

Original Research Article

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Soil Analysis and Diversity of Earthworms in the Polluted Area of Palakkad, Kerala and Kanuvai, Coimbatore, India

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ABSTRACT

Keywords

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A comprehensive study was conducted on the distribution of earthworms and soil analysis in the Polluted area of Palakkad district. There are some exotic and native peregrine species which has the inherent ability to withstand in disturbed habitats. Such earthworm species have high medicinal value due to the presence of immunologically active compound in their body. The present study reveals that four different species of earthworms was identified from the sampling stations and analysed the influence of the soil parameters like macro and micro nutrients on earthworm diversity.

Introduction

Earthworms are the group of invertebrates belonging to the Phylum Annelida and class Oligochaeta and represented by more than 5000 species. Earthworms are present in moist and dark places in mud. Earthworms are of great economic value to mankind because they improve the soil quality by their action. They ingest organic material and facilitate the redistribution of crop residues and organic matter throughout the soil profile (Timothy *et al.*, 1999). In the Indian subcontinent earthworms are represented by 509 species in 67 genera under 10 families (Julka, 1993). Darwin (1881) though popularly known for his theories on evolution but he was one of the pioneers who

highlighted the role of earthworm in soil health also. The book entitled “the formation of vegetable mould, through the action of worms, with observation on their habits”, published in 1881 shows his deep understanding of earthworm biology and their role for paedogenesis. Earthworms are the most important components of the soil biota in terms of soil formation and maintenance of soil structure and fertility. Earthworm species are generally categorized environmentally as being Epigeic, endogeic and anecic. Epigeic species live in organic litter near the soil surface and generally have a short life cycle and high fecundity. Endogeic earthworms live in and feed on the soil. They make horizontal

burrows through the soil. Anecic earthworms make permanent vertical burrows in soil.

Research has shown that earthworm species composition and distribution is dependent upon the properties of the soil, including soil moisture, texture, depth, pH, and organic matter content (Curry, 2004). However, local earthworm distribution can also significantly affect soil structure, varies from species to species. Earthworm diversity and distribution pattern are generally governed by a variety of biotic and abiotic factors such as soil properties, surface litter, vegetation type and its dynamics, land use pattern, local or regional climate and pressure of human activities.

India is one of the major earthworm diversity countries and has 11.1% available out of total earthworm diversity in the world. Majority of Indian earthworm has specific preference for natural habitats; a few peregrine Indian species have successfully colonized in agro ecosystem. Totally 88 species and sub species of earthworms are identified from Kerala, among these 30% of earthworms are reported from Palakkad district (Narayanan *et al.*, 2012). Earthworms are among the most important components of soil biota in terms of soil formation, maintenance of soil structure and fertility (Bhadauria and Saxena, 2010). In the present study we have analysed the earthworm diversity of polluted area of Palakkad district, Kerala.

Materials and Methods

Study site

Palakkad is located 10.7867° N, 76.6548° E. It has an average elevation of 140 metres (460 ft) with a width of 30 kilometres (19 mi). This is the largest district out of the 14 districts in Kerala state. Palakkad is the gateway to Kerala due to the presence of Western Ghats.

The total area is 4480 Km² out of which about 1360 km² is covered with forests. The climate is pleasant for most part of the year. Collection location was near the municipal bus stand, near automobile's washing unit.

Taxon sampling and preservation

Adult earthworms are collected from the polluted area near lorry washing location in Palakkad district by digging and hand sorting method (Julka, 1993).

Collection was done during the month July 2016. The collected specimens were identified by Dr. P. Kathireswari. The presence of earthworm was located based on availability of worm caste on surface soil and colour and humidity of soil. Adult earthworms were sorted and taken in to college laboratory along with their native soil. Then they are washed with distilled water and preserved in 68% formalin solution for identification. The preserved specimens were identified by Dr. P. Kathireswari.

Determination of Macro and Micro Nutrients

The determination of macro and micro nutrients of soil inhabited by earthworms are done in soil analysis centre, RS Puram, Coimbatore, Tamil Nadu. Macro nutrients like N, P, K and Micro nutrients like Fe, Mn, Zn, Cu, and sulphur were analysed by titration method (Van Reeuwijk, 2002).

Results and Discussion

The earthworm survey conducted in polluted area Palakkad town revealed that the occurrence of 4 species of earthworms belonging to 3 families namely *Eudrilus eugeniae*, *Lampito mauritii*, *Megascolex konkanensis* and *Esinea foetida* were identified.

Sl. No.	Family	Species	Ecological category	Native/ exotic
1	Eudrilidae	<i>Eudrilus eugeniae</i>	Epigeic	Exotic
2	Megascolecidae	<i>Lampito mauritii</i>	Anecic	Native
3	Megascolecidae	<i>Megascolex konkanensis</i>	Endogeic	Native
4	Lumbricidae	<i>Esinea foetidae</i>	Epigeic	Exotic

Eudrilus eugeniae

Taxonomy: It is included in the phylum: Annelida, class: Oligochaeta, Order: Opisthopora, Family: Eudrilidae

Distribution: This species of earthworm native to tropical West Africa and now widespread in warm regions, both wild and under vermicompost, and also called the African night crawler

Lampito mauritii

Taxonomy: It is included in phylum annelid, class; Oligochaeta, order: Haplotaxida and family: Megascolecidae.

Diagnosis: Average length 9-13.5cm, average diameter -0.29-0.32cm. total segments or clitellar segments or type of clitellum -168-195; prostomium –prolobus, location of prostate gland.

Distribution: It is a peregrine species, distributed all over the world. Its habitat include garden, manure, heaps, fields etc.

Esinea fetida

Taxonomy: It is included in the phylum Annelid, class-Oligochaeta, order-Haplotaxida, family: Lumbricidae.

Diagnosis: it is smaller is size 3-4 inches long and they have altering bands of darker and lighter colour often with a yellow tip.

Distribution: They are native to Europe, but have been introduced to every other continent except Antarctica.

Megascolex konkanensis

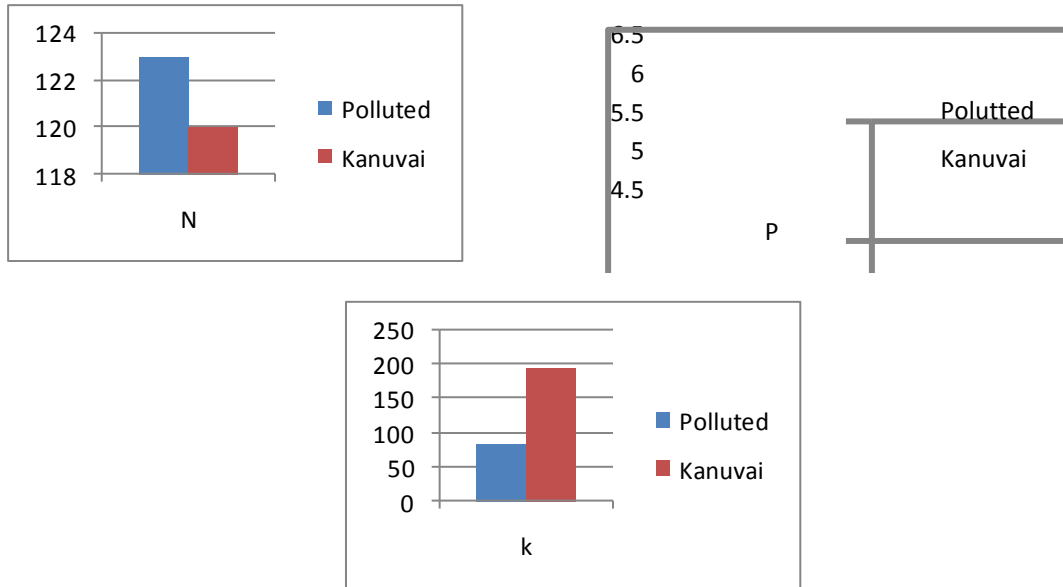
Taxonomy: Phylum Annelida, class Oligochaeta, family Megascolecidae, genus Megascolex (templeton, 1844), species Konkanensis (Fedrab, 1898).

Distribution: Megascolocidae are large family of earthworms which has native representatives in Australia, New-Zealand, both south-east and East Asia and North America. These are widely distributed in the tropical and temperate zones

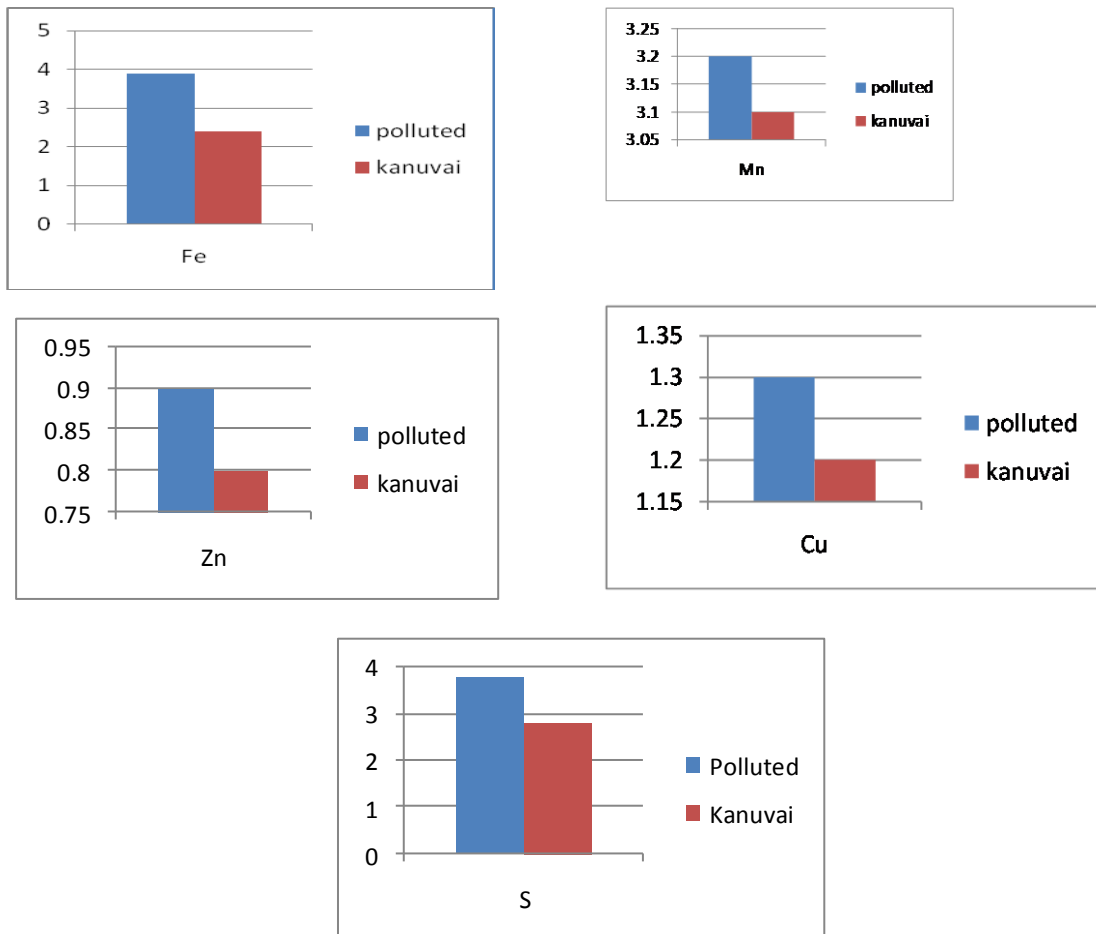
The result of soil analysis showed that earthworm rich in soil have high macro and micro nutrients. In the present study nitrates level is higher in polluted area of Palakkad district than the agroecosystem of Kanuvai, this may be due to the presence of more organic content and the polluted soil contain high amount of Cu, Mn and Zn.

The identified earthworms belong to 3 different families Megascolicidae, Eudrilidae and Lumbricidae and species *Eudrilus eugeniae*, *Lampitoma mauritii*, *Megascolex konkanensis*, *Esinea foetida* were identified. *Eudrilus eugeniae* is found abundant among the sampled species. They are ecologically categorized into epigeic, anecic and endogeic respectively. The earthworms ecologically categorized based on Bouche (1972) and Lavelle, 1983 and 1997) depending on their specific living space in the soil profile and their sources of food. Epigeic species are small sized, live in soil holorganic horizons and preferentially consume litter or dung.

Graph.1 Macro nutrients present in the surrounding soil of earthworm in percentage per hectare



Graph.2 Micro nutrients present in the surrounding soil of earthworm in percentage per hectare



determined. Macro nutrients as N, P, K and micro nutrients as Zn, Mn, Cu, S, and Fe were noted. Earthworm cultured soil has high level of micro and macro nutrients. It may be due to the presence of oil and other wastes from auto mobiles.

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