Study of cauvery river water quality and its improvement using biomass treatment

Prakash S, J.Aravind Kumar and Joshua Amarnath

Sathyabama University, Chennai.

ABSTRACT

The present investigation was undertaken to study of Cauvery river water at ten different locations in Namakkal district, Tamilnadu, India. The water samples were collected from different places and analyzed for various water quality parameters like Appearance, Adour, Turbidity, pH, EC, TDS, Total alkalinity, Total hardness, Calcium, Magnesium, Sodium, Potassium, Iron, Manganese, Ammonia, Nitrite, Chloride, Fluoride, Sulphate, Phosphate, Tidy's, Dissolved oxygen, Biological oxygen demand, Chemical oxygen demand. The water quality parameters are analyzed after biomass treatment using vetiveria Zizanoides. Water quality parameters were compared WHO, USPH, BIS

Introduction

Water is not only a vital environmental factor to all form of life, but it has also a great role to play in socio-economic development of human population. Water is invariably polluted in all countries. India is no exception to this phenomenon. River water is the cheapest and most practical means of providing water to small communities. It is subjected to less contamination and has high mineral content. Today the river water resources are contaminated by the constant addition of industrial waste water, etc. The extent of river water pollution depends on distance from the source of contamination, and soil properties such as permeability. Water quality also depends on chemical, physical and bacterial constituents. People residing in this area use river water for their domestic and drinking consumption. The present paper attempts to evaluate and improve the quality of river water in Namakkal district, Tamilnadu, India and thereby to analyze the various related aspects.

Introduction of vetiver:

Vetiveria is one of the most versatile genera in plant kingdom. It has been well established that microorganism's uptake metals either actively (bioaccumulation) and / or passively (bio sorption). However, feasibility studies for large-scale applications have demonstrated that bio sportive processes are more applicable than the bio accumulative processes. This is because; the living organisms (active uptake) quite often need the addition of nutrients and consequently increase BOD or COD in the effluent. . After water quality improved using vetiveria Zizanoides. After analyzing the water quality parameters. The value is compared WHO, USPH, BIS etc. Environmental Pollution is threatening the world with serious problem of global warming, green house effects, depletion of ozone in the atmosphere etc., Our air, water and land are polluted by the population, which is exploding these days. The alarming rate of population results in drastic and unplanned industrialization. This has given birth to mushroom growth of various big and ancillary industries, which let their wastes and effluents ruthlessly in to our atmosphere, water and land. The

present investigation is an attempt to understand the degree of pollution caused to river water in the outskirts of Namakkal district. Which a lateral distance of about 2 km from each other separates, are chosen for investigation.

Chapter-2,

Experimental Works

Sampling Procedure:

A sampling of Water for Physico-chemical examinations done in two ways.

Grab sample

i. A grab sample is manually collected single portion sample of water.

ii. When a grab sample is collect at a time interval regularly and then it is mixed uniformly the sample is called composite sample.

Quantity of sample

Generally five liters of the sample is used.

Sample Container

Ordinarily stopper Winchester quartz bottle of 5 liters of capacity is sufficient. Generally glass containers are preferred to polyethylene materials. All sample containers must be cleaned thoroughly before to remove extraneous matter. Soda lime glass bottle are not recommended as sample containers.

Preservation of Samples

Generally samples should be kept in the dark at low temperature. However, some specific methods are followed.

1. Oxygen demand- samples preserved 4^0 c.

2. Total organic carbon- add concentrated H_2SO_4 and lowers the pH below 2.

3. Nitrogen balance-add 1 ml of concentrated H_2SO_4/dm^3 and keep in a refrigerator.

4. COD - add conc. H_2SO_4 to bring pH to about 3.

5. Sulphide-add 0.2 ml zinc acetate solution per 100 ml of sample.

6. Metals-add conc. HNO_3 and adjust pH below 2.

Labeling of the sample

The label should contain the following information,

Tele:
E-mail addresses: pon.prakash@rediffmail.com

1. Dates and Time.
2. Sample number.
3. Source of sample.
4. Exact point of sampling.
5. Name and signature of the collector.

Water Samples

In the present investigation river water samples were collected from 10 different locations in Namakkal District. The residents of area use all the river water for drinking as well as other domestic purposes. All the samples were collected in cleaned and well-dried polyethylene bottles. The collected samples were stored in an icebox and brought to laboratory for both physical and chemical parameters.

All the chemicals were AR grade to prepare reagents and calibration standards. Double distilled water was used to prepare all the reagents. All the glassware used was of good quality glass.

Glassware was cleaned with commercial HCl followed by several portions distilled water. The Physico-chemical analysis was carried out according to standard methods. The various parameters are analyzed including color, odor, turbidity, pH, EC, TDS, Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, SO_4^{2-}, NO_3^-, F^-, BOD, COD, DO, total hardness, permanent hardness, temporary hardness and etc.,

The pH and Electrical Conductivity were measured by using a digital pH meter and Conductivity meter respectively. TDS are measured by using evaporating methods at 185^0C.

Total Hardness, Calcium, Magnesium were measured by EDTA titration method. Total Alkalinity is measured by titration method. Sodium, Potassium is measured by flame photometry method.

Chloride is measured by volumetrically by Silver nitrate titrimetric method using K_2CrO_4 as indicator. Fluoride is measured by Ion-selective electrode method. Sulphate is measured by Gravimetric method by using $BaCl_2$. Phosphate is measured by Spectro-photometer method. BOD and DO were measured by Iodometric titration. COD is measured by Dichromate reflux method.

Biomass Preparation

It is well known that the roots of any plant have more sportive power than any other part of the plant. Hence in the current investigations the roots of the plant VETTIVERIA Zizanoides have been chosen. The roots have been washed several times with dil HCL followed by deionized / distilled water and dried in oven at 40 C for three days. The roots have been then cut in to small pieces and finally grand to the fine powder.

Biosorption Process

A small quantity (~ 7g) of biomass is stirred with water sample to be analyzed and poured into a glass column pre-packed at the bottom with cotton. The column is of 6.5 cm wide and 83 cm height. The water trickles down leaving the biomass above the cotton layer. In this way a column of biomass of about ~4 cm is made ready for biosorption process.

After packing the column with biomass, the water sample to be tested is passed through the column slowly. The treated water sample is collected after about 20 minutes of treatment. This treatment is repeated for all the other water samples. The treated water samples are various parameters obtained for untreated samples.
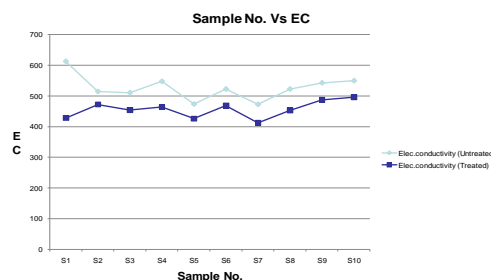
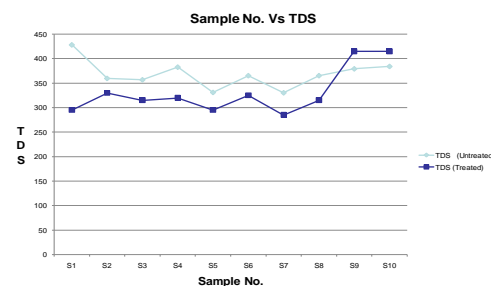**Vetiveria Zizanoids Roots**

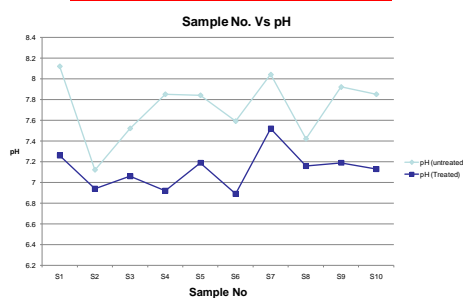**Experimental Setup**

Graph-1

Comparison of Sample No & EC

Sample No. Vs EC

Graph-2
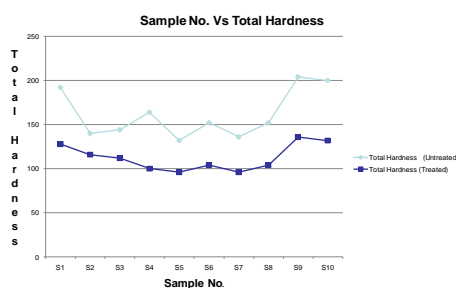
Comparison of Sample No & TDS
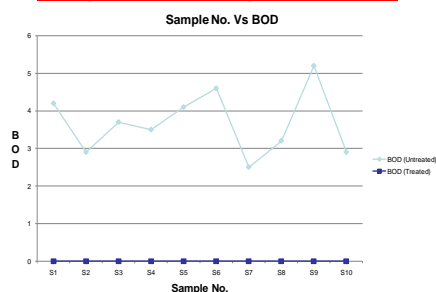

Sample No. Vs TDS

Graph-3

Comparison of Sample No & pH
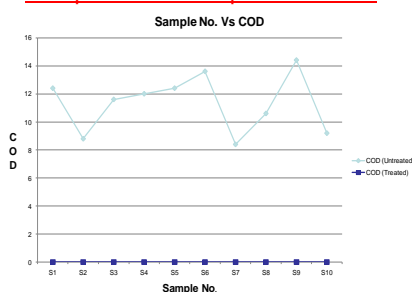

Graph-4

Comparison of Sample No & TH

Graph-5

Comparison of Sample No & BOD

Graph-6

Comparison of Sample No & COD

Chapter-3,Discussion

Colour and odour:

Water is used for drinking and domestic purposes. Sample should be colourless and odourless. Samples analyzed are colourless and odourless.

Turbidity:

Samples are slightly turbid, biomass treated water is not turbid.

pH:

pH of treated and untreated samples lies in the range 6.92-8.12. This is the safe range prescribed by WHO. Biomass alters the pH within this range.

Electrical conductivity (ec):

EC of untreated samples lie in the range 472-612 (µmho/cm). Biomass treatment decreases EC. EC lies within permissible limits.

Total dissolved solids (tds):

TDS of untreated samples lies in the range 330-428 mg/L. Treated water samples have TDS value far lower than untreated samples.

Total alkalinity:

The total alkalinity of untreated water samples lies in the ranges 100-156 mg/L. Treated water samples have alkalinity within permissible limits.

Total hardness:

The total hardness of untreated water samples generally lies above permissible limits (132-204 ppm). Biomass treatment slightly decreases these parameter.

Sulphate:

The sulphate content of untreated water samples lies in the range between 10-19 mg/L. Some samples lie at border line of permissible limits. But treated water samples lie below permissible limits.

Chloride:

The chloride content of untreated water samples ranged from 72-125 mg/L. Biomass treatment decreases chloride content.

Fluoride:

Fluoride content of untreated samples lies in the range 0.0-0.2 mg/L. This is the safe range prescribed by WHO. However, biomass treatment decreases the fluoride to zero.

BOD and COD:

BOD and COD values of untreated samples lie far above permissible limits. Biomass treatment makes BOD and COD zero.

Chapter-4, Summary

The present investigation is aimed at assessing the quality of kauvery river water samples in different location of Namakkal district. Measurement of physic-chemical analysis such as pH, Electrical Conductivity, Total Dissolved Solid, Total Hardness, Total Alkalinity, Phenolphthalein alkalinity, Calcium, Magnesium, Sodium, Potassium, Iron, Manganese, Ammonia, Nitrite, Nitrate, Chloride, Fluride, Sulphate, Phosphate, Dissolved Oxygen, Bio chemical oxygen demand and Chemical oxygen demand are carried out comparison made. After biomass treatment again all the parameters are measured. All the values are compared before biomass treatment and after biomass treatment. The treatment values are compared WHO, USPH, BIS etc.,

Chapter-5, Conclusion

➤ Except for BOD, EC, TDS,pH, Total Hardness all other physic-chemical parameters lie either on the lower side of permissible limits or below permissible limits.

➤ Bio mass Treatment with vetiveria zizanodes domestically alter these parameters and bring them with in permissible limits.

➤ Compare the parameters of after biomass treatment the result of vetiveria zizanodes less than before biomass treatment.

➤ Biomass treatment bring down BOD, COD makes Zero. The reason is due to the adsorption of biomass material

Physico- Chemical Parameters obtained from different methods for untreated water samples are summarized table -1

Sl.No.		Sample No.	Appearance	Odour	Turbidity	Elec.conductivity	Total Dissolved Solids	pH	Phonolphthalin Alkalinity	Total Alkalinity	Total Hardness	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Ammonia	Nitrite	Nitrate	Chloride	Fluoride	Sulphate	Phosphate	Tidy's	DO	BOD	COD
1	A	S1	Colourless	None	0	612	428	8.12	0	156	192	45	19	49	9	0.1	0	0	0	8	96	0	19	0	0	8.6	4.2	12.4
2	A	S2	Colourless	None	0	514	360	7.12	0	144	140	32	14	47	8	0.2	0	0	0	8	80	0	16	0	0	7.9	2.9	8.8
3	A	S3	Colourless	None	0	510	357	7.52	0	152	144	34	14	45	8	0.2	0	0	0	7	72	0.2	17	0	0	8.1	3.7	11.6
4	A	S4	Colourless	None	0	547	383	7.85	0	140	164	37	17	50	10	0.1	0	0	0	7	92	0	17	0	0	7.2	3.5	12.0
5	A	S5	Colourless	None	0	473	331	7.84	0	120	132	30	13	51	7	0.2	0	0	0	6	80	0	19	0	0	6.9	4.1	12.4
6	A	S6	Colourless	None	0	522	365	7.59	0	112	152	34	16	46	8	0.1	0	0	0	6	104	0.2	12	0	0	8.5	4.6	13.6
7	A	S7	Colourless	None	0	472	330	8.04	0	116	136	30	14	43	9	0.2	0	0	0	7	80	0	18	0	0	9.2	2.5	8.4
8	A	S8	Colourless	None	0	522	365	7.42	0	120	152	30	18	46	9	0.2	0	0	0	8	92	0	22	0	0	10	3.2	10.6
9	A	S9	Colourless	None	0	542	379	7.92	0	100	204	45	22	39	7	0.1	0	0	0	10	126	0.2	10	0	0	7.8	5.2	14.4
10	A	S10	Colourless	None	0	549	384	7.85	0	108	200	43	22	38	6	0.2	0	0	0	10	124	0	10	0	0	9.9	2.9	9.2

Physico- Chemical Parameters obtained from different methods for treated water samples are summarized table - 2

Sl. No.		Sample No.	Appearance	Odour	Turbidity	Elec.conductivity	Total Dissolved Solids	pH	Phonolphthalin Alkalinity	Total Alkalinity	Total Hardness	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Ammonia	Nitrite	Nitrate	Chloride	Fluoride	Sulphate	Phosphate	Tidy's	DO	BOD	COD
1	B	S1	Colourless	None	49	428	295	7.26	0	112	128	29	13	35	8	0	0	0	0	7	72	0	15	0	0	9.2	0	0
2	B	S2	Colourless	None	45	472	330	6.94	0	120	116	26	13	40	7	0.1	0	0	0	6	72	0	15	0	0	8.5	0	0
3	B	S3	Colourless	None	52	454	315	7.06	0	116	112	26	12	39	6	0.1	0	0	0	5	64	0	15	0	0	8.9	0	0
4	B	S4	Colourless	None	48	464	320	6.92	0	108	100	24	10	45	9	0	0	0	0	6	72	0	16	0	0	7.6	0	0
5	B	S5	Colourless	None	35	426	295	7.19	0	104	96	22	10	44	5	0.1	0	0	0	5	76	0	15	0	0	8.1	0	0
6	B	S6	Colourless	None	47	468	325	6.89	0	116	104	21	13	49	6	0.1	0	0	0	7	80	0	18	0	0	9.2	0	0
7	B	S7	Colourless	None	40	412	285	7.52	0	104	96	19	12	36	9	0	0	0	0	6	72	0	14	0	0	9.6	0	0
8	B	S8	Colourless	None	32	453	315	7.16	0	100	104	22	12	41	8	0.1	0	0	0	7	88	0	15	0	0	11	0	0
9	B	S9	Colourless	None	29	487	415	7.19	0	104	136	30	14	45	6	0.1	0	0	0	5	108	0	10	0	0	8.5	0	0
10	B	S10	Colourless	None	42	496	415	7.13	0	108	132	29	14	47	5	0.2	0	0	0	4	104	0	10	0	0	10	0	0

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