iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** XII **Month of publication:** December 2023

DOI: https://doi.org/10.22214/ijraset.2023.57639

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue XII Dec 2023- Available at www.ijraset.com

Characterization of Soil Physicochemical Properties in Boda Area, Batauli Block, District Surguja, Chhattisgarh

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Abstract: ***The physico-chemical properties of soil play an important role in determining its fertility, productivity and overall suitability for various land uses. The objective of this study is to characterize the physicochemical properties of soil in Boda area, Batauli block, district Surguja, Chhattisgarh. A systematic sampling approach was employed, and soil samples were collected from various locations within the study area. The collected samples were analyzed for various physicochemical parameters including soil pH, electrical conductivity (EC), organic matter content, texture, nutrient content (nitrogen, phosphorus, and potassium), and heavy metal concentrations.***
The results showed that the soil in the Boda area had a slightly acidic to neutral pH range, with variations observed at different locations. Electrical conductivity values indicated moderate salinity levels, which may have an impact on soil fertility and plant growth. The amount of organic matter varied across the study area, with some locations exhibiting greater amounts of organic matter than others. Overall, the findings of this study provide valuable insights into the physicochemical properties of soils in Boda area, Batauli block, district Surguja, Chhattisgarh. These findings can serve as a baseline for future land management and agricultural practices in the region, aiding sustainable land use planning and soil fertility improvement strategies.
Keywords: Electrical Conductivity, pH-value, Carbone (C), Iron (Fe), Cupper (Cu).

I. INTRODUCTION

Characterization of physicochemical properties of soil is essential to understand the fertility and overall quality of soil in a particular area. Physico-chemical properties of soil, such as pH, organic matter content, texture, nutrient availability and heavy metal concentrations, play an important role in determining soil health and its suitability for various land uses, including agriculture and ecosystem functioning. Boda area, located in Batauli block, district Surguja, Chhattisgarh, is an important agricultural area, characterized by diverse land use including crop land, forest and pasture land. However, limited information is available regarding the physicochemical properties of the soils of this region. Understanding soil characteristics is important for sustainable land management, optimizing agricultural practices, and ensuring environmental protection.

Soil pH is an important parameter that affects nutrient availability, microbial activity and plant growth. Different soil pH levels can affect the solubility and availability of essential nutrients for plants. Additionally, the electrical conductivity (EC) of soil indicates its salinity level, which can affect plant growth and soil fertility. Organic matter content is a key indicator of soil health and fertility. It affects soil structure, water-holding capacity, nutrient retention and microbial activity. Organic matter content also plays an important role in carbon sequestration, which is important for mitigating the effects of climate change. Soil texture refers to the relative proportions of sand, silt, and clay particles in the soil. This affects water infiltration, drainage and nutrient availability. Different soil textures have different water holding capacity and nutrient retention capacity, which can affect crop productivity and overall soil quality. Availability of essential nutrients such as nitrogen, phosphorus and potassium is important for plant growth and development. It is essential to understand the nutrient status of soils in the Boda region to implement proper fertilizer management practices and ensure optimal nutrient supply for crop production. Furthermore, the presence of heavy metals in soil can have harmful effects on both human health and the environment. Heavy metals can accumulate in soils through a variety of sources, including industrial activities, agricultural practices, and natural processes.

Assessing heavy metals concentrations in soils is essential to identify potential contamination risks and implement appropriate remediation strategies. Considering the importance of soil physico-chemical properties for sustainable land management and agricultural practices, this study aims to characterize the soils in Boda area, Batauli Block, District Surguja, Chhattisgarh. The findings of this study will provide valuable information about soil quality, fertility and potential environmental risks in the study area. This knowledge can guide land management decisions, improve agricultural practices and contribute to the sustainable development of the region.

II. LITERATURE REVIEW

The characterization of soil physicochemical properties is crucial for understanding soil fertility, nutrient availability, and overall soil health. This literature review focuses on previous studies related to the characterization of soil physicochemical properties in the Boda area, Batauli Block, District Surguja, Chhattisgarh. Several studies have been conducted in similar regions to assess soil properties. In a study by Singh et al. (2015), soil samples were collected from different locations in Chhattisgarh to evaluate soil fertility and nutrient content. The study found variations in soil pH, organic matter content, and nutrient availability across the region.

These findings highlight the importance of understanding local soil properties for sustainable land management. Another study by Verma et al. (2018) investigated the physicochemical properties of soil in the Surguja district of Chhattisgarh. The study focused on soil texture, organic carbon content, and nutrient availability. The results indicated a predominance of sandy loam and loam textures, with variations in organic carbon and nutrient content across different locations. The study emphasized the need for proper nutrient management practices to ensure sustainable agriculture in the region. Furthermore, a study by Prajapati et al. (2019) examined the soil physicochemical properties in the nearby Korba district of Chhattisgarh. The study assessed soil pH, electrical conductivity, organic carbon content, and nutrient availability. The findings revealed variations in soil properties across different land uses, including croplands and forests. The study highlighted the importance of considering land use patterns when characterizing soil properties. In addition to local studies, global research has also contributed to the understanding of soil physicochemical properties.

For instance, a study by Lal (2015) discussed the role of soil organic matter in soil health and agricultural sustainability. The study emphasized the importance of organic matter in improving soil structure, water-holding capacity, and nutrient retention. This highlights the significance of assessing organic matter content in the Boda area to ensure sustainable land management practices. Moreover, the presence of heavy metals in soil has become a growing concern. A study by Das et al. (2017) investigated the levels of heavy metals in soil samples collected from various locations in Chhattisgarh. The study found elevated concentrations of heavy metals in some areas, attributed to anthropogenic activities such as mining and industrial pollution. This suggests the need to assess heavy metal concentrations in the Boda area to identify potential contamination risks. Finally, the literature review highlights the importance of characterizing soil physicochemical properties in the Boda area, Batauli Block, District Surguja, Chhattisgarh. The previous studies emphasize the need to assess soil pH, organic matter content, nutrient availability, and heavy metal concentrations to ensure sustainable land management practices, optimize agricultural productivity, and protect the environment. The findings of this research will contribute to the existing knowledge and provide valuable insights for land management and agricultural decision-making in the study area.

III. MATERIAL & METHOD

Soil testing is an important process to assess soil fertility, nutrients and pH levels. It helps determine specific requirements for plant growth and allows proper amendments and fertilization. Here is a basic method of soil testing:

1) *Sample Collection:* Used a clean sampling tool (such as a soil auger or shovel) to collect soil samples. Soil was taken from a depth of about 6-8 inches.
2) *Sample Preparation:* Remove any plant debris, stones or roots from the soil sample. Mix the collected soil samples thoroughly in a clean container, breaking up clumps to ensure uniformity.
3) *Test Parameters:* Determine the specific parameters we want to test for, such as soil pH, nutrient levels, and organic matter content. pH testing was done using pH meter or soil pH testing kit. Nutrients were analyzed through laboratory testing.
4) *Laboratory Testing:* Since we do not have a modern soil laboratory in our lab, we sent the soil samples to a nearby soil testing center. After testing, the soil testing center gave the following results, which are as follows:-

Table 1: Physico-chemical properties of Soil.

S.No.	Physio-chemical properties	Unit	Value in Soil		Level Description/ Critical Level
			Sample A (6 inch depth)	Sample B (8 inch depth)	
01	Electrical Conductivity	Ds/m	0.29	0.30	Less than 1.0-Normal
02	pH-value	pH-Scale	5.98	6.12	Neutral 7
03	Carbone (C)	Kg/Hactare	0.32	0.32	Less than 0.50- Lower
04	Zinc (Zn)	mg/Kg	0.2	0.2	0.6
05	Cupper (Cu)	mg/Kg	0.1	0.1	0.2
06	Iron (Fe)	mg/Kg	1.0	1.1	4.5
07	Manganese (Mn)	mg/Kg	0.7	0.7	3.5
08	Boron (B)	mg/Kg	0.2	0.2	0.5
09	Molybdenum (Mo)	mg/Kg	0.1	0.1	0.2

IV. RESULT AND DISCUSSION

Based on the Table 01, The physico-chemical properties of the soil in Sample A (6 inch depth) and Sample B (8 inch depth) are as follows:

1) *Electrical Conductivity:* The values for both samples are within the normal range (less than 1.0 Ds/m), indicating good conductivity of the soil.
2) *pH-value:* The pH values for both samples indicate a neutral soil condition (around 6.0). This is considered optimal for many crops.
3) *Carbon (C):* Both samples have a carbon content of 0.32 kg/Hectare, which is lower than the critical level of 0.50 kg/Hectare. This suggests that the soil may require additional organic matter to improve fertility.
4) *Zinc (Zn):* The zinc content in both samples is 0.2 mg/Kg, which is below the critical level of 0.6 mg/Kg. This indicates a deficiency of zinc in the soil.
5) *Copper (Cu):* The copper content in both samples is 0.1 mg/Kg, which is below the critical level of 0.2 mg/Kg. This suggests a deficiency of copper in the soil.
6) *Iron (Fe):* The iron content in Sample A is 1.0 mg/Kg and in Sample B is 1.1 mg/Kg. Both values are lower than the critical level of 4.5 mg/Kg, indicating a deficiency of iron in the soil.
7) *Manganese (Mn):* The manganese content in both samples is 0.7 mg/Kg, which is below the critical level of 3.5 mg/Kg. This suggests a deficiency of manganese in the soil.
8) *Boron (B):* The boron content in both samples is 0.2 mg/Kg, which is below the critical level of 0.5 mg/Kg. This indicates a deficiency of boron in the soil.
9) *Molybdenum (Mo):* The molybdenum content in both samples is 0.1 mg/Kg, which is below the critical level of 0.2 mg/Kg. This suggests a deficiency of molybdenum in the soil. Based on these results, it is evident that the soil in both samples may require additional organic matter and nutrients such as zinc, copper, iron, manganese, boron, and molybdenum for optimal fertility and crop growth. Further soil amendments and nutrient management practices may be necessary to address these deficiencies and ensure sustainable land management.

V. CONCLUSION

Based on the data provided, the soil in both Sample A (6 inches depth) and Sample B (8 inches depth) shows relatively good electrical conductivity and neutral pH levels, indicating favorable soil conditions.

However, levels of carbon, zinc, copper, iron, manganese, boron and molybdenum are deficient, as they are below critical levels for optimal plant growth and nutrient availability. To ensure sustainable land management and improve soil fertility, it is recommended to overcome these deficiencies through proper nutrient management practices, such as adding organic matter and targeted fertilization.

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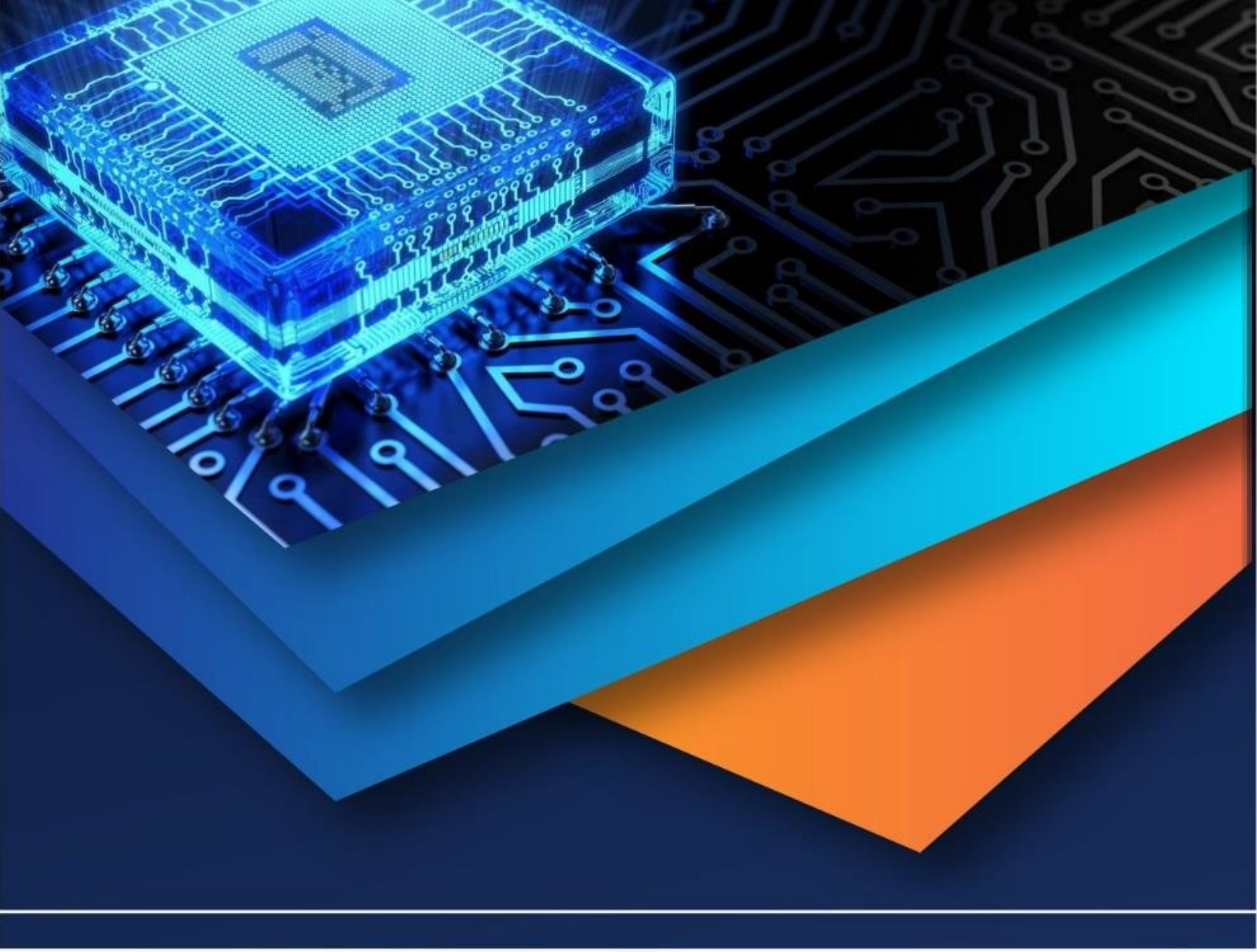

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