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EFFCTS OF THERMAL POWER FLY ASHES ON THE POPULATION STRUCTURE OF SOIL MICRO-ARTHROPODS AT KOLAGHAT, EAST MIDNAPORE DISTRICT, WEST BENGAL

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ABSTRACT : *A field study was conducted at Thermal Power Station area in East Midnapore district of West Bengal for the purpose of establishing the effects of continuous emitting of fly euedaphic ashes on the soil ecosystem and microarthropods.*

KEYWORDS : *Pollution, Soil microarthropods, Population.*

INTRODUCTION

Kolaghat Thermal power station emits fly ashes from coal combustion for generating electricity A high amount of fly ash has been disposed from the power station units in surrounding areas. Some studies have been conducted on the environmental impact of fly ashes on upper soil (Sahota and Gill, 1998), on the aquatic populations (Guthric *et al.*, 1973), cultivated crops (Sarangi and Mishra, 1998), soil and vegetation (Bohra and Kumar, 2002) etc. Since there was no work about the effect of fly ashes on soil micro arthropod fauna for this reason the present investigation was undertaken.

SAMPLING SITES

Three plots were chosen for the sampling *viz.* (i) **Kolaghat Thermal Power Station area**, (ii) **Burari**, 3 km away from Thermal Power Station and (iii) **Kankta**, 7 km away from Thermal Power Station.

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MATERIALS AND METHODS

A total of 108 soil samples were drawn. Altogether 6 plots were chosen from three sites and two per area Three cores from each area of sampling were collected at random at an interval of one month from January, 2004 to November, 2004. The cores were taken by stainless steel corers having the inner (Core cross section diameter of 8 sq cm). The extraction of the soil core was made by means of Tulgren funnels modified by Macfadyen (1953). A 40-watt bulb was used as source of lighted heat. The relative humidity of surface soil was recorded by using a dial hygrometer, temperature by soil thermometer and pH was estimated by using electronic pH meter.

OBSERVATION

Total arthropod populations of Thermal Power station were 256 in number (Table 1). Acarina and Collembolan were dominant group. Maximum soil arthropod's population was found in the month of September and minimum was found in the month of March. Mesostigmata (Acarina) was the dominant group followed by Isotomide (Collembola), Diplura, Entomobroidae (Collembola), Prostigmata (Acarina), Cryptostigmata (Acarina), Coleoptera, Isopoda, Millipede, Centipede.

Table 1. : Thermal power station showing the microarthropods population in different months of the year 2004.

Group/Order	Jan.	March	May	July	Sep	Nov	Total
1. Prostigmata (A)	1	0	1	5	6	3	16
2. Mesostigmata (A)	9	3	12	17	19	7	67
3. Cryptostigmata (A)	0	1	0	6	7	0	14
1. Entomobryidae (C)	3	0	0	2	7	8	20
2. Hypogastruidae (C)	3	3	0	7	5	0	18
3. Isotomidae (C)	17	5	7	18	12	1	60
4. Sminthuridae (C)	0	1	0	3	0	0	4
DIPLURA	9	5	5	7	9	3	38
ISOPODA	1	0	0	2	2	0	5
MILLIPED	1	0	0	1	2	0	4
COLEOPTERA	3	1	1	0	3	1	9
CENTIPED	1	0	0	0	0	1	1
Total	**48**	**19**	**26**	**68**	**72**	**23**	**256**

Table 2. : Showing microarthropods population in different months of the year 2004 at Burari.

Group / Order	Jan.	March	May	July	Sep	Nov	Total
1. Prostigmata (A)	7	5	5	18	22	6	63
2. Mesostigmata (A)	18	8	7	9	18	7	67
3. Cryptostigmata (A)	7	5	1	12	12	0	37
1. Entomobryidae (C)	9	5	3	6	12	5	40
2. Hypogastruidae (C)	3	6	7	12	7	0	35
3. Isotomidae (C)	5	2	6	21	11	3	48
4. Sminthuridae (C)	7	9	0	5	0	0	21
DIPLURA	1	1	2	5	7	2	18
ISOPODA	2	1	0	7	5	0	15
MILLIPED	2	3	2	3	2	0	12
COLEOPTERA	4	7	5	0	6	1	23
CENTIPED	1	0	0	0	1	0	2
Total	**66**	**52**	**38**	**98**	**103**	**23**	**381**

Table 3. : Showing microarthropods population in different months of the year 2004 at Kankta.

Group / Order	Jan.	March	May	July	Sep	Nov	Total
1. Prostigmata (A)	17	5	18	37	26	7	110
2. Mesostigmata (A)	26	11	9	12	21	9	88
3. Cryptostigmata (A)	12	8	9	19	18	4	70
1. Entomobryidae (C)	26	17	12	13	21	6	95
2. Hypogastruidae (C)	18	7	9	18	13	3	68
3. Isotomidae (C)	7	12	9	39	12	5	84
4. Sminthuridae (C)	7	13	4	12	0	2	38
DIPLURA	3	3	2	1	7	2	18
ISOPODA	7	4	3	12	6	3	35
MILLIPED	6	4	3	5	1	1	20
COLEOPTERA	5	9	9	3	6	2	34
CENTIPED	0	0	1	3	1	0	5
Total	**134**	**93**	**88**	**174**	**132**	**44**	**665**

A = Acarina; C = Collembola

Total arthropod populations in Burari were 381 in number (Table 2). Maximum arthropod populations were found in the month of September, 2004 and minimum in the month of November, 2004. Mesostigmata (Acarina) was the most dominant followed by Prostigmata (Acarina), Isotomidae (Collembola), Entomobryidae (Collembola), Hypogasturidae (Collembola) Coleoptera, Sminthuridae (Collembola), Diplura, Isopoda, Centipede.

Total arthropod populations in Kankta were 665 in number (Table 3). Maximum arthropods populations were found in the month of July, 2004 and minimum in the month of November, 2004. Prostigmata (Acarina) was the most dominant group followed by Entomobryide (Collembola), Isotomidae (Collembola), Cryptostigmata (Acarina), Hypogastruridae (Collembola), Sminthuridae (Collembola), Isopoda, Coleoptera, Millipede, Diplura, Centipede.

RESULTS AND DISCUSSION

From the present study the faunal group like Prostigmata, Mesostigmata, Cryptostigmata, Entomobryidae, Hypogastruridae, Isotomidae, Sminthuridae, Diplura, Isopoda, Millipede, Coleoptera, Centipede were obtained from Table 1, 2, 3 of three sites (Thermal Power Station area, Burari, Kankata). Table 1, 2 & 3 also reveals that the higher soil microarthropods populations were found in Kankta followed by Burari, Thermal Power Station area. During the study period monthly soil microarthropods populations' fluctuations were found but soil microarthropod population was higher in ash free area than ash field area. Soil factors were found to vary in different sites in different months of the year (Fig. 2). In thermal power station area Relative Humidity was higher than Burari, Kankta sites. Table 4, 5 & 6 shows the maximum temperature was found in March and that of minimum in January in all three sites. Maximum pH value was obtained from Kankta and minimum value from Thermal Power Station area. During the study period pH value was found to he comparatively lower in Thermal Power Station area than other two study sites (Fig. 2). This might be due to high amount of fly ashes and their biochemical changes. Maximum Relative Humidity was found in Thermal Power Station area in July and that of minimum was found in Kankta (Fig. 2). Fig. 3 shows maximum density was found in Kankta than Burari & Thermal Power Station area. Figure 1 shows the highest soil microarthropods population peak always found in Kankta than Burari & Thermal Power Station area. Figure 1 also shows that the highest populations were round in the month of July and lowest populations were found in the month of November. The density of soil microarthropods population increase with the increase of distance from the discharge source of ashes. This might be due to the toxicity of ashes become lower as the site away from the discharge source Dindal *et al.*, (1973) reported from U.S.A. that industrial discharge decrease the micro community stability of Acari and Collembola, which result coincide with the present investigation. So it can be concluded that soil microarthropods population may be affected adversely by the deposition ashes toxicity on top soil. Details study is in progress.

Table 4. : Showing number of microarthropds, Temperature, Ralative Humidity & pH at the Thermal Power Station area in different months of the year 2004.

Months	Arthropods population	Temperature (°C)	pH	RH (%)
January	48	**22**	6.7	90.2
March	**19**	**32**	7.2	88.2
May	26	28	**6**	92
July	**98**	27	6.2	**95**
September	72	27.5	**6.7**	87.8
November	23	24.5	6.9	**88**
Mean value	48	26.83	6.61	90.02

Table 5. : Showing number of microarthropds, Temperature, Ralative Humidity & pH at the Burari area in different months of the year 2004.

Months	Arthropods population	Temperature (°C)	pH	RH (%)
January	66	**22**	7.2	88
March	52	**32.2**	7	87
May	**38**	28	**6.9**	**89.2**
July	98	26.5	7.22	88
September	**103**	27	**7.3**	85.6
November	23	24.5	7.1	**85**
Mean value	64	26.7	7.12	87.13

Table 6. : Showing number of microarthropds, Temperature, Ralative Humidity & pH at the Kankata area in different months of the year 2004.

Months	Arthropods population	Temperature (°C)	pH	RH (%)
January	134	**21.5**	7.2	85
March	93	**32**	7.1	**86**
May	88	27.8	7.1	82
July	**174**	26	**7**	**81.2**
September	132	26.5	**7.3**	85
November	**44**	24	7.2	80
Mean value	111	26.3	7.15	83.2

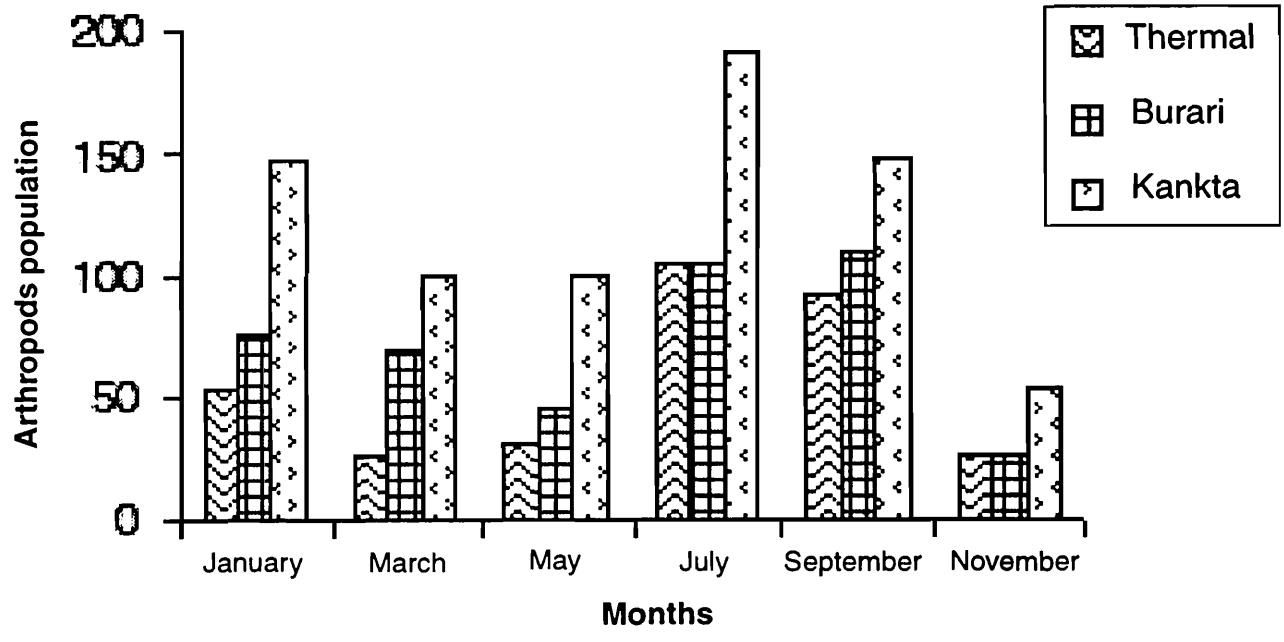

Fig. 1. : Histogram showing microarthropods population in Thermal, Burari & Kankta sites in different months of the year 2004.

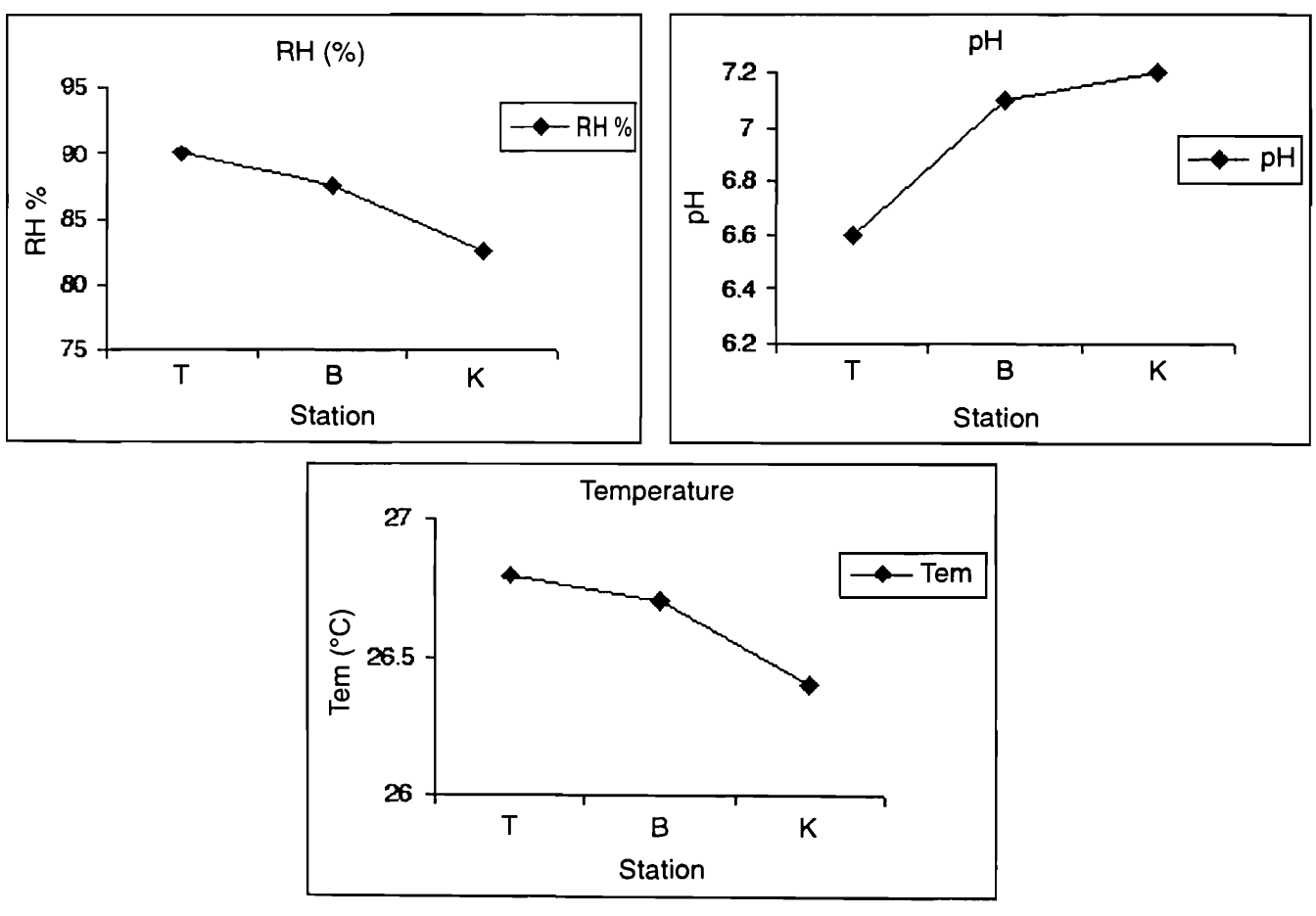

Fig. 2. : The graphs showing mean values of different soil factors in Thermal (T), Burari (B) and Kankta (K) sites.

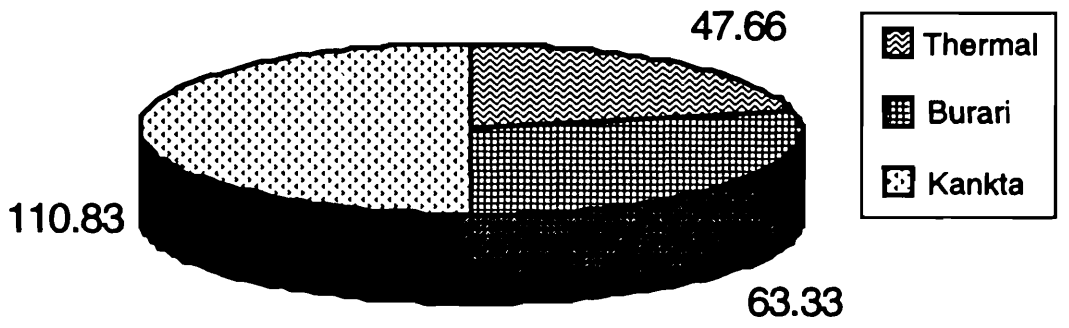

Fig. 3. : Showing density of soil microarthropods population in three study sites of Kolaghat Thermal Power Station.

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