

Assessment of the Prevalence and Diversity of Earthworm Species in Wheat Fields of Hoshangabad District, Madhya Pradesh

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ABSTRACT: This study investigates the prevalence and diversity of earthworm species in the wheat fields of Hoshangabad district, Madhya Pradesh, emphasizing their crucial role in maintaining soil health and enhancing agricultural productivity. Earthworms contribute significantly to soil structure, aeration, and nutrient availability, making their study essential for sustainable agriculture. A total of 88 earthworm specimens were collected using the digging and hand sorting method across five study areas, representing different agricultural practices, including stubble-burning and non-burning fields. The sampling involved triplicate collections over a surface area of 30 cm x 30 cm, with soil excavated to 30 cm deep. The results revealed that *Perionyx excavatus* was the most abundant species, comprising 25.9% of the total specimens, followed by *Lampito mauritii* at 18.5% and *Eudrilus eugeniae* at 14.8%. These species play vital roles in soil fertility through organic matter decomposition and nutrient cycling. While other species like *Metaphere houlleti* (11.1%) and *Polypheretima elongata* (4.9%) were identified, their lower prevalence suggests ecological factors affecting their distribution.

The findings indicate a healthy soil ecosystem, essential for sustainable farming practices. By providing insights into the existing soil fauna, this research informs better soil management strategies, reinforcing the importance of biodiversity in agriculture. In conclusion, this study highlights the critical role of earthworms in improving soil quality and promoting sustainable agriculture in the Hoshangabad district. Future research should explore their ecological roles and responses to various agricultural practices to optimize soil health and productivity.

Keywords: Assessment, Earthworm Species, Prevalence, Diversity, Wheat Fields, Hoshangabad District, Madhya Pradesh.

INTRODUCTION

Earthworms play a crucial role in maintaining soil health and enhancing agricultural productivity (Akhila & Entoori 2022). They are recognized as ecosystem engineers, influencing soil structure, aeration, and nutrient availability. In India, where agriculture is a primary livelihood, understanding the diversity and prevalence of earthworm species is particularly important for sustainable farming practices. Earthworms enhance soil fertility by breaking down organic matter and facilitating nutrient cycling, ultimately contributing to improved crop yields (Datta *et al.*, 2016). The conservation of soil habitat is the first step towards sustainable management of its biological properties, which determine long-term quality and productivity. It is generally accepted that soil biota, including earthworms, benefits soil productivity; however, little is known about the organisms that inhabit the soil and their specific functions within the soil ecosystem. Nutrient cycling is a vital function of the ecosystem and is essential for life on Earth (Veisi Nasab *et al.*, 2015). Studies conducted in recent years have shown increasing interest in developing

productive agricultural systems that utilize internal resources efficiently, thereby reducing input costs (National Research Council, 2010).

Earthworms, as part of the soil macrofauna, modify soil and litter environments indirectly through the accumulation of their biogenic structures. Their silent role in increasing soil fertility has been recognized since ancient times. Darwin was the first to observe and scientifically explain their actual role in the ecosystem, and his findings sparked interest in earthworms from the late nineteenth century (Vejdovsky 1884; Beddard, 1895).

The Hoshangabad district in Madhya Pradesh is primarily an agricultural region, with wheat being one of the main crops cultivated (Sharma and Sharma 2016). Understanding the impact of agricultural practices on earthworm populations in wheat fields is essential for sustainable agricultural management. While previous studies have documented various earthworm species across different agro-ecosystems in India, comprehensive studies focusing specifically on the Hoshangabad district and its wheat fields remain limited. This paper aims to assess the prevalence and diversity of earthworm species in the wheat fields of

Hoshangabad district, Madhya Pradesh. By mapping the existing soil fauna, we intend to provide valuable insights that can inform sustainable agricultural practices in the region.

MATERIAL AND METHODS

Field Selection for the Study: The study will be conducted in the Hoshangabad district of Madhya Pradesh, focusing on wheat fields. The selection of these fields aims to assess the impact of different agricultural practices on earthworm populations in various habitats.

Earthworm Sampling. Earthworms for this taxonomic study will be collected using the digging and hand sorting method (Jiménez *et al.*, 2006) which is a widely accepted technique for soil fauna sampling. Sampling will take place in five designated study areas within the Hoshangabad district, ensuring representation of the diverse habitats available. In each selected area, sampling will be performed in triplicate, utilizing a quantitative modified hand sorting method over a surface area of 30 cm × 30 cm. The soil will be excavated to a depth of 30 cm at each sampling point to collect the available earthworms. Upon collection, specimens will be fixed in 30% alcohol for approximately 2 minutes for anesthetization and will then be transferred to a 10% formalin solution for permanent preservation.

Identification of the collected earthworm specimens will be carried out with the aid of photographs, monographs, and existing literature on the subject, particularly referencing the work of Blanchart and Julka (1997).

Morphometric Analysis: After the collection of earthworm species, morphometric measurements will be conducted to gather relevant data (Lowe and Butt 2007). Measurements will include the total length, width, and other specific morphometric traits of the specimens. A tape measure and centimeter scale will be used for precise measurement to facilitate identification and comparison among the species collected. By employing these methodologies, the study aims to provide a comprehensive assessment of the prevalence and diversity of earthworm species in the wheat fields of Hoshangabad district, along with insights into how agricultural practices may influence soil health and biodiversity.

RESULTS AND DISCUSSION

The assessment of earthworm species in the wheat fields of Hoshangabad district revealed significant findings regarding their prevalence and diversity. A total of 88 earthworm specimens were collected, comprising several species, as illustrated in Table 1. Among the identified species, *Perionyx excavatus* exhibited the highest prevalence, with 21 individuals, accounting for 25.9% of the total samples (Rajpal *et al.*, 2014). Commonly known as the California Redworm, this species prefers moist, organic soils and is often found in decomposing plant material near the topsoil layer. Its effectiveness in processing organic waste makes it particularly valuable in composting systems,

where it significantly enhances soil fertility and structure, highlighting its importance in sustainable agriculture.

Table 1: Prevalence of Earthworm Species in Wheat Fields of Hoshangabad District, Madhya Pradesh.

Sr. No.	Species	Number	Prevalence (%)
1.	<i>Eudrilus eugeniae</i>	12	14.8
2.	<i>Lampito mauritii</i>	15	18.5
3.	<i>Metaphere houlleti</i>	9	11.1
4.	<i>Perionyx excavatus</i>	21	25.9
5.	<i>Polypheretima elongata</i>	4	4.9
6.	Other species	27	33.3

Following this, *Lampito mauritii*, referred to as the Indian Blue Worm (Ananthakrishnasamy & Gunasekaran 2014), was the second most abundant species, with 15 individuals representing 18.5% of the total. This species thrives in moist soils, including agricultural fields, and is commonly found in environments rich in organic matter. The activities of *Lampito mauritii* promote nutrient cycling and enhance soil properties, making it beneficial for sustainable farming practices.

Eudrilus eugeniae (Vijaya *et al.*, 2012), commonly known as the African Nightcrawler, was identified with 12 specimens, constituting 14.8% of the population. This earthworm thrives in tropical and subtropical regions, favoring moist, organic-rich soils. In agricultural settings, *Eudrilus eugeniae* contributes to soil health by efficiently breaking down organic waste. Known for its high reproduction rate, it is widely utilized in vermicomposting processes, making it a valuable ally for farmers aiming to improve soil fertility and structure.



Eudrilus eugeniae



Eisenia fetida

Fig. 1. Photograph of Collected Earthworm Specimens of the present study.

Conversely, *Metaphere houlleti*, a lesser-known earthworm species, showed a prevalence of 9 individuals (11.1%). Although specific uses of *Metaphere houlleti* are not extensively documented, it plays a role in improving soil health and facilitating nutrient movement through its biological activities, similar to other recognized species (Vishwakarma and

Yadav 2017). *Polypheretima elongata* was the least prevalent among the listed species, with 4 individuals (4.9%). Frequently encountered in soils enriched with organic matter, such as those found in fields and gardens, this species contributes to soil aeration and nutrient cycling, albeit not as widely known as others. Interestingly, a diverse category labeled as "Other species" included 27 individuals, accounting for 33.3% of the total. This high percentage indicates a significant presence of various unidentified or less common earthworm species in the region. The diversity among species enriches soil ecosystems and enhances nutrient cycling, which can lead to improved agricultural productivity.

Overall, these earthworm species are essential for maintaining soil health by enhancing processes such as organic matter decomposition and nutrient cycling. The observed diversity reflects the varying ecological conditions within the wheat fields, influenced by management practices such as crop rotation and soil amendments. Assessing their prevalence and diversity, especially in agricultural environments like the wheat fields of the Hoshangabad district, provides valuable insights into the ecological health of the soil ecosystem and informs sustainable agricultural practices. The findings of this study emphasize the critical role that earthworms play in enhancing soil quality and promoting sustainable agriculture. Future research should focus on the ecological roles of these species and their responses to different agricultural interventions to further enhance soil management strategies in the region.

CONCLUSIONS

This study assessed the prevalence and diversity of earthworm species in the wheat fields of Hoshangabad district, Madhya Pradesh. A total of 88 specimens were identified, with *Perionyx excavatus*, *Lampito mauritii*, and *Eudrilus eugeniae* being the most prominent species. These earthworms play a vital role in enhancing soil fertility through organic matter decomposition and nutrient cycling. The findings highlight the importance of maintaining diverse ecological conditions in agricultural settings to support earthworm populations. The presence of various unidentified species indicates a healthy soil ecosystem, which is crucial for sustainable agriculture.

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Conflict of Interest. None.

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