



Effect of ecological factors on the distribution of earthworms in Baghdad

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Abstract

Monthly earthworm samples were collected from four sites in the vicinity of Baghdad. The sites included citrus and palm orchard, vegetable field, Tigris river bank and a house garden. Records of soil temperature, PH, moisture, texture and organic matter content were also measured at all sampling sites. Soil temperature ranged between 10C° to 43C° as recorded during February and August respectively. Values of PH have ranged between 4.4 to 6.5. Soil moisture and Organic matter content were highest in river bank's samples, 66.6% and 3.82% respectively. However, lowest soil moisture and organic matter percentage were 25.21% and 2.30% recorded at the vegetable field and the palm orchard respectively. All sites were characterized by loamy acidic reactive soils.

Key words: Ecological factors, Distribution, Earthworms, Baghdad.

Introduction

Earthworms play important role in soil, Charles Darwin was the first scientist to acknowledge the significance of earthworms, which he described it as "nature's plough" (Townsend *et.al.*, 2004). Soils that are moist and rich in organic matter are the preferred habitat and distribution of these worms depends on proximity to human habitat (Dorsey *et.al.*, 2006). earthworms called ecological engineering because their role to mix soil with leaves and fertilizers that find inside or on the soil surface and effect on chemical and physical properties of soil (Jimenes *et.al.*,2004).

There are many factors affecting the distribution of earthworm like temperature, pH, organic matter, moisture and soil texture (Moreno and Mischis, 2004). Soil moisture play good role on movement and breathing oxygen of earthworms while any change in temperature affect the activity of earthworm (Holmstrup, 2004). PH important for earthworms because increased or decreased in PH value lead to kill earthworm (Chan *et.al.*,2003). There is a relationship between earthworms and type of soil, some of species preferred chalky soil or loam while others like mud soil more than sand and gravel (Hernandez *et.al.*,2003).

Materials and Methods

Sampling methods

Earthworm collected from December 2005 to end of November 2005 from four ecological regions. (Table 1) (map -1-) by collected seven replies for each sample by degraded soil like a quadrat shape length of 40 X 40 cm in dimension and for 40 cm depth (Moreno and Mischis, 2002).



Figure (1): map of studied regions.

Ecological Measurement:

- 1- Temperature : measured by mercuric thermometer 0-200 C°.
- 2- PH: measured by PH-meter Philips pw 9420.
- 3- Estimation of organic matter of soil: dry soil weight and burned using furnace oven 450-500 C° for 24h. then weight again (Allison *et al.*, 1954).
- 4- Estimation of moisture, samples of soil weight and dried using electric oven 65-70C° for 24h. then weight again to estimation the percentage of moisture (Allison *et al.*, 1954)
- 5- Soil texture: According to the method of Al-Saadi *et al.* (1990), using multi-screen apparatus.

Table(1): regions of study in Baghdad and there characterizes.

Characteristics of regions	Studied regions	Sample of regions
Citrus and palm orchard	Al-Egreat, north of Baghdad	A
Vegetable field	Al-Tarmya, north of Baghdad	B
Tigris river bank	Al-Tarmya, north of Baghdad	C
House garden	Al-Dora, south of Baghdad	D

Results and Discussion

Table (2) showed ecological factors that studied in four study regions of Baghdad, region A high temperature was 41 C° in August, low temp. 12 C° in March, pH value recorded 6.5 in March and 4.5 in August. Percentage of moisture 56% in December while in July 41.15%. High percentage of organic matter record in September 2.30% while low percentage 3.76% recorded in November while percentage of mud, silt and sand were slightly differed through studied months and recorded high percentage of mud 10% in November while lower percentage 9.06 % in

November while silt higher percentage in August 54.24% and lower 52.38% in December, in July recorded high percentage was 37.82% and low percentage 36.47% in June. In region B oscillation values temperature through study months and recorded high temperature in August was 42 C° but lower temperature in March was 10 C°, higher value of PH in Marsh was 6.2 but lower value 4.4 recorded in August, the percentage of organic matter, moisture, mud, silt and sand they were closed in the months of study, the higher percentage of organic matter 3.26% in June while lower percentage 2.51% record in March, lowest percentage of moisture 25.12% in July while high percentage 30.23% in March, while high lowest percentage of moisture 25.12% in July while high percentage 30.23% in March, while high percentage of mud 12.6% in November, the lower percentage 11.11% in July, while lower percentage of silt 46.09% and higher percentage 49.48% in March in same month lower percentage of sand 39.1% and in July record higher percentage was 42.66%. In region C oscillation the values of temperature and record higher degree 42 C° in August while lower value 10 C° in January, values of PH closed in study months the highest value 6.1 in March while in August record lowest value was 4.8 and as last region percentage values of organic matter, moisture, mud, silt and sand were closed in study months, high percentage of organic matter 3.85% in March while the lower 2.85% in August while in January higher percentage of moisture was 66.6% while lower percentage 64.1% in August and higher percentage of mud 9.3 % in March but in April record lowest percentage was 8.52% while high percentage of silt in August was 57.22% but lower percentage was 55.15% record in April while in same month record higher percentage of sand was 36.33% but in March record the lowest was 34.09%. Like in all regions oscillation values of temperature record high degree 43 C° in August while lowest degree 16 ° in March , high value of PH 6.1 in January but in August record lowest value was 4.5 and percentages of organic matter, moisture, mud, silt and sand were closed in all study months. High percentage of organic matter and moisture were 3.25%, 30.6% in August and January and lowest percentage were 2.65% and 27.9% in March and June.

Table (2): Ecological factors in Region (A) of Baghdad in all studied months:

Percentage of sand	Perc. Of silt	Prce. Of Mud	Percentage of Moisture	Percentage of organic matter	PH values	Soil temperature	Months	Total numbers of earthworms ind./m ²
37.14	53.53	9.33	56	3.32	6.1	15	1	55
37.77	52.86	9.37	55.7	3.26	6.5	12	2	47
37.34	53.24	9.42	43.17	3.11	6	16	3	24
37.5	53.11	9.39	43.81	3.26	5.4	25	4	32
36.47	54.08	9.45	43.25	3.23	5	32	5	53
37.23	53.62	9.15	42.91	3.06	4.7	35	6	44
37.82	53.12	9.06	41.15	3.1	4.6	37	7	20
36.55	54.24	9.21	41.22	2.86	4.5	41	8	13
37.52	53.06	9.42	36.20	2.30	5	29	9	20
37.46	52.93	9.61	47.14	2.6	5.2	25	10	25
37.71	53.23	9.06	51.68	3.1	5.5	23	11	46
37.62	52.38	10	64.39	3.75	5.6	20	12	50

Table (3): Ecological factors in Region (B) of Baghdad in all studied months:

Percentage of sand	Perc. Of silt	Prce. Of Mud	Percentage of Moisture	Percentage of organic matter	PH values	Soil temperature	Months	Total numbers of earthworms ind./m ²
41.3	46.5	11.2	29.04	2.81	6	14	1	17
39.1	49.48	11.42	30.23	2.68	6.2	10	2	30
41.68	47.2	11.12	28.25	2.51	5.9	12	3	20
41.5	47.22	11.28	27.29	3.2	5.5	25	4	38
41.35	47.33	11.32	26.18	3.22	5.2	30	5	24
41.34	47.46	11.11	26.02	3.26	5	32	6	22
42.66	46.09	11.25	25.12	3.1	4.8	36	7	19
40.35	47.11	12.54	26.05	3.11	4.5	42	8	18
41.13	46.85	12.02	27.3	2.92	4.4	41	9	18
41.5	46.2	12.3	28.02	3.15	4.9	38	10	14
40.8	46.6	12.6	28.01	3.11	5	28	11	17
41.6	46.3	12.1	29.12	2.98	5.3	22	12	15

Table (4): Ecological factors in Region (C) of Baghdad in all studied months:

Percentage of sand	Perc. Of silt	Prce. Of Mud	Percentage of Moisture	Percentage of organic matter	PH values	Soil temperature	Months	Total numbers of arthworm ind./m ²
34.6	56.01	9.03	66.6	2.99	6	10	1	15
34.09	45.61	9.3	66.21	3.82	6.1	12	2	22
35.67	55.32	9.01	64.61	3.51	6.3	16	3	18
36.33	55.32	8.52	65.11	3.21	6	25	4	18
35.27	55.82	8.91	64.9	3.12	5.6	30	5	14
34.66	56.12	9.22	64.11	3.06	5.1	32	6	12
35.1	56.25	8.65	64.12	2.92	5	41	7	15
33.67	57.22	9.11	64.1	2.85	4.8	42	8	14
33.67	55.81	8.98	66.12	3.06	5.3	31	9	40
34.6	56.2	9.2	65.2	3.1	5	29	10	21
35	55.9	9.1	66.1	3.2	5.3	28	11	15
34.54	56.5	8.96	66.3	3.15	5.5	22	12	14

Table (5): Ecological factors in Region (C) of Baghdad in all studied months:

Percentage of sand	Perc. Of silt	Prce. Of Mud	Percentage of Moisture	Percentage of organic matter	PH values	Soil temperature	Months	Total numbers of earthworms ind./m ²
37.98	50.3	11.72	30.4	2.98	6.1	19	1	25
35.47	52.31	12.22	29.11	2.89	6	16	2	24
36.66	51.78	11.56	28.54	2.65	5.8	20	3	34
37.66	50.89	11.45	29.21	2.99	5.5	26	4	40
38.26	49.82	11.92	27.9	2.72	5.1	31	5	35
38.11	50.12	11.77	28.11	2.98	5	35	6	30
37.27	51.09	11.64	27.79	2.71	4.8	40	7	25
37.93	50.49	11.58	28.31	3.25	4.5	43	8	29
37.81	50.65	11.54	30.12	3.1	4.7	39	9	26
38.2	50.1	11.7	29.2	3.2	5	37	10	35
38.35	50	11.65	30.1	3.2	5.4	30	11	34
38.29	49.9	11.81	30.6	3	5.7	23	12	35

Earthworm distribution depended on Temperature its values in all study regions 10-43 C° and that value very good to earthworms when Temperature become high or low earthworms moved to the lowest layer of soil and rotate around itself in the end of channel that made it and its bioactive decreased until Temperature be good (Holmstrup,2004). Whalen *et al.*, (1999) found the growth of earthworms was 0.0139 g/day in soil its temperature 10 C°.

The value of PH in all study regions 4.4-6.5 and its values closed in all study months in all regions, Weisenhorn (2000) recorded that earthworms can lives in soil has PH ranged 5-9 because that region contained organic matter and that lead to dissolved organic matter then change PH value, Baker and Whitby (2003) observed that earthworms can lives in soil its PH 4.5- 4.7 but cant lives in soil its PH less than 3.5 , Davis , 2005 said PH value 4.2 – 8 and that agreed to the results of our study. The percentage of soil moisture in all studied regions ranged from 25.12 to 66.60%, Mason *et al.* (2000) explained that Moisture very important factor to life of earthworm but moisture not must be high because that made soil particles adheres to the body of earthworms and affect respiration, Whalen and Parmelee (1999) founded soil moisture values were ranged from 20 to 85% of all studied samples and that closely to our result and the percentages of organic matter not change very much in all months of study so that like our results. Soil that contain different amounts of mud, silt and sand its very good to earthworm lived and all regions of study contain from these materials so they good for earthworm life (Hendrix *et al.*, 1992; Baker *et al.*, 1992).

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