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ROLE OF SOIL pH ON THE COLLEMBOLAN FAUNA OF TWO UNCULTIVATED FIELDS OF NORTH 24 PARGANAS, WEST BENGAL

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INTRODUCTION

Among the various factors in the soil the role of pH in limiting the distribution of collembolan fauna is still very poorly known. Workers like Agrell (1941), Bellinger (1954), Christiansen *et al.*, (1961), Dhillon and Gibson (1962), Davis (1963), Choudhari and Roy (1967), 1971, 1972) Hazra, *et al.*, (1976) made some sporadic attempts from time to time but failed to establish any decisive role played by soil pH on collembolan population. In view of this the present work made an extensive investigation for further evalution of the factor and the influence exerted by it on collembolan fauna sampled from two uncultivated fields of 24 Parganas district (N), West Bengal.

Location and characteristics of sampling sites

Two uncultivated sites, 'A' (area : 40 m × 30 m) and 'B' (area 30 m × 25 m) in the village 'Badu' of 24 Parganas (N) district were selected for sampling. The village Badu is 10 kms. from Madhyamgram Railway station. These sites though about 2 km apart from each other were with almost equable ecological condition and experienced and average annual rainfall ranging between 150–160 cms. Both the site were uncultivated, undisturbed and covered with thickly-vegetated with herbs and shrubs of different plant families and soil surface was covered with debris of fallow leaves and dried twigs from trees such as *Casurina* sp. and *Mangifera indica*. Soils of the sampling sites were grayish or grayish black in color alluvial in nature, soil and fine sand with more or less equal proportion.

MATERIALS AND METHODS

Soil samples from each site were collected at random, 48 soil samples were collected from the sites 24 from each of the two site at monthly intervals for a period of two years (from

January' 2004 to December '2005). Samples were drawn by using a stainless steel corer (inner cross sectional diameter 8.5 sq cm) as employed by Dhillon and Gibson (1962). Separate sample units were taken from each site for the estimation of soil parameters. The soil samples thus collected were kept immediately in sterile polythene packet and stored in the laboratory. Soil pH value in each case was determined from soil suspension by an electric pH meter as described by Piper (1942). In these method 25 gms of soil was taken in a flask to which 100 ml of aerated distilled water was added and then stirred for one hour. The pH value was than determined within 60 seconds after the glass electrode was immersed in freshly shaken suspension.

Extraction of Collembola

Collembola were extracted from the soil using Tullgren funnels as modified by McFadden (1953). A 40 watt bulb was used for heat and light source. Soil samples were placed on wire screen (2 mm mesh) in the funnels approximately 15 cm below the bulbs. Collection jars (200 ml) with approximately 50 ml 70% ethanol plus 5% glycerin were attached below the funnels and the extraction period was 3 days. Specimens collected were identified as far as possible to species level and quantified to estimate the collembolan densities of the sites.

OBSERVATION

Collembolans fauna obtained from both the sites belonged to five genera (Table 1 and Fig. 1) of these five genera *Salina, Cyphoderus* and *Lepidocyrtus* were common in both the sites, while *Entomobraya* were found in site-A and *Isotomina* found in site-B. Of the 48 collections available for comparable standards 43 yielded less than 100 specimens, 5 yielded 100–200 specimens, 2 yielded more than 200 specimens, site-B was comparatively thickly populated than site-A. In degree of numerical dominance in site-A *Salina* came first followed by *Cyphoderus* and *Lepidocyrtus* while in site-B the predominant forms were *Lepidocyrtus* followed by *Isotomina* and *Salina*. The collembolan population through out the period of sampling in both the sites exhibited an irregular trend of fluctuation being maximum in July-August.

DISCUSSION

Altogether five species of Collembolan fauna were obtained during the present study. The pH values of the soil samples did not exhibit a wide range of variation and were between 7.0–7.5. The pH values were between 7.0–7.2 in 32 samples, 7.3 in 8 samples, 7.4 in 3 samples, 7.5 in 3 samples and 7.6 in 2 samples (Table 2 and Figs. 2, 3). In order to find out as to whether there was any significant correlation between soil pH and collembolan population, correlation coefficient (r) were worked out (Table 3). The population throughout the period of sampling in plot A exhibited a very weak positive correlation with soil pH while in plot B it was negative in the samples of 2004 and positive in those of 2005.

Table 1. : Collembolan fauna extracted from plot A and B at 'Badu' in two years.

	Genus	Total no. of each genus collected
Plot A	*Salina bengalensis*	617
	Cyphoderus sp	403
	Lepidocyrtus sp	297
	Entomobraya sp	227
	Total no. of collembolan fauna in plot A	1544
Plot B	*Lepidocyrtus* sp	558
	Isotomina thermophila	352
	Salina bengalensis	212
	Cyphoderus sp	164
	Total no. of collembolan fauna in plot B	1286

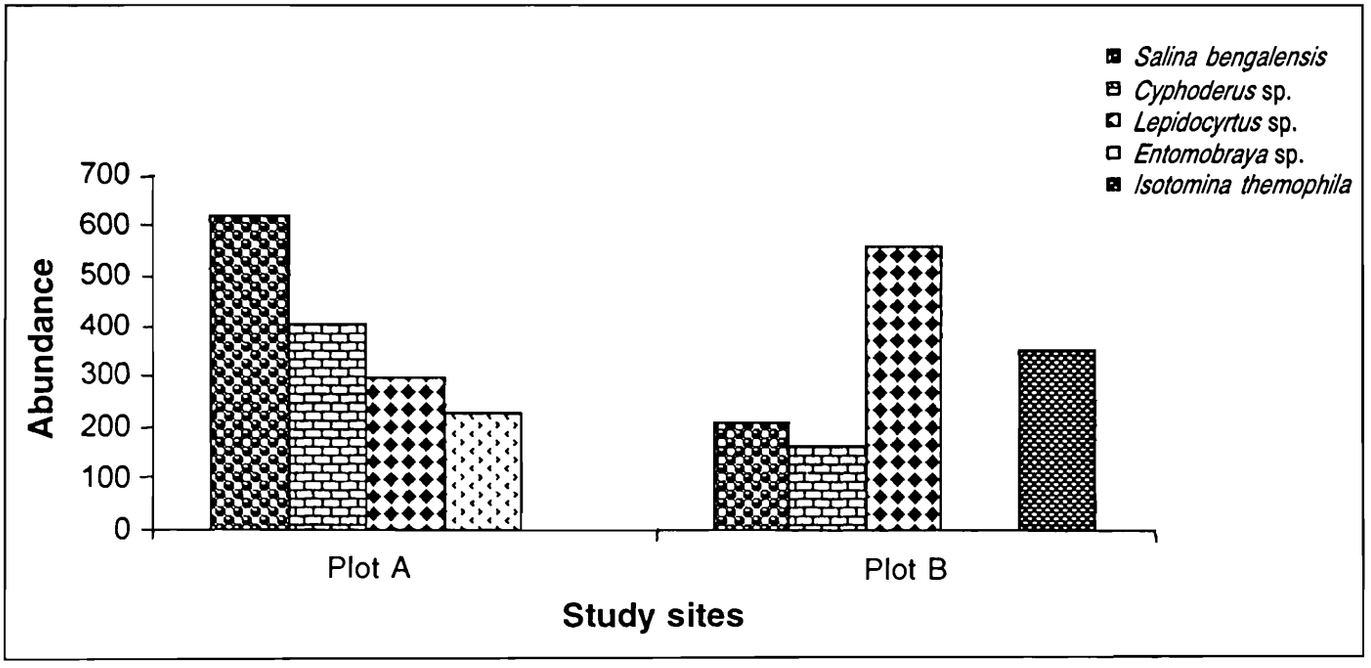

Fig. 1. : Abundance of Collembolan species in two plots.

The data clearly indicate (Table 2 and Figs. 2, 3) the neither the soil pH nor the collembolan fauna exhibited any regular trend of fluctuation. In the monsoon months in both sites the maximum population during which pH values were within the range between 7.2–7.4. Here nutrient conditions were favorable without being extreme and availability of certain salts was maximum. Besides, the values of pH in most cases were very near the natured point and were well within the tolerance range of most or rather all of the species (Choudhuri & Roy, 1972). The collembolan populations in most cases were either negatively correlated to soil pH or exhibited very weak positive correlation

Table 2. : No of collembolan and values of soil pH in samples of Badu, North 24 Pgs., West Bengal (From 48 samples in two years).

	YEAR 2004				YEAR 2005			
	SITE-A		SITE-B		SITE-A		SITE-B	
MONTHS	X	Y	X	Y	X	Y	X	Y
JANUARY	49	7.4	55	7.3	76	7.1	63	7.2
FEBRUARY	31	7.1	30	7	58	7	41	7.3
MARCH	25	7.2	33	7.2	44	7.4	37	7
APRIL	24	7.3	24	7.1	42	7.2	27	7.1
MAY	30	7.5	18	7.6	32	7.5	23	7.3
JUNE	27	7	21	7.3	33	7.1	20	7.1
JULY	132	7.4	117	7.2	326	7.2	278	7.2
AUGUST	52	7.3	53	7.6	178	7.1	159	7.1
SEPTEMBER	35	7.5	39	7.2	40	7.3	36	7.2
OCTOBER	24	7.1	22	7	40	7	37	7.2
NOVEMBER	20	7	15	7.2	51	7.2	41	7
DECEMBER	78	7.2	26	7.3	97	7.1	71	7.1

X = No. of collembolan per collection; Y = Value of Soil pH

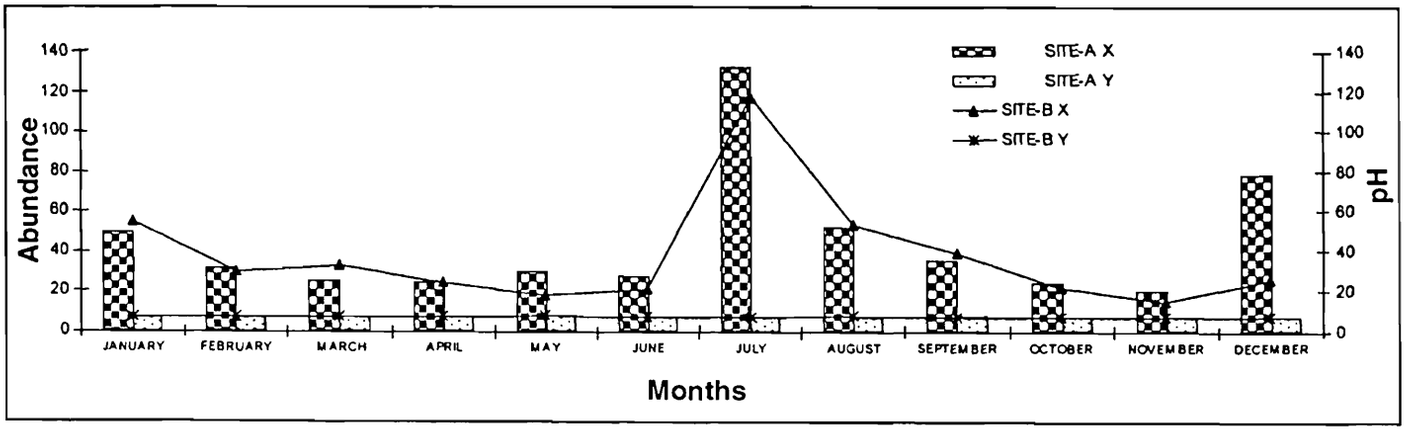

Fig. 2. : Monthly variation of Collembolan species in relation to soil pH at site-A and site-B in the year 2004.

(Table 3). It is therefore, clear from this study that pH has very little or no direct effect on collembolan population which is compatible with the findings of Agrell (1941), Bellinger (1954), Dhillon & Gibson (1962), Davis (1963) & Hazra *et al.*, (1976). Since the microorganisms and higher plants respond markedly to soil pH and since most of the collembolans are either Saprophagous or phytophagous it is assumed that soil pH may exert indirect influence on collembolan population by controlling the growth and activities of micro and macro flora.

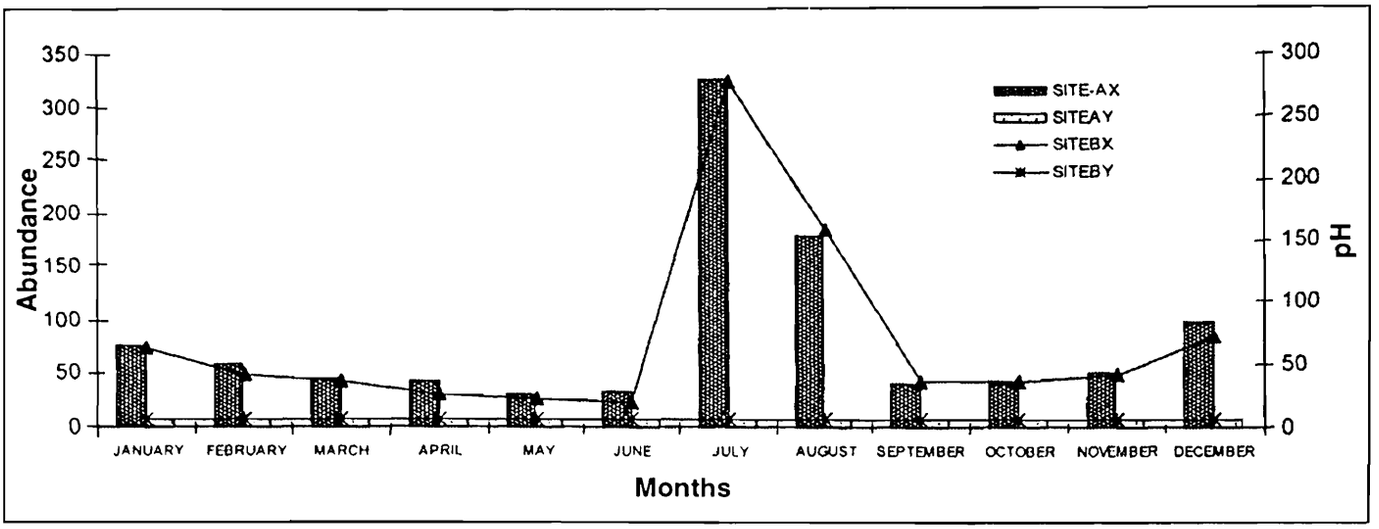

Fig. 3. : Monthly variation of Collembolan species in relation to soil pH at site-A and site-B in the year 2005.

Table 3. : Correlation coefficient (*r*) for soil ph and collembolan population (From 48 samples in two years).

PLOT	YEAR		VALUE OF 'r'
A	2004	Collembolan population : Soil pH	0.348 NS
	2005	Collembolan population : Soil pH	0.053 NS
B	2004	Collembolan population : Soil pH	–0.129 NS
	2005	Collembolan population : Soil pH	0.057 NS
			NS = Not significant

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