



“ SYNTHESIS , CHARACTERIZATION AND ANTI BACTERIAL ACTIVITY OF ORGANIC MOLECULES”

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CERTIFICATE

This is to certify that Mr.KOLADIYA DVARKESH CHANDULAL (Enrollmet No. 200507021070) student of M.Sc. in Chemistry has carried out the dissertation under my supervision at Department of Chemistry, Silver Oak Institute of Science (SOIS), Silver Oak University, Gujarat, India. The dissertation entitled “SYNTHESIS , CHARACTERIZATION AND ANTI BACTERIAL ACTIVITY OF ORGANIC MOLECULES ” is a record of bonafied research work carried out by him/her under my supervision and guidance for partial fulfilment for award of degree of Master of Science (Chemistry).

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I hereby declare that this dissertation report entitled “SYNTHESIS , CHARACTERIZATION AND ANTI BACTERIAL ACTIVITY OF ORGANIC MOLECULES” was carried out by me (**MrKOLA**) for the degree of Master of Science under the guidance and supervision of **Dr. SHALINI CHATURVEDI**, Assistant professor, Department of Chemistry, Silver Oak Institute of Science (SOIS), Silver Oak University, Gujarat, India. I will not publish this work anywhere without the consent from the supervisor.

Signature:

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Sahil Kanani

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CHEPTEER 1 INTRODUCTION

1.1 SEDIMENT POLLUTION :-

Suspended sediment absorbs pollutants from flowing water in rivers and deposits onto the bed. However, the pollutants accumulated in the river bed sediment may affect the bio-community through the food chain for a long period of time. To study the problem the concentration of heavy metals (Cr, Cd, Hg, Cu, Fe, Zn, Pb and As) in water, sediment, and fish/invertebrates were investigated in the middle and lower reaches. The concentrations of heavy metals were 100-10,000 times higher in the sediment than in the water. Benthic invertebrates had relatively high concentrations of heavy metals in their tissues due to their proximity to contaminated sediments. Benthic invertivore fish had moderately high concentrations of heavy metals whereas phyto planktivorous fish, such as the silver carp, accumulated the lowest concentration of heavy metals. The concentrations of Cu, Zn, and Fe were higher than Hg, Pb, Cd, Cr, and As in the tissue samples. The concentration of heavy metals was lower in the river sediments than in the lake sediments. Conversely, the concentration of heavy metals was higher in river water than in lake water. While a pollution event into a water body is often transitory, the effects of the pollutants may be long-lived due to their tendency to be absorbed in the sediments and then released into the food chain. The heavy metals were concentrated in the following order: bottom material > demersal fish and benthic fauna > middle-lower layer fish > upper-middle layer fish > water.

Sediment has an important role in the nutrient cycle of aquatic environments. In some cases, sediment is responsible for transport of essential nutrients as well as pollutants (Mohd Ekhwan, T., 2009)

The impacts of sediment organic matter enrichment on marine benthos have been canonized in the benthic ecological literature in the Pearson and Rosenberg model (PR) (1978) which suggests that benthic community parameters initially increase, but then show strong decreases as sediment organic content continues to increase. Organic matter may also interact with anthropogenically derived toxic chemicals to affect their toxicity in sediments (Di Toro et al. 1991). Thus, direct or indirect measurement of sediment organic content have often been included in marine monitoring

programs, in site-specific (Wildish et al. 2001, Carroll et al. 2003), regional (Washington State 1995, Wells 2004) and national scale studies such as the U.S. National Coastal Condition Assessment (US EPA 2004, 2008, 2012) and National Status and Trends Bioeffects Program (Hartwell et al. 2018). While in some cases sediment organic content has been used primarily as an environmental descriptor or for normalization of chemical contaminant concentrations (Hartwell et al. 2018), in other cases it has been used as an abiotic surrogate indicator (McArthur et al. 2010) of benthic community condition (US EPA 2012).

Pollutant levels in lake sediments can be a firm criterion for the evaluation of degradation in water bodies; sediments reveal higher pollutant concentrations than the overlying waters and stable surplus levels over time (Salbu & Steiness, 1995), while lake sediments are the final recipients of anthropogenic activities within the lake-basin, operating as pollutants storage tanks and reflecting long-term impacts (Maltby, 1992). Since lakes are essentially closed, or nearly closed systems with respect to sediment transport, metals are amassed through atmospheric deposition and/or watershed leaching and are then potentially adsorbed onto the organic or clay fraction in sediments (Salomons & Förstner, 1984). Through water-level fluctuations lake sediments are periodically either exposed to the atmosphere or inundated. In sediments that undergo periodic flooding there may be considerable variation of oxidation-reduction states, and as the oxidation condition of the sediments changes, redox-active inorganic constituents are affected (Maltby, 1992). Inorganic and/or microbially mediated redox reactions transform the physicochemical forms and valency of metals affecting their bioavailability and toxicity.

The concept of soil fertility includes not only the quantity of nutrients a soil contains but how well nutrients are protected from leaching, how available the nutrients are and how easily plant roots can function. Depending upon the cropping pattern, leaching, erosion, etc soil loses a considerable amount of nutrients every year. Soil testing provides information regarding nutrient availability in soils which forms the basis for the fertilizer recommendations for maximum crop yield. It also helps in reducing excess and indiscriminate use of fertilizers, pesticides, fungicides etc which eventually cause pollution since farmers and planners are lack of knowledge regarding the quantity of these to be applied. A soil fertility map for a particular area can prove highly beneficial in guiding the farmers and planners in ascertaining the requirement of various fertilizers in a season/year and making projections for increased requirement based on cropping pattern and intensity. (Larsen w.E.). There is an increasing pressure to reduce the application of fertilizers in

commercial agriculture and minimize non-point sources of pollution of both surface and ground waters. Therefore, application of variable rather than uniform rates of fertilizer has been proposed to avoid the application of fertilizers where it will not be properly utilized by the crops.(milar M.p.)

1.2 SOURCES OF POLLUTANTS :-

Vehicles directly and indirectly contribute much of the pollution found in highway runoff. Vehicles are a source of the metals, chemical oxygen demand, oil and grease, and other materials deposited on highways. Other major sources of contaminants in the runoff include dustfall and dissolved constituents in the rain itself. Rainfall can contribute the majority of ionic contaminants leaving the road surface in runoff and can also wash vehicle derived pollutants out of the atmosphere. Dustfall loadings can be a significant fraction of the loadings in runoff and an important source of highway pollution. This is especially true for highways near or in urban areas. Thus the surrounding land use has a major impact on the amount of pollution in dustfall deposited on a highway and the ensuing quality of stormwater runoff. A number of common highway maintenance practices also may adversely affect water quality. The nature of the materials and methods used and the proximity of the maintenance activity to a body of water increases the likelihood of adverse effects.(Barrett, M. E., (1995).

1.3 SOURCE OF SEDIMENT POLLUTION :-

Sediment pollution is increase due to the rapid increase of the population and development of industry. The sources of pollution are the untreated domestic and industrial wastes, atmospheric pollution, agricultural pollution, shipping, dredging activities in the harbor and the disposal of the dredged material to the outer bay. Among these, domestic and industrial wastes are the most important sources of pollution. Domes- tic wastewater is discharged to the bay from over 100 major raw sewage outfalls located either around the inner bay or at the streams flowing into the inner bay. Industrial wastewater is mostly discharged into the streams without being treated. Both

domestic and industrial wastewater is discharged to the Gediz River, which is at the outer bay. Trace elements are good tracers to understand sources contributing to the pollution at a particular site. Discharges from different industries have fairly different compositions. For example, Cd is known to be rich in fly ash discharged to the marine environment, discharges from alloy producing and ceramic plants, Cr is enriched in discharges from tanneries, textile and metal production, Cu is discharged particularly from metal plating and glass producing plants, Pb is a good indicator of traffic-related sources or battery recycling plants, Ni is discharged from the metal plating industry, S is rich in fly ash and discharges from petroleum processing, Zn is enriched in discharges from various industries such as tanneries, paint and metal plating. Mercury is an excellent tracer for paper production. Litophilic elements such as Al, Si, Sc, Fe, Co, rare-earths can be used to identify natural sediment matrix components. Discharge data on other anthropogenic elements such as Sb, In, Mo are scarce, but they are enriched in domestic wastes and various industrial discharges. Enrichment of different elements in different sources can be used to apportion sources contributing to the pollution at a given basin using trace element measurements. Such receptor oriented techniques are widely used in air pollution studies, but their use in water pollution studies is more limited due to reactivity of some of the elements in the marine environment.

1.4 PHYSICAL AND CHEMICAL PARAMETERS OF SEDIMENT :-

Correlation analysis among physico-chemical variables in sediments shows that many variables were correlated with each other. Physico-chemical variables can be divided into three groups. The first group includes organic material related variables: C, H, N, P, LOI, Bulk Density, Water Content. Bulk Density was negatively correlated with N and LOI and P, N, and LOI were positively correlated. The second group includes mineral and heavy metals: Na, Ca, Mg, Cd, Cu, Ni, Pb. Mg was positively correlated but Ca and Na were negatively correlated with heavy metals. Correlation analysis showed the strong positive correlation among heavy metals. This suggests that heavy metals came from the parent rock materials and Mg can be a candidate for heavy metal indicators of parent materials. The other group includes P, Ni, Cu, Pb, N, and LOI. Phosphorus

was strongly related with other variables in this group. The major portion of phosphorus in sediments is typically bound to clay or soil particles. The relatively high phosphorus content in these metals sediments may indicate a significant input of soil particles from the watershed. **The relationships in the third group support that Mg and heavy metals originated from the parent materials in the watershed.**

1.5 SOURCE OF ORGANIC MATTER :-

In the case of comparison among organic sources versus TOC, source categories with very small sample size (n=4) were either combined with similar sources (e.g. sewage + sewage sludge) or were dropped from analysis. Although studies with only natural sources of sediment organic matter were not a principal focus for collection, pooled data (n=102) from Stout (1976) and Whitlatch (1977) were used to examine the regression relationship of $\ln(\text{Abundance} - 2)$ and TOC

1.6 DEPTH OF SAMPLES :-

Linear regressions of the four biotic response metrics, LOI, TOC, sulfide, ORP and percent fines versus the four Depth Zones were computed with either Sigmaplot 13 or the PROC Reg procedure in SAS 9.4. Sample sizes ranged from 281–710.

1.7 SEDIMENT PERCENT FINES :-

Data from three studies (Anderson and O'Connell 1977, Conlan and Ellis 1979, Walker 1973) with wood waste as the organic source were excluded from the regression analysis of LOI on percent fines since multiple samples tended to be extreme outliers, but these three studies were pooled and analyzed as a separate subset.

In addition to the data on sediment percent fines which were extracted from the database literature, an additional data set was used to examine whether significant variability in the regression

relationship of percent fines to sediment TOC exists over the scale of hundreds of kilometers typical of regional scale monitoring programs. TOC and percent fines data were collected from 8 estuaries in Oregon (7) and California (1) using identical methods as part of a study to classify estuaries of the Pacific Northwest region (Lee and Brown, 2009), and totaled 741 samples with a minimum of 62 observations per estuary. Quality assurance, collection and analysis methods are provided in Appendix B of Lee and Brown (2009). Statistical analysis was conducted with ANCOVA, as described above. The regression for data from the U.S. EPA National Coastal Assessment (USEPA 2012) was plotted for comparative purposes.

1.8 ALTERNATE METRICS OF SEDIMENT ORGANIC CONTENT :-

A small subset of studies (Brooks 2001, Karakassis et al. 2000, Papageorgiou et al. 2010, Wildish et al. 1999), contained data from multiple study site locations, which allowed evaluation of whether there was significant among-site variation in the regression relationships between pairs of variables (ANCOVA, Holm-Sidak method) that represented alternate measurements of sediment organic content, specifically LOI, TOC, ORP, or sulfide concentration. Sulfide data from Wildish (1999) were reported as log S and were recorded and analyzed as such. Unfortunately, the study with the largest number of study sites and data points (Brooks 2001) did not report study site locations, which were considered confidential business information, so that maximum spatial scale could not be assessed in this case. In one study (Wildish et al. 1999), comparisons included one site sampled in two different time periods, allowing consideration of temporal variation in regression relationships within site

1.9 EFFECT OF CARBON :-

A. Effect of Carbon monoxide on human

The high concentration of CO can cause death. The combination of CO and hemoglobin leads to the formation of carboxyhemoglobin (COHB) reduces the oxygen carrying capacity of blood. At a concentration of 100 ppm people experience dizziness and headache. • The cigarette smoke contains 400 to 450 ppm CO the percentage of COHB in blood of cigarette smokers increases with increase in smoking. At a concentration of 750 ppm of CO it will cause death.

B effect of carbon monoxide on plane

CO reduces nitrogen fixing bacteria. Which affects the plant growth. High concentration of CO causes leaf drops, reduces the size of leaf and ageing. Effects on materials:- • Carbon monoxide appears to have no detrimental effect on materials.

1.10 CONTROL OF SEDIMENT POLLUTION :-

Reducing chemical fertilizer and pesticide use. • Recycling is another way to reduce and control soil pollution. Recycling paper, plastics and other materials reduces the volume of refuse in landfills, another common cause of soil pollution. Reusing of materials. De-forestation, the cutting down of trees, causes erosion, pollution and the loss of fertility in the topsoil. Planting trees--or re-forestation--helps prevent soil erosion and pollution. Weeds soak up minerals in the soil. Reducing weed growth helps reduce soil pollution. One of the more common methods of reducing weed growth is covering the soil with numerous layers of wet newspapers or a plastic sheet for several weeks before cultivation. This prevents light from reaching the weeds, which kills them. Designated pits should be used for the dumping of soil wastes. These wastes should be treated chemically and biologically to make them less toxic and hazardous.

1.11 POLLUTION BY SEDIMENT HAS TWO MAJOR DIMENSIONS :-

One is the PHYSICAL DIMENSION - top soil loss and land degradation by gullying and sheet erosion and which leads both to excessive levels of turbidity in receiving waters, and to off-site ecological and physical impacts from deposition in river and lake beds.

The other is a CHEMICAL DIMENSION - the silt and clay fraction (<63 μ m fraction), is a primary carrier of adsorbed chemicals, especially phosphorus, chlorinated pesticides and most metals, which are transported by sediment into the aquatic system.

Erosion is also a net cost to agriculture insofar as loss of top soil represents an economic loss through loss of productive land by erosion of top soil, and a loss of nutrients and organic matter that must be replaced by fertilizer at considerable cost to the farmer in order to maintain soil productivity. The reader is referred to Roose (FAO, 1994a) for a detailed analysis of the social, economic and physical consequences of erosion of agricultural land and of measures that should be taken to control erosion under different types of land use, especially in developing countries. Whereas Roose is mainly concerned with the impact of erosion on agriculture, this publication is primarily concerned with agricultural erosion from the perspective of its impacts on downstream water quality.

Control of agricultural pollution usually begins, therefore, with measures to control erosion and sediment runoff. Therefore, this chapter deals with the principal mechanisms which govern erosion processes, and those measures which can be taken to control erosion. Processes discussed here also apply to fertilizer and pesticide runoff presented in the following chapters

1.12 OBJECTIVE :-

This Study Primary Aims to evolution of chemical characteristics of sediment.

- A. To determine the pollutant load of the selected sample of sediment.
- B. To determine the total organic carbon content in sediment.
- C. To determine physical and chemical parameters of sediment.

CHEPTEER 2. LITERATURE REVIEW

Hyland, J., Warwick, R. (2005). the present study, synoptic data on the structure of macroinfaunal communities and total organic carbon (TOC) content of sediment were obtained from 951 stations representing 7 coastal regions of the world: the northern Black Sea (Crimean and Caucasian coasts); eastern Mediterranean Sea (Greece); North Sea (Ekofisk oil field); Firth of Clyde and Liverpool Bay, UK; Seto Inland Sea, Japan; Boston Harbor and Massachusetts Bay, USA and estuaries of the southeastern USA. Macroinfaunal and TOC data were examined to look for patterns of association consistent with conceptual model predictions and to identify TOC critical points corresponding to major shifts in the benthic data. Species richness, Hurlbert's E(S), was selected as the primary response parameter. Results suggested that risks of reduced species richness from organic loading and other associated stressors in sediments should be relatively low at TOC concentrations less than about 10 mg g, high at concentrations greater than about 35 mg g¹, and intermediate at concentrations in between. Predictive ability across these ranges was high based on results of re-sampling simulation. While not a measure of causality, it is anticipated that these TOC critical points may be used as a general screening-level indicator for evaluating the likelihood of reduced sediment quality and associated bioeffects over broad coastal areas receiving organic wastes and other pollutants from human activities.

Di Toro, D. M., & Paquin, P. R. (1991). The purpose of this review paper is to present the technical basis for establishing sediment quality criteria using equilibrium partitioning (EqP). Equilibrium partitioning is chosen because it addresses the two principal technical issues that must be resolved: the varying bioavailability of chemicals in sediments and the choice of the appropriate biological effects concentration.

Perie, C., & Ouimet, R. (2008). In this study, SOC was measured by dry combustion (SOC_{DC}) and wet digestion (SOC_{WD}) methods, and organic matter by loss-on-ignition (LOI). Our results suggest that, in these soils: (1) LOI can be used for estimating SOC ($r^2 = 0.95$, RMSEP = 16%) and $\text{SOC}_{\text{DC}}/\text{SOM}$ significantly decreased with increasing depth from 0.49 to 0.27; (2) SOC_{DC} and SOC_{WD} were highly correlated. Even if SOC_{WD} provided near complete recovery of SOC_{DC} , dry combustion remains the preferred method for SOC analysis since recovery decreased with increasing depth from 100 to 83%. (3) BD was also strongly related to SOM ($r^2 = 0.81$). We recommend using the organic density approach to estimate BD from SOM because it allows BD to be predicted without significant bias and with a degree of accuracy of 14%.

Miralles, I., & Soriano, M. (2009). Soil physical and chemical characteristics as well as climatic and geomorphological factors have been determined in 68 sites of a mountain calcimorphic ecosystem (Sierra María-Los Vélez Natural Park, Almería) in Southeastern Spain. Land use and vegetation were natural pine forest, evergreen oak forest, reforested pine forest of different ages, bush, juniper forest, and olive, almond and cereal crops under conventional tillage. By using multivariate data treatments, 17 soil variables were processed. A large part of the total variability was controlled by local topographical features through their effect on moisture retention and vegetation. Most characteristics were significantly correlated with total organic C (mean = $28.5 \pm 4.6 \text{ g kg}^{-1}$), which demonstrates the central role of the organic matter in the functioning of the whole ecosystem. New soil quality descriptors consisting of ratios to soil organic carbon were obtained, informing about the specific activity (per C unit) or performance of the organic matter, independently of its total content. When soil data are directly processed by using principal component analysis, we found a set of high quality soils under natural and old reforested forests, where environmental services provided by soil depend on the high levels of quality descriptors related to organic carbon, e.g. cation exchange capacity (CEC), total porosity, or aggregate stability. When variables such as CEC, porosity and aggregate stability are calculated as ratios to the total organic carbon, a new

classification pattern is obtained, allowing to detect soils with organic matter of high maturity which in general do not coincide with soils with high organic matter content. The results suggest the assessment of soil quality based on ratios informing on the organic matter performance should be emphasized as an alternative to direct descriptors based on the total organic carbon content.

Buruaem, L. M., & de Souza Abessa, D. M. (2013). The study aimed to assess the recent status of sediment quality from 5 zones of Port of Santos by applying a lines-of-evidence approach through integrating results of: (1) acute toxicity of whole sediment and chronic toxicity of liquid phases; (2) grain size, organic matter, organic carbon, nitrogen, phosphorus, trace metals, polycyclic aromatic hydrocarbons, linear alkylbenzenes and butyltins; (3) benthic community descriptors. Results revealed a gradient of increasing contamination for metals and organic compounds, alongside with their geochemical carriers. Sediment liquid phases were more toxic compared to whole sediment. Low number of species and individuals indicated the impoverishment of benthic community. The use of site-specific sediment quality guidelines was more appropriate to predict sediment toxicity. The integration of results through Sediment Quality Triad approach and principal component analysis allowed observing the effects of natural stressors and dredging on sediment quality and benthic distribution. Even with recent governmental efforts to control, pollution is still relevant in Port of Santos and a threat to local ecosystems.

Bouchet, V. M., & Du Châtelet, E. A. (2021). This work contributes to the ongoing work aiming at confirming benthic foraminifera as a biological quality element. In this study, benthic foraminifera from intertidal and transitional waters from the English Channel/European Atlantic coast and the Mediterranean Sea were assigned to five ecological groups using the weighted-averaging optimum with respect to TOC of each species. It was however not possible to assign typical salt marsh species due to the presence of labile and refractory organic matter that hampers TOC characterization. Tests of this study species' lists with Foram-AMBI on two independent datasets showed a significant correlation between Foram-AMBI and

TOC, confirming the strong relation between foraminifera and TOC. For one of the validation datasets, associated macrofaunal data were available and a significant correlation was found between the foraminiferal Foram-AMBI and the macrofaunal AMBI. The here proposed lists should be further tested with sensitivity-based indices in different European regional settings.

Jiao, N., & Legendre, L. (2021). Microbial degradation of dissolved organic carbon (DOC) in aquatic environments can cause oxygen depletion, water acidification, and CO₂ emissions. These problems are caused by labile DOC (LDOC) and not refractory DOC (RDOC) that resists degradation and is thus a carbon sink. For nearly a century, chemical oxygen demand (COD) has been widely used for assessment of organic pollution in aquatic systems. Here, we show through a multicountry survey and experimental studies that COD is not an appropriate proxy of microbial degradability of organic matter because it oxidizes both LDOC and RDOC, and the latter contributes up to 90% of DOC in high-latitude forested areas. Hence, COD measurements do not provide appropriate scientific information on organic pollution in natural waters and can mislead environmental policies. We propose the replacement of the COD method with an optode-based biological oxygen demand method to accurately and efficiently assess organic pollution in natural aquatic environments.

Pekey, H. (2006) In present study sediments in the fraction <63 µm collected from eight stations along the north coastline of Izmit Bay, north-eastern Marmara Sea, Turkey, were analyzed for major (organic carbon, Al, Ba, Fe and Mg) and trace (As, Cd, Co, Cr, Cu, Mo, Ni, Pb and Zn) elements by using inductively coupled plasma atomic emission spectrometry (ICP-AES). Sediments heavily contaminated are evaluated by the Sediment Quality Guidelines (SQG) of US EPA. The results were compared with the marine sediment quality standards (SQS), as well as literature values reported to assess the pollution status of the sediments. The enrichment factors (EFs) were calculated to evaluate actual level of contamination for all the elements using the earth crust as reference matrix, based on elemental values by

Mason which show a normal pattern near to unity. The analysis revealed two groups of elements: (i) Arsenic, Cd, Pb, and Zn are the most enriched elements; (ii) Barium, Co, Cr, Cu, Fe, Mg, Mo and Ni are at background levels. The results show that road traffic run-offs, paint industries and coal combustion are among the most significant sources.

Birch, G. F. (2018) This review of 19 chemical approaches used in assessing sediment quality are classified into empirical, mechanistic and sediment quality indices (SQI) groups. Empirical sediment quality guidelines (SQGs), based on matching chemical and biological-effects data and the mechanistic techniques, founded on equilibrium partitioning principals (EqP), are well established and most used. Empirical SQGs provide a useful screening tool to initially identify locations and chemicals of most concern, but are not regulatory criteria. The EqP approach is causally linked however, the scheme assumes porewater chemistry largely controls sediment toxicity. SQIs are not based on matching chemical-biological data and combine schemes with multiple narrative intents. The 41 SQGs reviewed show a considerable range in upper and lower guideline values. Grain size and organic content should be included into SQGs, however inclusion of suspended sediment into SQGs raises concerns. SQGs are built into decision-tree schemes with other lines-of-evidence and evaluated in a weight-of-evidence framework.

15 LaRowe, D. E., (2020) In this review, we summarize how recent findings are changing entrenched perspectives on organic matter degradation in marine sediments: a shift from a structurally-based chemical reactivity viewpoint towards an emerging acceptance of the role of the ecosystem in organic matter degradation rates. That is, organic carbon has a range of reactivities determined by not only the nature of the organic compounds, but by the biological, geochemical, and physical attributes of its environment. This shift in mindset has gradually come about due to a greater diversity of sample sites, the molecular revolution in biology, discoveries concerning the extent and limits of life, advances in quantitative modeling, investigations of ocean carbon cycling under a variety of extreme paleo-conditions

(e.g. greenhouse environments, euxinic/anoxic oceans), the application of novel analytical techniques and interdisciplinary efforts. Adopting this view across scientific disciplines will enable additional progress in understanding how marine sediments influence the global carbon cycle.

CHAPTER 3. MATERIALS & METHODS

3.1 TEXTURE :-

A portion of the air dried sample was hand crushed and analyzed for the soil texture and grain size (sand, slit and clay) after sieving through a series of standard sieves of different mesh sizes. The soil texture specifically refers to the proportion of sand, slit and clay in a mass of soil, while texture class determines the biological and biochemical reaction taking place in such soil. Soil texture or particle size distribution is a stable soil characteristic which influences physical and chemical properties of the soil.

The sizes of the soil particles have a direct relationship with the surface area of the particles. Soil particles remain aggregated due to various types of binding forces and factors which include the content of organic matter, other colloidal substances present in the soil, oxides of iron and aluminium and the hydration of clay particles, etc. To estimate the content of various sizes of soil particles, the soil sample has to be brought into dispersed state by removing various types of binding forces. In the dispersed soil samples, the soil particles settle down at a differential settling rate according to their size. In the estimation of soil texture, particles below 2 mm diameter are separately determined which constitute sand, slit and clay.

Depending upon their size, the mineral particles of the soil or sediment may be differentiated as clay, slit, and sand. Different sizes of sieves are used to differentiate them according to the size of particles, details of which are given below.

Find sand : 0.5 – 2.0 mm diameter

Slit : 0.2 – 0.5 mm diameter

Clay : <0.2 mm diameter

100 g soil sample was taken after drying in shade. Then by using sieve of 3 different pore size, sand, slit, and clay were differentiated. Each fraction of the sieved soil was weighed and the percentage of sand, slit, and clay was calculated. The soil type was calculated from the soil texture triangle. (Shrini M., 2015).

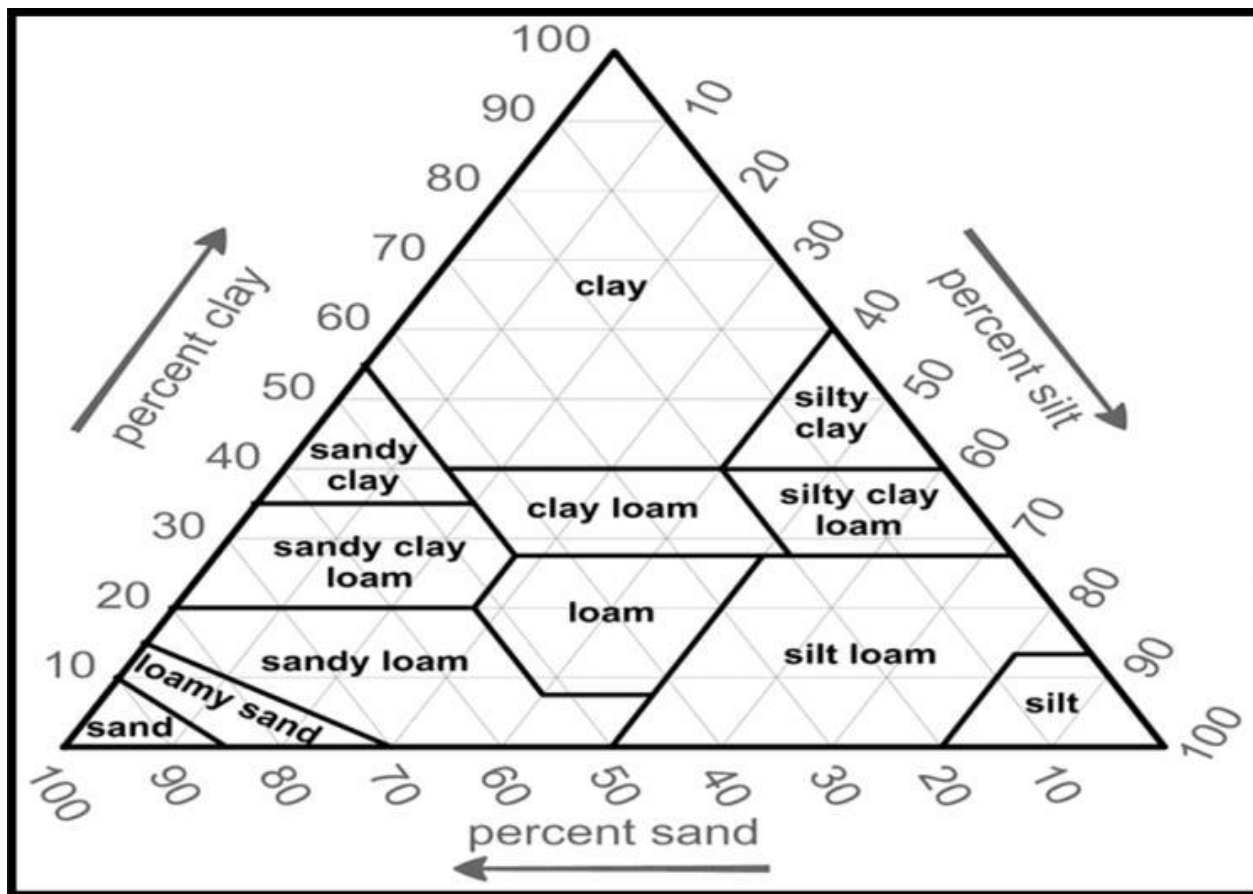


Figure 1. Sediment texture triangle

3.2 ANALYSIS OF THE SOIL SAMPLES ORGANIC CARBON

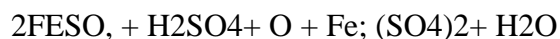
A known weight (0.5g) of 0.2mm sieved soil was treated with a known excess volume chromic acid ($K_2Cr_2O_7 + H_2SO_4$). After the oxidation of organic carbon, the unreacted $K_2Cr_2O_7$ left in the contents was back titrated with standard ferrous ammonium sulphate using diphenylamine indicator. (Bhavya, V. P., 2017).

3.3 TOTAL ORGANIC CARBON (TOC) :-

Soils and sediments contain a large variety of organic materials ranging from simple sugars and carbohydrates to the more complex proteins, fats, waxes, and organic acids. Important characteristics of the organic matter include their ability to: form water- soluble and water insoluble complexes with metal ions and hydrous oxides; interact with clay minerals and bind particles together; sorbs and desorbs both naturally- occurring and anthropogenic ally-introduced organic compounds; absorb and release plant nutrients; and hold water in the soil environment. As a result of these characteristics, the determination of total organic carbon (a measure of one of the chemical components of organic matter that is often used as an indicator of its presence in a soil or sediment) is an essential part of any site characterization since its presence or absence can markedly influence how chemicals will react in the soil or sediment. Soil and sediment total organic carbon (TOC) determinations are typically requested with contaminant analyses as part of an ecological risk assessment data package. TOC contents may be used qualitatively to assess the nature of the sampling location.

Principle :-

The organic matter in the soil gets oxidized by potassium dichromate and concentrated sulphuric acid utilizing the heat of dilution of H_2SO_4 . The excess potassium dichromate, not reduce by the organic matter of the soil is determine by back titration with standard ferrous sulphate ($FeSO_4 \cdot 7H_2O$) ferrous ammonium sulphate [$FeSO_4$ or $(NH_4)_2SO_4 \cdot 6H_2O$].

Reaction :-**Reagents :-**

1. Standard 1N potassium dichromate: 49.04 gm of AR grade $\text{K}_2\text{Cr}_2\text{O}_7$, (oven dried at 90°C) is dissolved in distilled water and make up the volume to one Litre.
2. 0.5 N ferrous ammonium sulphate: 196 g of the hydrate crystalline salt dissolved in one Litre of distilled water containing 20 ml of conc. H_2SO_4 . This solution is relatively more stable and convenient to work than that of ferrous sulphate. However, it should be prepared fresh for each set of samples.
3. Diphenylamine indicator: 0.5 g diphenylamine dissolved in a mixture of 20 ml of water and 100 ml of conc. H_2SO_4 .
4. Concentrated sulphuric acid (sp. gr. 1.84) containing 1.25 percent silver sulphate (In case of soil free from chlorides use of Ag_2SO_4 can be avoided).
5. Ortho-phosphoric acid...

calculation :-

$$\text{Total organic carbon \%} = \frac{N(B-T) \times 0.003 \times 100}{\text{Weight of sample (0.5) gm}}$$

Weight of sample (0.5) gm

Where; N= normality of ferrous ammonium sulphate

B= Blank reading

T= Titrate reading

CHAPTER 4. RESULTS & DISCUSSION

4.1 Texture Analysis of Sediment Samples

The texture analysis of Kavvayi Lake sediment samples. The sediment samples reported sandy texture in more than 90% with an average sand percentage of 95.1%. Maximum value of 98.25% of sand was found in the sample KV-12 (mixing point of Kariangode River into lake) and the minimum value of 92.5% of sand was found in the sample KV-6 (Ayittikadavu). The percentage of clay in the samples ranged from 1.0% to 5.50%. Highest percentage for clay was 5.50%, reported at KV-2 (mixing point of Kavvayi river into Lake) and lowest amount of 1.0% was reported at KVVP-1 (Mavila Kadappuram). The silt percentage in the samples varied from 0.5% to 3.25%. Highest percentage of silt (3.25%) was reported at KV-6 (Ayittikadavu) and lowest percentage of silt (0.50%) at KV-12 (mixing point of Kariangode River into Lake). The texture can provide information about water flow potential, water holding capacity, fertility potential, etc. Clay holds nutrients and water much better than sand. As water drains from sand, it often carries nutrients along with it. Silt has the best ability to hold large amounts of water in it. (Shrini M., 2015).

4.2 soil organic carbon under different land use systems

Organic carbon content at different depths as influenced by different horticulture crops is presented in figure. The organic carbon content of soil was higher in the surface layer of the soil i.e., 0-15 cm as compared to other subsurface soil depth in all the cropping systems. The carbon content differed significantly with different cropping systems; the mango orchard had higher organic carbon content ie, 6500.00, 6316.00, 5846.00, and 4611. 00 mg kg' at 0-15 cm, 15-30 cm, 30-50 cm and 50-100 cm depths respectively which was followed by cashew orchard. However the medicinal and aromatic block had lowest organic carbon 4300.00, 3916.00, 3834.00 and 3786.00 mg kg' at 0-15 cm, 15-30 cm, 30-50 cm and 50-100 cm depths respectively. This is due to the continuous addition of organic matter in perennials crops like mango and cashew orchard which

leads to accumulate more organic matter to the soil and thereby it helps to increase the carbon content in the soil.

Since organic manures are incorporated in to the surface soil and a major portion of the left over residues of shallow rooted crops usually accumulate in the top few centimetre of the soil layers, there was possibility for a relatively greater accumulation of organic carbon in 0-15 cm soil as compared to the soils of lower layer. (Bhavya, V. P., 2017).

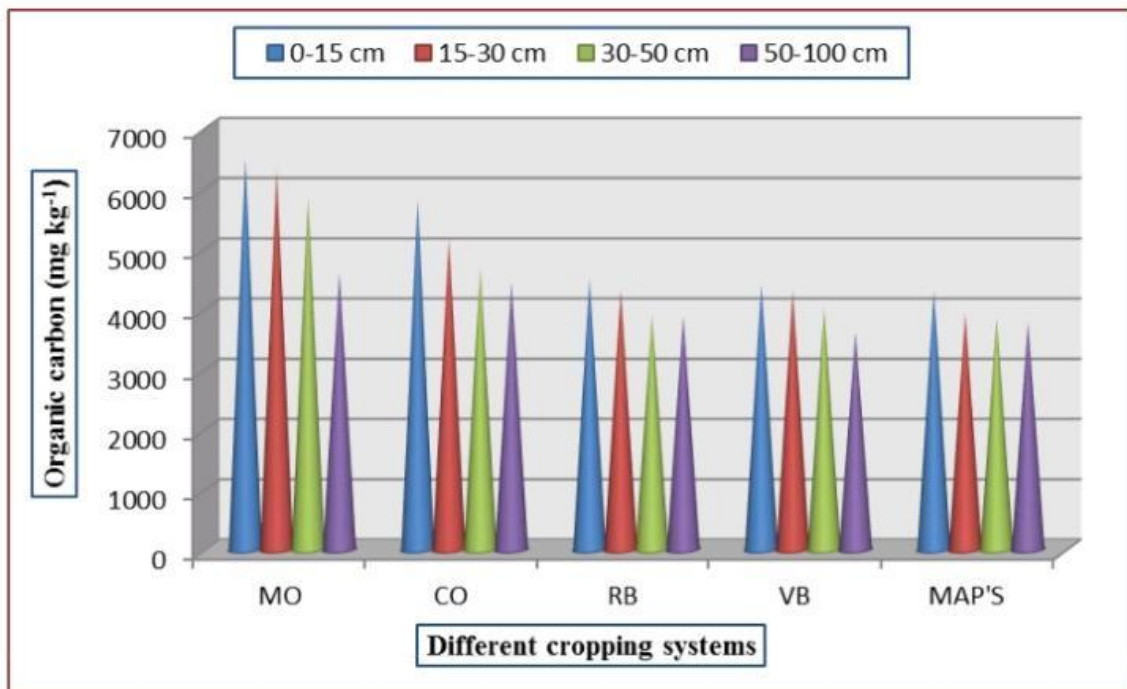


Figure 2. organic carbon content in different cropping systems.

4.3 Total Organic carbon (TOC):

Organic carbon is another influential factor which increases the availability of iron and boron but decreases the availability of manganese, zinc and copper to the plants. In Halkurke soil samples organic carbon was 0.67% and 0.57% and the soil was of medium quality rating as per table-2. OC contents of Eachanur soil samples were 0.63% and 0.67% respectively and OC of V. Mallenahalli soil sample was 0.50% and these samples were also of medium quality rating. All the soil samples belong to medium class as their OC was in 0.5 to 0.75% range. The low OC can be attributed to continuous cultivation, removal of crops residues without return, effects of water and wind erosion which preferentially remove the soil colloids including the humidified organic fractions. (Shivanna, A. M., 2014).

Table 1: Interpretation of soli rating base on total organic carbon.

Rating	TOC (%)
Low	< 0.5
Medium	0.5 – 0.75
High	>0.75

Table 2: showing the observed soli characteristics of the samples taking average of the two depths.

Sr.No.	Sample details	TOC (%)
1	Ha-1	0.61
2	Hb-2	0.57
3	Ea-1	0.63
4	Ea-2	0.67
5	V.M	0.50

Ha-1 = Halkurke-1

Ha-2 = Halkurke-2

Ea-1 = Eachanur-1

Ea-2 = Eachanur-2

V.M. = V.Mallenahalli soil

4.4 GRAIN SIZE :-

In Dakhla Bay, Rudites are variable in the sediments. They range from 0.60% to 3.94% of the total dry sample weight. These Rudites mainly come from the biogenic fraction consisting of lamellibranch and gastropod shells [28]. The particle size distribution of the sediments collected at the Dakhla, shows an abundance of Arenites with percentages ranging from 75.60% to 98.28% respectively for the Port Basin and Boutalha sites. This result informs about the hydrodynamic aspect of the bay and shows that the currents in the downstream part are stronger than in the upstream part. For the Lutites fraction, the sediments contain 1.56% for Boutalha and 22.01% for the harbour basin. The sediment in Dakhla Bay therefore has a predominantly sandy and sandy-muddy particle size texture

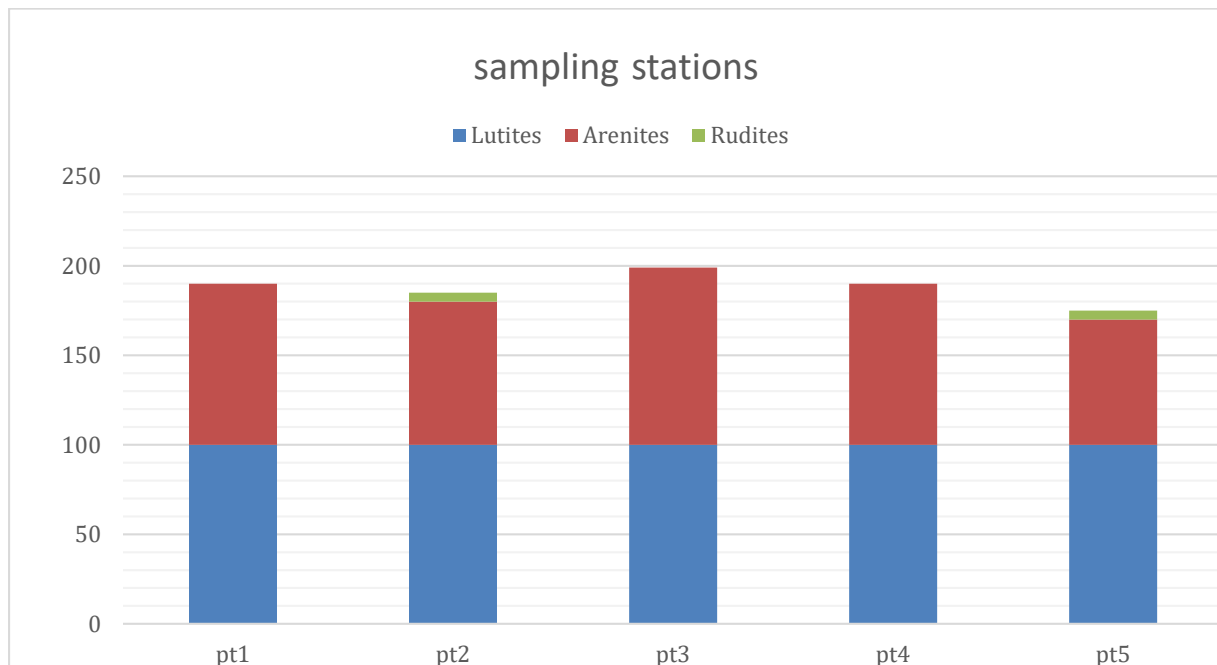


Figure 3. Spatial evolution of the sedimentary texture of Dakhla Bay

4.5 ORGANIC CARBON :-

During the present study, the percentages recorded for organic carbon oscillate around a minimum of 0.20% in Boutalha and a maximum of 2.85% in the port basin (Figure 12). Examination of the results of this study shows that the percentage of organic carbon gradually increases from the downstream to the upstream part. We find that the percentage of organic carbon follows the same evolution as the distribution of fine sediment fractions. The percentage of organic carbon in the harbour basin is ten times greater than in the bay, due to the confinement of the basin on the one hand, and on the other hand to the organic-laden discharges that could be dumped into the harbour.

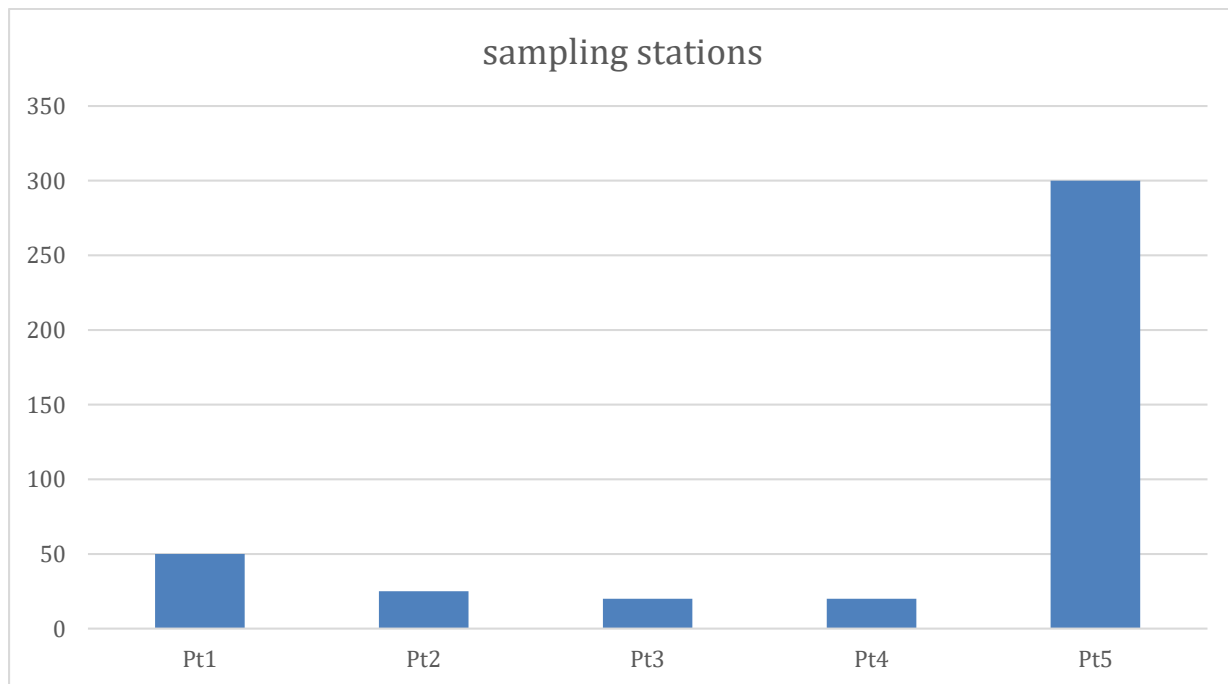


Figure 4. Spatial distribution of organic carbon in the sediment of Dakhla Bay

CHAPTER 5. CONCLUSION

In the present study has been carried out to evaluate of sediment texture and total organic carbon in sediment samples. In the conclusion found to be within the location the sediment texture was observed in increasing order clay, silt and sand and TOC concentration was moderately fluctuation of within the sampling points. The values of all the parameters analyzed during the present study are under permissible limits as per GPCB. The TOC % is high in Eachanur-2. The organic carbon content of soil was higher in the surface layer of the soil .(Bhavya, V. P., 2017).

Sediment quality criteria need to be developed to protect public health and the environment. However, it is important that such criteria perform their function without being overly protective so that, for instance, neither innovation in the chemical industry is inhibited nor is society deprived of certain chemicals that may be primarily beneficial.(Chapman, P. M. 1989).

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