relative abundance of Collembolan species in Site-A (sugar cane plantation field) and site-B (betel plantation field)

Name of collembolan fauna in site A	Relative abundance in site A	Name of collembolan fauna in site B	Relative abundance in site B
Salina indica	25.8	*Lepidocyrtus sp.*	50.2
Isotomurusbatteeatus	22.7	*Isotomurus sp.*	24.0
L. heterolepis	19.8	*Isotomella minor*	11.4
Cyphoderusjavanus	06.9	*Cryptopygus thermophilus*	03.1
Sminthuridesappendiculatus.	03.6	*Sminthurides sp.*	02.7
Isotomiella minor	02.3	*L. exploratus*	02.8
L. cyaneus	00.5	*Xenylla obscura*	01.6
Seiraindica	02.4	*Cyphoderusjavanus*	01.9
L. exploratorius	00.5	*Entomobrya sp.*	01.9
Entomobrya sp.	04.7		
Bollistrurabengalensis	01.5		
Xenylla obscura	00.7		
*Homidia*sp	01.9		
Yossiadehradunia	03.1		
Dicranocentrus sp.	01.4		
Dicranocentroides sp.	00.6		
Frieseayosii	00.7		

There may be one reason for less collembolan species in site B due less plant debris as result of clean cultivation as compared to site A. Collembolan species favour the fallen leaves and debris for decomposition. Thus, the species abundance is less in site B. The anthropogenic influences are more in site B due to excessive use of fertilizer and pesticides for high yielding of betel which might have reduced the collembolan species. The effects of chemical fertilizer and insecticides need to be further investigation.Percentage of collembolan obtained was found to be maximum in the month of December in both the years. A partial increase in population in August as obtained in this site might be due to prevalence of moisture maxima resulting from increased population of some species of collembola.

The pH values of the soil samples did not exhibit a wide range of variation and were between 6.4 to 7.3 (Table 2). In order to find out as to whether there was any significant correlation between soil pH and collembolan population, correlation coefficient values (r) were worked out (Table 3). The populations throughout the period of sampling in both the plots were exhibited a weak negative correlation.

Table 2: Collembolan density (no/sq.m) and values of soil pH in the study sites from April, 2014 to March, 2016

Months	Site-A		Site-B	
	X	Y	X	Y
Apr,14	7.0	5750.8	7.0	2091.2
May	7.2	1960.5	7.0	1045.6
Jun	7.0	2091.2	7.2	1176.3
Jul	6.9	7580.6	7.1	1307
Aug	6.9	16860.3	7.0	7711.3
Sep	7.0	10063.9	6.9	3136.8
Oct	7.1	11501.6	6.7	1960.5
Nov	7.2	13331.4	6.6	6796.4
Dec	7.1	16729.6	6.5	10325.3
Jan	7.0	13070	6.8	4443.8
Feb	6.8	10194.6	7.0	3528.9
Mar	6.9	6665.7	7.0	2352.6
Apr, 15	7.0	4574.5	6.9	2352.6
May	7.3	1568.4	7.0	1437.7
Jun	7.1	2875.4	7.1	1045.6
Jul	7.0	8234.1	7.2	1045.6
Aug	6.8	17905.9	7.1	5228
Sep	7.0	15684	6.8	3528.9
Oct	7.0	16598.9	6.6	4051.7
Nov	7.1	16860.3	6.5	4705.2
Dec	7.0	17121.7	6.4	8887.6
Jan	6.8	12547.2	6.7	3267.5
Feb	6.7	9149	6.9	3267.5
Mar,16	6.9	7842	7.0	2221.9

X = value of soil pH
Y= density of collembola (no/sq.m)

Table 3: Correlation coefficient (r) for soil pH and collembolan population

Site		Mean	SD	'r' value	Regression equationY=a + bX
A	pH	6.98	0.13	-0.217	Y= 561.17 -69.34X
B	pH	6.87	0.22	-0.679	Y=443.21 -60.48X

Y: Collembola population

The data clearly indicated that neither the soil pH nor the collembolan population exhibited any regular trend of fluctuation (Table 2). The value of pH of the soil samples was measured minimum 6.4 at site B and maximum 7.3 at site A and these were perhaps well within the tolerance range of most of the species as reported. The statistical analysis showed that the pH in site A and B showed very weak negative correlation with the collembolan population.

It is, therefore, clear from this study that pH has very little or no direct effect on collembolan population. Since the microorganisms and higher plants respond markedly to soil pH and most of the Collembolans either saprophagus or phytophagus, it is assumed that soil pH may exert indirect influence on collembolan population by controlling the growth and activities of micro and macroflora and physic chemical properties of the soil.

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