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A Comparative Study on Population of Soil Microarthropods at Two Different Habitats at Uttar Dinajpur, West Bengal, India

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Abstract: ***Soil samples were collected from two different soil habitats-one agricultural and one brick field in the alluvial plains of northern West Bengal. Abunadance of microarthropod populations differed significantly between the sites (p<0.05). Seasonal fluctuation pattern was more or less similar. Soil acarines were the most abundant fauna at the sampling sites while, collembolans were the second most numerically dominant group. Oribatids were more abundant at agricultural sites while, the mesostigmatids were higher in abundance at the brick field.***

Keywords: soil microarthopods, acari, collembola, population abundance

1. Introduction

Soil microarthropod are known to play a significant role in edaphic dynamics. Their remarkable diversity and ecological peculiarities have drawn attention of workers throughout the globe (Sanyal, 1982; Crossley and Coleman, 1999; Bhattacharya and Chakraborti, 1994; Norton, 1994; Chitrapati and Singh, 2006).

There is however, a darth of information on diversity and abundance of microarthropods in the region of alluvial plains in the northern parts of Bengal. The present work was therefore conducted to highlight some regional attributes of the major microarthropds groups recoeded in the sampling sites.

2. Materials and Methods

Sampling was done with a monthly intervals from an agricultural site (S1) and a brick-field (S2) at Madanpur in the district of Uttar Dinajpur, West Bengal, during March 2014 to february 2015. Data were assessed as per seasons-summar, monsoons, post monsoon, winter. Sampling was done from five $1m^2$ sub-plots from each site and 3 cores of soil (5 cm diameter x 5 cm depth) were taken from each plot.

Modified tullgren funnel apparatus (Macfadyen, 1953) was used for the extraction of microarthropods and separation was made using needles and fine camel hair brush. Logarithmic transformations of data were made as per necessity the statistical analyses.

3. Result and Discussion

Mean abundance of soil microarthropods was higher at S1; further, coefficient of variation was also higher at the same site. It may be due to the effect of cycles of agricultural practices (Table 1, Figure 1). Abundance, mean and variance of population differed significantly as t-test, Tukey test and one-way analysis of variance (ANOVA) indicated ($p<0.05$); (Tables 2, 3 and 4).

Lowest abunbdances of total micrarthrpods were recorded during the summar while, during the post monsoons, higher abundances were noticed at bothe the sites (Figure 1).

This observations are in conformity with the observations made by Bhattacharya and Raychoudhuri (1979), Bhattacharya et al., (1980) in West Bengal, but differs from works conducted in the hilly area of the state (Moitra et al., 2007; 2012) . Steepness of the slope of hills, climatic variation, particularly low temperature might have caused such variation. The fall of abundance during summer may be due to high temperature and poor availability of moisture.

Numerical dominance of acarines was common to bothe the sites. Among acarines, oribatids were found the highest abundant group in most of the collection efforts. Mesostigmatid mites and collembolans were among the other abundant groups (Figure 2). Similar observations were made at different parts of West Bengal and India by a number of workers (Sanyal 1982; Bhattacharya and Chakraborti, 1994; Joy and Bhattacharya, 1997; Chitrapati and Singh, 2006; Moitra et al., 2007, Sarkar et al., 2015).

4. Conclusion

Agricultural practices result significant disturbance in the normal population dynamics of soil microarthroarthropods. Poor abundance in the selected field corroborates this view. It was however observed in the present study that the scarcity of vegetation, shadow and moisture rendered more negative impact than agricultural processes in the sampling area.

Table 1: Mean abundance of soil microarthropods at collection sites (individual / sub-plot)

		Site-I	Site-II
Total microarthropods	Mean (±SE)	31.10 ± 5.28	18.36 ± 4.13
	CV	19.21	16.38

(SE = Standard Error; CV = Coefficient of variation)

Table 2: Result of t test on abundance of micrarthopods at the sites.

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Two-sample T for N

S           N      Mean      StDev   SE Mean
S1          4     3.662      0.380      0.21
S2          4     2.046      0.344      0.19

Estimate for difference:  1.038
95% CI for difference:  (0.390, 1.698)
T-Test of difference = 0 (vs not =): T-Value = 4.11  P-Value = 0.010
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Table 3: Result of Tukey's test for microarthropods population ath the sampling sites

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Tukey's pairwise comparisons
    Family error rate = 0.0500
Individual error rate = 0.0500

Intervals for (column level mean) - (row level mean)

                S1
      S2      0.5127
              1.0046
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Table 4: One-way ANOVA for variation of microarthropods populations at the sampling sites.

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Analysis of Variance for N
Source     DF        SS        MS        F        P
S           1     2.048     2.048    15.86    0.007
Error       6     0.713     0.124
Total       7     2.985

                                Individual 95% CIs For Mean
                                Based on Pooled StDev
Level       N      Mean     StDev  ----------+---------+---------+------
S1          4    3.6621    0.3803                    (-----*------)
S2          4    2.0460    0.3441   (-----*-----)
                                    ----------+---------+---------+------
Pooled StDev =   0.3302             3.00      3.60      4.20
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DF = Degree of Freedom, SS = Sum of square, MS = Mean square, F = F statistics, StDev = Standard deviation, CIs = Confidence Intervals

[Individual confidence intervals given in dotted line indicate (with 95% confidence) the probable range of occurrence of the mean. The asterix in the middle of the line marks the present mean. The ranges of mean within parentheses not overlapping implies that those means are different]

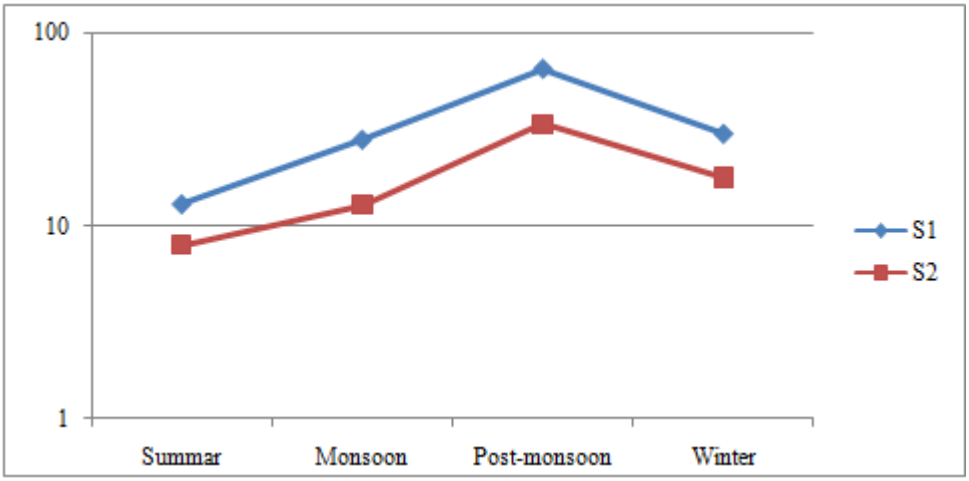

Figure 1: Seasonal fluctuation of abundance of soil microarthropods at the sampling sites (at logarithmic Y axis).

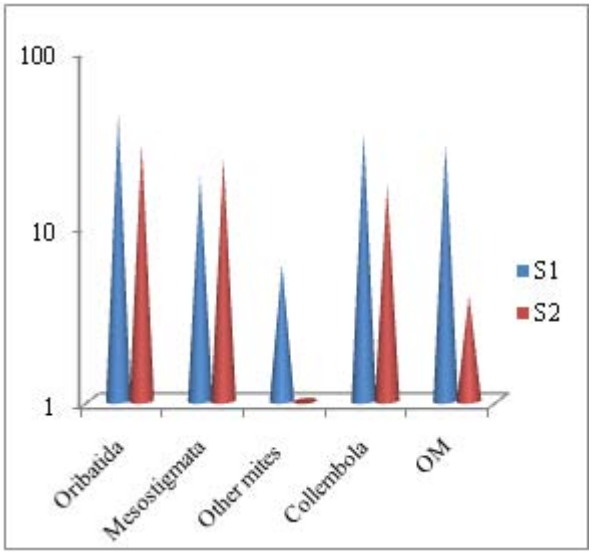

Figure 2: The abundance of major groups of soil microarthropods at the sampling sites (at logarithmic Y axis).

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