International Journal of Ecology and Environmental Research

Journal homepage: www.mcmed.us/journal/ijeer

ANALYTICAL STUDIES OF SOIL IN KABIRDHAM DISTRICT

Manish Upadhyay

Associate Professor & Head, Department of Chemistry, C.V. Raman University, Kota, Bilaspur, Chattisgarh, India.

Article Info

Received 25/10/2013
Revised 15/11/2013
Accepted 18/11/2013

Key words:
Deficiencies Toxicity, Loamy Soil, Parameters, Conductivity.

ABSTRACT

An investigation was carried out to study the soil properties at the pandaria block. The main objectives of this study is to collect information of soil type, slope, acidity viz. of the soil causes trace element deficiencies, N, P and K deficiencies, to study the physical and chemical properties, to know what soil pH & conductivity is and how it is calculated, Crop fertility, Understand and analyze the soil quality of Pandaria block. For this study 5 sampling points were selected those are Anwari, Kulhadi, Gatapar, Thuha and Kodapar. In this study we observed that there are four types of Soil in pandaria block which are kanhar, Bhata, Matasi, & Dorsa., Soil contain various element like N, P, K, Al3+,Mg2+ etc. By analyzing the taken Soil Sample, soil was Loamy Soil, which is also called Matasi, it has mixture of sand, slit and clay. pH & electrical conductivity of soil depends on the basis of mobility of ions and also the importance of soil depends on the basis of pH. By Studying to this soil sample we measure that the productivity of rice, oily seeds (ground nut, mustard) is best in this area. Maximum Matasi Soil Samples of Pandaria block have low water retention capacity & low fertility status. The non-saline nature of soil is due to the presence of carbonates & bicarbonates of Na+Ca2+,Mg2+,K+ and acidic nature is determined by the presence of chloride or sulphate salts of Na+ Mg2+ etc. High correlation between pH & Conductivity in soil is that pH values affect the conductivity. Conductivity based on salt ion mobility of soil. A decrease in the pH value decreases E.C. or any change in pH value induces a change or variability in the E.C with the help of this study we found the pH & conductivity of the soil. Moreover we also get to know about the nature of the soil (acidic or basic) and the type of ions found in it. So we concluded that the pH of this area is mainly below 6.5 to 8.5. This causes soil acidity and low productivity, whereas electrical conductivity of this area is mainly below to 1, which are well within the limit for the normal crop growth and it suggests that soil is not salty.

INTRODUCTION

A vast region of Chhattisgarh is covered by red & yellow soil. There are a number of types of soil found in Pandaria area but there are four major types namely Kanhar, Matasi, Dorsa and Bhata, which cover major portion of the total land area. The red colour of soil is generally related to unhydrated ferric oxide, and partially hydrated ions oxides. The yellow colour in soil is also due to oxides of iron. The soils of the region are deficient in important mineral nutrients like nitrogen, phosphorous, lime and potash, which are concentrated in the lower parts of the soil layer. However, the tropical red and yellow soils or the red sandy soils of the region possess texture suitable for growing crops. Data on area under different soil types was available from fifteen areas. We have derived data for the other areas from our maps. For the state as a whole, the predominant soil type is red and yellow loamy Soil. The percolation/water retention capacity, as well as the productive capacity of different soils, varies [1-5].

The following types of soils are found in Chhattisgarh: Kanhar (clayey): A low-lying deep bluish black soil with high moisture retention capacity. It is well suited for rabi crops, particularly wheat [6].

Corresponding Author

Dr. Manish Upadhyay
Email:- man_bsp@rediffmail.com

Matasi (sandy loamy): This is a yellow sandy soil, with an admixture of clay. It has limited moisture retention capacity. Though used for paddy, Dorsa (clay-loam): This type of soil is intermediate in terms of soil moisture retention between kanhar and matasi. This is best described as loamy and is a colour between brown and yellow.

Bhata (laterite): This soil is a coarse-textured, red sandy-gravelly soil, found on upland tops. It is deficient in minerals and other productivity enhancing nutrients [7].

STUDY AREA

Coordinates:22°04′N 81°41′E, Chattisgarh, India. The climate of Pandaria block in Chhattisgarh is mostly dry. The summer season is mostly warm and dry while the winter season is cool and pleasant. The ideal time for traveling to pandaria is during the autumn and winter seasons when the weather is fine It is situated between 200 42' N Latitude and 810 33' Longitude. The total area of the district is 2029 km² and it is 305 meters above the sea level. In the east, Satpura range is located. It is popularly known as Sihawa pahad [8-11].

SELECTION OF SAMPLING POINTS

For this study 5 sampling points were selected those are

Sampling Point	Code
Rohra	SN_1
Polmi	SN_2
Dashrangpur	SN_3
Hathmundi	SN_4
Mahka	SN_5

SAMPLING AND ANALYSIS

Different type of equipments can be used for sampling. Soil auger tube or knife or Khurpi and polythene bags are used for taking samples. Firstly Divide the field in to area so that each sample represents an area .A sample should be collected separately from areas which differ in soil colour. Clean the site from where soil sample is to be collected by removing un decomposed organic materials, garbage, etc. Scrap away the surface litter and insert sampling tube to a plough depth (above 15 cm) dig a V-shaped shaped hole to a plough depth. Take at least 05 samples randomly distributed over each area in a polythene [12-16].

The following methods are used for analysis of Soil samples:

S.No.	Nutrient	Method adopted
1	Soil Reaction(pH)	Glass Electrode (1:2.5 soil water suspension)
2	Soluble salts(EC)	Conductivity Bridge (1:2 soil water Suspension)
3	Organic Carbon	Colorimetric method (Datta *et al.*,1962)
4	Available Phosphorous	Brays and Kurtz P1 method(1945)
5	Available Potassium	Ammonium acetate extraction method

RESULTS AND DISCUSSION

Analysis results of Physical and chemical parameters of Soil samples of are mentioned in the below Table.

S. No.	Sampling site	pH	E.C(ds/m)	Nutrients		
				O.C.(Kg/ha)	P(Kg/ha)	K(Kg/ha)
1	SN1	5.7	0.34	0.20	2.50	272
2	SN2	5.6	0.07	0.22	3.00	75
3	SN3	5.5	0.13	0.24	4.00	111
4	SN4	5.5	0.07	0.21	5.00	179
5	SN5	6.0	0.05	0.25	3.50	168

Details of the same physico - chemical parameters determined in the soil from various sources of the different 5 soil samples are described below.

pH

The pH values were in the range of low 5.5 to high 6.0. Minimum pH was observed from Thuha soil and a maximum pH was observed from Kodapar village. The acceptable limit of pH value is between 6.5 to 8.5.

Electrical Conductivity

Electrical conductivity is a measure of the ability of solution to conduct electricity. It is related to the amount of conduct electricity. It is related to the amount of dissolved substance (or ions) in soil solution. It gives an indication of which minerals are present. Changes in conductivity over time may indicate changing soil quality. Soils have at least small amounts of various soluble salts in them .These salts may be acidic, neutral or basic. They may arise from different sources such as -

1. Primary minerals found in soil and in the exposed rocks of the earth crust and
2. Surface and ground waters.

The EC values were in the range of .05 to 0.34. Minimum EC was .05 observed from Kodapar village, and a maximum of .34 was observed from Anwari village. Beyond this range it will not affect the crop production.

Organic Carbon

Organic carbon are used to assess the amount of organic matter in soils Increasing soil organic carbon (SOC) can improve soil health and can help to mitigate climate change. Carbon consists of inorganic and organic carbon. The inorganic carbon, present as carbonate or bicarbonate ions, must be removed or quantified prior to the analysis of organic carbon. Once the inorganic carbon is removed, subsequent analysis of the sample aliquot assumes that all carbon remaining is organic. On the basis of different percentage of organic carbon it can be divided

in to low, medium and high. The organic carbon values were in the range of .20 to .25 Minimum was observed from Anwari village and maximum was observed from Kodapar. The organic carbon was lower in Anawari & high in Kodapar so the organic carbon value is medium effect; beyond this range the soil will affect crop productivity.

Phosphorus

Phosphorus (P) is an essential element classified as a macronutrient because of the relatively large amounts of P required by plants. Phosphorus is one of the three nutrients generally added to soils in fertilizers. One of the main roles of P in living organisms is in the transfer of energy. The Phosphorus values were in the range of 2.50 to 5.00. Minimum P was observed from Awari and maximum was observed from Jurda. So the Phosphorus value is low. Beyond this range the soil will affect crop fertility. On the basis of different percentage of phosphorus it can be divided in to low, medium and high.

Potassium

Potassium (K) is an essential nutrient for plant growth. Because large amounts are absorbed from the root zone in the production of most agronomic crops, it is classified as a macronutrient. Potassium is associated with movement of water, nutrients, and carbohydrates in plant tissue. If K is deficient or not supplied in adequate amounts, growth is stunted and yields are reduced. Some crops exhibit characteristic deficiency symptoms when adequate amounts of K are not available for growth and development. Potassium is mobile in plants and will move from lower to upper leaves. For corn, the margins of the lower leave turn brown. On the basis of different percentage of potassium it can be divided in to low, medium and high.

The Potassium values were in the range of 75 to 272. Minimum k was observed from Kulhadi and maximum K was observed from Anwari.

CONCLUSION

1. There are four types of Soil in pandaria block which are kanhar, Bhata, Matasi, & Dorsa, Soil contain various element like N, P, K, Al3+, Mg2+ etc.
2. By analyzing the taken Soil Sample, soil was Loamy Soil, which is also called Matasi, it has mixture of sand, slit and clay.
3. pH & electrical conductivity of soil depends on the basis of mobility of ions and also the importance of soil depends on the basis of pH.
4. By Studying to this soil sample we measure that the productivity of rice, oily seeds (ground nut, mustard) is best in this area.
5. Maximum Matasi Soil Samples of Pandaria block have low water retention capacity & low fertility status.
6. The non-saline nature of soil is due to the presence of carbonates & bicarbonates of Na^+,Ca^{2+},Mg^{2+},K^+ and acidic nature is determined by the presence of chloride or sulphate salts of Na^+, Mg^{2+} etc.
7. High correlation between pH & Conductivity in soil is that pH values affect the conductivity. Conductivity based on salt ion mobility of soil. A decrease in the pH value decreases E.C. or any change in pH value induces a change or variability in the E.C With the help of this study we find out that the pH value & conductivity of the soil. Moreover we also get to know about the nature of the soil (acidic or basic) and the type of ions found in it .The measurement of pH value is important because it is helpful in growing crops as they show proper and maximum growth at optimum pH. If the pH of the soil is found to be acidic then in order to neutralize its acidity farmers are advised to use CaCO3 in their land and if the pH is found to be basic then they are advised for the use of Gypsum for neutralizing the alkalinity of the soil. With the help of conductivity measurement we can find out the amount of soluble salts present in the soil. If it is above 3 then it hampers the process of seed germination as the soil becomes smooth and fine. In order to decrease the amount of salts in soil farmers are advised to have more and more amount of water so that its conductivity would decrease significantly. The pH value also helps to determine the presence of toxic elements present in the soil. Furthermore it tells about the effect of such element in the fertility of the soil. With the help of conductivity and alkalinity of the soil, presence of some elements and their effect on plant growth. Its increased content in soil produces toxic effect in plants. So we concluded that the pH of this area is mainly below 6.5 to 8.5. This causes soil acidity and low productivity, whereas electrical conductivity of this area is mainly below to 1, which are well within the limit for the normal crop growth and it suggests that soil is not salty.

REFERENCES

1. Tomar VS, Gupta GP and Kaushal GS. Oil resources and Agroclimatic zones of Madhya Pradesh. 37-38.
2. Mishra VN, Shrivastava LK, Samadhiya KV, Sanger SS. (2007). Soil Test Based Fertilizer Prescriptions for C.G., Depart of Soil Science, IGKV, Raipur (C.G.).
3. Sharma JP. Environment & Ecology, University Science Press Laxmi Publication, New Delhi.
4. Brady NC and Well RR. (2004). Element of the nature and properties of soils, Upper Saddle River, NJ; Prentice Hall. The latest version of this famous US textbook which ran into 13 editions! A very.
5. Thomas GW and Hargrove WL. (1984). The Chemistry of Soil Acidity and Liming 2nd ed., F. Adams (ed.) Agronomy Series No.12, American Society of Agronomy, Madison. 3-56.

6. Ghosh SK and Das SC. (1976). Acid Soil profiles. *Bull. Ind Soc. Soil Science*, 15, 145-156.
7. Nigam SP and Thakur RP. (1982). Detailed Soil Survey o Gej Tank, Project MP. Soil Survey Bilaspur Unit .Rep No.5.
8. Gallant A. (1997). Understanding the Importance of pH. Turf and Recreation Magazine. Gallant provides a further reference to the Illinois Agronomy Handbook 21, 1979-1980.
9. Mclean EO. (1973). Testing Soils for pH and Lime requirement .In: Soil Testing and Plant Analysis (Revised edition). Walsh LM and Beaton JD (eds.), Soil Science Society of America, Madison. 77-95.
10. Watson ME and Brown JR. (1998). pH and lime requirements. North Central Regional Research Publication. International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands. 221, 13-1668.
11. Soil Survey Staff. (1993). Soil Survey Manual (revised and enlarged edition). United States Department of Agriculture Handbook No.18 USDA, Washingtons.
12. Soil Survey Staff (1975). Soil Taxonomy – A basic system of Soil classification USADA Hand Book No. 436-Washington.
13. Bhaumic HD and Donahue RL. (1964). Soil Acidity and use of Lime in India. ICAR publication. Ministry of food and Agriculture, New Delhi.
14. Donahue RL, et al. (1964). Soil acidity and use of lime of India .ICAR. Publication. Ministry of food and agri, New Delhi
15. Jackson ML. (1973). Soil Chemical Analysis. Prentice - Hall of India Pvt. Ltd, New Delhi, 40.
16. Hesse PR. (1984). A Text book of soil chemical analysis, CBS Publisher and Distributers. Arrangement with chemical publisher Co-Inc USA.