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A Complete Analysis of Physiochemical Properties, Microbial Diversity of Soil Along with Economically Important Plant Found in a Tropical Dry Deciduous Forest Debdarha, Bargarh, Odisha

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ABSTRACT

Devdarha is a tropical dry deciduous forest situated in Padampur subdivision of Bargarh district Odisha India. It is present near to Odisha Chhattisgarh border having Latitude 21.12035˚N and longitude 83.04503˚E. The forest is bisected by the Ong River. In this investigation there was an attempt had been made to analyze the physicochemical property of soil, Bacterial diversity of forest soil and Dominant economically important plant species found in Devdarha. In this investigation, it was found that soil was slightly acidic soil having a pH 6.8. High water holding capacity, moisture content, organic carbon content, NPK content indicate that it was fertile soil and luxuriant for plant growth. There were four different species of bacteria found among them *Rhizobium spp.* important for nitrogen fixation. Here we had found 32 economically important plant species belonging to 17 families. This type of investigation gives us an idea about the interaction of biotic and abiotic components of a typical forest ecosystem.

Keywords- Devdarha, dry deciduous forest, soil parameters, soil bacteria, phytodiversity

I. INTRODUCTION

Devdarha is a tropical dry deciduous forest situated in Padampur subdivision of Bargarh district Odisha India. It is present near to Odisha Chhattisgarh border having Latitude 21.12035˚N and longitude 83.04503˚E. The forest is bisected by the Ong River.

In this investigation, there was an attempt had been made to analyze the physicochemical property of soil, the Bacterial diversity of forest soil and the Dominant economically important plant species found in Devdarha. Khamari et.al. (2021) analyzed the biodiversity of tree species in a tropical dry deciduous forest and found 36 different types of plant species.

II. MATERIAL AND METHODS

Soil sampling

The soil samples were collected during the month June 2019 from the forest sites randomly and packed into sterile polythene bags. The stones were removed from the collected soil samples and then sieved. The sieved samples each (500g) were taken for nutrient analysis.

Determination of physicochemical properties of soil

Soil texture was determined by the Bouyouncos hydrometer method (Bouyouncos, 1962) and bulk density (Klute, 1988) by the soil core method. Water holding capacity was determined according to Keen's box method given in Piper (Piper, 1944), while soil moisture was determined by using a soil moisture meter. Soil pH and electrical conductivity were determined in a soil-water suspension using a digital pH meter and E.C meter respectively. Soil organic carbon was determined by dichromate oxidation and titration with ferrous ammonium sulphate (Walkley and Black, 1934) and total organic carbon by dry combustion method.

Nitrogen was estimated Kjeldahl method. Available and Exchangeable sodium and potassium were determined using a flame photometer (Jackson, 1958). Calcium and Magnesium were determined by EDTA titration. Soil nitrate and sulphate content were determined using colorimetric method.

Isolation of Bacteria

The soil bacteria were isolated by serial dilution technique on Potato Dextrose Agar (PDA). One gram of soil from the sample was suspended in 10 ml of sterile distilled water and mixed well. The suspension was serially diluted from 10-1 to 10-8. Spread plate technique was carried out to isolate the organism from

the diluted sample. 0.1 ml was pipette out onto plates with PDA and spread with a glass rod and incubated at 37°C for 24 hours in a BOD incubator. The colonies were isolated and maintained for further studies. Isolated unidentified bacteria assign with strain code (FAAB) and number.

Identification and Characterization of Bacteria

Isolated bacteria were identified based on shape, size, gram staining, various biochemical tests reflected in table no 3 Collins and Lyne (1989).

Identification of Dominant plants

In the course of the investigation, dominant plants were identified using relevant flora books (Haines, 1921-1925 and Saxena & Brahmam 1994-1996). The herbarium was prepared and preserved as per Jain & Rao (1977) for future reference.

III. RESULTS

Soil parameter reflected in table no-1, Soil nutrient given in table no-2, Soil bacteria given in table-3 and plant species given in table 4.

Table 1: Soil Properties

Parameters	Value
Sand (%)	49.03±1.14
Slit (%)	12.06±1.4
Clay (%)	41.02±1.06
Bulk density (gm/cm^{-3})	1.86±0.02
Water Holding capacity (%)	68.01±1.39
Moisture content (%)	24.61±1.02

Table 2: Soil pH and Nutrient analysis

Sl.No.	Parameter	Value
1.	pH	6.7±1.01
2.	EC(µS/cm.)	164.3±2.4
3.	Total Nitrogen(g/kg.)	45.06±1.7
4.	Phosphorous(µg/gm.)	0.39±0.04
5.	Potassium(g/kg.)	5.32±0.89
6.	Sodium(g/kg.)	0.32±0.01
7.	Nitrate(g/kg.)	0.23±0.02
8.	Sulphur(mg./kg.)	0.39±0.05
9.	Calcium(g/kg.)	0.17±0.01
10.	Magnecium(g/kg.)	0.39±0.06

Table 3: Morphology and biochemical TEST of bacterial isolates

NO	ISOLATE	MORPHOLOGY	Gram stain	Catalase test	MR test	VP test	Indole	Citrate	IDENTIFIED BACTERIA
1	FAAB01	Bacilli	-	+	-	+	-	+	*Klebsiella Spp.*
2	FAAB02	Cocci	+	+	-	-	-	-	*Streptococcus Spp.*
3	FAAB03	Rod	-	+	-	-	-	-	*Rhizobium Spp.*
4	FAAB04	Cocci	+	+	+	-	-	+	*Micrococcus Spp.*

Table 4: Plant Species

Sl. No.	**Scientific Name of the Species**	**Family**	**Local Name**
1	*Acacia catechu (L.f.) Willd.*	Leguminosae	Khair
2	*Azadirachta indica A. Juss.*	Meliaceae	Neem
3	*Boswellia serrata Roxb. exColebr.*	Burseraceae	Siali/sale
4	*Bridelia retusa (L.) A.Juss.*	Phyllanthaceae	Khais
5	*Buchanania lanzan Spreng.*	Anacardiaceae	Char
6	*Butea monosperma (Lam.) Taub.*	Leguminosae	Palsa
7	*Caesalpinia pulcherrima (L.) Sw.*	Leguminosae	Radha Chuda
8	*Careya arborea Roxb.*	Lecythidaceae	Kumbhi
9	*Casearia tomentosa Roxb.*	Salicaceae	
10	*Cassia fistula L.*	Leguminosae	Sunari
11	*Chloroxylon swietenia DC.*	Rutaceae	Veru
12	*Cleistanthus collinus (Roxb.) Benth. exHook.f.*	Phyllanthaceae	karla
13	*Dalbergia sissoo DC.*	Myrtaceae	Sisu
14	*Diospyros melanoxylon Roxb.*	Ebenaceae	Kendu
15	*Eucalyptus citriodora Hook.*	Myrtaceae	Euclipatas
16	*Gardenia latifolia Aiton*	Rubiaceae	Dum kurdu
17	*Gmelina arborea Roxb.*	Lamiaceae	Gambhri
18	*Haldina cordifolia (Roxb.) Ridsdale*	Rubiaceae	karma
19	*Helicteres isora L.*	Malvaceae	kanmurli

20	*Ixora parviflora Lam.*	Rubiaceae	Tel kuruan
21	*Madhuca indica J.F.Gmel.*	Sapotaceae	Mahul
22	*Morinda tinctoria Roxb.*	Rubiaceae	Achu
23	*Nyctanthes arbor-tristis L.*	Oleaceae	Gangsiuli
24	*Pongamia pinnata (L.) Pierre*	Leguminosae	Karanj
25	*Shorea robusta Gaertn.*	Dipterocarpaceae	Sal
26	*Syzygium cumini (L.) Skeels*	Myrtaceae	Jam
27	*Tectona grandis L.*	Verbenaceae	Saguan/Teak
28	*Terminalia bellirica (Gaertn.) Roxb.*	Combretaceae	Bahada
29	*Terminalia chebula Retz.*	Combretaceae	Harda
30	*Terminalia tomentosa Wight &Arn.*	Combretaceae	sahaj
31	*Woodfordia fruticosa (L.) Kurz*	Lythraceae	Dhatuki
32	*Ziziphus xylopyrus (Retz.) Willd.*	Rhamnaceae	Buro

IV. CONCLUSION

In this investigation, it was found that soil was slightly acidic soil having a pH 6.8. High water holding capacity, moisture content, organic carbon content, NPK content indicate that it was fertile soil and luxuriant for plant growth. There were four different species of bacteria found among them *Rhizobium spp.* important for nitrogen fixation. Here we had found 32 economically important plant species belonging to 17 families. These types of investigation give us an idea about the interaction of biotic and abiotic component of a typical forest ecosystem.

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