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**ANALYSIS OF SOIL PHYSICO-CHEMICAL CHARACTERISTICS  
FOR ENVIRONMENTAL ASSESSMENT IN SUBHASH NAGAR,  
AMBIKAPUR, CHHATTISGARH INDIA.**

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**ABSTRACT:**

The present study aims to analyze the physico-chemical characteristics of **topsoil (15-30 cm depth)** in Subhash Nagar, Ambikapur, Chhattisgarh, India, for environmental assessment. Topsoil is the most active and productive layer of soil, playing a crucial role in nutrient cycling, plant growth, and ecological balance. Soil samples were collected from selected sites within the study area and analyzed using standard laboratory procedures. Key parameters such as soil texture, moisture content, bulk density, pH, electrical conductivity (EC), organic carbon, and essential nutrients including nitrogen (N), phosphorus (P), potassium (K), and micronutrients (Fe, Zn, Mn, Cu, and B) were determined. The results indicated that the topsoil is generally **slightly acidic to neutral in nature**, with low to moderate electrical conductivity, suggesting non-saline conditions. Organic carbon content was found to be moderate, reflecting fair biological activity and fertility status. Macronutrient analysis revealed variable levels of nitrogen, phosphorus, and potassium, while micronutrient concentrations were mostly within acceptable limits, with minor deficiencies in some locations. The observed variations in soil properties are influenced by land use practices, organic matter content, and anthropogenic activities. The study concludes that the topsoil of Subhash Nagar exhibits **moderate fertility and stable environmental conditions**, making it suitable for agricultural and ecological purposes with proper soil management. The findings

serve as baseline data for environmental monitoring, soil conservation, and sustainable land use planning in the region.

**KEYWORDS:** Soil Physico-Chemical Properties, NPK Nutrient Status, Soil pH and Electrical Conductivity.

## INTRODUCTION:

Soil is a vital natural resource that supports terrestrial ecosystems, agricultural productivity, and environmental sustainability. It acts as a medium for plant growth, a reservoir of nutrients, and a regulator of water and biochemical cycles. The physico-chemical characteristics of soil, such as texture, structure, pH, electrical conductivity (EC), organic matter content, and nutrient availability, play a significant role in determining soil fertility and environmental quality. Understanding these properties is essential for evaluating soil health and ensuring sustainable land use practices.

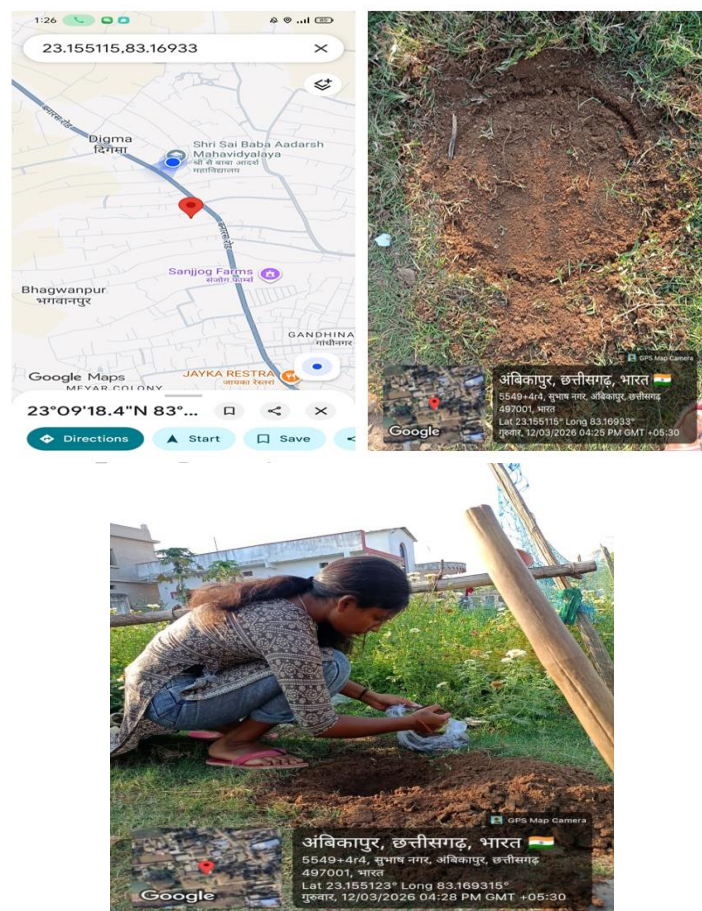


Figure 1: Study area and soil sample.

In recent years, increasing urbanization, agricultural intensification, and anthropogenic activities have led to noticeable changes in soil properties. These changes can affect nutrient balance, soil structure, and overall ecosystem functioning. Therefore, systematic assessment of soil physico-chemical characteristics is necessary to monitor environmental conditions and to identify potential degradation or contamination. Subhash Nagar, located in Ambikapur city of Surguja district in Chhattisgarh, India, represents a region with mixed land use, including residential areas, agricultural fields, and open lands. Such variability in land use can significantly influence soil properties due to differences in organic inputs, waste disposal, and human activities. However, limited scientific data is available regarding the soil quality of this specific area, highlighting the need for a detailed investigation. The present study focuses on the analysis of physico-chemical characteristics of soil in Subhash Nagar for environmental assessment. By examining key parameters such as pH, EC, organic carbon, macronutrients (nitrogen, phosphorus, potassium), and micronutrients (iron, zinc, manganese, copper, and boron), the study aims to evaluate soil fertility status and its suitability for agricultural and environmental purposes. The findings of this research will provide baseline information for future monitoring, soil management strategies, and sustainable development planning in the region.

## **MATERIALS AND METHODS:**

### **Soil Sampling:**

Following standard sampling procedures, soil samples were collected from a depth of 15–30 cm using a soil auger. The samples were air-dried, ground, and sieved through a 2 mm sieve to remove debris and stones. Subsequently, the sample was quartered, and one portion was sieved through a 0.5 mm sieve. This portion was then quartered again, and one part was sieved through a 0.02 mm sieve.

### **Materials Used:**

Standard laboratory equipment and chemicals were utilized, including a pH meter, electrical conductivity meter, weighing balance, oven, glassware, and reagents necessary for nutrient analysis.

### **Analytical Methods:**

The soil pH value was determined using a digital pH meter in a 1:2.5 soil-water suspension. Electrical Conductivity (EC) was measured using a conductivity meter. Organic carbon was assessed using the 'Walkley and Black method.' Available nitrogen was determined using the 'Alkaline Permanganate method.' Available phosphorus was analyzed using the 'Olsen

method.' Available potassium was assessed using a flame photometer. Micronutrients such as zinc, iron, copper, and manganese were analyzed using standard extraction methods.

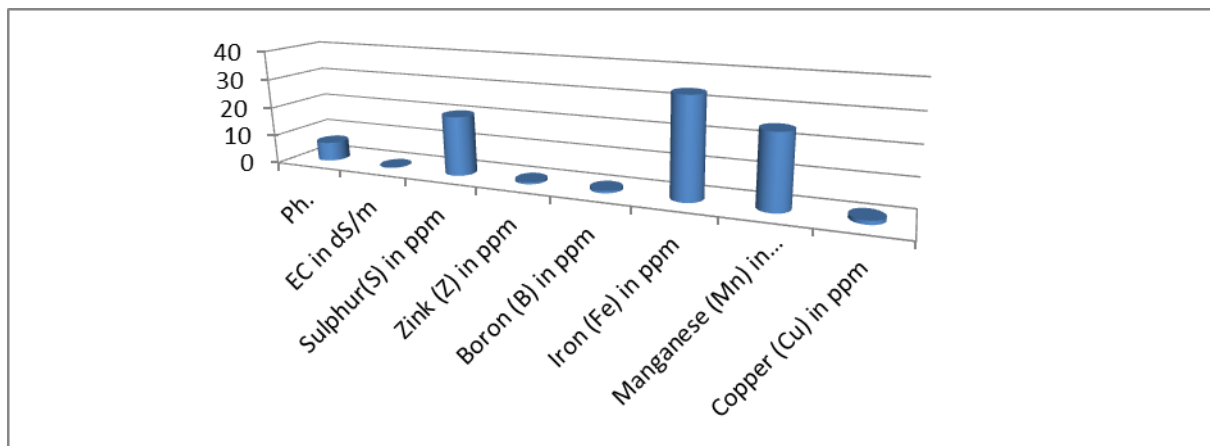
**Data Analysis:**

Observations derived from the analysis of the soil samples are as follows:

**Table 1: Physico-chemical properties of soil sample taken from Dhanpuri village.**

Ph.	EC in dS/m	Sulphur(S) in ppm	Zink (Z) in ppm	Boron (B) in ppm	Iron (Fe) in ppm	Manganese (Mn) in ppm	Copper (Cu) in ppm
5.1	0.11	25.4	0.71	0.8	31.6	25.4	1.38

**RESULTS AND DISCUSSION:**



**Graph: 1: All Physico-chemical properties of soil sample.**

The analyzed soil sample shows a **pH of 5.1**, indicating moderately acidic soil conditions, which can influence nutrient availability and microbial activity (Brady & Weil, 2016). The **electrical conductivity (EC) of 0.11 dS/m** suggests low salinity, indicating that the soil is non-saline and suitable for most crops without salinity stress (Richards, 1954). The **sulphur content (25.4 ppm)** falls within the adequate range, supporting proper plant growth and protein synthesis (Havlin et al., 2014). Similarly, **zinc concentration (0.71 ppm)** is near the critical limit, indicating marginal sufficiency, which may require monitoring to prevent deficiency symptoms in sensitive crops (Alloway, 2008). The **boron level (0.8 ppm)** is within the optimal range, playing a key role in cell wall formation and reproductive growth of plants (Gupta, 1993). The **iron content (31.6 ppm)** is sufficiently high, which is typical in acidic soils due to increased solubility, ensuring adequate availability for plant uptake (Lindsay, 1979). The **manganese concentration (25.4 ppm)** is also adequate, as acidic conditions enhance its availability, supporting enzymatic functions in plants (Kabata-Pendias,

2011). The **copper content (1.38 ppm)** is within a sufficient range, contributing to various physiological processes such as photosynthesis and respiration (Alloway, 2013).

#### CONCLUSION:

Based on the analyzed parameters, the soil exhibits a **moderately acidic pH (5.1)** and **low electrical conductivity (0.11 dS/m)**, indicating non-saline conditions suitable for most crops. The availability of essential nutrients such as **sulphur, boron, iron, manganese, and copper** is within adequate ranges, supporting healthy plant growth and metabolic activities. However, **zinc (0.71 ppm)** is close to the critical limit, suggesting a possibility of deficiency in sensitive crops over time. The acidic nature of the soil enhances the availability of micronutrients like iron and manganese but may limit overall crop productivity if not managed properly.

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