Global Journal of Animal Scientific Research

Journal homepage: www.gjasr.com

Print ISSN: 2345-4377 *Online ISSN: 2345-4385*

Occurrence of Earthworms in Relation to Soil TC, TOC, TIC in Benghazi, Libya

Maher Haeba[1], Jan Kuta[2], Rami Gebril[3], Walid Awgie [1]

[1] Benghazi University, Science Faculty, Zoology Department, Benghazi, Libya
[2] Masaryk University, Faculty of Science, Research Centre for Toxic Compounds in the Environment (RECETOX), Kamenice 126/3, 625 00Brno, Czech Republic
[3] Benghazi University, Science Faculty, Statistic Department, Benghazi, Libya

ARTICLE INFO

Corresponding Author:
Maher Haeba
maherhaiba@yahoo.com

How to cite this article:
Haeba, M., J. Kuta, R. Gebril and W. Awgie. 2014. Occurrence of Earthworms in Relation to Soil TC, TOC, TIC in Benghazi, Libya. *Global Journal of Animal Scientific Research. 2*(2):116-119.

Article History:
Received: 10 April 2014
Received in revised form: 27 April 2014
Accepted: 29 April 2014

ABSTRACT

Benghazi city is the second biggest city in Libya and getting bigger promptly. The city surrounded by farms. However, urban invasion has decreased the agriculture area a lot. In this study, survey on earthworm and TOC around the city has been done. Existing of earthworm is highly related to TOC around the city. Earthworms around the city were in Bouatni ≥ Jarotha ≥ El-Guarsha ≥ Hawari soil. The study show decline in the species in Hawari area. Four species of earthworm were identified around Benghazi city. These were *Aporrectodeatrapezoides*, *Aporrectodea*rosea, *Eiseniaandrei*, and Microsolex*dubius*. *A.* trapezoids formed the dominant and most widespread species of Benghazi.*E. Andrei* was new record in the area. This can lead to using earthworms as bioindicators, which appears to be a useful way to classify soil quality. Harsh environmental conditions and low organic matter may not only limit reproduction but the survival of adult earthworms from year to year.

Keywords: Benghazi, Earthworm, Soil, TOC.

INTRODUCTION

Benghazi (32_10¢N, 20_06¢E), the second largest city in Libya, is colonized by some invertebrates such as earthworms, which contribute much to the soil fertility. Moderate information is available on their distribution and ecology around Benghazi city (Nair et al, 2005). Soil is the region on the earth's crust where geology and biology meet, it is the land surface that provides a home to plant and microbial as well as invertebrates (Pelzer et al., 1993). Soil samples differ in their content depending on climate, soil origin, composition and human activities (Hashem and Al-Obaid, 1996).

Soil organisms are among the major components of soil biomass and play important roles in maintaining the structure and fertility of soil. Invertebrate-mediated processes such as drainage, aeration, and incorporating and degrading organic matter are important in improving soil quality (Barber *et al.,* 1998).There are billions of organisms that make up the soil food web. These include bacteria, fungi, protozoa, nematode, and invertebrates. Each

type of organism plays an important role in keeping the soil healthy. Earthworm is considered as a domain soil organism widely distribution worldwide. Earthworm constitute 60-80% of the terrestrial invertebrate's biomass and play a critical ecological role in soil specially in structuring and increasing the nutrient content of the soil (Connor, 1988).Earthworms are known to play important roles in soil profile development, nutrient cycling, and plant productivity where their population densities are high.Play an important role in decomposition processes by the fragmentation of litter material and stimulating and/or ingesting fungi and bacteria that are very important in the cycling of nutrients (Culyand Berry, 1995). Our aims were to survey earthworm distribution around Benghazi city and compared earthworm distribution with TC (includes both organic and inorganic sample constituents).

MATERIAL AND METHODS

Four stations located within the municipality of Benghazi were selected for the study (Fig.1) . These stations were (1) Bouatni,, (2) El-Guarsha, (3) Jarotha, and Hawari (4), they were categorized into three different habitats of earthworms and Isopoda. These were (i) Clayey loam soil, lemon, olive, guava and orange farm (stations 1) , (ii) Loamy sand soil, rose and flower garden (station 2), (iii) Silt clay soil, plain landscape with wild grasses and Pomegranate and olive plants having medium-sized trees forming canopy (station 3), (iv) rose and flower garden (station 4). Soil, Earthworms and Isopoda were sampled during in March 2012, following these steps a plot of 20 x 20 cm replicates ten times were measured within the survey site 10 x 10 m, of each station with two substations. A ditch of 10 cm deep was dug in the plot and the soil organisms were removed and spread on a white plastic tray, and hand-sorted removing earthworms, Isopoda as they were found. The earthworm and isopods were rinsed in distilled water for a few seconds to remove particles of soil from the body surface and placed in Petri. "Identification and taxonomic assignment was performed using the available detailed studies on earthworm taxonomy and distribution for the whole of France (Bouché, 1972), Hungary (Csuzdi and Zicsi, 2003) and Great Britain (Sims and Gerard, 1999)."

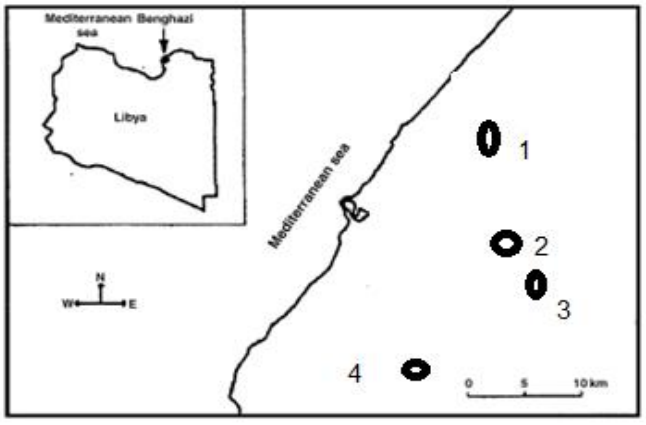

Figure 1. Location of study stations in Benghazi (up to down)
(1) Bouatni, (2) Hawari (3) El-Guarsha, and (4) Jarotha.

RESULTS AND DISCUSSION

Four species of earthworm were identified around Benghazi city (Fig.1). These were *Aporrectodeatrapezoides*, *Aporrectodea*rosea, and *Eiseniaandrei* belonging to the family Lumbricidae, and Microsolex*dubius* belonging to the family Microscolecidae (Table 1). Out

of the four species, *Aporrectodeatrapezoids* formed the dominant and most widespread species of Benghazi and this earthworm was present in all stations.

Table 1. Earthworm species sampled from different stations around Benghazi

stations	Our samples	Nair *et al*., 2005, samples
Bouatni	*Aporrectodea trapezoids, Aporrectodearosea, Eiseniaandrei*	*Microscolexdubius, A. trapezoides, A. rosea*
El-Guarsha	*Aporrectodea trapezoids*	*A. caliginosatrapezoides*
Jarotha	*Aporrectodea trapezoids, Micro scolexdubius, Aporrectodearosea*	*Non*
Hawari	Non	*caliginosatrapezoides*

This was followed by *A. rosea* sampled from two stations (Bouatni and Jarotha). Meanwhile, *Eiseniaandrei* were sampled from just one station (Bouatni) as well as *M. dubius*were sampled from one station Jarotha. *A. caliginosa* trapezoids formed the dominant and most widespread species of Benghazi. This was followed by *A. rosea* sampled from two and *M. dubius* from one and *E andrei* from one stations. Earthworm diversity tended to be low with one to three species present within location. Low earthworm species diversity within a site is not uncommon. Most earthworm diversity studies report the presence of between two and five species at any one location (Lee, 1985). This survey highly agreed with previous survey which done in 2002 by (Nair *et al*., 2005).

However, *E. andrei*was new record in the area. Also, three species of earthworm *A. trapezoids*, *M. scolexdubius*, *Aporrectodearosea*were recorded in Jarotha area, this area was not included in the previous study. In the Hawari stations no earthworm were found However, Nair and his group found the *A. trapezoids*in the area which was not confirmed by our survey, this could mean decline in the earthworm population in the area. Bouatni soil seem to be more suite soil to earthworm species and biodiversity were higher than other soil followed be Jarotha station, these two stations are remain in agriculture use and far from urban invasion, so, they are rich of nutrient. This due to high concentration of TOC compared to other location. Exist of the earthworm highly related to TOC concentration (Fig.2).

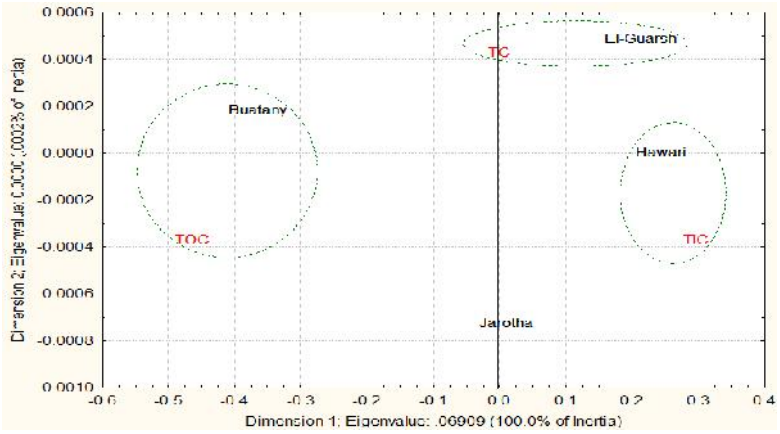

Figure 2. Correspondence analysis plot for. A significant difference exists between the three analyses within the areas.

Higher numbers of species were found in Bouatni than in other sites, this appeared to be related to higher organic matter content in site resulting from fertilizer additions and leaf litter inputs, which improve earthworm food quality, quantity, and soil environmental conditions.

This is consistent with previous research that established correlations between earthworm diversity and soil litter quality (Sinha *et al*., 2003).These species play a paramount role in the decomposition of soil litter and their distribution correlates with that of the TOC. Organic

matter contains nutrients necessary for earthworm survival, and soils lacking organic matter do not typically support large earthworm populations (Lee, 1985; Edwards and Bohlen, 1996). Jordan *et al.*, (2000) found that earthworm density decreased in El-Guarsha as well as Hawariwhere organic matter had been decreased due to reduction in the agriculture area and invasion of urban, and attributed the population decline to decreased nutrient availability. The low organic C content in El-Guarsha as well as Hawarisite soils did not appear to provide sufficient nutrients to support earthworm populations similar in density to those in Bouatnior Jarothasites.This can lead to using earthworms as bioindicators,which appears to be a useful way to classify soil quality. Our recommendation to use soil around Benghazi city in agriculture purpose can be Bouatni ≥ Jarotha ≥ El-Guarsha ≥ Hawari soil. This study were put more emphasis on the pervious study which done in 2002, and *Aporrectodea trapezoids* were domain species and *Eisenia Andrei were recorded as* new species. Moreover, Jarotha area, has not been considered in earthworm survey, and was rich of some species that not found on other area. Also, put indication about decline of earthworm in Hawari area. Finally, harsh environmental conditions and low organic matter may not only limit reproduction but the survival of adult earthworms from year to year.

ACKNOWLEDGEMENT

This research has been co-funded from the European Social Fund and the state budget of the Czech Republic.

REFERENCE

Barber, I., J. Bembridge, P. Dohmen, P. Edwards, F. Heimbach, R. Heusel, K. Romijn, and H. Rufli. 1998. Development and evaluation of triggers for earthworm toxicity testing with plant protection products. In Sheppard S, Bembridge J, Holmstrup M, Posthuma L, eds, Proceedings, Advances in Earthworm Ecotoxicology: *2nd International Workshop on Earthworm Ecotoxicology*. April 2-5. Amsterdam, The Netherlands. SETAC, Pensacola, FL, USA. pp: 269–278.

Boucher, B. 1972. Lombriciens de France. Écologie et Systématique (n'hors-série). Institut National de la Recherche Agronomique. *Annales de Zoologie-É cologie Animale*.

Connor, G.O., and J. Qual. 1988. Double and Brown, in Earthworm Ecology, ed.C. Edwards, St. Lucie Press, Boca Raton. FL. pp: 179–211.

Csuzdi, C., and A. Zicsi. 2003. Earthworms of Hungary (Annelida: Oligochaeta; Lumbricidae). Hungarian Natural History Museum, Budapest.

Culy, M.D., and E.C. Berry. 1995. Toxicity of soil-applied granular insecticides to earthworm populations in cornfields. *down to Earth*. 50: 20–25.

Edwards, C.A., and P.J. Bohlen. 1996. Biology and Ecology of Earthworms. Chapman and Hall, London.

Hashem, A.R., and A.M. Al-Obaid. 1996. Effect of Cadmium on the Growth of*Aspergillus flavus* and *Ulocladium chalmydosporum. Internat. J. Exper. Bot.* 59(1/2):171-175.

Jordan, D., V.C. Hubbard, F. Ponder Jr, and E.C. Berry. 2000. The influence of soil compaction and the removal of organic matter on two native earthworms and soil properties in an oak-hickory forest. *Biol. Fertil. Soils*. 31:323–328.

Lee, K.E., 1985. Earthworms: Their Ecology and Relationships with Soil and Land Use. Academic Press, New York.

Nair, G.A., K.Y. Abdelgader, A.E. Muftah, M.F. Abdelsalam, and I.J. Maria. 2005. Occurrence and density of earthworms in relation to soil factors in Benghazi, Libya. *Afr. J. Ecol.* 43:150–154

Pelczar, M.J., E.C.S. Chan, and N.R. Krieg. 1993. Microbiology: Concept &Application International edition McGraw-Hill, USA. pp: 281-324.

Sims, R.W., and M.B. Gerard. 1999. Earthworms. Synopses of the British Fauna (New Series). No. 31 TheLinnean Society of London and the Estuarine and Coastal Sciences Association. London. p:169.

Sinha, B., T. Bhadauria, P.S. Ramakrishnan, K.G. Saxena, and R.K. Maikhuri. 2003. Impact of landscape modification on earthworm diversity and abundance in the Hariyali sacred landscape, Garhwal Himalaya. *Pedobiologia*. 47:357–370.