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Characteristics of nutrients in the estuaries of Kanyakumari district-A comparative study

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Abstract : The seasonal variations of physico-chemical parameters were studied in four estuaries of Kanyakumari district. The purpose was to access the quality of water from the sources in three different seasons. Water samples were analyzed for physico-chemical parameters including PH, Electrical conductivity, turbidity, TDS, alkalinity, total hardness, DO, BOD, Nutrient elements (NO_2-,NO_3-,PO_4^{2-}), Major elements(Na,K,Cl^-),Carbonate elements (Ca,Mg),Mobile elements(Fe,Mn,So_4^{2-}). The concentration of most of the investigated parameters in the water samples from the Manakudy estuaries were exceeded the permissible limit of WHO and CPHEEO water quality guidelines.
Keywords : seasonal variations, Mobile elements, Nutrient elements, WHO , CPHEEO.

Introduction

Kanyakumari a coastal district in Tamilnadu state is located on the southern extremity of the Indian peninsula between latitude8°2, and 8°4,N and between longitude77°26, and 77°30,E and the coast line is surrounded by three seas, namely Arabian sea, Indian Ocean and Bay of Bengal, but the major part of the Kanyakumari District is surrounded by Arabian sea. The rivers Pazhayar, Ponnivaikal, Valliar, Pompoori Vaikal and Thamiraparani are enriching this district and form smaller and larger estuaries along the south west coast. Thengapattanam and Manakudy are the two major estuaries. Valliyar estuary at Kadiapattnam and pantry estuary at Rajakamangalam, and pamber estuary at Colochel are the prominent minor estuaries of this district.

The estuaries are subjected to a wide range of fluctuating physico-chemical and biological parameters by short term changes resulting from monsoonal cycles. Hydro graphical studies of estuaries and coastal waters in India were investigated by many authors. The present comparative study was conducted to study the physic-chemical parameters of water in four different estuaries of kanyakumari District.

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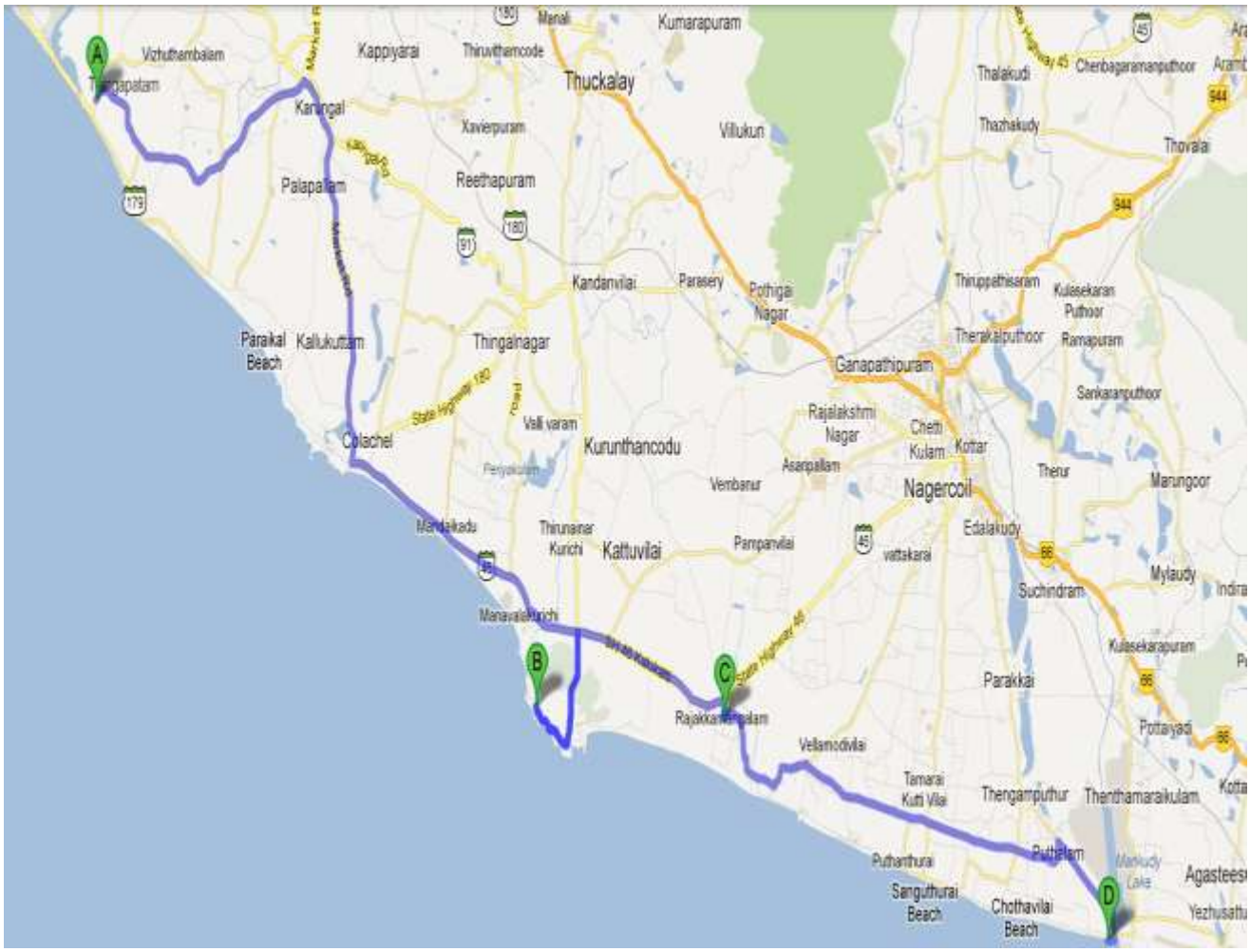
Description of the study area



Manakudy estuary is situated nearly 13 km. away from Nagercoil in the south east of Agasteeswaram Taluk. This estuary covers an area of about 150 ha and extends over 5 km sustaining a good fishery of different species. More than 200 coconut husk retting ponds and a good number of salt pans are situated along the banks of the estuary. It receives agricultural runoff from the nearby coconut plantations, salt pan waters from the salt pans during rain fall, retting effluents from the retting pits and sewage from the adjacent coastal villages. This creates a dynamic environment and causes a greater diversity of micro algal flora.It is connected with the Arabian Sea which opens during rainy season or at times of intermittent rains when flood water enters. A boat jetty is situated at the bar of this station.

Thengapatnam estuary ($8^{0}14$'N latitude and 77^{o} 10'S longitude) is one of the major estuaries in Kanyakumari District, Tamilnadu. It is formed by the confluence of Thamiraparani river with the Arabian sea at Thengapatnam. It is connected with the Arabian sea on most of the days during the rainy season due to the flux of freshwater through river Thamirabarani.

Valliyar Estuary is situated at Kadiapattanam 17 km. away from Nagercoil town and is formed by Vaillyar river, originating from Pechhiparai hills and finally merges with the Arabian Sea. This estuary is a seasonal one and the flow of fresh water is nil during summer season. The length of the estuary is about 4 km.

Pantry estuay is situated at Rajakamangalam which is formed by the river.

Ponnivaikkal originates from Velimalai hills about 25 km northwest of Nagercoil. It forms a small estuary before it joins the Arabian Sea. The estuary is seasonal and receives fresh water during the monsoon periods and gets separated from the sea by a sand bar formed by wave action during the other seasons. It receives agricultural runoff, effluents from coconut husk retting ponds and sewage disposals.

The study was carried out over a period of 12 months from June 2011 –May 2012. Throughout the study period sampling of water was carried out on a monthly basis.

Experimental Methods

Water samples were collected in monthly interval from the station-I(Manakudy estuary), station-II(Thangapattanam estuary) ,station-III(Valliyar estuary) and station-IV(Pantry estuary) to estimate the physico –chemical and biological parameters. The water samples were collected, preserved and transported to the laboratory as per the standard methods. The rain fall data collected from meteorological unit. P_H was measured by electrometric method. The turbidity was estimated with the help of Nephelometric turbidity meter. Dissolved oxygen and BOD was estimated by Winklers method.

Results and discussion

Rain fall

The above mentioned four estuaries received maximum rainfall during the monsoon season(November) and minimum during the postmonsoon season(February and March)in station I and III and pre monsoon season in station II and IV. The highest rainfall received by station-III(Valliyar estuary) of 434.7mm and minimum at station-IV(Pantry estuary) of 221.8 mm during monsoon season.

Temperature

The atmospheric temperature varied from 22.1^o to 33.7^o.Minimum atmospheric temperature in monsoon season and maximum temperature in postmonsoon season in all the studied estuaries.

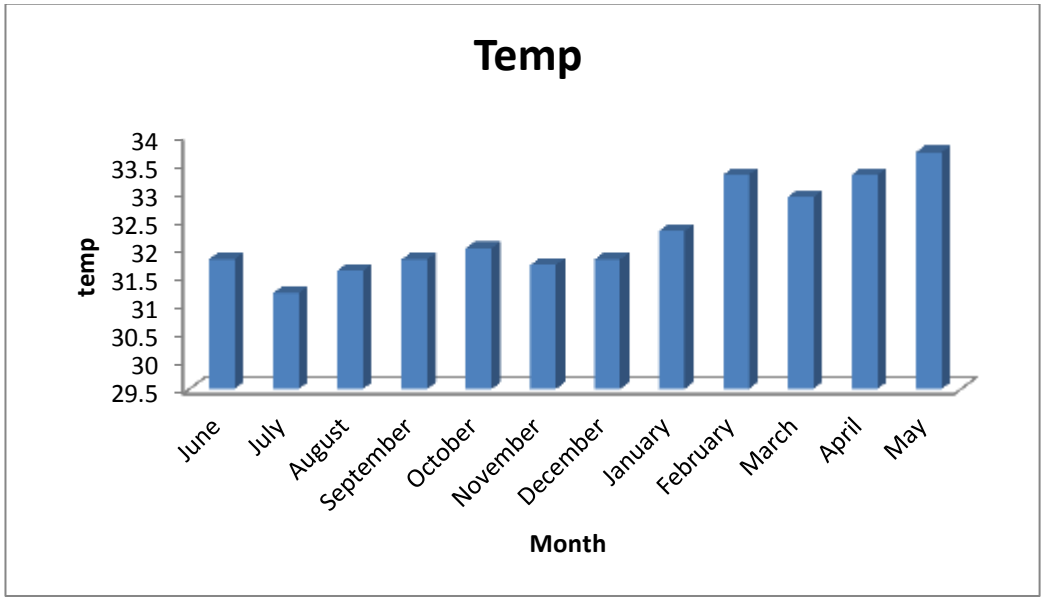


Table1.Mean value of salinity,pH,DO and nutrient elements at different sites four estuaries.

	kadiyapattanam	**thengapattanam**	**rajakkamangalam**	**Manakudi**
Chemical Examination	MEAN	MEAN	MEAN	MEAN
Salinity	2214.25	5928.75	2846.5	6047.41
PH	7.94	7.62	7.64	7.42
DO	5.55	6.075	5.34	4.56
Nitrite	0.14	0.19	0.2	0.24
Nitrate	3	5	4.83	5.85
Phosphate	0.96	0.99	1.43	1.67

P^H

Data onpH of four estuaries are given in table1. The pH was ranged from 7.0 to 8.1 with a mean value of 7.4 at station I(M), 7.0 to 8.36 with amean value of 7.62 at station II(T), 7.0 to 8.56 with a mean value of 7.64 at station III(R)and7.2 to 8.5 with amean value of 8 at station IV(K). In all the stations(estuaries) the pH value was alkaline throughout the year. High pH value was observed during the post monsoon season and low value at monsoon season due to rainfall, discharge of fresh water, temperature changes and biological activities. High pH value is due to the removal of co_2 during higher rate of photo synthesis. This statement is already reported by Bragadeeswaran et al(1), Thangaraj(2) and Srinivasan(3).

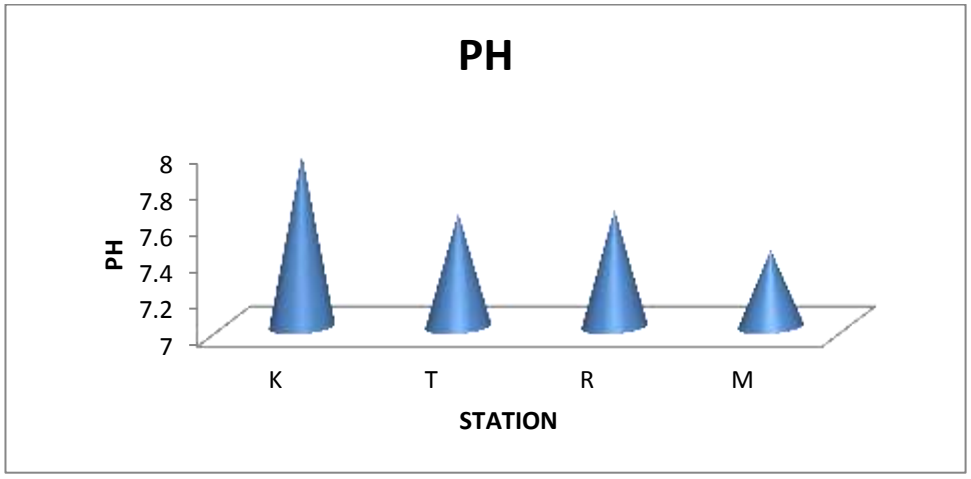


Fig 1.1 – seasonal variation of P^H at different estuaries.

Dissolved oxygen

Dissolved oxygen is an important constituent of water bodies and its concentration in water is an indicator of prevailing water quality and ability of water body to support a well balanced aquatic life. DO was ranged from 1.6 to 7mg/l with a mean value of 4.56 at station I(M),1.4 to 7.6 mg/l with a mean value of 6.07 at station II(T), 1.2 to 6.8 mg/l with a mean value of 5.34 at station III (R) and 1.3 to 7.7 mg/l with a mean value of 6.03 at station IV(K).High DO was observed at station II during the monsoon season and low DO was during post monsoon season. Higher values of DO in monsoon season is due to turbidity nature of water caused by rainfall in the study area and also inflow from runoff and decomposition of organic matter in water bodies. Similar observations were also madein the velar estuaries by Vijayalakshmi and Venugobalan (4), Chandran(5) and Senthil Nathan (6); in Pappankannior estuary by Chezhien and Habib Mohammed(7) Chandran and Ramamoorthy (8) and Mohandhas (9) in the vellar estuary.

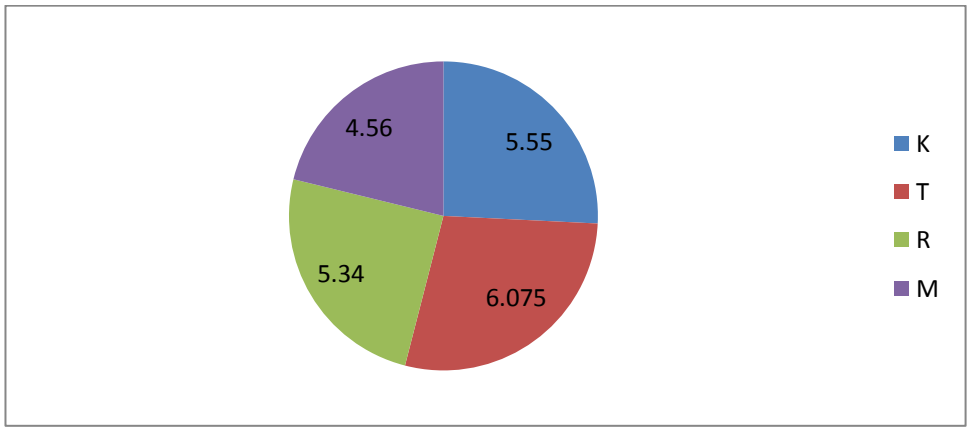


Fig 1.2 – seasonal variation of DO at different estuaries.

Salinity

Salinity has been regarded as one of the most important variables influencing the utilization of organisms in estuaries (10). Salinity is reported to be the most fluctuating parameter with wide range of variations in the estuarine environment (11).The salinity was ranged from 4635mg/l to 7959.5 mg/l at station I(M) ,with a mean value of 6047.41mg/l ,1564 to 15960 mg/l at station II (T)with a mean value of 5928.75mg/l, 1124 to 4595mg/l at station III(R), with a mean value of 2846.5 mg/l, and 65 to 9240 mg/l with a mean value of 2214.25 mg/l at station IV(K).Higher values in postmonsoon season at all the stations could be attributed to the low amount of rainfall, higher rate of evaporation. Lower values are due to rainfall and the fresh water inflow from the land moderately reduced the salinity.

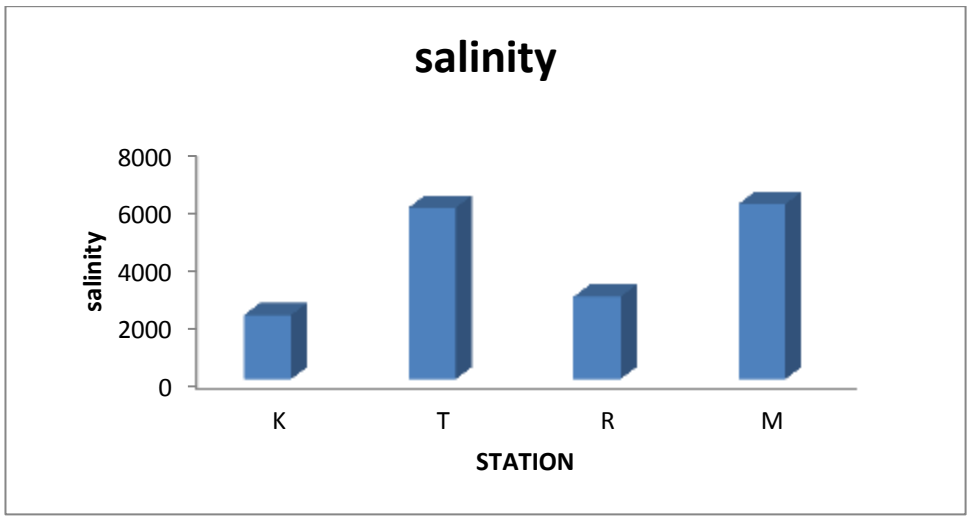


Fig 1.3 – seasonal variation of salinity at different estuaries.

Nutrient Elements

Nitrite

The presence of nitrites indicates presence of partily decomposed organic matter. The nitrite was ranged from 0.04mg/l to 0.43 mg/l with a mean value of 0.24mg/l at sataion-I(M), 0.05 mg/l to 0.56 mg/l with a mean value of 0.3 mg/l at station II(T), 0.08mg/l to 0.78 mg/l with a mean value of 0.20 mg/l at station III(R), 0.04mg/l to 0.35 mg/l with a mean value of 0.16mg/l at station IV(K).High nitrite was observed during premonsoon and low during post monsoon at station-II. The low value of nitrite during postmonsoon might be due to the lesser amount of fresh water inflow and high salinitys. It may be Similer results were obtained by Anitha.Getal(12).

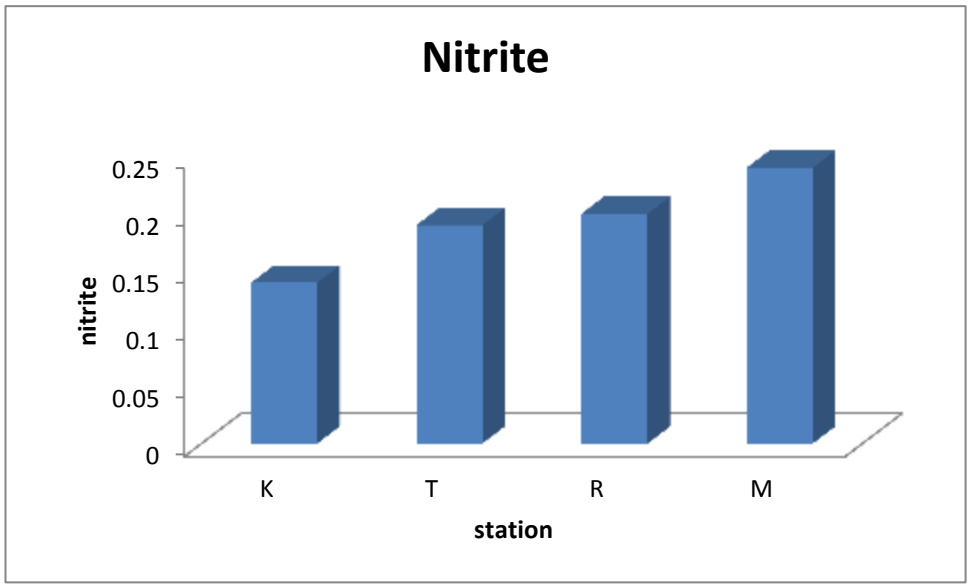


Fig 1.4 – seasonal variation of nitrite at different estuaries.

Nitrate

The presence of nitrate indicates the presence of fully oxidized organic matter present in the water.The nitrate was ranged from 2 mg/l to 10 mg/l, with a mean value of 5.85 mg/l at sataion-I(M), 2 mg/l to 9 mg/l, with a mean value of 5 mg/l at station II(T), 3mg/l to 9 mg/l with a mean value of 4.83 mg/l at station III(R),2 mg/l to 4 mg/l with a mean value of 3mg/l at station IV(K).High nitrate was observed during post monsoon and low during pre monsoon at station-I(M). The presence of nitrate ion is due to anthrobogenic sources like domestic sewage, agricultural wash off and other effluents containing nitrogen elements.

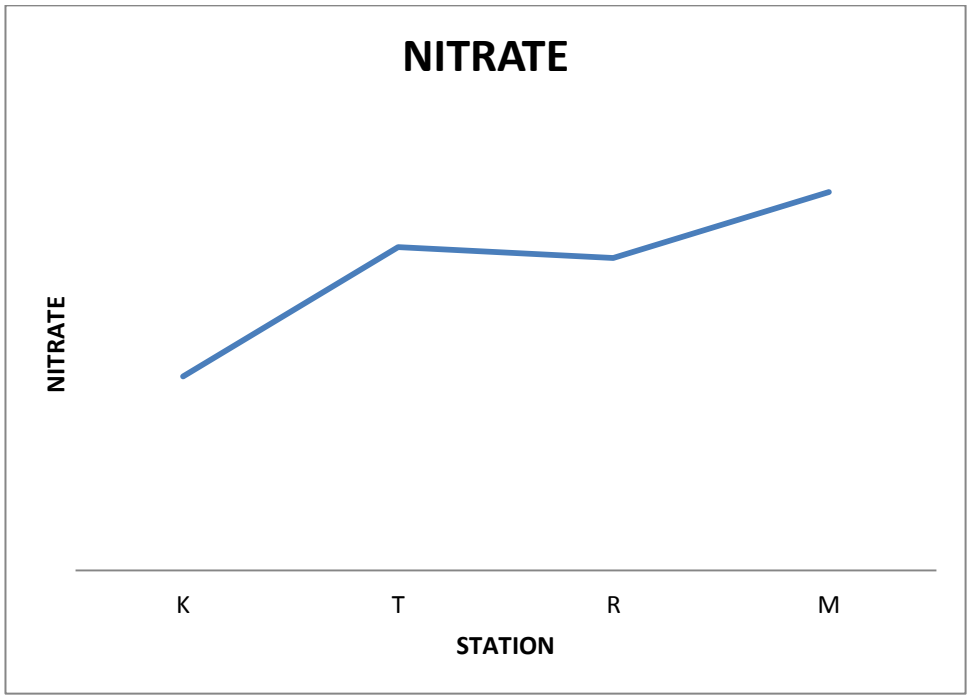


Fig 1.5 – seasonal variation of nitrate at different estuaries.

Phosphate

The phosphate was ranged from 0.4mg/l to 4.6 mg/l with a mean value of 1.67mg/l at sataion-I(M), 0.4mg/l to 3.2 mg/l with a mean value of 0.98 mg/l at station II(T), 0.15mg/l to 2.75 mg/l with a mean value of 1.43 mg/l at station III(R), 0.3mg/l to 2.8 mg/l with a mean value of 0.96 mg/l at station IV(K). High phosphate was observed during pre monsoon and low during post monsoon at station-III. Comparitively the Manakudi eswtuary contain more phosphate content. It may be due to, the discharge of small scale industries and fertilizers used in the agricultural side, and decomposition of particulate organic matter.

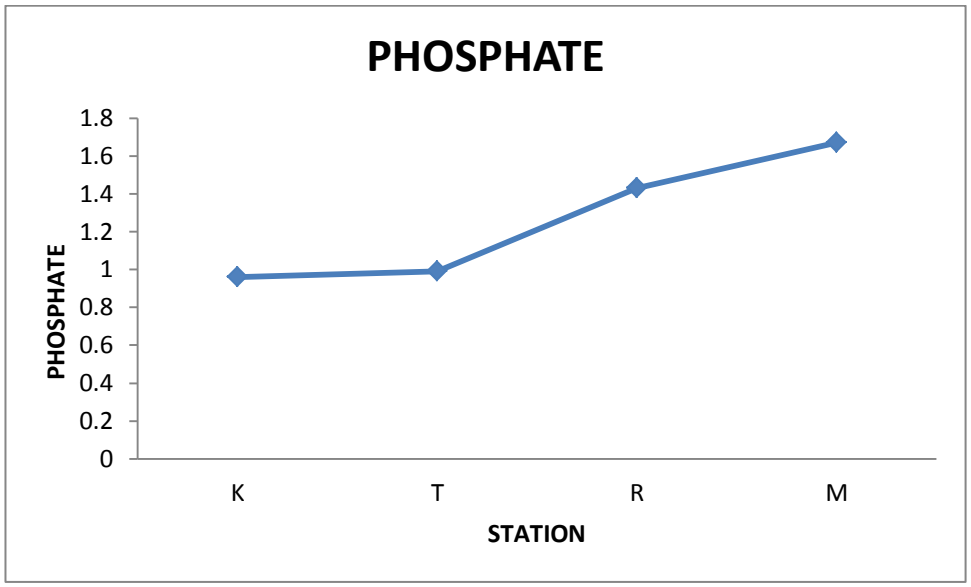


Fig 1.6 – seasonal variation of phosphate at different estuaries.

Conclusion

The present study summarizes the seasonal fluctuations in various physic-chemical parameters in the coastel waters of studied at four different estuaries of Kanyakumari district. Comparing the nutrient characteristics in these estuaries suggest that Manakudy estuary(station-I) consist of more concentration of nutrient elements, mobile elements and carbonate elements. This indicates that this estuary was polluted by man- made activities like discharge of wastage, surface runoff, usuage of fertilizers etc. In order to protect our estuaries ecosystem we have to take some steps before the discharge of wastages, the estuary would remain healthy in the long run.

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