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Physico-Chemical analysis of Vaigai River water quality in Madurai Dist. Tamil Nadu

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Abstract
In this present study, analysis of Vaigai River water quality in seven locations was carried out to determine the physical and chemical characteristics of water. The sampling sites were selected on the basis of their distance, such as Sholavandan (S1), Thiruvedakam (S2), Thenur (S3), Kochadai (S4), Arappalayam (S5), Goripalayam (S6) and Teppakulam ((S7). The pH value 7.0 is considered as best and ideal. The pH is range from 7.38 to 7.87 which was the permissible limit. Total dissolved solids and Electrical conductivity were found moderate in S1 to S6 site and S7 were recorded maximum. The total hardness and alkalinity also recorded maximum in S7 site than that remains. The Calcium, Mg, and Fe were recorded maximum in S7 site rest of others were permissible limit. Free NH_3 was found maximum in S5 (1.2mg/L), S6 (1.5mg/L) and S7 (2.5mg/L) site. Nitrite was observed high in S3 (1.5mg/L). Phosphate was found objectable limit in S3 (1.2mg/L) and S7 (2.0mg/L). Finally, the result was concluding that the surface running water was contaminated at few sampling sites namely S5 (Arappalayam), S6 (Goripalayam) and S7 (Teppakulam) due to the anthropogenic activity. But the sampling sites S1, S2, S3 and S4 are recommended for use to drinking and other purpose.

Keywords: Vaigai River, Water Quality, Physico-chemical analysis.

1. Introduction
Water is essential for life and access to clean drinking water is a necessity for good health. However, clean drinking water is not available everywhere, due to water scarcity and pollution of existing water resources. The pollution can be in the form of natural or anthropogenic activities (Trivey and Pandey, 1990) [13]. The quality of river water is influenced by various natural factors such as rainfall, temperature and weathering of rocks and anthropogenic activities which alter the hydrochemistry of river water (Indrani Gupta *et al.,* 2011) [6]. Turbidity, nutrients and biological oxygen demand of river indicates the pollution level (Rajmohan and Elango, 2005) [9]. Unplanned urbanization and rapid growth of industrialization increase river pollution crisis in river ecosystem. The problem of water quality deterioration is mainly due to human activities such as discharge of industrial and sewage wastes and agricultural runoff which cause ecological damage and pose serious health hazards (Bhattacharya *et al.,* 2012) [2]. Water sources available for drinking and other domestic purposes must possess high degree of purity, free from chemical contamination and microorganisms. The rapid growth of urban areas has further affected the water quality due to over exploitation of resources and improper waste disposal practices.
The study on physico-chemical parameters of surface water in river Vaigai has been observed for the period of three months (October 2014 to March 2015). The physico-Chemical parameters like color, electrical conductivity, odor, total dissolved solids, pH, dissolved oxygen, BOD, COD, total alkalinity, calcium, Magnesium, Iron, Manganese, Free ammonia, Nitrate, Chloride, Fluoride, Sulphate, Phosphate were recorded in all seven samples.

2. Study Area
Madurai is situated in South India of Tamil Nadu State. The city has grown on both sides of Vaigai River. The city is situated on 9°48' N longitude and 78°06 E longitude. The sampling sites (Plate.1) were selected on the basis of their distance, such as Sholavandan (S1), Thiruvedakam (S2), Thenur (S3), Kochadai (S4), Arappalayam (S5), Goripalayam (S6) and Teppakulam ((S7).

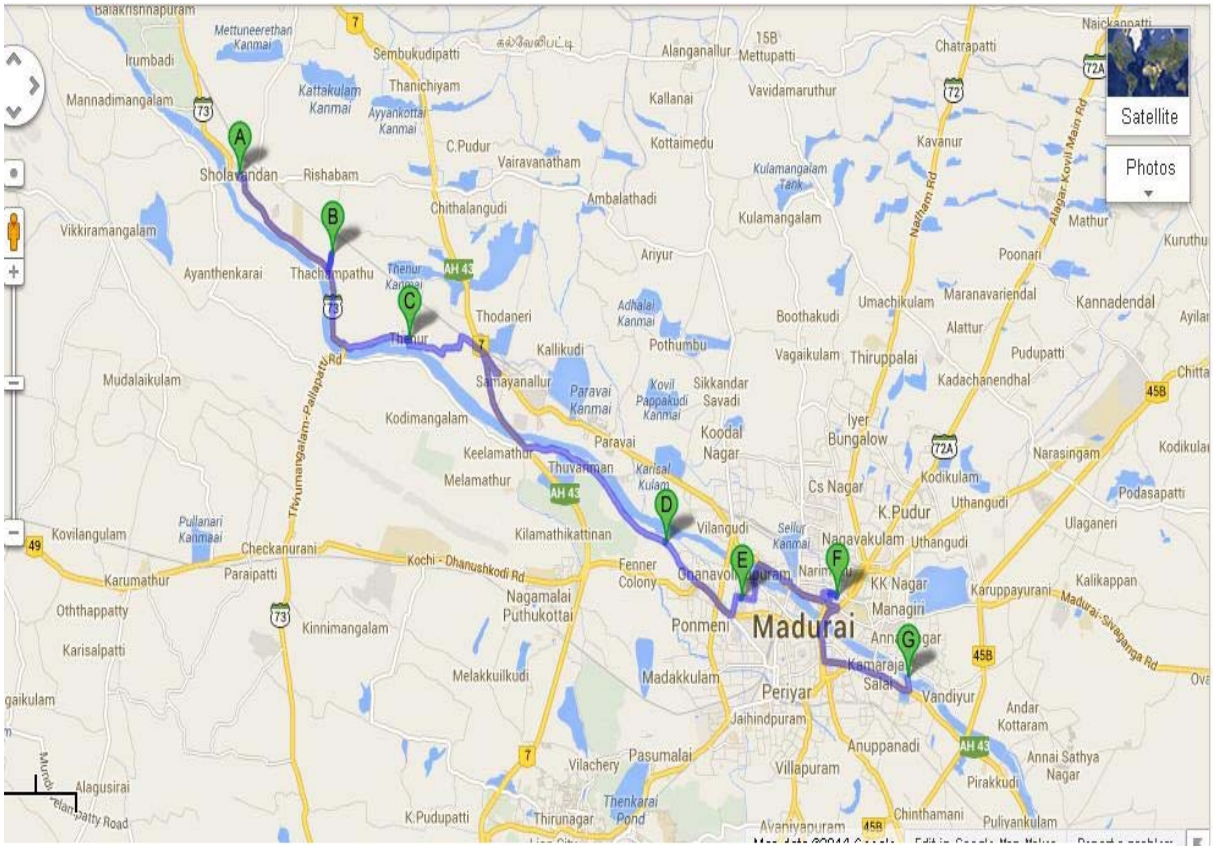

Plate 1: Show that study area of Vaigai River sampling sites.

3. Materials and Methods

Water samples were collected from October 2014 to March 2015. Water samples were collected in sterilized clean high density polythene bottles. Acidifying the water samples after every collection and take to the samples at laboratory within a day. The samples were analyzed (Physical and chemical Parameters) by (BIS, 1983 and APHA, 1998) [3, 1] method. The following parameters were analyzed such as Color, Odour, Turbidity, TDS, Electrical conductivity, pH, Total Alkalinity, Total Hardness, Ca, Mg, Fe, Manganese, Free NH_3, NO_2, NO_3, Cl, F, SO_4 and PO_4.

4. Results and Discussion

In this present study, analysis of surface river water quality in seven locations was carried out to determine the physical and chemical characteristics of water. The Water Samples are collected from Vaigai River bed area flowing on the West and East of Madurai city respectively and receiving domestic, industrial and agricultural pollutants from their catchments areas, using clean polythene bottles and taken to the laboratory and preserved by using HNO3. pH is determined by using pH meter; Dissolved Solid is determined by using TDS meter. The other parameters are measured by using different standard methods. (APHA, 1985) [11]. Total alkalinity was determined by visual titration method using methyl orange and phenolphthalein as indicator. Total hardness and calcium were measured by EDTA titrimetric method using EBT indicator respectively. Chloride is determined by Argentometric method using potassium chromate indicator.

The results indicate that the quality of water varies from location to location. The pH value of a water source is a measure of its acidity or alkalinity. For most reaction as well as for human beings, pH value 7.0 is considered as best and ideal. The pH is range from 7.38 to 7.87 which was the permissible limit.

The high conductivity in some of the samples is likely due to the prolonged and extensive agricultural practices such as irrigation coupled with the inherent geological conditions acquiring high concentrations of the dissolved minerals. Total dissolved solids and Electrical conductivity were found moderate in S1 to S6 site and S7 were recorded maximum.

Water hardness has no known adverse effects; however, it causes more consumption of detergents at the time of cleaning and some evidence indicates its role in heart disease (Scroeder, 1966) [10]. Excess hardness is undesirable mostly for economic and aesthetic reasons (Ragunath, 1987) [8]. The total hardness and alkalinity also recorded maximum in S7 site than that remains.

The Calcium, Mg, and Fe were recorded maximum in S7 site rest of others were permissible limit. Free NH_3 was found maximum in S5 (1.2mg/L), S6 (1.5mg/L) and S7 (2.5mg/L) site.

The high concentration of nitrate in drinking water is toxic and causes blue baby disease/methaemoglobinaemia in children and gastric carcinomas (Comly, 1945 and Gilly *et al.*, 1984) [4, 5]. Most of the locations the source of nitrate in groundwater occurs by direct anthropogenic pollution (septic tanks etc). In urban areas urbanization is leaching of fertilizers in agricultural area is the source for the high concentration of nitrate in all locations. The result indicates that nitrate concentrations exceed the standards and are not fit for drinking purposes. Nitrite was observed high in S3 (1.5mg/L).

The fluoride ion content should be within 0.5 to 1.0 ppm as suggested by WHO (1984) [14]. In present study Fluoride

contents were found permissible limit in all sampling sites. Phosphate was found objectable limit in S3 (1.2mg/L) and S7 (2.0mg/L).

In the present study water was very hard and crossed the permissible limits. It is well known that hardness is not caused by a single substance but by a variety of dissolved polyvalent metallic ions, predominantly calcium and magnesium cation, although other cation likes barium, iron, manganese, strontium and zinc also contribute. The high concentration of total hardness in water samples may be due to dissolution of polyvalent metallic ions from sedimentary rocks, seepage and run off from soil. As we know calcium and magnesium, are the two principal ions. The concentration of total hardness in drinking water sources ranged between 75 and 1110 mg/L (Nawlakhe; 1995) [7], the obtained value of many of the parameters of some area exceeds permissible limit and some area does not exceeds limit of WHO (1984) [14] standards. It should be observed that several parameters are with or not within the permissible limit of the International Standards. Water quality standards vary significantly due to different environmental conditions, and ecosystem. The variation observed were probably due to various factors such as trace metal contents, environmental pollutions due to organic pollutant, domestic usage etc.,

Finally, the result was concluding that the surface running water was contaminated at few sampling sites namely S5 (Arappalayam), S6 (Goripalayam) and S7 (Teppakulam) by the anthropogenic activity. But the sampling sites S1, S2, S3 and S4 are recommended for use to drinking and other purpose.

Table: Showing results of physico-chemical results of Vaigai River sampling sites (Average value of Oct 2014 to March 2015)

Parameters	S1	S2	S3	S4	S5	S6	S7
TDS	535	553	639	698	792	952	2008
EC	757	775	898	952	998	1360	2868
pH	7.44	7.49	7.43	7.54	7.38	7.52	7.87
T.A	200	220	260	280	280	300	800
T.H	240	260	340	340	350	360	920
Ca	60	65	85	60	75	90	230
Mg	23	25	33	23	29	35	88
Fe	0	0	0	0	0	0	0
Mn	0	0	0	0	0	0	0
Free NH_3	0.4	0.8	1.0	1.0	1.2	1.5	2.5
NO_2	1.0	1.0	1.5	0.4	0.8	0.2	0.2
F	0.8	0.8	1.2	1.0	0.8	0.8	1.0
SO_4	10	21	10	12	14	31	55
PO_4	1.0	0.8	1.2	0.6	1.0	1.0	2.0

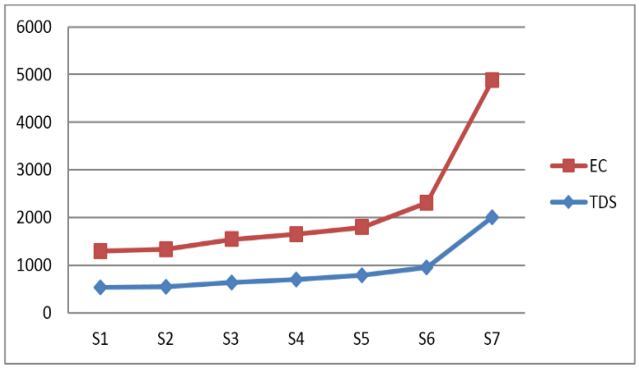

Fig 1: show the EC & TDS concentrations of sampling sites of the Vaigai River

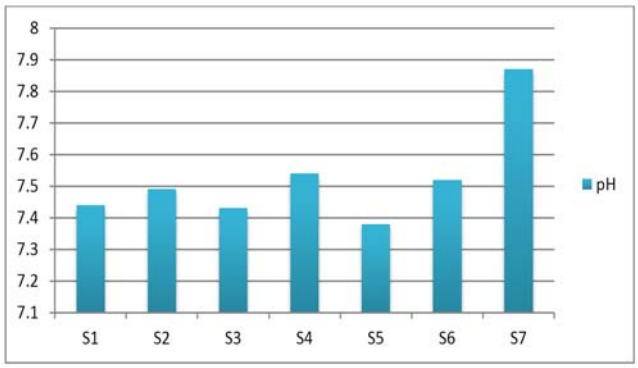

Fig 2: show the pH values of different sampling sites of the Vaigai River

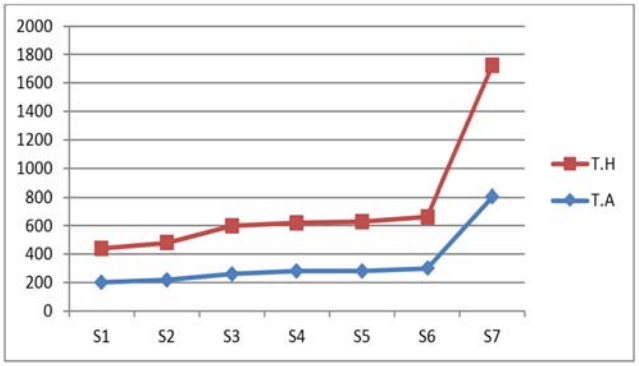

Fig 3: show the Total hardness and Total Alkalinity ranges of different sampling sites of the Vaigai River

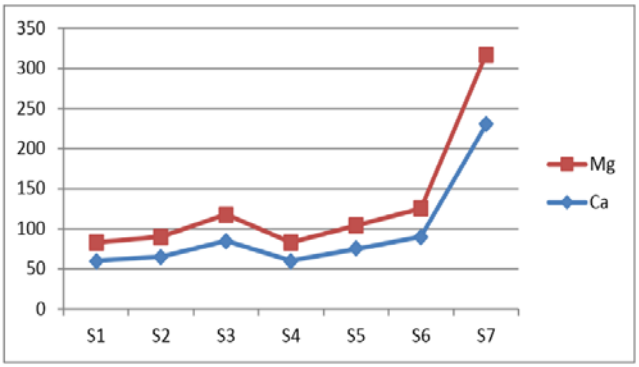

Fig 4: show the Mg and Ca concentrations of different sampling sites of the Vaigai River

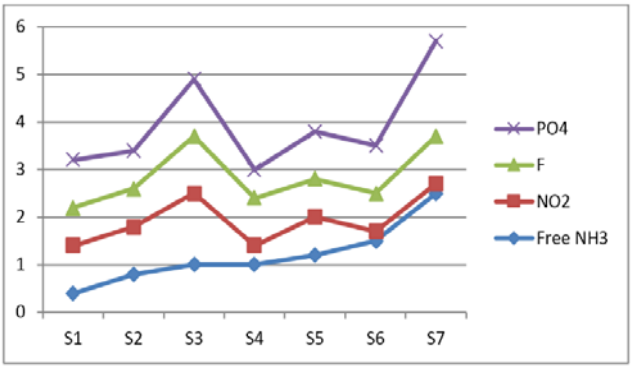

Fig 5: show the Phosphate, Fluoride, Nitrogen di oxide and Free ammonia concentrations at different sampling sites of the Vaigai River.

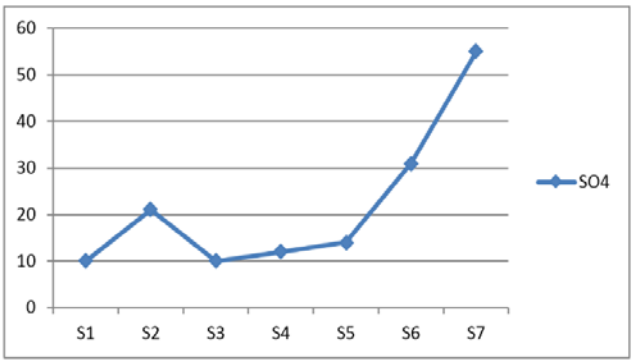

Fig 6: show the Sulphate concentration at different sampling sites of the Vaigai River

5. Reference

1. APHA. Standard Methods for the Examination of Water and Wastewater, 20th Ed., American Public Health Association, Washington D.C, 1998.
2. Bhattacharya T, Chakraborty S, Tuck Neha. Physico chemical Characterization of ground water of Anand District, Gujarat, India, I Res J Environment Sci. 2012; 1(1):28-33.
3. BIS. Standards for water for drinking and other purposes, Bureau of Indian standards publication. New Delhi, 1983.
4. Comly HH. Cyanosis in infants caused by nitrates caused in well water, J Am Mw. Assoc, 1945; 129:12-144.
5. Gilly G, Corrae G, Favilli S. Concentration of nitrates in drinking water and incidence of gastric carcinomas first descriptive study of the Piemonate regions, italy, Sci. Total Environ 1984; 34:35-37.
6. Indrani Gupta, Salunkhe Abhaysingh, Rohra Nanda, Kumar Rakesh. Groundwater quality in Maharashtra, India, Focus on Nitrate pollution, Journal of Environmental Science and Engineering. 2011; 43(4):453-462.
7. Nawlakhe WG, Lutade SL, Patni PM, Deshpande LS. Indian J Env. Prot. 1995; 37(4):278-284.
8. Raghunath HM. Groundwater, New Delhi, Wiley Eastern, 1987, 563.
9. Rajmohan N, Elango L. Nutrient chemistry of groundwater in an intensively irrigated region of southern India, Environmental Geology 2005; 47:820-830.
10. Scroeder HA. Municipal drinking water and cardiovascular death rates, J Am Med. Assoc. 1966; 195:81-85.
11. Standard Methods for the Examination of Water and Wastewater, APHA, 16th Edition, Washington DC, 1985.
12. Tiwari TR. Indian Journal of Environ Health. 2001; 43(1):176.
13. Trivey AK, Pandey SN. Water Pollution, shish Publishing House, New Delhi, 1990, 4.
14. WHO. Guidelines for Drinking Water Equality, World Health Organisation, Geneva 1984; 2:49.