Cover Page

DOI: http://ijmer.in.doi./2021/10.08.89

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(5), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

STUDY OF DIVERSITY AND ABUNDANCE OF SOIL MICRO-FAUNA (NEMATODES AND MICRO-ARTHROPODS) IN THE FLOODPLAIN REGION OF SARAN DISTRICT, BIHAR

Kumari Renuka Srivastva
Research Scholar, J.P. University
Chapra, Bihar, India

Abstract

Floodplain regions host a variety of soil organisms including microflora and micro-fauna. Floods are usually seasonal. These add to the embankment regions a lot of humus and nutrients to the soil. In addition, presence of rich biota in such soil increases its quality. Soil microorganisms in these regions are extremely diverse and contribute to a wide range of ecosystem services that are essential for sustainable function of natural ecosystems. The soil biota can have direct or indirect impacts on land productivity. Even though most of the micro-fauna play an important role in decomposition of organic matter in floodplain soil, some of them act as parasite of crop plants. The soil of floodplain regions is chiefly inhabited by micro-fauna like nematodes and micro-arthropods. In this study we aimed to observe various soil micro-fauna of four different locations of floodplain region, with preference to their diversity and abundance. Diversity and distribution of soil micro-fauna was best explained in accordance with pH, organic matter content and moisture content of the soil. Soil samples were collected from four different sites located in the floodplain region of Saran district namely—Devaria (Revilganj), Karu Dharu (Manjhi), Rewari (Jalalpur), and Newaji Tola (Chapra). The samples were collected in fidderent seasons viz. summer, rainy and winter. The micro-fauna showed significant variation in their abundance with respect to season. Number of micro-fauna in the soil sample was maximum during rainy season while it was relatively low during summer and winter season. On the basis of observations, soil biodiversity of Karu Dharu (Manjhi) was maximum, and Newaji Tola (Chapra). Findings also revealed that soil with more abundant micro-fauna were more fertile, thereby indicating the role and importance of micro-fauna in maintaining the quality of soil.

Keywords: Soil Biota, Sustainable Functions, Micro-Fauna, Ecosystem Services.

Introduction

Floodplains are rich in biodiversity. Soil micro-fauna such as nematodes and micro-arthropods represent chief components of soil ecosystem of floodplain regions, acting and consumers and decomposers of microbial communities. Soil micro-fauna (<0.1 mm in size or diameter) consists of free-living protozoans, nematodes, rotifers and micro-arthropods, and are generally present in organic and mineral soil horizons. They live in water-filled spaces of the soil. Traditional methods of quantifying micro-fauna likely discriminate against rare populations, these with unique substrate and growth conditions, and less active populations, which makes comparisons of abundance difficult across methodology (Foissner, 1999; Coleman and Wall, 2007). Rotifers, nematodes and microarthropods are desiccate-resistant and hence, can thrive even in dry periods. As compared to protozoans and rotifers, nematodes have a much wider range of prey, including fungi and roots of higher plants. Soil fauna are categorised into three groups, on the basis of their size:

(i) **Macro-fauna**—like mice, moles, earthworms, ants, beetles, termites, spiders, etc. which are generally less than 2mm in diameter.
(ii) **Meso-fauna**—like Acari, collembolan, protura, diplura, symphyla, isopteran, etc. whose diameter ranges between 0.1 to 2mm.
(iii) **Micro-fauna**—like parotozoa, nematode, rotifer, etc whose diameter ranges between 0.001mm to 0.1mm.

For a holistic approach to soil biotic health, it is important to pair soil fauna population dynamics, abundance and community with soil nutrient processes.

Materials and Methods

Study Area

Research was conducted at four different floodplain sites of saran District of Bihar i.e., Devaria (Revilganj), Rewari (Jalalpur), Karu Dharu (Manjhi), and Newaji Tola (Chapra) is located at 25.784°N 84.7274°E. it has an average elevation of 36 merers (118 ft.). the floodplain region of Chapra is composed of fine loamy soil which is very fertile. The soil is suitable for the growth of rotifers, bacteriovorous nematodes and micro-arthropods.

Data Collection

Four different sites of Saran district (Devaria, Rewari, Karu Dharu, and Newaji Toal) were selected for sample collection. These samples consisted of four cores and were taken randomly with a soil anger (area-25cm^2, depth 15cm). the soil samples were collected during various seasons i.e., Winter (November-January), Summer (April-June) and Rainy season (July-September) of a

Cover Page

DOI: http://ijmer.in.doi./2021/10.08.89

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(5), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

calendar year 2019-2020. These variable periods were chosen in terms of temperature variation and availability of water in the soil, which affects the development of soil faunal communities. All the necessary data on micro-faunal type at various sampling sites were well documented. Hence, the data are representative of the study area.

Methods

The soil samples collected were naturally air-dried, compartmentalized, packed in different polythene bags and labeled with various related information like dated and place of sample collection. In the laboratory, three replicate 30-50gm dry mass samples from each plot were moisturized for 24 hours. This method is suitable and is used for quantifying all groups of microfauna, avoiding unfavourable conditions such as heat and light. Prior to counting, the soil samples of different sites were placed separately in Baermann funnels on open facial tissues. Sufficient water was added to the funnels and were left undisturbed for approximately 48 hours at room temperature. Each sample solution (about 5-10 ml) were collected in separate petriplates. In order to observe various microfauna, a drop of solution was placed on glass slide and its number was counted directly with the help of compound microscope with 25x magnification. This process was repeated several times. Similarly, these steps were carried out for sample solutions of remaining three sites. Several permanent slides were prepared during different seasons, for calculating the abundance of micro-fauna in the soil samples of different sites. These slides were labeled accordingly and preserved for future reference.

Results

The soil samples of various sites differ slightly in context of soil moisture, organic matter content and pH. Accordingly, slight variations were seen regarding abundance of micro-fauna in different soil samples.

Table-1: Various Soil Parameters of different Sites

Soil Parameter	Site 1Devaria	Site-2 Rewari	Site-3 Karu Dharu	Site-4 Newaji Tola
Soil moisture (%)	32	15	36	12
Organic Matter (%)	9.1	7.6	9.8	3.7
pH	6.7	6.5	6.6	6.2

On the basis of observation, data regarding abundance of microfauna at different sites were presented in the form of following tables:

Tabe-2 Micro-fauna observed at site-1 Devaria (Revilganj)

Microfauna	No. of micro-fauna observed in different seasons (per 10 ml sample solution) Winter	Summer	Rainy	Total no of micro-fauna observed	Seanonal Average no. of micro-fauna
Nematoda	10	11	12	33	11
Aphelenchoide bessey	10	12	14	36	12
A. ritzemabosi	09	08	16	33	11
A. araachidis	04	01	04	09	03
Micro-arthoopodss	07	09	14	30	10
Bugs	10	09	14	33	11
Mites					
Milipedes					

Table-3: Micro-fauna observed at Site 2 Rewari (Jalalpur)

Microfauna	No. of micro-fauna observed in different seasons (per 10 ml sample solution) Winter	Summer	Rainy	Total no of micro-fauna observed	Seanonal Average no. of micro-fauna
Nematoda	04	07	13	24	8
Aphelenchoide bessey	08	10	12	30	10
A. ritzemabosi	05	05	08	18	06
A. araachidis	02	01	03	06	02
Micro-arthoopodss	06	07	09	21	07
Bugs	13	12	14	39	13
Mites					
Milipedes					

Cover Page

DOI: http://ijmer.in.doi./2021/10.08.89

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(5), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

Table-4 Micro fauna observed at Site 3- Karu Dharu (Manjhi)

Microfauna	No. of micro-fauna observed in different seasons (per 10 ml sample solution) Winter	Summer	Rainy	Total no of micro-fauna observed	Seanonal Average no. of micro-fauna
Nematoda	11	13	15	39	13
Aphelenchoide bessey	12	15	18	45	15
A. ritzemabosi	10	10	16	36	12
A. araachidis	03	03	06	12	04
Micro-arthoopodss	08	10	15	33	11
Bugs	13	11	18	42	14
Mites					
Milipedes					

Table-5 Micro fauna observed at Site 4- Newaji Tola (Chapra)

Microfauna	No. of micro-fauna observed in different seasons (per 10 ml sample solution) Winter	Summer	Rainy	Total no of micro-fauna observed	Seanonal Average no. of micro-fauna
Nematoda	06	05	10	21	07
Aphelenchoide bessey	05	08	11	24	08
A. ritzemabosi	04	03	05	12	04
A. araachidis	01	00	02	03	01
Micro-arthoopodss	07	03	02	12	04
Bugs	11	05	08	24	08
Mites					
Milipedes					

Table-6 Seasonal average abundance of micro fauna at different sites of floodplain area of Saran

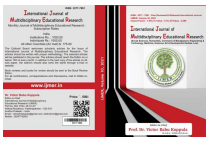
Microfauna	Seasonal Average no. of Micro-fauna in the Sample solution (per 10ml) Site-1	Site-2	Site-3	Site-4
Nematodes	11	08	12	07
Aphelenchoide bessey	12	10	15	08
A. ritzemabosi	11	06	12	04
A. araachidis	03	02	04	01
Micro-arthoopods	10	07	11	04
Bugs	11	13	14	08
Mites				
Milipedes				

Note: Minimum abundance 0-5
Average abundance 6-10
Maximum abundance 11-15

Conclusion

The present work was conducted at four different sites of floodplain region of Saran, Bihar. Due to less available data related to various components, an extensive research is carried out in different seasons of year 2019-2020, in order to observe the abundance of micro fauna in the soil. The abundance of micro-fauna depends largely on various physic-chemical properties of soil, like soil moisture, organic matter content and soil pH. Micro-fauna plays dual role in context to soil health. On the one hand, they decompose organic matter into simpler forms, thereby returning nutrients to their mineral forms. On the other hand, several of them actg as pathogen for different plants. The research carried out shows huge abundance of micro-fauna in different sites of floodplain region of Saran, which indicates its richness in context to biodiversity and soil fertility.

In conclusion, it is found that soil samples of all experimental sites differed slightly in their physic-chemical properties and in their micro-faunal communities. The abundance of these community varies with season. This study also showed that abiotic


Cover Page

DOI: http://ijmer.in.doi./2021/10.08.89

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881; IMPACT FACTOR :7.816(2021); IC VALUE:5.16; ISI VALUE:2.286
Peer Reviewed and Refereed Journal: VOLUME:10, ISSUE:8(5), August: 2021
Online Copy of Article Publication Available: www.ijmer.in
Digital certificate of publication: http://ijmer.in/pdf/e-Certificate%20of%20Publication-IJMER.pdf
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: 4th August
Publication Date:30th August 2021

variables are correlated with the composition of soil micro-fauna. The biotic community of the soil is determined, mainly by nutrient and organic matter content.

Reference

- C.J. Weston, K.L. Waittaker, 2004. Encyclopedia of Forest Sciences.
- Foissner, Wilhelm, 1999. Protist Diversity. Estimates of the near Imponderable.
- Trap, J., Bonkowski, M., Plassard, C. et al., 2016. Ecological importance of soil bacterivores for ecosystem functions.