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Distribution of Biogeochemicals in the Sedimentary Environment of Polachira Wetland in Kollam District, Kerala

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Abstract: ***Wetlands cover approximately 5%-8% of the universal land area and are important part of the ecological unit The present study was undertaken in the Polachira wetland located in Kollam district, kerala. Sediment samples were collected from five different sampling stations for a period of one year from april 2013 to march 2014. The sediment samples collected were analyzed for biogeochemicals like carbohydrate, protein and lipid. The month wise data of sediment carbohydrate ranged from 0.02mg/g to 0.12mg/g during August, May and June at all stations and August(at station3&20 and June (at station 4) respectively. The monthly data on protein fluctuated from 1mg/g during May at station I to 79.1mg/g during June at station 3. The month wise concentration of lipid varied from 0.05mg/g to 0.9mg/g during the month of January (at station 1) and July (at station 1) respectively. Among the biogeochemicals analyzed, protein was found high and the least concentration found was carbohydrate and lipid.***

Keywords: Wetland**,** Biogeochemicals, Carbohydrate, Protein, Lipid

1. Introduction

Wetlands are transitional area between land and water, which suffer from a number of environmental problems that primarily can be attributed to an excess of organic matter and nutrient inputs from the watershed [8]. Further impacts are related to the over exploitation of the aquatic environment and of biological resources [7]. Wetlands have high sediment-surface-area to water volume ratios. Therefore, the water quality and the biota of wetland were influenced by the processes occurring within the sediment and at the water–sediment interface. Wetlands are often situated at points of ground water recharge and discharge or along streams and rivers, and thus biogeochemical processes in wetlands can affect downstream water quality, as for example by removing nutrients [10,11].

The present study was carried out in the Polachira wetland (80 50’ 26.89”- N latitude, 760 42’ 0.3”longitude) which spread over 600 hectares located in Kollam district, kerala. The wetland is a favourite destination of migratory birds. Polachira wetland formed in the estuaries of the Ithikkara River and Paravur backwaters is encircled by small rivulets and is thickly vegetated. Five different sampling stations of Polachira wetland were selected. No research work has been reported on the biogeochemicals in the sediments of Polachira wetland. Hence the present investigation has been undertaken with a view to studying the distribution of sedimentary biogeochemicals of Polachira wetland.

The major biogeochemicals present in the wetland sediments are carbohydrates, protein and lipids. The biogeochemistry of organic matter in the Bay of Bengal based on hydrolysable neutral carbohydrates and amino acids were studied by [12]. Studies on sedimentary biogeochemicals are relevant in the assessment of impact of pollutants in an aquatic realm. Sediments act as source and sink of organic, inorganic and bioorganic compounds. The distribution of carbohydrates in the Karst estuary in relation to mineralogic and granulometric composition of surface sediments was analyzed by [4]. Therefore, the study on biogeochemicals in the sediment provides information based on the complexities that govern the transformations, fate and source of organic compounds.

2. Materials and Methods

Sediment samples were collected from five different sampling stations (station 1-Thalachira, station 2- Polachira nadappalam, station 3- Mannathipara, station 4- Manalmukku, station 5- near Meenadu Bridge) of Polachira wetland. The sediment samples were collected from April 2013 to march 2014. The sediment samples were taken in polythene bags, and transported to the laboratory. The sediment samples were dried, powdered and sieved for the chemical analysis. The sediment samples collected were analyzed for carbohydrate, protein and lipid. Carbohydrates were estimated by the phenol-sulphuric acid method [2].Protein content was analysed following the method suggested by [5]. Lipids were extracted according to the method proposed by [1].

3. Results and Discussion

The information on sedimentary biogeochemicals can be used as a useful tool in elucidating the metabolic pathways and sources of organic matter in aquatic environment. The monthly variations on sedimentary biogeochemicals of polachira wetland are presented in table 1.

a. Carbohydrates

Carbohydrates are the common storage and structural elements in terrestrial and aquatic organisms. The source of carbohydrate in water is primarily by the leaching of vascular plant litter and phytoplankton. Monthly data of carbohydrate (fig 1) in the sediments of Polachira wetland varied from 0.02mg/g in the months of April, May and June at all stations to 0.12mg/g during the months of August (at stations 3&2) and June (at station 4). The low concentration

of carbohydrate may be due the dilution of autochthonous and allochthonous organic components by rain water [9]. Sandy texture of Polachira wetland may be another reason for the low concentration of carbohydrate.

b. Protein

Proteins account for most of the nitrogen in aquatic and terrestrial organisms and are the most abundant biological macromolecule. The monthly data on concentration levels of protein (fig 2) in the sediments of Polachira wetland ranged from 1mg/g in the month of May at station 1 to 79.1mg/g in the month of June at station 3. The high protein content may be attributed to the decomposition of organic matter and phytoplankton along with domestic waste.

c. Lipid

Lipids are a group of chemically heterogenous substances released due to the mineralization of detritus by plankton. Monthly distribution of lipid (fig 3) fluctuated from 0.05mg/g during the month of January at station 1 to 0.9mg/g during the month of July at station 1. The low value of lipids in Polachira wetland indicated the absorption of lipid as an energy source by the heterotrophic organisms [3,6].Sediment texture is important for the absorption of lipids. Sandy texture of Polachira wetland weakly takes up lipids.

4. Conclusion

The biogeochemical compounds like carbohydrate and lipid estimated with lowest concentration at the Polachira wetland stations may be ascribed to the sandy nature of the substratum. The higher value of protein indicated the presence of domestic waste. The biogeochemicals estimated herein could independently be used as biomarkers of the physical condition of the wetland. Continuous monitoring of sediment quality of Polachira wetland is needed for the conservation and maintenance of ecological balance of the wetland.

5. Acknowledgment

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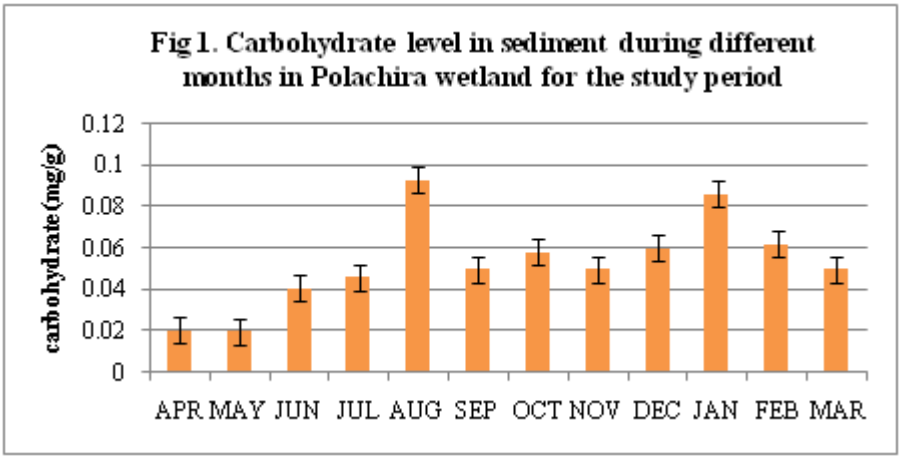

Fig 1. Carbohydrate level in sediment during different months in Polachira wetland for the study period

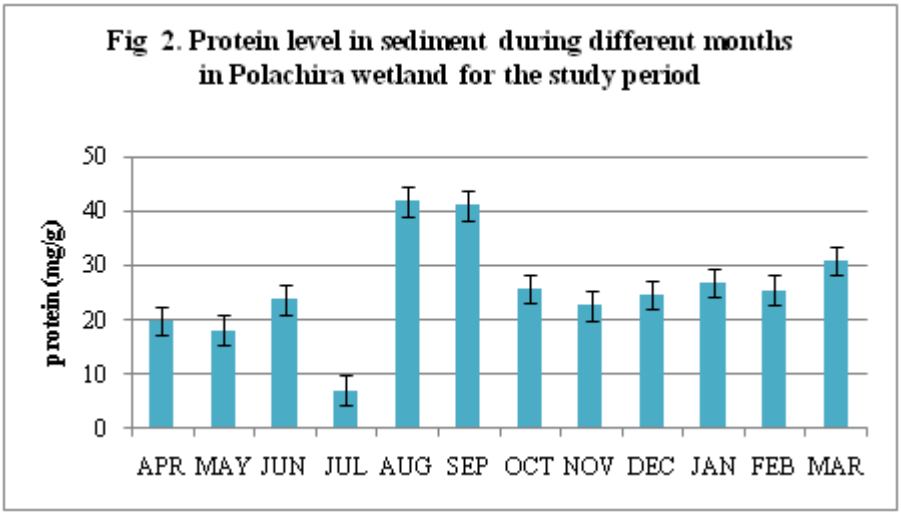

Fig 2. Protein level in sediment during different months in Polachira wetland for the study period

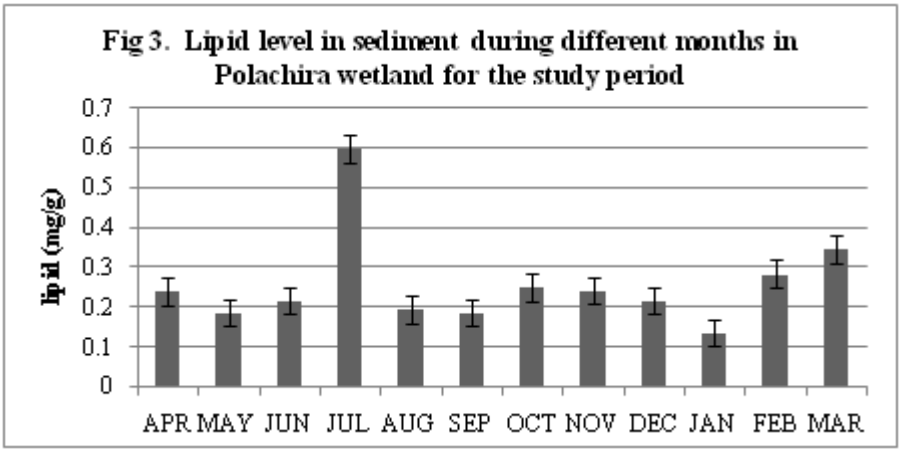

Fig 3. Lipid level in sediment during different months in Polachira wetland for the study period

Table 1: Biogeochemicals during different months in Polachira wetland for the study period

Month	*(Mean ± SE)*		
	Carbohydrate	*Protein*	*lipid*
April	0.0204±0.00	19.882±4.70	0.24±0.06
May	0.02±0.00	18.184±6.81	0.188±0.03
June	0.0406±0.02	23.78±14.02	0.218±0.12
July	0.046±0.01	7.04±3.43	0.598±0.14
August	0.093±0.01	41.92±11.49	0.194±0.06
September	0.05±0.00	41.04±10.22	0.188±0.05
October	0.058±0.00	25.76±4.87	0.25±0.03
November	0.05±0.00	22.8±7.08	0.242±0.04
December	0.06±0.00	24.72±6.48	0.218±0.05
January	0.086±0.01	26.94±7.29	0.136±0.02
February	0.062±0.00	25.54±6.50	0.284±0.10
March	0.0502±0.00	30.94±3.69	0.346±0.12