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Study of Co-Relationship between the Soil pH and Organic Carbon

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Abstract- Organic carbon, is an essential tool for carbon sequestering in soil and also balancing carbon dioxide concentration in the atmosphere. Soil organic carbon indicates the soil quality such as organic matter and water holding capacity etc. Soil pH help in solubilizing mineral nutrient helping sustain agricultural process. This research paper mainly focuses on study area near mining zone and know the soil quality status with the help of these two parameters. In order to help in socio-economic benefit to local livelihood.

Keyword: pH, organic carbon, co-relationship, organic matter and water holding capacity.

Introduction

Because of agricultural production, soil is vital to life as we know it. It can lower the dangers of global warming and aid in maintaining the equilibrium of the earth's nutrient cycle. Anthropogenic activities like mining and other activities are to blame for the current decline in soil quality. Crop productivity will decline as a result of mining operations altering the physical and chemical characteristics of the soil. The primary focus of this study work is on soil physical parameters that aid in identifying early signs of soil deterioration. The pH of the soil is a crucial factor in determining its quality, including fertility and the biogeochemical process. The pH of the soil has a crucial role in controlling the availability of nutrients, which in turn supports primary productivity, microbial survival, and vegetation.(1)

The pH of the soil is influenced by a number of variables, including topography, the age of the rock, seasonal variations, and time scales. (2). Because low pH levels inhibit the actions of leguminous bacteria involved in nitrogen fixation, they decrease the rate at which nitrogen is absorbed (3).

Knowing the quantity of hydrogen and hydroxyl ions as well as the activity of the soil water system is aided by pH analysis. It serves as a gauge for the soil's acidic, alkaline, or neutral composition. (4). The organic carbon parameter is another crucial one. Because it shows the succession of various species on terrestrial ecosystems and maintains the carbon sequestration process, it aids in controlling the carbon cycle, which is crucial to the global climate change process.

A healthy pH of the soil will promote crop nutrient uptake and strengthen the crop root system, which will assist preserve the organic carbon in the soil. If the organic carbon content is within the specified range, properties such as aggregation, compaction, energy flow, surface sealing, microbial activity, and water penetration improve. Organic carbon is a sign of soil organic matter (6,7).

Study Area - The capital of coal mining is Dhanbad. Dhanbad is mostly known for its red soil, which is generally apathetic in nature. Dhanbad features a dry deciduous forest and a humid subtropical climate (8).

Due to human activities, the soil quality is not suitable for agricultural use. Samples were gathered close to the mining location in Digwadih. From the plot, three soil samples were taken for physical parameter measurement (pH and Organic Carbon). To assess the quality of the cultivation, sampling was done. In order to gather a soil sample throughout the summer, random systematic sampling was carried out.(9)

Fig: Map of Dhanbad

Material and Methodology: pH- 1:2.5 (w/v) soil to water ratio for the soil sample that was obtained. Put ten grammes of air-dry soil in a beaker. Add 25 millilitres of double-distilled water, give it a good shake with a glass rod for five minutes, and let it sit for thirty minutes. After a 30-minute break, switch on the pH metre and give it a 15-minute warming period. standardise the glass electrode by using pH 7, pH 4, and pH 9 buffer solutions. After calibration, wait 30 seconds after dipping the electrode in the soil solution. Take note of the reading. (11)

Organic carbon (Walkley & Black method)- Weigh 1.0g air dried soil sample (0.2mm) into 500ml Erlenmeyer flask. Add 10 ml of 0.167 M $K_2Cr_2O_7$ and swirl the flask gently to disperse the soil in the solution and 20 ml conc. H_2SO_4, the swirl the flask for 1 minute and minimize heat loss, allow the flask to stand on an insulated sheet for 30 minutes in a fume hood. Then add slowly 200ml of distilled water to the flask and 10 ml of 85% H_3Po_4. Add 1ml of diphenylamine sulfonate indicator. Colour changes to deep violet-blue. Take 0.5 M $FeSO_4$ solution in 50 ml burette and titrate it till the end point i.e., the colour changes sharply to brilliant green (11).

Results- The results after the analysis process of sample are given below. The soil sample was analysed by pH meter and organic carbon measured by titration process. The value of both physical parameters is given in table below:

Table 1- pH and Organic value given in log value given below:

Sl. No	pH	OC (%)
1.	6.35	1.235
2.	6.32	1.238
3.	6.24	1.240

The regression equation of organic carbon shows the significant negative co- relationship between the pH and organic carbon in the experimental soil sample (12).

Discussion- The pH value of soil sample is 6.24 minimum and maximum 6.35. and organic carbon is minimum 1.235 and maximum 1.240. Regression value is 0.571. soil sample is acidic in nature due to mining activity. organic carbon good in soil.

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