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Comparison of Wet and Dry pH Values in the Sediment Samples from the Sea Side Mangrove and River Side Stations at Kadalundi Region, Kozhikode District, Kerala, India

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***Abstract*—The potential hydrogen value plays a vital role in our environment. The growth of microorganisms, survival of the benthic organisms, diatom assemblage on the sediment, heavy metal releases from the sediment are affected due to the variation of the pH values in the sediments. The absorption of the nutrients and other elements by the mangrove plants are also pH dependent. Sometimes the sediments exposure to sunlight in sea, river and mangrove ecosystems. Here an attempt is made to study the difference of pH in the wet and dry sediment samples and a comparison of mangrove sediments with the sea side and the river side is also made. This is the first study to document on the study of dry pH in sediments both in the marine as well as in the mangroves and river side samples. This study will help the global researchers to focus on further detailed studies on the dry pH in the sediments of other mangrove and marine ecosystems globally and its impact on the flora and fauna in the system.**

***Index Terms*— Dry pH, Mangrove, River, Sea, Sediment, Wet pH**

I. Introduction

Mangrove forests are unique type of vegetation with special features. Mangrove forests are occupied by shrubs and huge trees and apart from that mangrove contains ferns also. The main difference between the terrestrial forests and the mangrove forests are that these forests exist in saline water - logged places. This special vegetation is seen in the tropical and the subtropical regions of the world. Mangroves occupy less than one percentage of global coastal area.

In Kerala State, all the mangroves are sandwiched between the sea and the river and the only one exemption from this is the "Mangalavanam" the protected mangrove ecosystem – which is also known as the Salim Ali Bird Sanctuary at Cochin and is without the river side. In the entire mangrove the freshwater input is through the river. During the high tide seawater enters or fully submerges the entire sediment in the mangrove.

At Kadalundi, which is the study area the mangrove trap sediments from the river side and lot of nutrients, as fertilizers and pollutants etc. are flushed through the mangrove due to the runoff from land through the river system. This forms the habitat for many microorganisms, insects, polychaete, worms, sea anemones, microalgae, diatoms, cyanobacteria, fungi etc. During dry season or low tide these mudflats are exposed to sunlight and sometimes become dry. Some of the earlier studies on the Indian mangroves are [1]-[12].

Reference [13] studied the pH of the surface sediment from the port area showed alkaline pH. Reference [14] in his study states that in places where salinity is high and tidal flooding is infrequent, the mangrove root biomass is likely to be higher. Reference [15] studied on the Sunderban mangrove and the sediment pH and the salinity range from 6.78 to 6.86. Reference [16] studied the soil pH in a soil suspension and showed alkaline pH in the different layers.

The Study Area

Kadalundi mangrove is located at 11°07'36.5" N - 75o 50'02.0" E in the Kadalundi river, Kerala and covers just around 1.5 hectors. Recently the forest department planted in 0.5 hectors of land with Rhizophora apiculata seedling towards the river side on the eastern side of rail Way Bridge. During the high tide the mangrove mudflat is covered with water. Through Kadalundi river, fresh water enters the mangrove and the bar mouth is 3 km away from the mangrove patch. Three sampling stations were fixed in which the first one was towards the bar mouth (I A), the second (I B) was within the mangrove and the last (I C) was in the northern end. On either banks of the river mangrove patches are seen. The Kadalundi mangrove is very near to the dwelling area and due to human interference; much damage is made to mangrove ecosystem. Some area of the mangroves can be accessed through land and the other region by country boat.

II. Material and Method

Monthly sediment samples are collected using van-veen grab sampler (covering an area of 0.038m2) from the seaside, mangrove and river side in Kadalundi region for 12 months, Sediment samples were immediately packed air tightly in labelled polypropylene covers and kept in ice, transported to the laboratory and kept frozen at -20°C in deep freezer until analysis is done.

Sediment samples were air dried in shade / oven dried at 50°C. The sediment is pulverised gently in a porcelain mortar and pestle, later sieved through a 1 mm sieve to remove large particles and later analysed.

A. Wet Potential hydrogen (Wet pH)

Reading is taken directly in the field itself using the probe of a multiparameter analyzer TOA, Model No. WQC22A, DDK-TOA Corporation, Japan and kit.

B. Dry Potential hydrogen (Dry pH)

According to the method of Jackson (1985) and later reading is taken using glass electrode ECIL pH meter (Model pH 5652).

Statistical analysis – Pearson Correlation coefficient (r) was done using the statistical package SPSS version 20 software for windows. Excel is used to create table and graph.

III. Results

The details of wet pH values recorded in the sediment samples in all the three stations at Kadalundi region are given in Fig. 1. At Kadalundi region, in the seaside station (I A), mangrove station (I B) and river side (I C) station the average wet pH in the sediment samples was recorded as 7.13 ± 0.43, 7.02 ± 0.24 and 7.06 ± 0.44 respectively. At Kadalundi region, the sediment sample from the sea side station shows 7.79 (Mar 2002) as the maximum wet pH and 6.42 (June 2002) as the minimum wet pH. In the mangrove station sediment sample shows 7.41 (Feb 2002) as maximum and 6.70 (May 2002) as minimum. But in the river side station sediment shows 7.78 (Mar 2002) as the maximum and 6.35 (July 2002) as minimum. On comparison of all the values recorded in Kadalundi region represents the lowest pH from the river side (I C) wet sediment as 6.35 and maximum at the sea side station (I A) sediment sample as 7.79 during July 2002 and Mar 2002 respectively.

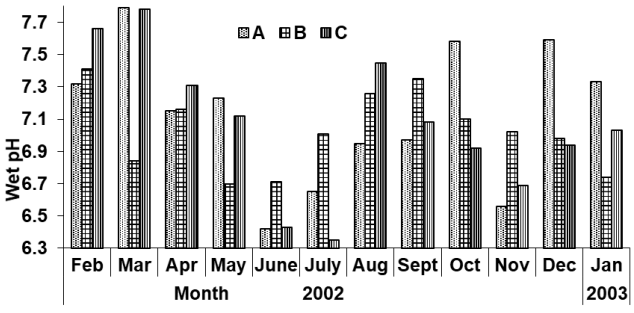

Fig. 1. Comparison of sediment wet pH values in the samples from the sea side (I A) mangrove (I B) and river side (I C) stations at Kadalundi region

The details of dry pH values recorded in the sediment samples in all the three stations at Kadalundi region are given in Fig. 2. At Kadalundi region, in the seaside station (I A), mangrove station (I B) and river side station (I C) the average dry pH in the sediment samples was recorded as 7.08 ± 0.40, 6.74 ± 0.49 and 7.04 ± 0.45 respectively. At Kadalundi region, the sediment from the sea side station shows 6.49 (Nov 2002) and 7.70 (May 2002) as the minimum and maximum dry pH values. In the mangrove station sediment shows 6.09 (Dec 2002) and 7.57 (Sept 2002) as minimum and maximum values. The river side station sediment sample shows 6.50 (Dec 2002) and 7.90 (May 2002) as the minimum and maximum values. On comparison of all the values recorded at Kadalundi region reports 6.09 as minimum dry pH during Dec 2002 at mangrove station (I B) and 7.90 as maximum during May 2002 at river side station (I C).

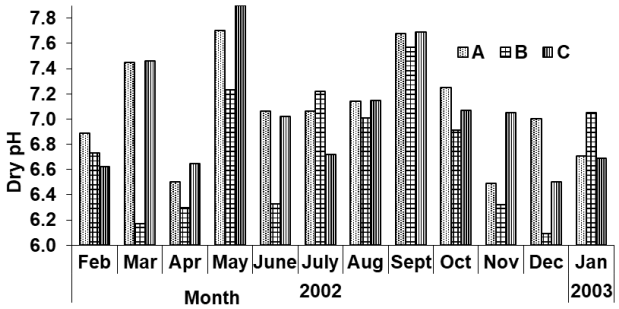

Fig. 2. Comparison of sediment dry pH values in the samples from the sea side (I A) mangrove (I B) and river side (I C) stations at Kadalundi region

A. Correlation Analysis

TABLE I
Pearson Correlation Analysis of Sediment Wet pH Values in the Samples from the Sea Side (A), Mangrove (B) and Riverside (C) at Kadalundi Region

	I A	I B	I C
I A	1	.014	**.664***
I B		1	.356
I C			1
*. Correlation is significant at the 0.05 level (2-tailed).			

TABLE II
Pearson Correlation Analysis of Sediment Dry pH Values in the Samples from the Sea Side (A), Mangrove (B) and Riverside (C) at Kadalundi Region

	I A	I B	I C
I A	1	.497	**.794****
I B		1	.425
I C			1
**. Correlation is significant at the 0.01 level (2-tailed).			

In Kadalundi region, the Pearson correlation analysis of wet pH values between the stations (Table-1) records significant correlation between the stations I A & I C (r=0.664), stations I A & I B (r=0.014) shows very weak positive correlation and stations I B & I C (r=0.356) shows a positive weak correlation. But the Pearson correlation of dry pH values between the stations (Table-2) shows significant correlation between the stations I A & I C (r=0.794), the stations I A & I B (r=0.497)

shows a moderate positive correlation and stations I B & I C (r=0.425) records a moderate positive correlation

IV. Conclusion

The study of dry pH on the sediment from the seaside, mangrove and the river side helps to know the impact of dryness in the seaside and the mangroves during the prolonged exposure of the sediment by the tidal variations, variation of the inflow of fresh water etc which led the variation of the flora and fauna during that period. The comparison of the wet and dry pH study will enable to study the difference in the pH on the subsequent occasions. It is also observed that the wet pH is higher in mangrove area than the river side area during June, July and September to December and lower than in the sea side area in March, May, October, November and December. It is also found that the dry pH level of the sea side is higher than the mangrove and river side in February, October and December. Similarly the dry pH of the mangrove area is found to be higher than the river side in July and January. The results of the study may also help future workers to observe the faunal and floral variations if any happens in relation with the wet and dry pH variations in the sediment habitat in the sea side, mangrove and river side.

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