IRJSE International Research Journal of Science & Engineering
Int. Res. J. of Science & Engineering, Volume 9 (2) 2021
ISSN: 2322-0015
SJIF Impact Factor 6.70
ORIGINAL ARTICLE
OPEN ACCESS

Physico-chemical Properties of Sediments of Kondeshwar Lake, Badnera, District Amravati, Maharashtra, India

Deshmukh SV[1] and Wharekar SR[2]

[1]Bar. RDIK and KD College Badnera, Amravati, MS, India
[2]Department of Environmental Science, Art, Commerce and Science College, Kiran Nager, Amravati, MS, India
Email: shrikant.warhekar@gmail.com

Manuscript Details
Received :11.03.2021
Accepted: 25.04.2021
Published: 30.04.2021

Available online on https://www.irjse.in
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

Cite this article as:
Deshmukh SV and Wharekar SR. Physico-chemical Properties of Sediments of Kondeshwar Lake, Badnera, District Amravati, Maharashtra, India, *Int. Res. Journal of Science & Engineering*, 2021, Volume 9(2): 57-60.

Abstract

Kondeshwar Lake is situated near historical Kondeshwar Temple of Lord Shiva near Badnera city of Amravati District. The purpose of this study was to assess the physico-chemical properties of sediments of Lake. The sediment samples were collected from the Kondeshwar Lake. Physico-chemical analyses of the collected samples was done. The parameters monitored include: pH, Electrical Conductivity, percentage of Organic Matter, Bicarbonate Alkalinity, Available Nitrogen, Available Phosphorus and Available Potassium.

Keywords: Dregs, catchment, lake sediments, available phosphorous

1. Introduction

Sediment is a mixture of organic and inorganic material washed into lakes from the catchment and generated within the lake. By far the most abundant component in lowland lakes is silt (soil) washed in from the catchment. Sediment is natural in lakes and its presence is inevitable. Sediments in lakes has various valuable attributes. Sediment is the loose sand, silt and other soil particles that settle at the bottom of a body of water [1]. Bottom sediments are a mixture of material both, organic and inorganic, derived chiefly from the lake and its catchment, but material in trace quantities are also derived from the atmosphere [2]. Being a result of lake life, bottom sediments are extremely important for its nutrient economy, acting as sink or source of nutrients depending upon the redox conditions [3,4]. Sediment is an integral part of aquatic ecosystem, providing

habitat, feeding, spawning and rearing areas for many aquatic organisms. Protecting sediment quality is an important part of restoring the biological integrity of water bodies as well as protecting aquatic life, wild life and human health [5]. Sediment analysis is increasingly important in evaluating qualities of the total ecosystem of a body of water, in addition to the water sample analysis practiced for years [6].

With the increasing anthropogenic pressure on inland fresh water resources because of sewage pollution, soil erosion, agricultural and industrial dumping of waste etc., it become highly important to monitor the sediment quality which ultimately accumulate all of these excessive wastes. As compared to the usual water testing, sediment testing reflects the long-term quality situation which is independent of current inputs [7,8]. Because pollutants are conserved in sediments over long periods of time according to their chemical persistence and the physical-chemical and biochemical characteristics of the substrata. Land use issues, poor catchment management and excessive erosion result in excessive quantities of sediment. Sediment accumulation results in the loss of open water, which is a serious problem in landscape parks and other sites where retaining open water is important. With the sediment come phosphate and nitrate which cause enrichment or eutrophication of the lake, very poor water quality and algal blooms. The sediment acts as a store of phosphorus, which 'leaks 'out into the water, causing long term pollution [9]. The current research aimed to study the physico-chemical properties of sediment and its utility for agriculture.

2. Materials and Method

The Kondeshwar Lake is near Govindpur village and 5 km away from Badnera city of Amravati District. The Lake is covered by agriculture and forest region and 200 meters away from the Temple. For the analysis purpose, the sediment samples were collected in polythene bags from Kondeshwar Lake and were transported to laboratory. Physico-chemical characteristics of sediments such as pH, EC (ds/cm), organic matter (%), bicarbonate alkalinity, available phosphorous, available nitrogen and available potassium were studied according to method given by Chemical and biological methods for water pollution studies [10].

3. Results and Discussion

The experimental data on physico-chemical properties of sediment samples collected at 4 different sampling sites from the Kondeshwar lake is presented in Table 1.

Table1: Physico-chemical parameters of Sediments of Kondeshwar Lake.

Sr. No.	Parameters	Sample I	Sample II	Sample III	Sample IV
1.	pH	7.53	7.39	7.49	7.72
2.	Electrical Conductivity	0.697 m mho cm^{-1}	0.509 m mho cm^{-1}	0.623 m mho cm^{-1}	0.723 m mho cm^{-1}
3.	Organic Matter	8.49 %	9.16 %	8.06 %	9.74%
4.	Bicarbonate Alkalinity	158.6 mg/100g	149.4 mg/100g	155.5 mg/100g	168.7 mg/100gm
5.	Available Phosphorus	0.191 mg/100g	0.183 mg/100g	0.250 mg/100g	0.280 mg/100g
6.	Available Nitrogen	9.8 mg/100g	14.2 mg/100g	11.2 mg/100g	18.2 mg/100g
7.	Available Potassium	1.18 mg/100g	1.31 mg/100g	1.51 mg/100g	2.10 mg/100g

Soil pH is the single soil characteristic, which elucidates an overall picture of the medium for plant growth including nutrient supply trend. The amount of heavy metals mobilized in soil environment is a function of pH, properties of metals, redox conditions, soil chemistry, organic matter content, clay content, cation exchange capacity and other soil properties [11,12,13]. Heavy metals are generally more mobile at pH < 7 than at pH >7. The pH of the sediments from the Kondeshwar Lake was recorded 7.39 to 7.72; this is therefore non- hazardous for agricultural purposes. Electrical conductivity is a measure of the current carrying capacity, which is due to the presence of soluble salts in the soil. The electrical conductivity is positively correlated with all the heavy metals in the soils [14]. The electrical conductivity from different spots during study was found in the range 0.509 m $mhocm^{-1}$ to 0.723 m $mhocm^{-1.}$

Soil organic matter is composed of many elements, but carbon and nitrogen are most important. Generally higher levels of carbon and nitrogen are found in colder and wetter soil, where organic matter tends to accumulate. Lesser amounts are found in more intensively weathered soils and in hotter and drier areas, where biomass production is more limited and organic matter breakdown is rapid because of warmer temperature [15]. The organic matter of sediments during study was found in the range of 8.06 % to 9.74 %. The maximum organic matter was found in sample IV, which may be due to the heavy decomposition of various substances as compared to other sites. The total alkalinity of the soil is due to the carbonates and bicarbonates present in it. The dissolution of carbonates and bicarbonates in the soil takes place from the parent weathered rock. The bicarbonate alkalinity of soil from different spots was found in the range 149.4 mg/100g to 168.7 mg/100g. The solubility of phosphorus in the soil is controlled by soil pH. In acidic soils, most plant available phosphorus is associated with Fe and Al oxides. In alkaline soils, most soil phosphorus is associated with the Ca, either absorbed to carbonate minerals or existing as various calcium phosphate minerals, the most common of which is apatite [16]. The available phosphorus range during study was found between 0.183 mg/100g to 0.280 mg/100g. The larger effect of nitrogen fixers on soil nitrogen is clearly understandable from the perspective of nitrogen inputs. Nitrogen fixation by herbs and shrubs with much lower primary productivity than adjacent or control non-fixing vegetation often produces large increases in the soil production [17]. The available nitrogen content of samples were found in the range of 9.8 mg/100g to 18.2 mg/100g. Potassium in the soil is one of the macronutrient and is essential for plant growth. Plants growing in soils with low levels of potassium (<100 mg/kg) have a greater probability of exhibiting deficiency symptoms than plants growing in soils with higher levels of these elements [18]. The available potassium during study was found in the range of 1.18 mg/100g to 2.10 mg/100g.

4. Conclusion

The present study concluded that the concentration of plant nutrients in sediments analyzed to date has been low. The addition of these minerals in dregs may be due to the agriculture runoff. As the sediment has good quality of crop nutrients it can be use in agriculture as manure and it has been suggested that dredged sediment could be used as a soil conditioner in gardens, possibly mixed with other materials and composted.

Conflict of interest

No conflict of interest influenced in this research.

5. References

1. United States Environmental Protection Agency (USEPA) (2002) Water Quality Monitoring for Coffee Creek (Porter County, Indiana). Retrieved from: http/www.usepa/research.htm.modecode=62- 28-00-00
2. Battarbee RW (1999) The importance of paleolimnology to lake restoration. Hydrobiologia, 395/396:149-159.
3. Matisoff G, Fisher JB and Matis S (1985) Effects of benthic macroinvertebrates on the exchange of solutes between sediments and freshwater. Hydrobiologia, 122:9-33

4. Sahoo JK, Khuntia B K and Sial NK (2007) Nutrient dynamics in the sediments of lagoonal environment of Bahuda estuary, Orissa. *J. Aquat. Biol.,* 22(1) :39-44.

5. Issa BR, Arimoro FO, Ibrahim M, Birma GJ and E A Fadairo (2011) Assessment of sediment contamination by heavy metals in river Orogodo (Agbor, Delta state, Nigeria), Current World Environment,6 (1): 29- 38.

6. Pravin US, Manisha PT and M M Ravindra (2011) Assessing the Physico-Chemical Parameters of Sediment Ecosystem of Vasai Creek at Mumbai, India. Marine Science,1(1):22-29.doi: 10.5923/j.ms.20110101.03.

7. Hodson PV(1986) Water quality criteria and the need for biochemical monitoring of contaminant effects on aquatic ecosystem. In: Water Quality Management: Freshwater Eco-toxicity in Australia, Hart, B.T. (ed.), Melbourne Water Studies Center, pp:7-21.

8. Haslam SM (1990) River pollution: An ecological perspective, Belhaven Press. London, pp:253.

9. Sediment Management and Dredging in Lakes (2002) A report based on a workshop held at Arlington Court, Devon.

10. Trivedy RK and Goel PK (1986) Chemical and biological methods for water pollution studies. Environmental Publication, Karad.

11. Arun B and Mukharjee N (1998) A review of occurrences, uses, emissions, and concentration in the environment in Finland. *Environ.Rev.*6:1-5.

12. Kimberly MFH and William H (1999) Trace metals in Montreal urban soils and the leaves of *Teraxacum officinale*. *Can.J.Soil Sci.* 79:L385-387.

13. Sauve S, Henderson Wand Allen HE (2000) Solid solution portioning of metals in contaminated soils: dependence on pH, total metal burden and organic matter. Env. Sci. Techn. 34:1125-1131.

14. Rana L, Dhankhar R. and Chhikara S. (2010) Soil characteristics affected by long term application of sewage wastewater. *Int. J. Environ. Res.,* 4(3): 513-518, Summer 2010

15. Henderson GS (1995) Soil organic matter: A link between forest management and productivity. In: W.H. McFee and J.M. Kelly, editors. Carbon forms and functions in forest soils. Madison, WI: Soil Science Society of America: 419-435

16. Soil and Plant Analysis Council (1999) Soil Analysis. Handbook of reference methods. Boca Raton, FL: CRC Press. 247 p.

17. Woods CW, Mitchell R J, Zutter BR and Lin CL (1992) Loblolly pine plant community effects on soil carbon and nitrogen. Soil Science 154, 410-419.

18. Amacher C, Michael KP, O'Neill and Perry CH (2007) Soil Vital Signs: A new soil quality index (SQI) for assessing forest soil health. Res. Pap. RMRS-RP-65WWW. FortCollins, CO: US Dept. of Agriculture, forest service, Rocky Mountain Research Station. Pp.12.