IDENTIFICATION OF EUTROPHICATION IN OLD PALLAVARAM WETLAND, CHENNAI - A REVIEW

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Abstract: The sequential chemical extractions, Phosphorous are supposed to be selectively removed from different compounds in the sediments. Extraction schemes using strong acids and alkaline solutions have been tested on different sediments and found not to extract well-defined fractions. The SEDEX (sequential extraction method) method, another popular modification, is widely applied in biogeochemical research as it can separate authigenic carbonate fluorapatite from fluorapatite. All extraction procedures still yield operationally defined fractions and cannot be used for identification of discrete Phosphorous compounds.

Keywords: Eutrophication, phosphorous fraction, algal blooms, extraction, procedures, sediments

1. INTRODUCTION

1.1.1 Status of the lake and Environment:

The dumping of waste from all the 42 wards of the Pallavaram Municipality for about 10 years is the primary explanation behind the shrinkage of the water body. Almost 25 sections of land had been lost to infringements alone. The development of Pallavaram–Thoraipakkam Road, an undertaking started to associate Chennai Airport and Rajiv Gandhi Salai, had part the lake into two parts. The segment of the lake on the southern side of the street has totally been secured by refuse. On the northern side of the street, the release of sewage from business foundations and homes and furthermore effluents from a portion of the cowhide fabricating units in Nagalakeni has influenced the nature of the water.

1.1.2 Phosphorous in Sediments:

The phosphorus cycle is the biogeochemical cycle that depicts the development of phosphorus through the lithosphere, hydrosphere, and biosphere. Not at all like numerous other biogeochemical cycles, does the climate not assume a huge part in the development of phosphorus, since phosphorus and phosphorus-based mixes are normally solids at the ordinary scopes of temperature and weight found on Earth. The generation of phosphate gas happens in just particular, neighbourhood conditions.

On the land, phosphorus continuously turns out to be less accessible to plants more than a large number of years, since it is gradually lost in overflow. Low centralization of phosphorus in soils lessens plant development, and moderates soil microbial development - as appeared in investigations of soil microbial biomass. Soil microorganisms go about as the two sinks and wellsprings of accessible phosphorus in the biogeochemical cycle.[1] Locally, changes of phosphorus are compound, natural and microbiological: the major long haul moves in the worldwide cycle, be that as it may, are driven by structural developments in geologic time

1.1.3 Identification of Phosphorous:

There are numerous strategies to decide the phosphorous in residue. Be that as it may, assurance of aggregate phosphorous does not
give a thought of the phosphorous that are bioavailable. Along these lines, with the consecutive substance extractions, P should be specifically expelled from various mixes in the residue. The idea of phosphorous that is extricated is for the most part in bioavailable. The bio accessible phosphorous can be characterized as the measure of inorganic phosphorous which can be used by a phosphorous inadequate algal populace over a time of 24 hour or more. The bioavailable P, or extractable P, in which they used to decide the phosphorous sum introduce in dregs accessible for edit development and to decide the likelihood of yield reaction to included phosphorous. The phosphorous structures that are separated from the frail extractants are utilized by the green growth in the photic zone of lakes under oxygen consuming conditions.

The phosphorous exists in sediment in both organic and inorganic fraction. The organic fractions of phosphorous do not contribute to the phosphorous nutrition of the plants as they are low inorganic matter. Among the inorganic fractions Ca, Fe, and Al phosphates are in a dynamic Equilibrium with water soluble phosphorous. Therefore, a measure of these inorganic phosphorous fractions is considered a useful index of the available phosphorous in the soils.

The choice of extraction depends on the nature of the sediment and the kind of phosphorous compounds found in the soil. First of all a preliminary trail has to be conducted to get information on the nature of the extractant to be used for a particular soil as the nature of the phosphate compounds vary with the type of soils.

### 1.2 Eutrophication occurring in sediments:

An essential goal of most lake administration plans is to back off social eutrophication by lessening the Inputs of supplements and residue to the lake from the encompassing zone. Measuring the lakes eutrophication isn't simple as lakes are a perplexing environments of physical, chemical and organic segments.

Supplements are the main source of eutrophication. Nitrogen and phosphorus both fortify plant development. Both are measured from tests of water and detailed in units of ug/l (micrograms per liter), or ppb (parts per billion). Phosphorus is the most critical supplement, and is regularly utilized specifically as a measure of eutrophication.

Broken up Oxygen (DO) which is oxygen deteriorated in the water, is critical to oversee edge peoples. Fish, for instance, trout, require more DO than warm water species. Eutrophic lakes now and then have levels of DO underneath the base for fish to survive, and edge executes can happen. Leftovers can be measured to choose how speedy material is putting away on the base. This may indicate watershed crumbling, or a generous stop to exist of land and water proficient plants. Fish can be analyzed using nets.

In an oligotrophic lake there are most likely going to be crisp water species, for instance, trout. Warm water point, for instance, sunfish, bass, bullheads, and carp are more typical of an eutrophic lake. Temperature impacts the advancement of plants, the landing of supplements, and the mixing of layers of water in the lake. Temperature estimations can choose whether mixing happens, moving supplements from the lake base up into the surface waters propelling green development blooms.

Eutrophication rises up out of the oversupply of supplements, which prompts plenitude of plants and green development. After such living creatures kick the can, the bacterial defilement of their biomass exhausts the oxygen in the water, thusly making the state of hypoxia. As demonstrated by Ullmann's Encyclopaedia, "the fundamental obliging component for
eutrophication is phosphate." The availability of phosphorus all around propels outlandish plant advancement and decay, favouring clear green development and minute fish over other more frustrated plants, and causes an extraordinary reducing in water quality. Phosphorus is a vital supplement for plants to live, and is the limiting component for plant advancement in various freshwater natural frameworks.

2. LITERATURE REVIEW

Eutrophication: A Case Study of Highly Eutrophicated Lake Udaisagar, Udaipur (Raj.), India with regards to its Nutrient Enrichment and Emerging Consequences R. P. Vijayvergia – studied the cases the lotic ecosystem have been used thoughtlessly as repositories for disposal of domestic sewage, industrial effluents and agricultural run-off etc., which leads to nutrient enrichment, growth of micro & macrophytic vegetation and ultimately cause eutrophication. Standard methods for the examination of water and waste water of American Public Health Association (APHA) and American Water Works Association (AWWA), (1980) and Mackereth (1963) were followed.

Results have been discussed with reference to eutrophication and emerging challenges which may cause drastic effect for well being of human society. The flowering of water in Lake Udaisagar by Cyanobacteria, Microcystis aeruginosa as one of the dominant plant species indicated the high degree of eutrophication.

Eutrophication and deterioration in water quality, siltation and consequent shallowing and shrinking of lakes are major problems and are assuming alarming proportion in India due to various anthropogenic activities. The term eutrophication can popularly be attributed to Weber (1907) who used ‘eutrophic’ and ‘oligotrophic’ to describe the conditions of water and soil solution in German bogs. Eutrophic water is nutrient rich and oligotrophic water is nutrient poor.

P. Purushothaman & G. J. Chakrapani (2013) studied the Kumaun Himalayan lakes, situated in the state of Uttarakhand, which is one of the tourist place in northern India. This study aims to understand about the different chemical forms of phosphorous and behaviour of phosphorous where the samples are collected to analyse the major oxides, phosphorous fractionation, nutrients such as nitrogen, biogenic silica, phosphorous. Along with Kumaun Himalayan lakes, all other Nainital, Bhimtal, Sattal, and Naukiuhiatal located in nainital district were also tested. The sediment core samples were collected from deepest part of lakes which is subdivided into subsamples of 2 cm thickness and stored in air tight polythene bags. Major oxides were determined by XRF at Wadia Institute of Himalayan Geology, Dehradun, India. The mineralisable nitrogen was analyzed using Kjeldahl instrument. The biogenic silica was determined after digesting the sediment samples with 1MNaOH at 150 °C (Hartikainen et al. 1996) and analyzed using UV–Visspectrophotometer. Organic matter in sediments was removed by treatment with H2O2 and digested using triacid (HCl+ HNO3+HF) method and was analyzed for total sulfur using DRC3000Elan, PerkinElmerICP-MS at Institute Instrumentation Centre, I.I.T Roorkee. The USGS standard SCO-1 was used to calibrate the instrument for total sulfur analyes. Phosphorous fractionation was analysed using SEDEX method (Ruttenberg 1992). This study concludes the high concentration of P & S in nainital lake affected by natural activities, silica is high compared to other lakes. The phosphorous fractionation in sediment has the carbonate flour apatite form and resulting in release of phosphorous from fractions.

A new tool for the assessment of severe anthropogenic eutrophication in small shallow water bodies - L. Serranoa, M. Reina says about the assessment of eutrophication in shallow water bodies should be based on the interaction between water and sediments. The availability of P is normally higher in shallow water bodies in
which sediment undergoes adsorption, precipitation and release process. When the P-binding capacity of the sediment becomes saturated, the o-P concentration increases in the water as long as both the biological uptake and the sediment adsorption are unable to cope with the rate of P-release from the sediment under a long-term P load. In such conditions, the ratio of total-P exceeds 2.0 in the water, and has used this threshold to validate this tool in other sets of wetlands.

Coastal water quality monitoring and modelling off Chennai city Pravakar Mishra, Uma Sankar Panda, Umakantha Pradhan, C. Saravana Kumar, Subrat Naik, Mehmuna Begum, J. Ishwarya says By knowing the coastal water quality is vital from the perspectives of coastal resource usage and management. Worldwide, along many urbanized coastal regions, massive input of industrial, agricultural and sewage effluents have tremendous impact by altering the nutrient characteristics, triggering toxic algal blooms affecting biodiversity, fisheries, tourism, recreation and other activities. This paper evaluates the seasonal and monthly variations of water quality parameters viz., salinity, pH, dissolved oxygen, nutrients, chlorophyll-a, primary productivity, phyto- and zooplankton, pathogen bacteria off Chennai metropolitain. Low dissolved oxygen (~ 5mg/l) levels and high concentration of nutrients (phosphates, nitrates) recorded in the Cooum and Adyar river waters. Presence of high level of pathogens, occurrence of toxic blooms, eutrophication and depleted oxygen levels are the key issues along Chennai coast arising due to untreated sewage brought by Adyar and Cooum rivers. Numerical model approach is applied and validated with the hydrodynamics and water quality parameters for Chennai coast. Sewage treatment plants, proper restoration programs for Adyar and Cooum rivers, awareness among stake holders and coastal communities would assuage the present pollution levels. In many developed countries, coastal waters exceeding the standards are closed for bathers and beachgoers. Hence, regular monitoring and forecast of the water quality needs to be integrated with automated sensor based monitoring systems that would enhance the predictive system and benefit the coastal community.

Physico-chemical analysis of water samples - Dr. C. Nagamani Independent researchers, Dr. C. Saraswathi Devi studies the Water Samples were collected from four Different places in the Morning Hours between 9 to 11am, in Polythene Bottles. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like Water Temperature, pH etc. While other Parameters Such as Hardness, Sodium, and potassium by Flame photometry, Manganese, Calcium & Magnesium Chloride, Sulphate and Nitrate were Estimated in the Laboratory By using Standard laboratory methods. The results shows that the amount of minerals such as Na, Ca, and Mg were present below than WHO recommended level but water from Urban regions of Bangalore contain more amounts of these minerals than Rural place of Bangalore, indicates that the required minerals are available in reasonable amounts in Bangalore Urban supply than Bangalore Rural supply.

Quality assessment of water in Pallavapuram municipal solid waste dumpsite area nearer to Pallavaram in chennai, Tamilnadu - N. Raman* and D. Sathyanarayanan studies Water is one of the most important compounds to the ecosystem. Better quality of water is described by its physical, chemical and biological characteristics. Due to the increased human population, industrialization, use of fertilizers in agriculture and man-made activity the water gets polluted. Water samples in and around from the wetland located in Pallavaram were studied to assess the impact of water quality in that area. Water samples were collected from different sites in and around the wetland, and they were tested to figure out the water quality in that area. The fare coefficients of the Pb rectified metals correspond well with sea living arrangement.
time, uncovering a comparable metal sorption/precipitation succession in the two soils and seas. Residue metal weights give a moderately simple approach to acquire metal fare coefficients from waste bowls, as well as the climatic affidavit of anthropogenic metals (e.g. Pb: S.E. Quebec, 950 mg*m⁻²; Laurentians, north of Montreal, 420 mg*m⁻²). The fare coefficients are not just less complex to get than by mass adjust estimations, at the same time, moreover, recognize the anthropogenic segment.

Eutrophication: Impact of Excess Nutrient Status in Lake Water Ecosystem

Hemant Pathak and Deepak Pathaksagar studies the Lake arranged in Sagar city, Madhya Pradesh, India has been subjected to family and plant wastewater discharges from various decades. An attempt has been made to find the general idea of water in Sagar lake, remembering the true objective to get a quantifiable model to break down water quality. As a result of eutrophication, nature of lake water has been continually spoiled, this result in extended substance of nitrates in soil as frequently as conceivable which prompts annoying changes in vegetation structure and numerous plant species. The physicochemical properties of water tests from six assessing centers in the midst of three seasons were analyzed remembering the ultimate objective to choose the contaminants in lake water. Results were bankrupt around using relationship examination, multi-backslide examination and quantifiable illustrating. The obtained results were differentiated and water quality benchmarks and standard regards endorsed by World Health Organization (WHO), and it was found that most of the water tests were exceptionally debased by sewage.

To restrain the complexity and dimensionality of considerable game plan of data a Systematic figuring of relationship coefficient between water quality parameters has been associated. The immense association has been furthermore affirmed by using centrality level. The results of this examination obviously demonstrate the handiness of multivariate quantifiable examination in hydro engineered examination.
current status of pallikaranai wetland: a review - Juniet, M. Jose, John Milton, M. C. and Ganesh. Studies the Lake arranged in Sagar city, Madhya Pradesh, India has been subjected to family and plant wastewater discharges from various decades. An attempt has been made to find the general idea of water in Sagar lake, remembering the true objective to get a quantifiable model to break down water quality. As a result of eutrophication, nature of lake water has been continually spoiled, this result in extended substance of nitrates in soil as frequently as conceivable which prompts annoying changes in vegetation structure and numerous plant species. The physicochemical properties of water tests from six assessing centers in the midst of three seasons were analyzed remembering the ultimate objective to choose the contaminants in lake water. Results were bankrupt around using relationship examination, multi-backslide examination and quantifiable illustrating. The obtained results were differentiated and water quality benchmarks and standard regards endorsed by World Health Organization (WHO), and it was found that most of the water tests were exceptionally debased by sewage. To restrain the complexity and dimensionality of considerable game plan of data a Systematic figuring of relationship coefficient between water quality parameters has been associated. The immense association has been furthermore affirmed by using centrality level. The results of this examination obviously demonstrate the handiness of multivariate quantifiable examination in hydro engineered examination.

Zhaokui Ni, Shengrui Wang, Yuemin Wang (2016) aimed to study about establishing the relative importance of the organic phosphorous of the sediment to the total phosphorous and the organic molecules that contributes to the sediment Po which is determined by measuring their susceptibility to enzymatic hydrolysis, lakes ranging from oligotrophic to eutrophic status. From the results Po is accounted for 21-60% of total Po and bioavailable Po is accounted for 9-34% of Po. The bioavailable Po mainly contains of labile Po and moderately labile Po. The bioavailable Po composition was related to the nutrients in the lake which implies the eutrophic state of lake. In the increase of the lake nutrients the bioavailable Po and alkaline phosphatase activities increased in sediments, which leads to increase in eutrophication and contributes to internal loading and resistance of eutrophic state which implies the eutrophic status and algal bloom even after the external input of phosphorous was controlled and total phosphorous has declined. Thus to reduce the risk of releasing the P more efficiently control technique should focus not only on reducing the total P and inorganic P, but should also pay close attention to the removal of bioavailable Po.

Cultural Eutrophication of Lonar Lake, Maharashtra, India - Vyankatesh B. Yannawar and Arjun B. Bhosle studies the Lonar is one of the most youthful Lake and is one of a kind on the planet for its alkalinity and saltiness of the water. Be that as it may, its alkalinity, pH and saltiness go on diminish step by step. An endeavor has been made to look at ecological investigation of Lonar Lake. Objective: This paper goes for enhancing the water quality in the lakes from hyper-eutrophic to minor eutrophic conditions. Techniques: The physical and substance parameters were dissected according to APHA. Results: It is discovered that major Spirulina types of green growth was found in lake water. This species Spirulina having restorative incentive for human body. This species involved the Lonar lake water phytoplankton around 90.0% or more. Rests of 10 % are different individuals from Chlorophyceae, Cynophyceae and Bacillariophyceae additionally found in this lake. Lonar lake water was observed to be extremely rich in mineral supplement substance. No fish species was recorded in a similar water body.

H. Karibasappa, H. B. Aravinda and S. Manjappa (2009) concerned about the eutrophication which relates to the rapid increase amount of nitrates and phosphates and attempted
to study about the Hosur town lakes to measure the level of eutrophication. Three types of lakes were chosen namely Chandrakudi lake, Doddan lake and Kelavarapalli dam. The samples were collected and also analysed for the soluble orthophosphates, chemical oxygen demand, inorganic nitrogen, organic nitrogen, free ammonia, total phosphorus and dissolved oxygen. The study which is onsite has also conducted for transparency, fish kill information, impairment of lakes. By using Wetzel's scheme the level of eutrophication was calculated and the study concludes the level of eutrophic is high i.e hyper eutrophic to very eutrophic.

A new tool for the assessment of severe anthropogenic eutrophication in small shallow water bodies - L. Serranoa, M. Reina studies the assessment of eutrophication in shallow water bodies should be based on the interaction between water and sediments. The availability of P is normally higher in shallow water bodies in which sediment undergoes adsorption, precipitation and release process. When the P-binding capacity of the sediment becomes saturated, the o-P concentration increases in the water as long as both the biological uptake and the sediment adsorption are unable to cope with the rate of P-release from the sediment under a long-term P load. In such conditions, the ratio of total-P exceeds 2.0 in the water, and has used this threshold to validate this tool in other sets of wetlands.

3. CONCLUSION:

This study investigated the characteristics of Phosphorous fractions in the surface sediments of lakes from the middle and lower reaches the eutrophication can be analysed by various methods such as SEDEX, SMT, etc., which can clearly derive the extractants in well defined fractions. Hence, concluding that in order to avoid the eutrophication in lakes the sewage and the dumping of garbage should be avoided and this will result the reduce level of nutrient enrichment and the eutrophication will be in control.

4. REFERENCES:


[7] Atmospheric loading of zn, cu, ni, cr and pb to lake sediments: the role of catchment, lake morphometry, and physico-chemical properties of...


