Research Article

Physico-Chemical Properties of Soil Collected from Chandrabhaga River in Kalmeshwar, Nagpur, Maharashtra

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I N F O

A B S T R A C T

Soil, itself means Soul of Infinite Life. Soil is the naturally occurring unconsolidated or loose covering on the earth's surface. Physical properties depend upon the amount, size, shape, arrangement, and mineral composition of soil particles. It also depends on the organic matter content and pore spaces. Chemical properties depend on the Inorganic and organic matter present in the soil. Soils are the essential components of the environment and foundation resources for nearly all types of land use, besides being the most important component of sustainable agriculture. Therefore, assessment of soil quality and its direction of change with time is an ideal and primary indicator of sustainable agricultural land management. Soil quality indicators refer to measurable soil attributes that influence the capacity of a soil to function, within the limits imposed by the ecosystem, to preserve biological productivity and environmental quality and promote plant, animal and human health. The present study is to assess these soil attributes such as physical and chemical properties season-wise.

Keywords: Physicochemical Properties, Soil, Sediment, Kalmeshwar

Introduction

Soil is the essential component of the environment and foundation resources for nearly all types of land use, besides being the most important component of sustainable agriculture. Therefore, assessment of soil quality and its direction of change with time is an ideal and primary indicator of sustainable agricultural land management. Sediment is the loose sand, clay, silt, and the soil particles that settle at the bottom of a body of water (Sarkar and Haldar, 2010). It can come from soil erosion or from the decomposition of plants and animals. The fertility of the soil is affected by various physical, chemical, and biological properties of soil. The soil's physical properties mainly soil texture and chemical properties such as pH, lime,

Electrical Conductivity (EC), and organic matter content and concentrations of macro- micronutrients mainly determine the soil fertility and its productivity. Soil makes up the "thin" layer of the earth where we live. The soil supports the plants that provide us with food, fiber, and forest products. Because the soil is located at the interface where the atmosphere and land meet, the soil acts like a policeman directing traffic by determining the amount of the rain that runs off and the amount of the rain that enters the soil. The soil stores and purifies water. Many waste products and chemical pesticides are destroyed by soil microorganisms. Soil that wanders about as sediment in waters or as dust in the air contributes to the pollution of our environment. Since the production of our food and the quality of our environment are so importantly related to the wise use of

Watkar AM
J. Adv. Res. Alt. Energ. Env. Eco. 2020; 7(2)

2

the soil, it is very important that all of us know some basic facts and ideas about the soil. The aim of the present study is to analyse the physic-chemical properties of nearby soil of the Chandrabhaga River.

Material and Method

The soil and water samples were collected from the site of Chandrabhaga River from January 2016 to June 2016. The collected samples of soil have been analysed to determine their physico-chemical characteristics. The soil samples were collected in the morning hours during the study period. The temperature and pH parameters were recorded in the field. Samples were collected in cleaned acid-washed plastic bottles and sterilized plastic bags and stored at 4°C. The

Chloride: Chloride exhibits a wide and high concentration range. This may be attributed to anthropogenic activities. In this analysis chloride values ranged between 52.2–293 mg/l. The decrease in chloride levels during the rainy season might be as a result of increased volume and subsequent dilution of a water body due to rainfall.

Nitrate: Nitrogen exists in the soil system in many forms and changes (transforms) very easily from one form to another. The values of nitrate ranged between 0.010–0.043. Nitrate values were higher during the rainy season and minimum during winter due to the heavy rain off of the organic matter from the catchments.

Phosphate: The value of phosphates ranged between 0.09–

Table 1.Monthly variation in physico-chemical properties of soil (mg/l) near Chandrabhaga River during January–June 2016.

Parameter→ Months↓	pH	EC (ms/cm)	Alkalinity	Chloride	Nitrate	Phosphate	Organic Matter
July	7.8	1.981	146	52.2	0.021	0.21	0.14
August	7.7	2.912	152	73	0.043	0.09	0.17
September	8.0	2.675	278	81.6	0.027	0.25	0.48
October	8.3	1.592	298	134	0.018	0.36	0.46
November	8.9	1.566	164	189.2	0.015	0.48	0.42
December	8.1	1.683	144	293	0.010	0.57	0.26

soil samples have been analysed for various parameters like pH, electrical conductivity (EC), etc. as per the standard methods of APHA (2005) and Trivedy and Goyal (1986).

Observation

Result and Discussion

pH: pH values ranged between 7.7 and 8.9 during the analysis period.

The pH of soil samples indicates that the soil is alkaline in nature. A pH value of near-neutral is suitable for the growth of diverse bacterial populations. The most appropriate range for bioremediation has been suggested to be 6-8 (Saxena, 1990 & Mane et al, 2006).

Electrical Conductivity: The values of electrical conductivity ranged from 1.566 to 2.912 ms/cm, higher in August and lower in November. The ionic status determines the EC. During rainy days the increased values of EC may be due to presence of carbonates and bicarbonates and lower value during winter may be due to exchange of inorganic ions by increased micro flora during the winter.

Alkalinity: The alkalinity ranges from 144–298 mg/l with the highest value in October. The death and decomposition of microbes must be increasing alkalinity as also reported by Sarkar and Haldar (2010). The alkalinity in soil is caused by carbonates, bicarbonates and hydroxyl ions.

0.57 mg/l, lower in rainy and higher in winter. Tukura et al., (2005) and Ekeanyanwu et al., (2011) also observed the same ranges with the discharged and subsequent sedimentation of suspended particles from phosphate and nitrogen fertilizers, and domestic wastages discharged into the river as a result of rainfall might have also contributed to the increase in sediment phosphate contents.

Organic Matter: The values of organic matter were found to be highest in September and minimum in July, 0.48 and 0.14 mg/l resp. Lower values were recorded in the rainy season. This may be due to intensive agricultural practices that intensify organic carbon oxidation (Wakene and Herf, 2003). High values in winter were due to the high rate of sedimentation and decomposition of foliage and other vegetative remains in the sediment. Saravanakumar et al., (2008) also reported similar observations.

Conclusion

Physical structure and texture of soil influence the rate at which water and air enter and move through the soil and affect root penetration and the nutrient supply of the soil. Soil pH is needed for managing nutrient availability, the effect on soil organisms, toxicities in acid soils, preferences of plants. From the above study it may be inferred that pH, chloride, organic matter, and phosphate increased during winter and were found minimum during the rainy season.

3

Watkar AM
J. Adv. Res. Alt. Energ. Env. Eco. 2020; 7(2)

Higher pH and alkalinity indicates the alkaline nature of the soil that adversely affects the life of benthic organisms.

References

1. APHA. Standard methods for examination of water and waste water. American Public Health Association, Washington, D.C., 21st Edition 2005.

2. Ekeanyanwu R, Ogbuniyi CA, Elienajirhevwe OF. Trace metals distribution in fish tissue, bottom sediments and water from Okemeshi river in Delta State, *Nigeria. Environ. Res. J.* 2011; 5: 6-10.

3. Mane SY, Raje SD, Disale SS et al. Status of soil in pollution prone area of Lote MIDC (M.S.), *India. Pollut. Res.* 2006; 25(2): 289-291.

4. Sarkar D, Haldar A. Physical and Chemical Methods in Soil Analysis: fundamental concept of Analytical Chemistry and Instrumental techniques, New Age International (p) Limited, Publishers, 2nd Edition, New Delhi 2010.

5. Saravanakumar A, Rajkumar M, Sesh J et al. Seasonal variations in physic-chemical characteristics of water, sediment and soil texture in arid zone mangrove of Kachchh-Gujrat. *J. Environ. Biol.* 2018; 29: 725-732.

6. Saxena MM. Environmental Analysis, Water, Soil and Air Sed. Ed., Agro. Botanical. Publishers, India 1990.

7. Trivedy RK, Goyal PK. Chemical and biological methods for water pollution studies. Environ. Publications, Karad 1986.

8. Tukura BW, Gimba CE, Ndukwe IG et al. Physicochemical characteristics of water and sediment in Mada River, Nasarawa State, Nigeria. *Int. J. of Environ. and Biol.* 2012; 1(3): 170-178.

9. Wakene N, Herf G. Forms of Phosphorus and status of available micronutrients under different land use systems of in Bako area of Ethopia. *Ethopian J. Natl. Res.* 2003; 5: 17-37.