



SEASONAL VARIATIONS IN SEDIMENT TEXTURAL CHARACTERISTICS OF AYIROOR RIVER IN THIRUVANANTHAPURAM, SOUTH INDIA

Ambili, T¹, F. George D'Cruz² and Reenamole, G.R³

^{1,2,3} Department Of Zoology, Zoology Research Centre, Fatima Mata National College, Kollam, University Of Kerala, Thiruvananthapuram-695581, India

Abstract

The present study was conducted on the textural analysis of the sediments of the Ayiroor river (8.75'N & 76.71'E) in Thiruvananthapuram, Kerala. It is the smallest river in Southern Kerala, about 17 Km in length and originate from Vilangara in Navayikulam, flowing through Thiruvananthapuram district and empties in to the Edava- Nadayara Kayal. The sediment samples were collected seasonally from the three stations (Station1-Panayara, Station2-Ayiroor and Station3-Nadayara) for a period of two years from February 2013 to January 2015. The samples were analyzed for various parameters like temperature, pH, organic carbon, sand, silt and clay. The range of various parameters were; temperature- 24.3 °C to 25.4 °C, P^H – 5.3 to 6.7, organic carbon- 3.7 to 4.9 %, organic matter- 6.55 to 8.45 mg/L, sand - 52 to 56(%), silt -37 to 40(%) and clay - 6 to 8(%). This study provides basic information about the current status of the sediment quality of Ayiroor River.

Keywords- Ayiroor river, Panayra, Nadayara, organic carbon

I. INTRODUCTION

Sediments are integral components of natural water bodies and the indicators of the overlying water column. The sediments enrich the water body with various nutrients required for biological production and influence the exchange of nutrients between the sediment and water (Petr, 1976; Bostrom *et al.*, 1982). Fresh water sediments contain an enormous variety of species, which involve in processing of organic carbon, recycling of nitrogen and breaking down of contaminants (Palmer *et al.*, 1997). In aquatic ecosystems, anthropogenic interference can change the physical and chemical characters of the sediment (Ansari *et al.*, 1994). The sediments are recognized as one of the largest sinks of pollutants (Tsai *et al.*, 2003; Rauf *et al.*, 2009; Dhanakumar *et al.*, 2011) and the extent of pollution can be understood by sediment analysis. The chemical characterization of the sediments in a river system helps to assess the magnitude of pollution caused in the aquatic system and assess the probable impact on the environment. The studies on the physico chemical characteristics of the sediments are useful in assessing environmental pollution, water quality and management of the ecosystem. The sedimentological parameters recorded in this study are temperature, P^H, organic carbon and sediment texture.

II. MATERIALS AND METHODS

Study Area- Ayiroor River, (8.75'N & 76.71'E) the smallest river in South Kerala, originating from the wet lands in Vilangara, Navayikulam of Chirayinkeezhu taluk in Thiruvananthapuram district is the present study area. It is about 17 Km in length draining an area of 66 Sq.Km and flowing through Thiruvananthapuram and Kollam districts to empty in to Edava – Nadayara Kayal. It is one of the few rivers in Kerala free from any dam or reservoir. The depth of the

river varies from 0.5 to 2.5 m. The river has a maximum basin length of 13.68 Km and has 10 micro watersheds and 6 sub basins which are located in Thiruvananthapuram and Kollam districts. The only important rain gauge station of the river is Varkala and the navigable length of the river is just 1Km. The average annual rainfall is 2200 mm³ and average annual stream flow is 1324 mm³. It is a comparatively unpolluted (in terms of industrial pollution) river of the state without any major industry on its bank. The river is mainly fed by rain water and severe water shortage had been experienced during drought periods in the past few years. During summer season the river becomes very shallow and narrow and dries up intermittently. The South West and North West monsoons influence the hydrographical condition of the river. The study stations are presented in Figures 1 to 3.



Station1
Panayara



Station 2
Ayiroor



Station3
Nadayara

B. SAMPLING

Sediment samples were collected seasonally from the above three stations using a polythene corer of length 25 cm and inner diameter 7.5 cm. The corer was forced in to sediment so as to fill its entire volume with the sediment. The entire sample contained in the corer was transferred in to a polythene bag and each sample was approximately labelled and transported to the lab. In the lab, each sediment sample was sun dried to full dryness, packed in polythene covers and labelled for further analysis of organic carbon and sediment texture.

C. METHODOLOGY

The temperature and P^H of the sediment samples were recorded at the site itself using Celsius thermometer of $\pm 0.1^{\circ}\text{C}$ accuracy and a digital P^H pen (Elico, Model No. LI -10, India) respectively. The organic carbon content of the sediment samples were determined by rapid titration method (Walkley and Black method, 1934) and the textural parameters comprising sand, silt and clay ratios of the sediment samples were carried out by pipette method (Carver, 1971).

D. STATISTICAL ANALYSIS

The data collected on water quality characteristics were tabulated and expressed as mean and standard error. Microsoft excel 2007 was used for the graphical representation of all parameters. Three way ANOVA was used to analyze the variations, effects and interactions of different hydrographical parameters. One way interactions were season, station and year, two way interactions were station X season, station X year and season X year and three way interactions were station X season X year by using the procedures of Gomez and Gomez (1984).

III. RESULTS AND DISCUSSION

The station wise seasonal variations in sedimentological parameters at the three stations are presented in Figures: 4 to 9.

The seasonal mean value of sediment temperature was highest (25.37 ± 0.08) in 2013 pre monsoon and lowest (24.33 ± 0.08) in 2014 monsoon. Two year average of temperature was maximum (25.35 ± 0.04) in pre monsoon at all the stations and minimum (24.45 ± 0.04) in monsoon at station 2. Three way ANOVA showed the significant seasonal variations (** $P < 0.01$ and F cal is 18.5062952**) in sediment temperature of the river. The high atmospheric and water temperatures during the pre monsoon period account for the high sediment temperature in pre monsoon.

The seasonal average value of P^H was highest (6.7 ± 0.14) in 2013 pre monsoon and lowest (5.4 ± 0.14) in 2014 monsoon. Two year average of P^H was maximum (6.75 ± 0.04) in pre monsoon at station 1 and minimum (5.35 ± 0.04) in monsoon at station 2. Three way ANOVA) showed that the sediment P^H does not shows any significance in seasonal, station wise, yearwise, station X season wise, station X year wise, season X year wise and station X season X year wise variations. Low sediment P^H in monsoon may be due to the dilution of water and reduction of sediment temperature.

Seasonal average of sediment organic carbon ranges from 3.8 ± 0.14 in 2014 pre monsoon to 4.77 ± 0.22 in 2014 monsoon. Two year average indicated a high value (4.75 ± 0.12) in monsoon at station 2 and a low value (3.75 ± 0.04) in pre monsoon at station1. Three way ANOVA showed the significant seasonal variations (** $P < 0.01$ and F cal is 14.29946524**) in sediment organic carbon content of the river. Land run off and terrigenous sources contributed to monsoonal increase of organic carbon content .

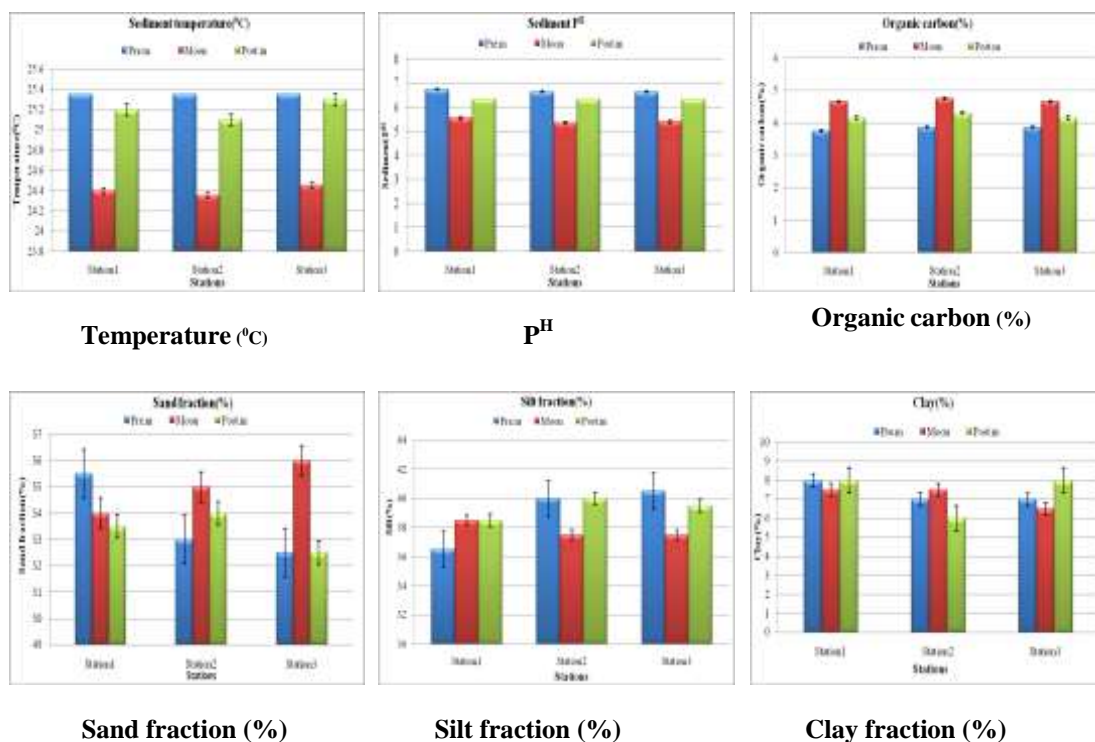


Figure: 4 to 9
 Station wise seasonal variation of sedimentological parameters at the three stations of Aviroor River during 2013-15

IV.CONCLUSION

The results of the sedimentological study of Ayiroor river, shows that the river sediment is more or less suitable for aquatic life and maintains its functional integrity useful for various purposes. The three way ANOVA revealed that all the parameters except pH and the clay showed significant seasonal variations. Most of these changes in the environmental parameters are related to monsoon which indirectly influences the physico-chemical and biological parameters of the sediment. There is not much difference in the composition of the textural components of bottom

sediments in the three stations and the sediment remained is sandy-silt throughout the study period. Most of these changes in the environmental parameters are related to monsoon which indirectly influences the physico-chemical and biological parameters of the sediment.

BIBLIOGRAPHY

- [1] Bosorm, B. Janson, M and Forsberg, C.1982. Phosphorous release from lake sediments Arch. *Hydrobiol. Benhic Ergebn Linnol.*, **18**:5-59
- [2] Palmer, C. G., Maart, B., Palmer, A.R and Keeffe, J.H.O 1997. An assessment of macro invertebrate functional feeding groups as water quality indicators in the Buffalo River, Eastern cape province, South Africa. *Hydrobiologia*. **318**: 153-164.
- [3] Ansari, Z.A., Sreepada, R .A and Kant, K.1994. Macro-benthic assemblage in soft sediment of Marmigae harbor. Goa. *Indian J. Mar. Sci.*, **23**:225-231.
- [4] Tsai, L. J., Yu, K. C., Chen, S. F and Kung, P. Y. 2003. Effect of temperature on removal of heavy metals from contaminated river sediments via bioleaching. *Water Res*, **37**: 2449-2457.
- [5] Rauf, A., Javed, M., Ubaidullah, M and Abdullah, S. 2009. Assessment of heavy metals in sediments of the river Ravi, Pakistan. *Int. J. Agric. Biol.*, **11**: 197-200.
- [6] Carver, R.E., 1971. Procedures in sedimentary petrology. Wiley Inter science, New York, pp. 653.
- [7] Walkley, A. J and Black, I. A. 1934. Estimation of soil organic carbon by chromic acid titration method. *Soil Sci*, **34**: 29-38.
- [8] Dhanakumar, S., Mani, U., Murthy, M., Veeramani, M and Mohanraj, R. 2011. Heavy metals and their fractionation profile in surface sediments of upper reaches in the Cauvery river delta, India. *Int. J. Geolog. Earth Environ. Sci.*, **1**: 38-47.
- [9] Gomez, K.A. and A.A. Gomez, (1984). Statistical procedures for agricultural research (2 ed.). John wiley and sons, NewYork, 680p