Physico-Chemical Analysis of Soil Taken from Ultapani Water Sources, Mainpat Area of Surguja Division of Chhattisgarh, India

Article · February 2023

CITATION
1

READS
200

4 authors, including:

Shailesh Kumar Dewangan
Shri Sai Baba Aadarsh Mahavidyalaya Ambikapur
80 PUBLICATIONS **935** CITATIONS

SEE PROFILE

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 02 | February - 2023 Impact Factor: 7.185 ISSN: 2582-3930

Physico-Chemical Analysis of Soil Taken from Ultapani Water Sources, Mainpat Area of Surguja Division of Chhattisgarh, India

Shailesh Kumar Dewangan[1], Gopal Krishna Sharma[2], S.K.Srivasrava[3]

[1]Research scholar, Sant Gahira Guru Vishawavidyalaya, Surguja, Ambikapur(C.G.) and
Asst. Professor & HOD Department of Physics, Shri Sai Baba Aadarsh Mahavidyalaya Ambikapur(C.G.)

[2]M.Sc.-I Semester Physics, Shri Sai Baba Aadarsh Mahavidyalaya Ambikapur(C.G.)

[3]Dean, Sant Gahira Guru Vishawavidyalaya, Surguja, Ambikapur(C.G.)

Abstract:-

This research is a study of the physical and chemical properties of the soil of the water flowing in the Ultapani area of Mainpat, Chhattisgarh, so that we can get information about the chemical elements present in the soil here, which will help in knowing the reason for this water flowing upwards. . We will also try to know the nature of the soil found here in our research. During this research, we will collect soil samples from the research area and determine the presence and quantity of physico-chemical properties such as conductivity, pH-value, *Fe, Cu, Zn, Ca, Mg* (Dewangan et al.,2022), *S, N* etc. During the research, we visited the research area, collected samples, studied the physico-chemical properties of the samples in the lab and studied related research papers, articles and books. This research will benefit the villagers of that area in agriculture, it will help to find out the reason for the water flowing upwards. India as well as the world can be told about this wonderful place so that tourists come here and there is progress.

Keywords :- Conductivity, pH-value, Iron(Fe), Physical properties, Chemical properties etc.

INTRODUCTION: -

In Surguja district, Mainpat is a block in the northern region of Chhattisgarh state in India and is located about 55 kilometers from Ambikapur. The geographical distance of the Mainpat is 35 km from Darima airport and about 55 km from district headquarter Ambikapur in Surguja division. The height of the Mainpat hill is about 3560 feet from its base (Chaohan et al., 2022). The stream of water flows a distance of 200 meters towards the hill by removing the bottom of a small stone from the side of the road (Dewangan S.K.,2022). In this block, there is a place called Ultapani, in village Visarpani, which is situated 5 km before

Mainpat Kamleshwarpur chowk on the 3 km right side of the Ambikapur, Mainpat road. The altitude of the Ultapani, village Visarpani is 1085 meter above sea level in the world map, latitude of the Ultapani surface water source is located at 22052'40 " N and longitude at 83016'51" E. On field visit survey, we found that the groundwater level is very near to earth surface on the village Visarpani. In this area, there is a dense forest nearby, in some portion of the Mainpat large number of geographical changes are observed.

LITERATURE REVIEW:-

Soil electrical conductivity, referred to as EC, is the ability of soil to conduct (transmit) or attenuate electrical current. EC is expressed in milli-Siemens per meter (mS/m) or at times is reported in deci-Siemens per meter (dS/m) (Hawkins,2017). Over the years, soil scientists have used EC to measure soil salinity. However, soil EC measurements also have the potential for estimating variations in soil physical properties where soil salinity is not a problem, including texture, moisture, depth of top soil plus others. The important aspect to remember is that anything that affects conductivity in the soil will influence measurements, so it is important to ground reference to understand the driving variable(s) for soil EC measurements (Liyan,2022). Soil pH is a measure of the acidity or alkalinity of the soil. A pH value is a measure of hydrogen ion concentration. Because hydrogen ion concentration varies over a wide range, a logarithmic scale (pH) is used: for a pH decrease of 1, the acidity increases by a factor of 10. It is a 'reverse' scale in that very acid soil has a low pH and a high hydrogen ion concentration. Therefore, at high (alkaline) pH values, the hydrogen ion concentration is low. Most soils have pH values between 3.5 and 10. In higher rainfall areas the natural pH of soils typically ranges from 5 to 7, while in drier areas the range is 6.5 to 9. Soils can be classified according to their pH value.6.5 to 7.5—neutral, over 7.5—alkaline, less than 6.5—acidic, and soils with pH less than 5.5 are considered strongly acidic (Oshunsanya, S. O., 2018) It is concluded that study of soil quality can be carried out by different parameters. Most of the parameters are quite higher or lower than acceptable limits. Therefore, it is very important to put a total ban on the human activities which are responsible for soil quality deterioration (Kekane et al.,2015). The effect of soil aggregation on soil physical and chemical properties of structured soils both on a bulk soil scale, for single aggregates, as well as for homogenized material. The higher the amount of dissolved organic carbon in the percolating soil solution (Horn et al.,1994). Proposed indicators include soil depth to a root restricting layer, available water-holding capacity, bulk density/penetration resistance, hydraulic conductivity, aggregate stability, organic matter, nutrient availability/retention capacity, pH, and where appropriate, electrical

conductivity and exchangeable sodium(Arshad, M. A.,et al.,1992). An increase in the degree of compactness resulted in higher penetration resistance, lower air-filled porosity and smaller daily temperature fluctuations, a greater accumulation of roots in the topsoil and shallower rooting depth(Lipiec,et al., 2004).

Material & Methods:- We have used experimental Method in our Research as Methodology. During this time we took a soil sample 12 cm deep in the research found in the Ultapani water source, Block Mainpat, district Surguja. Determined the presence and quantity of Physico-Chemical properties such as Fe, Cu, Zn, Ca, Mg, Mn, B, Mo conductivity, pH-value etc. of the sample taken from research area which are as follows table (01) -

Table 1 :Physio-chemical properties of Ultapani

Sl.No.	Physio-chemical properties	Unit	Soil Ultapani	Level Description/ Critical Level
01	Electrical Conductivity	Ds/m	0.34	Less than 1.0-Normal
02	pH-value	pH-Scale	6.42	Neutral 7
03	Carbone (C)	Kg/Hactare	0.38	0.75
04	Zinc (Zn)	mg/Kg	0.2	0.6
05	Cupper (Cu)	mg/Kg	0.1	0.2
06	Iron (Fe)	mg/Kg	1.2	4.5
07	Manganese (Mn)	mg/Kg	0.6	3.5
08	Boron (B)	mg/Kg	0.2	0.5
09	Molybdenum (Mo)	mg/Kg	0.1	0.2

RESULT & DISCUSSION:-

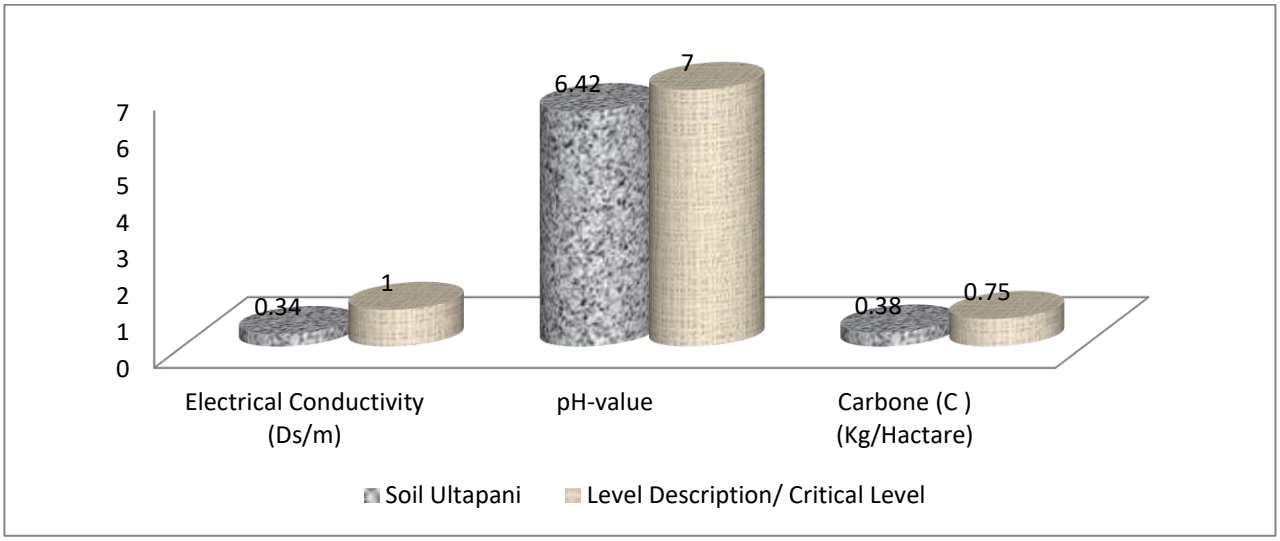

Figure 1 : value of electrical Conductivity, pH-value and Carbone with Critical level

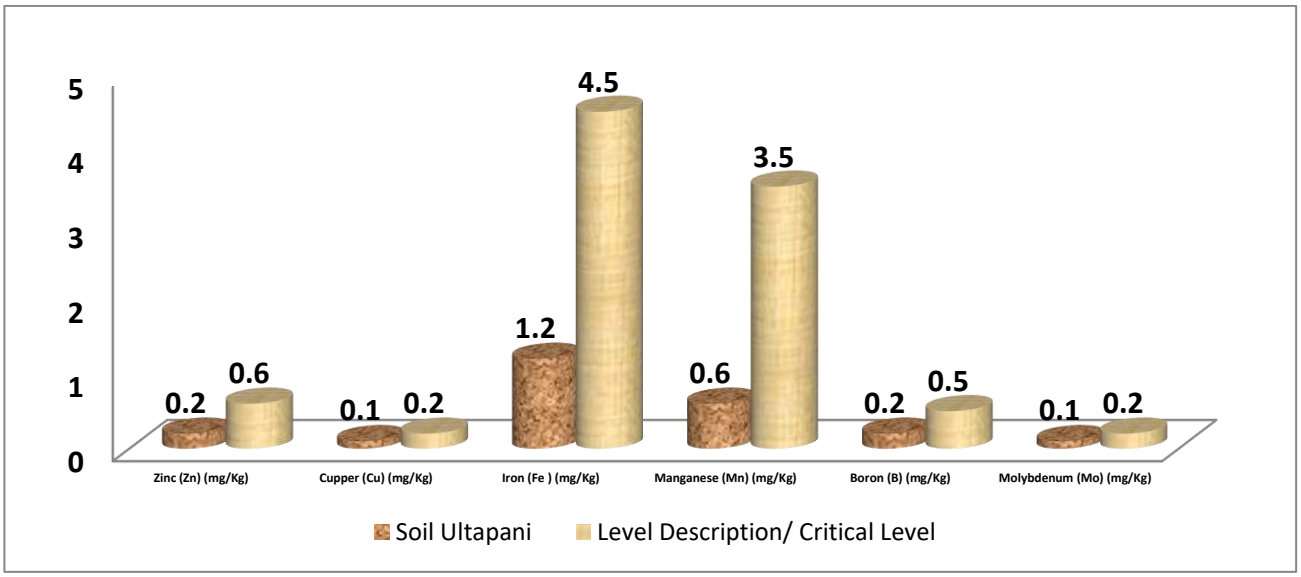

Figure 2 : value of Zn, Cu, Fe, Mn, B, & Mo with Critical level

The conductivity of the soil found in Ultapani water source was only 34% as compared to the critical level of conductivity of the normal level, so this soil would not be saline soil. The pH value of 6.42 was obtained, which means that the soil found in it is neutral. The carbon content was found to be 50% less than the critical level from Figure 1

The chemical properties of soil found in Ultapani water source were tested and Zn was found to be 33.3% less than the critical level, Cu was found to be only 50% of the critical level, Iron was found to be only 26. 6%, similarly Mn, B, and Mo achieved only 17.2%, 40%, and 50% of the critical level. The amount of all these chemical elements is very less, from Figure 1 .

Conclusion:-

- The conductivity of the soil found in Ultapani source is less than normal, hence the nature of the silt found here is not saline.
- The pH-value of the soil found in Ultapani source is a little less than the critical level, so the soil found here would be very less acidic.
- The amount of chemical elements Zn, Cu, Fe, Mn, B, & Mo in the soil found in Ultapani source was also found to be less than normal.

Reference:

1. Dewangan, S. K., Minj, A. K., & Yadav, S(2022). STUDY THE PHYSICO-CHEMICAL PROPERTIES OF SOIL OF BOUNCING LAND JALJALI MAINPAT, SURGUJA DIVISION OF CHHATTISGARH, INDIA. *International Journal of Creative Research Thoughts*,10(10), 312-315,Cross-ref.
2. Chaohan, S. K. D. B. R., Shrivastava, S. K., & Yadav, S. ANALYSIS OF PHYSICO-CHEMICAL PROPERTIES OF WATER TAKEN FROM ULTAPNI WATER SOURCES, MAINPAT AREA OF SURGUJA DIVISION OF CHHATTISGARH, INDIA. *GIS Science Journa,9(12), 175-180*. *Cross-ref*.
3. Dewangan, S. K. (2022). PHYSICAL PROPERTIES OF WATER OF ULTAPANI LOCATED IN MAINPAT CHHATTISGARH. *International Education & Research Journal [IERJ], p-19-20, 8*(8). Cross-ref. (Dewangan S.K.,2022)
4. Oshunsanya, S. O. (2018). Introductory chapter: relevance of soil pH to agriculture. In *Soil pH for Nutrient Availability and Crop Performance*. IntechOpen.3-6, Cross-ref.
5. Kekane, S. S., Chavan, R. P., Shinde, D. N., Patil, C. L., & Sagar, S. S. (2015). A review on physico-chemical properties of soil. *International Journal of Chemical Studies*, *3*(4), 29-32. Cross-ref.

6. Horn, R., Taubner, H., Wuttke, M., & Baumgartl, T. (1994). Soil physical properties related to soil structure. *Soil and Tillage Research*, *30*(2-4), 187-216. Cross-ref.
7. Arshad, M. A., & Coen, G. M. (1992). Characterization of soil quality: physical and chemical criteria. *American Journal of Alternative Agriculture*, *7*(1-2), 25-31. Cross-ref.
8. Lipiec, J., Tarkiewicz, S., & Kossowski, J. (1991). Soil physical properties and growth of spring barley as related to the degree of compactness of two soils. *Soil and Tillage Research*, *19*(2-3), 307-317. Cross-ref.
9. Thakur, T. K., Dutta, J., Upadhyay, P., Patel, D. K., Thakur, A., Kumar, M., & Kumar, A. (2022). Assessment of land degradation and restoration in coal mines of central India: A time series analysis. *Ecological Engineering*, *175*, 106493. Cross-ref.
10. Demir, Z. (2020). Effects of microbial bio-fertilizers on soil physicochemical properties under different soil water regimes in greenhouse grown eggplant (Solanum Melongena L.). *Communications in Soil Science and Plant Analysis*, *51*(14), 1888-1903.Cross-ref.
11. ohanty, M., Painuli, D. K., Misra, A. K., & Ghosh, P. K. (2007). Soil quality effects of tillage and residue under rice–wheat cropping on a Vertisol in India. *Soil and Tillage Research*, *92*(1-2), 243-250.Cross-ref.
12. Lapen, D. R., Topp, G. C., Gregorich, E. G., & Curnoe, W. E. (2004). Least limiting water range indicators of soil quality and corn production, eastern Ontario, Canada. *Soil and Tillage Research*, *78*(2), 151-170. Cross-ref.
13. Nunes, M. R., Karlen, D. L., & Moorman, T. B. (2020). Tillage intensity effects on soil structure indicators—A US meta-analysis. *Sustainability*, *12*(5), 2071. Cross-ref.
14. Lowery, B., Hickey, W. J., Arshad, M. A., & Lal, R. (1997). Soil water parameters and soil quality. *Methods for assessing soil quality*, *49*, 143-155. Cross-ref.
15. Asgarzadeh, H., Mosaddeghi, M. R., Mahboubi, A. A., Nosrati, A., & Dexter, A. R. (2010). Soil water availability for plants as quantified by conventional available water, least limiting water range and integral water capacity. *Plant and soil*, *335*(1), 229-244. Cross-ref.
16. Groenevelt, P. H., Grant, C. D., & Semetsa, S. (2001). A new procedure to determine soil water availability. *Soil Research*, *39*(3), 577-598. Cross-ref.
17. Zou, C., Sands, R., Buchan, G., & Hudson, I. (2000). Least limiting water range: A potential indicator of physical quality of forest soils. *Soil Research*, *38*(5), 947-958. Cross-ref.

18. Siegel-Issem, C. M., Burger, J. A., Powers, R. F., Ponder, F., & Patterson, S. C. (2005). Seedling root growth as a function of soil density and water content. *Soil Science Society of America Journal*, *69*(1), 215-226. Cross-ref.
19. Wu, L., Feng, G., Letey, J., Ferguson, L., Mitchell, J., McCullough-Sanden, B., & Markegard, G. (2003). Soil management effects on the nonlimiting water range. *Geoderma*, *114*(3-4), 401-414, Cross-ref.
20. Reichert, J. M., Morales, C. A. S., de Bastos, F., Sampietro, J. A., Cavalli, J. P., de Araujo, E. F., & Srinivasan, R. (2021). Tillage recommendation for commercial forest production: Should tillage be based on soil penetrability, bulk density or more complex, integrative properties?. *Geoderma Regional*, *25*, e00381. Cross-ref.
21. da Luz, F. B., Castioni, G. A. F., Tormena, C. A., dos Santos Freitas, R., Carvalho, J. L. N., & Cherubin, M. R. (2022). Soil tillage and machinery traffic influence soil water availability and air fluxes in sugarcane fields. *Soil and Tillage Research*, *223*, 105459. Cross-ref.
22. Neves, C. S. V. J., Feller, C., Guimarães, M. D. F., Medina, C. C., Tavares Filho, J., & Fortier, M. (2003). Soil bulk density and porosity of homogeneous morphological units identified by the cropping profile method in clayey Oxisols in Brazil. *Soil and Tillage Research*, *71*(2), 109-119. Cross-ref.
23. Bathke, G. R., Cassel, D. K., Hargrove, W. L., & Porter, P. M. (1992). Modification of soil physical properties and root growth response. *Soil Science*, *154*(4), 316-329.Cross-ref.
24. Dewangan, S. K., Minj, A. K., & Yadav, S(2022). STUDY THE PHYSICO-CHEMICAL PROPERTIES OF SOIL OF BOUNCING LAND JALJALI MAINPAT, SURGUJA DIVISION OF CHHATTISGARH, INDIA." International Journal of Creative Research Thoughts,10(10), 312-315, http://ijcrt.org/viewfull.php?&p_id=IJCRT2210499
25. Dewangan, S. K., Soni, A. K., & Sahu, K. (2022). STUDY THE PHYSICO-CHEMICAL PROPERTIES OF ROCK SOIL OF SANGAM RIVER, WADRAFNAGAR, SURGUJA DIVISION OF CHHATTISGARH, INDIA.International Journal of Research and Analytical Reviews,9(4), 119-121, http://ijcrt.org/viewfull.php?&p_id=IJCRT2210499
26. Dewangan, S. K., Yadav, R., & Haldar, R. (2022). STUDY THE PHYSIO-CHEMICAL PROPERTIES OF CLAY SOIL OF KANDORA VILLAGE OF JASHPUR DISTRICT, SURGUJA DIVISION OF CHHATTISGARH, INDIA. *EPRA International Journal of Research and Development (IJRD)*, *7*(11), 87-91., https://eprajournals.com/IJSR/article/9732,
27. Dewangan, S. K., Yadav,V, & Sahu, K. (2022). Study the Physio-Chemical Properties of Black Soil of Bahora Village of Jashpur District, Surguja Division of Chhattisgarh, India. *International Journal of Research Publication and Reviews*, *3*(11), 1962-1965.

.https://ijrpr.com/uploads/V3ISSUE11/IJRPR8037.pdf

28. Dewangan, S. K., Diptee Singh2 , Rekha Haldar3 Garima Tirkey4" "STUDY THE PHYSIO-CHEMICAL PROPERTIES OF HAIR WASH SOIL OF KARDANA VILLAGE OF JASHPUR DISTRICT, SURGUJA DIVISION OF CHHATTISGARH, INDIA. "International Journal of Novel Research and Development, Volume 7(11) November 2022,PP 13-17, https://www.ijnrd.org/papers/IJNRD2211103.pdf