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EARTHWORM BIODIVERSITY IN DIFFERENT LAND USE SYSTEM

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Abstract

Researches have proved that the occurrence of different species of earthworms in good numbers is a positive sign of healthy soil. Establishment of earthworm population makes the soil more compact and the poor structure of deep soil changes in to friable top soil. Twenty two species of earthworms are identified from different land use systems. The potential soil reclaiming species are Eutyphoeus incommodus, Eutyphoeus nicholsoni, Eutyphoeus waltoni, Octochaetona surensis, Amynthas morrisi, Metaphire posthuma and Lampito mauritii. Metaphire posthuma is very abundant in garden soils. Eutyphoeus nicholsoni is mostly confined to garden litter soil with medium and low population as deep burrowing species. Octochaetona surensis is very common in dense bamboo plantations. Amynthas morrisi is mostly confined to decomposing paddy straw and composting litter. The cultivated soils of sugarcane and jowar, the species association index of Eutyphoeus incommodus and Ramiella naniana is very high though Ramiella naniana is purely a geophagous species.
Seeds of earthworms can easily be transported if they are properly packed in vials with water soaked filter paper. The seeds will not hatch out within 10 days from the date of their laying.

Keywords: Cocoon; Earthworms; Land Use; Species.

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1. Introduction

Earthworms are one of the most important fauna of agro-ecosystems and they dominate the biomass of invertebrates in many soils of temperate and tropical regions of the world. More than hundred years ago, Darwin (1881) realized the value of earthworms as a major contributor to the formation of stable structural aggregates in soil. The benefits are now globally realized that earthworms can contribute much to the management of different pedo-ecosystems. They are useful in land reclamation, soil improvement and organic waste management in addition to their use as a protein-rich source of animal feed. Earthworms eat and mix large amount of soil or in

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burrows, depending upon the species concerned. Their casts contains high concentration of organic material, silt, clay and cations such as iron, calcium magnesium and potassium. Earthworms also release nitrogen into soil in their casts and urine. Earthworms change the physical characteristics of soil by aerating during rain or irrigation. Earthworms thus enhance incorporation and decomposition of organic matter, increase soil aggregate, improve porosity and water infiltration and increase microbial activity. All these studies are summarized by Edwards and Lofty (1977). However, more recently Edwards (1985), Baker *et.al*., (1997), Singh (1997), Edwards (1998), Janardan Singh and S.N. Rai (1998) and Indrajeet *et.al*., (1999) have emphasized on the qualitative index as well as on potentiality of earthworms.

Dinter *et.al.,* assess the earthworm field studies from six different European countries relealed that endogeic species are the dominant group. During last three decades various efforts have been made to explore the taxonomy, biology, population dynamics, behavior, ecology, physiology, ecotoxicology and biotechnology of earthworms. The composition of different species of earthworms in different soils has been studied by number of workers (Satchell, 1983, Singh, 1997). Julka and Paliwal (1986) have given a vivid description on the distribution of earthworms in northern mountains, Indo-Gangetic plain and Deccan peninsula of India but not in Indi-Gangetic plain of eastern part of Uttar Pradesh.

In retrospection of the above views, the aim of the present study is to identify the common species of earthworms and to study their qualitative composition from different agro-ecosystem in eastern part of Uttar Pradesh.

2. Materials and Methods

Earthworms were collected from eastern part of Uttar Pradesh. The following procedures were employed for collection of earthworms from different sites and to study their qualitative composition.

Study Area

The specimens of earthworms and the soil samples were collected from the Indo-Gangetic plain of eastern Uttar Pradesh. The districts selected in this region for study were Varanasi, Mirzapur, Allahabad, Ghazipur and Ballia. The different pedo-ecosystems in these districts were taken into consideration for the study.

Sampling Sites and Sampling Techniques

Samplings were done regularly from the garden soils, lawn soils, paddy fields, bamboo plantations, compost pits, sugarcane and jowar fields, decomposed paddy straw, kitchen channels and teak forests of Varanasi, Mirzapur, Allahabad, Ghazipur and Ballia districts.

The earthworm population were recorded with the help of a quadrate of 20X20 cm size. The soil was dug up to a depth of 20 cm. Soil samples were not dug beyond 20 cm depth as negligible number of worms were recorded beyond this zone. At a time 5 soil quadrate samples were dug and population of earthworms were sorted out. The earthworms were extracted by sieving and careful hand sorting. The sampled earthworms were thoroughly washed in fresh water and

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preserved in bottles containing 5-10% formalin. These bottles were brought to the laboratory and the collected earthworms were identified.

3. Results and Discussion

In total 22 species of earthworms belonging to 6 families were found from different pedo-ecosystems of Varanasi, Mirzapur, Allahabad, Ghazipur and Ballia districts of eastern Uttar Pradesh are listed in Table 1.

The species *Metaphire posthuma* was found most abundant in garden soil. Whereas, the species *Eutyphoeus incommodus* and *Eutyphoeus nicholsoni* were abundant in paddy field and garden soil. *Octochaetona surensis* was found abundant in bamboo plantation. *Ramiella bishambari* was found abundant in sugarcane and jowar field. The population of *Lampito mauritii* was found abundant in paddy field, compost pit, decomposed paddy straw and teak forest. *Metaphire posthuma* was found abundant in lawn soil and bamboo plantation. Whereas, the population of *Eutyphoeus incommodus* in garden soil, sugarcane and jowar field and decomposed paddy straw were found moderate. *Perionyx sansibaricus* was found moderate in garden soil and teak forest ad *Thatonia sambalpurensis* was moderate in kitechen channel. The species *Drawida calebi* in garden soil and teak forest, *Allolobophora parva* in lawn soil, *Glyphridrilus* sp. in paddy soil, *Malabaria* sp. in garden soil, *Ocnerodrilus occidentalis* in kitchen channel, *Dichogaster bolaui* in garden soil, lawn soil, paddy field, compost pit and kitchen channel, *Eutyphoeus incommodus* in compost pit, kitchen channel and teak forest, *Eutyphoeus waltoni* in garden soil, sugarcane and jowar field, kitchen channel and teak forest, *Lennogaster pusillus* in garden soil and kitchen hannel, *Octochaetona surensis* in sugarcane and jowar field and teak forest. *Octochaetona beatrix* in garden soil, paddy field and bamboo plantation, *Pellogaster bengalensis* in garden soil and teak forest, *Ramiella bishambari* in sugarcane and jowar field and kitchen channel, *Ramiella naniana* in garden soil and paddy field, *Ramiella sundargarhensis* in lawn soil and teak forest, *Amynthas morrisi* in garden soil and compost pit, *Amynthas diffringens* in garden soil, *Lampito mauritii* in sugarcane and jowar field and *Metaphire posthuma* in compost pit were nominally present.

In general *Metaphire posthuma, lampito mauritii, Eutyphoeus incommodus, Eutyphoeus nicholsoni, Octochaetona surensis, Dichogaster bolaui, Ramiella naniana* were found very common species in Indo-Gangetic plain of eastern Uttar Pradesh. It is evident from Table 1 that maximum numbers of species in this part of the country belong to family Octochaetidae. Nakamura (1968) reported the higher number of earthworms in autumn in the grassland sites of Japan. Julka and Paliwal (1986) have reported that occurrence of very few species of earthworms in Indo-Gangetic plain. Ismail (1986) pointed out that the highest and largest number of earthworms in Chennai varied in different months with respect to different localities. Baker *et.al*., (1997) recorded the highest number of earthworms in cultivated sites in month of August. Singh (1997) reported 11 species of earthworms from cultivated, non-cultivated grassland, garden and sewage sites from Uttar Pradesh. Singh and Rai (1998 and 2000) identified *Dichogaster bolaui, Eutyphoeus incommodus* and *Lampito mauritii* as major potential species on the basis of their relative abundance in a variety of habitats. This is somewhat in agreement to the present findings which can also be substantiated with reports of Edwards and Lofty (1977),

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Senapati *et.al*., (1979), Ghabbour and Shakir (1982), and Lee (1992). Sutar (2015) studied that earthworm abudance and diversity are reduced in agricultural fields compared to uncropped soil.

Table 1: Qualitative composition of earthworm species in Indo-Gangetic plain of eastern Uttar Pradesh

Family/Species	Garden Soil	Lawn Soil	Paddy Field	Bamboo Plantation	Compost Pit	Sugarcane & Jowar	Decomposed Paddy Straw	Kitchen Channel	Teak Forest
Family:Moniligastridae									
Drawida calebi	+								+
Family:Lumbricidae									
Allolobophora parva		+							
Family:Almidae									
Glyphridrilus sp.			+						
Family:Ocnerodrilidae									
Malabaria sp.	+								++
Ocnerodrilus occidentalis								+	
Thatonia sambalpurensis								++	
Family:Octochaetidae									
Dichogaster bolaui	+	+	+		+			+	
Eutyphoeus incommodus	++		+++		+	++	++	+	+
Eutyphoeus nicholsoni	+++					+		+	++
Eutyphoeus waltoni	+							+	+
Lannogaster pusillus	+							+	
Octochaetona surensis				+++		+			+
Octochaetona beatrix	+		+	+					
Pellogster bengalensis	+								
Ramiella bishambari	++					+		+	
Ramiella naniana	+		+		+++				
Ramiella sundargarhensis		+						+	

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Family:Megascolecidae									
Amynthas morrisi	+				+				
Amynthas diffringens	+								
Lampito mauritii			+++		+++	++	+++		+++
Metaphire posthuma	+++	+++		+++	+				
Perionyx sansibaricus	++							++	

+ - Present, ++ - Moderate, +++ - High

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