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A STUDY ON THE DISTRIBUTION OF ORGANIC MATTER AND TOXIC METALS IN THE SEDIMENTS OF AMARAVATHI RIVER IN KARUR DISTRICT, TAMIL NADU

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Abstract

The present study aims at examining the river bed sediments for the distribution of organic matter and toxic heavy metal in the Amaravathi River. Two sediment samples were collected at both the banks from 6 sampling stations. The samples were acid treated and the concentration of metals, like lead, copper and iron were recorded using atomic absorption spectrophotometer. The total organic matter and physico chemical parameters were analysed for all the samples. Most of the heavy metals have precipitated and settled into the river bed as carbonates, oxides and hydroxides. The pollutants are deposited in association with very fine particles of silt and clay. The silt and clay act as adsorbents along with the inorganic and organic mattes.

Index Terms- pollutants, metals organic matter, physico-chemical, river beds

I. INTRODUCTION

The modern civilization, industrialization, urbanization and increased population have led to fast degradation of our environments. Water is indispensable and one of the precious natural resources of this planet. A ground water and natural water resource is an important source of water supply through out the world. Its use in irrigation, industries and domestic usage continues to increase where perennial surface water sources are absent the quality ground water used for all purposes is more important as the case of quality (Mariappan *et al*., 2005). Discharge of textile effluent, sewage and industrial effluents into the river water with out any treatment causes alarming pollution. They cause damage histologically, physiologically and behaviorally to the human being and to the aquatic organisms. The river Amaravathi flows through the heart of the city Karur. It is being polluted by indiscriminate of textile, sewage and other industries wastes and a plethora of plants and human activity. They contain many toxic metals which have gained considerable importance because of their active participation in many metabolic reactions as well as their inhibitory role in the nutrient utilization by plants (Rajesh Kumar Sharma and Madhoolika Agrarwal, 2005; Wintz *et al*., 2002. The pollutants on their way settle on the banks of the river and degrade. The present study reports the distribution of organic matter and toxic metals in the sediments and the surface water of Amaravathi River.

II. MATERIAL AND METHOD

The samples were collected at both the banks of the Amaravathi River from 5 sampling stations during May 2003. K. Paramathy, Vairucetty Polayam, Pasupathy palayam, Thirumanilayur and Sunga gate, this are the sampling spots around the 10 km. The samples were collected using one feet PVC pipes (1 x2.5). The samples were air dried in the help of hot air oven at over night 60

± 2^{o} C and grind to fine powder. To 10 gm of each of the soil samples, were dissolved in triple acid till pale yellow colour appeared, it was cooled and 20 ml of con. HCl was added and heated to dissolve all the salts. It was cooled and filtered. The acid extract was diluted with deionised distilled water and analysed for heavy metals by atomic absorption spectrophotometer. The samples were preserved and analysed by adopting standard procedures (APHA, 1999) and Trivedy and Goel (1986). The water following in the sediment collection points were also analysed and the values of the different parameters were compared.

III. RESULT AND DISCUSSION

The physical parameters, organic matter and metals concentrations of sediments are shown in the Table -1. In table -2 shown parameters are running water in the river of Amaravathi. The results reveal that the bed sediment of the river becomes rich in toxic metals. There are no uniform distributions or incremental increase while going from sample 1 to 5. This is due to the variation in the human activity and the industrial untreated effluent discharge in to the river basin. Since the opposite beds of the river has different activity and the discharges, the parameters values are not uniform for the sample collection areas of the river beds at any collection points. The pH of the river water was slightly alkaline and the high in amount of electrical conductivity values suggest that the sediment and river water contains the organic constituents and metal ion in the form of oxides, hydroxides and carbonate (Dhanya *et al*., 2005), since the sediment is slightly alkaline in pH range from 8.12% to 8.78% the percentage of organic matter is high ranging from 4.6 to 5.98, electrical conductivity also vary from the sampling spot rang from 4.97 to 6.18 d.Sm^{-1}. The higher value may be attributed to the plant, animal and human activities in this stretch of the river and to be remains of the leaves and dead plants. Organic matter is highly beneficial in the soils and plants for retaining the nutrient and for aggregation (Bachewar and Metha, 2001**;** Mishra nd Bhattachraya, 2005; Saravanamoorthy and Ranjitha Kumari, 2007). The organic matter is adsorbed onto the soil with a monolayer formation (Kharttri and Singh, 1999) due to bioflocculation process. The sediments act as sinks for toxic metals. The deposition of heavy metals occurs in association with very fine particles of silt and clay. They decrease root respiration and nutrient uptake by the plants (Ali et al., 2000). Heavy metals reduce enzymatic activity and the microbial and micro faunal population in soils, (Mishra nd Bhattachraya, 2005**;** Mariappan *et al*., 2005 and Dhanya *el al*., 2005). They are environmentally stable, non degradable and induce toxic effects. The heavy metals accumulate in the sediment due to adsorption process. The ability to adsorb heavy metals in enhanced due to the present of organic particle and finer mineral grains are boost-up the soil nutrients values (Saravanamoorthy and Ranjitha Kumari, 2007 ;Uncles *et al*., 2002**;** Shangning Ji and Unger, 2001). The untreated soil containing organic matter has higher rate of adsorption than the organic matter free soil (Ali *et al*., 2000). The maximum of heavy metals in sediments is organic matter in (sample spot 2 and 3). Thus the heavy metal are adsorbed onto the organic matter and the concentration of metals in sediments are found to be higher than those obtained in rive water as was previously reported (Wade et al., 2002; Stolt *et al*., 2001). The heavy meals present in the running water interact with organic matter slowly and settle down resulting in high concentration of these in sediments.

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Table -1: Physico- chemical parameters of Amaravathi river sediments in Karur (May -2003)

Sampling spot	Temp	pH	E.C	Total organic matter (%)	Metal concentration in µg/gm				
					Zn	Pb	Fe	Cu	Mn
K. Paramathy	31.8	8.25	5.73	4.8	227	298	65	47	12.96
	30.4	8.57	4.97	4.6	259	312	54	39	12.25
	31.8	8.18	5.28	5.2	268	342	59	52	13.12
Vairucetty Palayam	30.2	8.12	6.12	3.9	295	4.98	55	59	15.12
	30.7	8.54	5.98	4.45	324	4.97	62	58	17.05
	30.5	8.35	5.85	4.92	365	4.78	68	62	17.25
Pasupathy palayam	305	8.25	6.08	5.68	365	4.56	59	69	16.56
	30.7	8.56	5.95	6.54	3.54	4.28	78	72	17.89
	30.4	8.45	6.18	6.59	3.65	4.65	69	68	18.25
Thirumanilayur	30.8	8.56	5.36	5.98	3.69	3.18	49	59	16.25
	30.7	8.64	5.38	5.87	3.89	3.68	52	55	16.02
	30.6	8.45	5.39	5.85	3.87	4.12	55	59	16.89
Sunga gate	30.8	8.64	5.63	5.98	4.56	287	45	52	15.35
	30.6	8.78	5.59	6.02	4.58	295	43	49	15.89
	30.5	8.75	5.57	6.18	4.49	309	39	58	16.14

Table -2: Physico - chemical parameters of Amaravathi river water in Karur (May 2003)

Sampling spot	Temp	pH	E.C	Total organic matter (%)	Metal concentration in µg/gm				
					Zn	Pb	Fe	Cu	Mn
K. Paramathy	27.8	7.25	316	3.56	194	200.86	0.25	14	2.9
	27.6	7.15	326	3.28	189	198.56	0.28	10.59	2.8
	27.5	7.16	315	3.37	198	203.15	0.19	12.68	2.45
Vairucetty Polayam	27.2	7.12	312	4.12	200.12	212.19	Nd	15.86	1.95
	27.8	7.05	311	4.15	200.04	207.89	Nd	14.89	1.85
	27.4	7.15	322	3.98	19.78	208.36	0.15	15.12	2.08
Pasupathy palayam	27.6	7.18	321	3.95	199.85	201.20	0.18	14.28	2.12
	27.9	7.32	315	3.56	200.18	203.15	Nd	14.68	2.15
	28.2	7.19	315	3.87	200.09	200.65	Nd	14.89	2.10
Thirumanilayur	27.8	7.24	305	3.12	197.25	182.45	0.12	10.25	1.45

	27.5	7.12	309	3.16	195.35	169.56	0.08	11.09	1.35
	27.6	7.31	315	3.54	197.12	181.35	0.09	11.12	1.22
Sunga gate	27.2	7.28	312	2.98	165.08	156.68	0.09	9.15	1.12
	27.5	7.27	315	2.78	158.32	162.25	0.08	9.58	1.19
	27.6	7.28	309	3.09	149.65	169.58	0.06	9.65	1.54

Figur-1 Sampling spot and rout of Amaravathi River