EFFECTS OF NATURAL ADSORBENTS FOR TREATMENT OF PHYSIO-CHEMICAL AND BACTERIOLOGICAL CHARACTERISTICS OF BHARATHAPUZHA RIVER WATER

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Abstract - *Rivers are the most important freshwater resource. Social, economic and political development has, in the past, been largely related to the availability and distribution of fresh waters contained in riverine systems. River water is mainly contaminated by physical and biological impurities consist of Totals suspended solids, turbidity, bacteria, virus, algae etc. which need to remove before supply and distribution of river water for various uses. In this project, we determine the analysis of Bharathapuzha river water and treatment by natural adsorbents like banana peel and jack fruit leaf powder. Adsorption is a eco-friendly technique used to treat the riverwater. The river water is subjected to adsorption using low cost and easily available natural adsorbents like banana peel and jack fruit leaves. The combination of both these adsorbents was used for the treatment of river water with different proportion of height and contact time. The treated water obtained will have a considerable decrease in parameters of drinking water as compared to initial characteristics of Bharathapuzha river water. This methodis highly economic and eco- friendly and it reduces the scarcity of water with improvements in rivers.*

***Key Words*: colour, odour, taste, turbidity, PH value, TSS,Total hardness, Iron, chlorides.**

1. INTRODUCTION

Geometric increase in population coupled with rapid urbanization, industrialization and agricultural development has resulted in high impact on quality and quantity of water in India. Hence, the availability and the quality of the freshwater resources are the most pressing of the many environmental challenges in India (CPCB 2011). The quality of water is of vital concern for mankind, since it is directly linked with human welfare. Poor quality of water adversely affects the plant growth and human health (WHO 1984; Hem 1985). A number of studies on water quality have been carried out in different parts of India (Sreedevi 2004; Semwal and Akolkar 2006; CPCB 2011; Thilagavathi et al. 2012; Brinda et al. 2014; Balwant et al. 2016). All these studies reveal that both rivers and groundwater in India are facing water quality issues.

The state of Kerala, located in the south-western corner of India, is blessed with 44 rivers and heavy rainfall of ~ 3000 mm/year. However, most of the water in the rivers is quickly drained into the Arabian Sea due to the steep seaward sloping of the state. Hence, in addition to rivers, the groundwater is also utilized to meet the water requirements of the state. The increase in population, development activities, urbanization, change in land-use pattern, etc. has created a concern among the people of Kerala regarding both the river water quality of various riverbasins.

Bharathapuzha River Basin, the second-longest (209 km) and the second-largest river basin of Kerala (4400 km^2), is the lifeline of approximately four million people residing in three administrative districts, namely Malappuram, Trissur and Palakkad districts of Kerala. The river originates from differentparts of the Western Ghats, as small brooks and rivulets which later join and form four major tributaries, namely Kalpathipuzha, Gayathripuzha, Thuthapuzha and Chitturpuzha.

Access to clean water is the major priority in all countries in the world in which millions of humans and living organisms die due to contaminated water-related diseases every year. Flora and fauna particularly urban rivers are losing attraction due to the problem of high turbidity in the water resources. Sedimentation and filtration had been regarded as efficient approaches in tackling high turbidity problem in river water. The primary objective of this research is to investigate the performance of banana peels and jack fruit leaf as adsorbent for the potential application in analysis of Bharathapuzha river water treatment process. Many natural adsorbents are usedfor the treatment of river water and waste water etc. In this project, we determine the analysis of Bharathapuzha river water and treatment by natural adsorbents like banana peel and jack fruit leaf powder. Adsorption is a eco-friendly technique used to treat the river water. The river water is subjected to adsorption using low cost and easily available

natural adsorbents like banana peel and jack fruit leaves. The combination of both these adsorbents was used for the treatment of river water with different proportion of height and contact time. The treated water obtained will have a considerable decrease in parameters of drinking water as compared to initial characteristics of Bharathapuzha river water. This method is highly economic and eco- friendly and it reduces the scarcity of water with improvements in rivers.

OBJECTIVES OF THE STUDY·

- To study the existing characteristics of Bharathapuzha river water.
- To find effectiveness of treatment of Bharathapuzha river water by natural adsorbents like banana peel and jack fruit leavesin adsorption column.
- To use various natural adsorbent like banana peel and jack fruit leaf for treatment of the polluted river water collected.
- To analysis the removal efficiency of pollutant by the selected adsorbents like banana peel and jack fruit leaves, and its optimum usage.
- To analyse the removal efficiency of pollutant bythe selected adsorbents like banana peel and jack fruit leaves treating at different height of adsorbents in adsorption column at different time periods.

SCOPE OF THE STUDY

Water scarcity is one of the major problem which is facing the day today era. So treatment of river water by suitable methods helps to reduce this water scarcity. Adsorption is the one of the suitable methodand effective methods to treat the Bharathapuzha river water .Adsorption method has proven to be an excellent way to treat effluent and also cost effective technique. Different adsorbent materials had been used to remove heavymetals from waste water: in this study adsorbent was used directly for adsorption experiment without any treatment. By use of locally available adsorbent we treat river water by low cost and effectively.The main aim of this project; is the project suitable for potable water by treating Bharathapuzha river water by banana peels and jack fruit leaf. The banana peel and jack fruit leaf waste was evaluated as a new sorbent for adsorption for contents of river water.

2. LITERATURE REVIEW

Dying river Bharathappuzha, also known as River Nila, is fast becoming a source of health hazards for the people of several panchayaths and municipalities on its banks. An examination of the water of the river by the Kerala Water Authority has revealed that it was not fit human consumption. The river is the source of drinking water for lakhs of people living on its banks from places east to Ottapalam to Ponnani inthe west.

Years of steady dumping of effluents, pollutants and waste into the river from human habitats on both banks have contaminated the water of Bharathappuzha, which is already in the process of a cruel death due to incessant and unscrupulous sand-mining and encroachments.

The Water Authority, which took the sample of water for examination from the river near Pattambi town, found that it posed health problems to the people who depend on it for life. Analysts found that 100 ml of the water contained an average 1,100 coliform bacteria. Health experts say that the water being distributed from the river for drinking and other purposes would not be free of the harmful bacteria however much it was treated.

There is no technology available to purify water with presence of such quantity of bacteria. Even if there is a technology, the KWA does not have it. In this situation, the people depending on this river are drinking this contaminated water. The wells on the banks of the river are sources of diseases. So far we have not had a water-bourne epidemic, but we will soon have it," said an environmentalist in Pattambi, who has been leading a movement for the past many years to keep the river clean.

Lack of good flow of water and the presence of check dams in the river are projected as the reasons for the presence of pollution in the water, but environmentalists are not ready to subscribe to this theory entirely. The bridge-cum-regulator at Thrithala, which has helped in keeping the water level in theriver even in harsh summers, is pointed out as the biggest reason for stagnancy of water. Check dams are necessary for keeping the water levelin the river in days of drought and to

keep the waterbed rich so that people do not die of thirst. The point is to keep the river in good health considering that there are check dams in it and that it is not to be polluted.

Health workers and environmentalists say that the KWA finding might not contain the entire truth. Therefore, they are calling for a better expert analysis. They want the water supplied by the Water Authority also to be analysed thoroughly.

A travel by either bank of the river would reveal the cruelty of humans to the river and so ultimately to themselves. Comfort stations of almost all the adjacent panchyayaths and municipalities push wastes including human excreta to the river. Drainages of all these civic bodies and towns like Ottapalam and Pattambi open to the river. Wastes from the general market, slaughter houses, etc also are removed to nowhere but to the river. All this contribute to contamination ofBharathappuzha. Unlike many other rivers in Kerala, Bharathappuzha's plain of flow is not all that slanted which makes the water to move slowly even during monsoon. The rapacious sand-mining mafia has already ensured that this aspect of the river is complicated through creation of vast troughs in the riverbeds.

An environmentalist says such troughs become virtual septic tanks as wastes get trapped in them.Several crusades have so far been carried out tosave Bharathappuzha, the depth of which has been increased by more than 20 feet in several places due to sand-mining – legal and illegal. But none has achieved its desired result. As sand-mafia and the Government continue to make money by plundering the sand of Bharathappuzha and encroachers add more acreage to their property by making the river narrower and narrower, Bharathappuzha is nearing its death.

ADSORPTION

Adsorption has emerged as promising technique for metal removal. The processes can occur at an interface between any two phases, such as, liquid-liquid, gas-liquid, or liquid-solid interfaces. Moreover, adsorption is coming to be regarded as a practicable separation method for purification or bulk separation in newly developed material production processes of, for example, high- tech materials and biochemical and biomedical products. Surface characteristics and pore structures of adsorbents are the main properties in determining adsorption equilibrium and rate properties which areneeded for plant design. New adsorbents are continuously being developed, introducing new applications for adsorption technology. Adsorption equilibrium is the fundamental factor in designing adsorption operations.When adsorption takes place with suspended adsorbent particles in a vessel, adsorbate is transported from the bulk fluid phase to the adsorption sites in the adsorbent particle. In this type of situation, changes in the amount adsorbed or concentration in the fluid phase can be predicted by solving the set of differential equations describing the mass balances in the particle, at the outer surface and between the particle and the fluid phase. Determination of diffusion parameters should be done with a simple kinetic system. These discussions are also applicable to the analysis and design of adsorption operation in a vessel or differential reactor. Another powerful technique for determining the rate parameters involved in an adsorption packed column gives the basic relations used for calculation of breakthrough curves.

TYPES OF ADSORBENTS

Most of the adsorption researches have been concentrated on the use of bacteria and fungi for the removal of heavy metals. Both viable and inactive cells have been studied. This generally involves culturing of these organisms using chemicals. A potential economical alternative would be to use, naturally abundant materials such as waste biomass. These natural materials can be easily processed and used for metal removal, and hence can offer an economical solution to the problem of heavy metal pollution.

There are 2 types of adsorbents: Natural and synthetic adsorbents. The natural adsorbents are naturally abundant materials such as waste biomass like orange peel, neem leaf, mango leaf etc. The synthetic adsorbents are human made adsorbents like activated carbon, silica gel, zeolites and activated alumina etc. The activation of natural adsorbents are comparatively less than the synthetic adsorbents. In this project, the banana peel and jack fruit leaves are taken as adsorbents.

Banana Peel

A pinch banana peels can be used as adsorbent. The main reason for this is due to the fact that they contain a number of acids and other molecules capable of purifying hydrogen and oxygen. Better still, these molecules are not at all harmful to humans. Specifically, banana peels contain sulfur, nitrogen, carboxylic acid and other atoms that function pretty much the same way magnets do in terms of attracting heavy metals. This is great news since heavy metals are one of the biggest problems in terms of water contamination. Some of these metals that can be found in unpurified water include lead, copper, mercury, and iron. These are lethal to humans, building up slowly in our bodies and eventually leading to brain

and nervous system damage. Heavy metals in water are generally positively charged and the carboxylic acid ions in the banana peels become negatively charged. The two compounds are drawn towards each other just like with a magnet.

Jackfruit Leaf Powder (Jlp)

Jackfruit or *Artocarpus heteropyllus* is a tropical plant. It is common in backyards and waste places. Carbonised jackfruit peel has already been used as adsorbent for the removal of basic dyes (Inbaraj and Sulochana, 2006, 2002) and Cd (II) (Inbaraj and Sulochana, 2004). Activated carbon prepared fromjackfruit peel has also been studied to remove phenoland chlorophenols from aqueous solution (Jain and Jayaram, 2007). However, no experiment has ever performed to use jackfruit leaf as adsorbent. In the present study column performance of jackfruit leaf powder (JLP) for the removal of methylene blue froman aqueous solution has been investigated. The adsorption capacity of some low cost adsorbents for methylene blue adsorption has been shown in our previous study. During preliminary studies carriedout at laboratory, jackfruit leaf powder had shown several folds higher adsorption capacity for methylene blue than the others. Moreover, it is available all over the year in Bangladesh. Due to its abundant availability and low-cost it can also be disposed off after use without need for expensive regeneration. The used adsorbent can be disposed after incineration to prevent the further impact on the environment. The ash obtained by incineration is not a pollutant rather it could be used as an adsorbent.

BHARATHAPPUZHA

Bharathapuzha ("River of Bhārata"), also known as the Nila, is a river in India in the state of Kerala. With a length of 209 km,[2] it is the second longest river in Kerala, after Periyar although the total length of Bharathapuzha is 250 km of which 41 km runs along Tamil Nadu from where it originates. Nila has groomed the culture and life of south Malabar part of Kerala. It is also referred to as "Peraar" in ancient scripts and documents. River Bharathapuzha is an interstate river and lifeline water source for a population residing in four administrative districts,namely Malappuram, Thrissur and Palakkad districtsof Kerala and Coimbatore,and Tiruppur of Tamil Nadu.

3. METHODOLOGY

This chapter includes the experimental and analyticalprocedures that were conducted as a part of the research work on treatment of agricultural waste water using different adsorbent.

COLLECTION OF WATER SAMPLE

Collection of water samples taken from the 3 locations of Bharathapuzha river as Santhitheerum hindu cemetery, Nilayorum resort and Municipalpark.

3.1.1 STUDY AREA

In this project we take 3 destinations of bharathapuzha termed as Punyatheerum Hindu cemetery, nilayorum ayurvedic resort, bharathapuzha railway bridgeareas about 5 Km each. Punyatheerum hindu cemetery 332^0 NW (N 10^{0}44′51″E 76^{0}15′26″), Nilayorum ayurvedic resort 50^{0}NE (N 10^{0}45′2″ E76^{0}18′4″), and municipal park 54^{0}NE(N 10^{0}45′2″E 76^{0}18′4″) within the Thrissur district of Kerala was visited and water samples were collected for analysis.The sample 1 taken from punnayatheerum, where so many incinerations of human dead bodies activities and after, preyers and bathinfg of humans are occuring and the ash is dumped to the river. The sample 2 taken from Nilayorum ayurvedhic resort, where the wastes of the ayurvedhic resort are thrownto the river. Then the pure clear water is changed to brown greenish colour due to the amount of wastes. The sample 3 taken from Muncipal park, where the plastic wastes are thrown by humans who reached inpark and travelers in train. And also the humans are bathing the cattle. That is the reason for taking these three points for my project.

Fig-3.1 collected samples

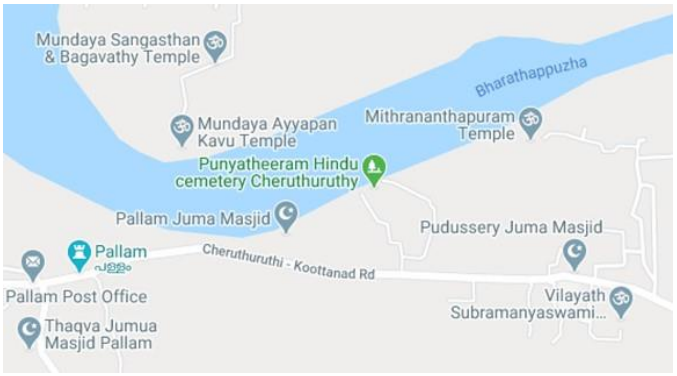

Fig-3.2 Punyatheerum Hindu Cemetery,Cheruthuruthy

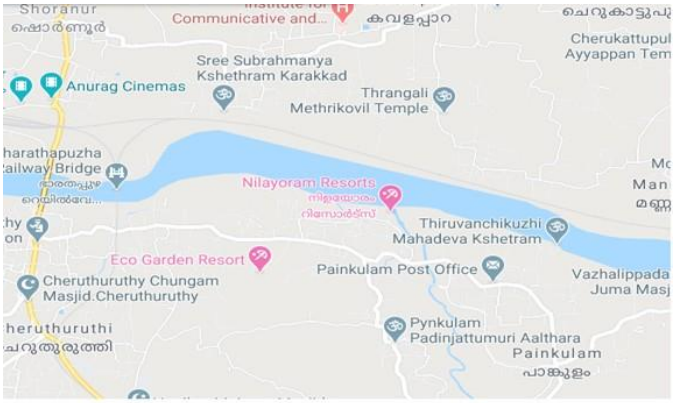

Fig-3.3 Nilayorum Ayurvedhic Resorts

Fig-3.4 Bharathapuzha Railway Bridge

MATERIALS

Biomaterials used as banana peel and jack fruit leaf foranalysis, pebbles and sand particles are used for filtering.

Banana Peel

Banana peels were collected from the market .The preparation of bio-flocculant was conducted based on the methods described with slight modifications. The banana peel samples were washed with distilled water several times to remove dirt and contaminants, followedby drying in a hot air oven (Memmert UNB 800) at 80 °Cfor at least 24 hours. The dried samples were then grinded or crushed using pestle and mortar, sieved well in fraction of 150 µm. The powdered sample was then stored in an airtight container prior to bioflocculant extraction processes. In the preparation of bio-flocculants, dried raw materials were soaked in distilled water at room temperature and stirred for 1 hour using a hotplate magnetic stirrer (Heidolph). The suspension was filtered through muslin cloth and the filtered extract was then used in the

subsequent experiments.

Fig- 3.5 Banana Peel

Fig -3.6 Dried Banana Peel

Fig- 3.8 Jack Fruit Leaf

Fig- 3.7 Powdered Banana Peel

Fig- 3.9 Dried Jack Fruit Leaf

JACK FRUIT LEAF

Jackfruit leaves were collected locally and were thoroughly washed with tap water and after washing with tap water it again washed with distilled water to remove all dirt and earthy materials and dried the jackfruit leaves under sun drying for 8 hrs. After drying under sun the leaves are again dried in a hot air oven at 105ºC overnight. The dried leaves were crushed and the crushed powder was boiled to remove lignin and other coloring components. After filtration, the powder was dried at 105ºC for 24 hrs and sieved to particle size of about 150 nm and stored in plastic bottle for use as adsorbent.

Fig -3.10 Powdered Jack Fruit Leaves

ADSORPTION COLUMN

An apparatus 75 cm length and 3.5 cm diameter is usedand an over head tank and collection tank is providedfor this experiment. An outlet was provided at the bottom of the tank experiment is conducted by placin the adsorbents in column apparatus separately at firs and combination of two adsorbents. At first add distilled water in to the apparatus and keep it for several time with outlet closed for dilute the adsorbent after severa time open the outlet for removing the excess water in the column apparatus . From the over head tank allow t pass the river water in to the apparatus , keeping th suitable retention time with outlet closed, after th retention period open the outlet and collect the wate from the collection tank.

Adsorption Using Banana Peel

The removal rate of various apparatus was tested usin banana peel in the column apparatus with differen heights such as 20cm, 30cm, 40cm,. At first the wast water is allowed to pass through the adsorption colum at rate of 0.075l/min which filled with banana peel a adsorbent. The amount of water after adsorption i collected in the collection tank. The collected water i analysed.

Adsorption Using Jack Fruit Leaves

The removal rate of various apparatus was tested usin jack fruit leaves in the column apparatus with differen heights such as 20cm, 30cm, 40cm,. At first the wast water is allowed to pass through the adsorption colum at rate of 0.075 l/min which filled with jack fruit leave as adsorbent. The amount of water after adsorption i collected in the collection tank. The collected water is analysed.

Adsorption Using Combination Of AllAdsorbent

The removal rate of various apparatus was tested using combination of banana peels and jack fruit leaves in the column apparatus with different heights such as 20cm, 30cm, 40cm,. At first the waste water is allowed to pass through the adsorption column at rate of 0.075 l/min which filled with combination of both as adsorbent. The combination is equally divided such as 20cm for banana peel and 20cm for jack fruit leaf. The amount of water after adsorption is collected in the collection tank. The collected water is analysed.

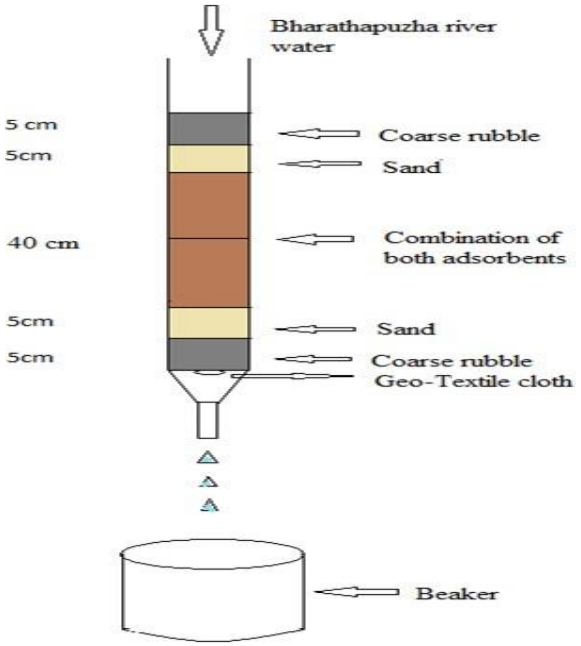

Fig- 3.11,Schematic Representation Adsorption Column

THE PARAMETERS TO BE TESTED

pH

The pH of a sample of water is a measure of the concentration of hydrogen ions. The term pH was derived from the manner in which the hydrogen ion concentration is calculated it is the negative logarithm of the hydrogen ion (H+) concentration. What this means to those of us who are not mathematicians is that at higher pH, there are fewer free hydrogen ions, and that a change of one pH unit reflects a tenfold change in the concentrations of the hydrogen ion. For example, there are 10 times as many hydrogen ions available at a pH of 7 than at a pH of 8. The pH scale ranges from 0 to 14. A pH of 7 is considered to be neutral. Substances with pH of less that 7 are acidic; substances with pH greater than 7 are basic. The colorimetric indicator method can be used only for approximate pH values.

Fig -3.14 pH Apparatus

Temperature

Temperature of water is basically important because it effects bio-chemical reactions in aquatic organisms. A rise in temperature of water leads to the speeding up of chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odours. The highest temperature being at 17.00 hrs. and the lowest at 05.00 hrs. The average temperatureof the present study ranged from 26.78 - 28.370 C.

Turbidity

Turbidity is an expression of optical property; where in light is scattered by suspended Particles present inwater(Tyndall effect) and is measured using nephelometer. Suspended and colloidal matter such as clay, silt, finely divided a organic and inorganic matter, Plankton and other microscopic organisms cause turbidity in water. Turbidity affects light scattering, absorption properties and aesthetic appearance in a water body. Increase in the intensity of scatter light results in a higher values of turbidity.

Fig -3.15 Turbidity Meter

Electrical Conductivity

An electrical conductivity meter (EC meter) measures the electrical conductivity in a solution. It has multiple applications in research and engineering, with common usage in hydroponics, aquaculture, aquaponics, and freshwatersystems to monitor the amount of nutrients, salts or impurities in the water.

Total Dissolved Solids

Total Dissolved Solids, also known as TDS, are inorganic compounds that are found in Water such as salts, heavy metals and some traces of organic compounds that are dissolved in water. Excluding the organic matters that are sometimes naturally presentin water and the environment, some of these compounds or substances can be essential in life. But it can be harmful when taken more than the desired amount needed by the body. The dissolved solids present in water are one of the leading causes of turbidity and sediments in drinking water. When left unfiltered, total dissolved solids can be the cause of various diseases. A total dissolved solid (TDS) is a measure of the combined total of organic and inorganic substances contained in a liquid. This includes anything present in water other than the pure H20 molecules. These solids are primarily minerals, salts and organic matter that can be a general indicator of water quality

Fig -3.17 TDS Meter

Bio-Chemical Oxygen Demand (BOD)

Microorganisms such as bacteria are responsible for decomposing organic waste. When organic matter such as dead plants, leaves, grass clippings, manure, sewage, or even food waste is present in a water supply, the bacteria will begin the process of breaking down this waste. When this happens, much of the available dissolved oxygen is consumed by aerobic bacteria, robbing other aquatic organisms of the oxygen they need to live. Biological Oxygen Demand (BOD) is a measure of the oxygen used by microorganisms to decompose this waste. If there is a large quantity of organic waste in the water supply, there will also be a lot of bacteria present working to decompose this waste. In this case, the demand for oxygen will be high (due to all the bacteria) so the BOD level will be high. As the waste is consumed or dispersed through the water, B0D levels will begin to decline. Nitrates and phosphates in a body of water can contribute to high BOD levels. Nitrates and Phosphates are plant nutrients and can cause plant life and algae to grow quickly. When plants grow quickly, they also die quickly. This contributes to the organic waste in the water, which is then decomposed by bacteria. This results in a high BOD level. When BOD levels are high, dissolved oxygen (DO) levels decrease because the oxygen that is available in the water is being consumed by the bacteria. Since less DO is available in the water, fish and other aquatic organisms may not survive.

Fig 3.18 BOD Bottle

Chemical Oxygen Demand

The **chemical oxygen demand (COD)** is a indicative measure of the amount of oxygen that can be consumed by reacations in a measured solution.it is commonly expressed in mass of oxygen consumed over volume of solution which in SI units is milligrams per liter (mg/L). A COD test can be used to easily quantify the amount of organics water. The most common application of COD is in quantifying the amount , of oxidizable pollutants found in surfacewater (e.g. lakes and rivers) or wastewater. COD is useful in terms of water quality by providing a metricto determine the effect an effluent will have on the receiving body, much like biochemical oxygen demand (BOD).

Fig 3.19 COD Digester

Dissolved Oxygen (Do)

It is an important parameter which is essential to the metabolism of all aquatic organisms that possess aerobic respiration. Presence of DO in water may be due to direct diffusion from air and photosynthetic activity of autotrophs 11. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. The DO values obtained in the present study are within ICMR standard.

Fig-3.20 DO Bottles

Nitrite

Nitrites are a salt or ester anion of nitrous acid, which can be naturally or artificially occurring in groundwater. Nitrites come from fertilizers through run-off water, sewage, and mineral deposits. Nitrite is used in food production for the curing of meat products due to it inhibiting the growth of bacteria. Unfortunately, it can also stimulate the grown of bacteria when introduced in high levels into a body ofwater.

3.4.10Ammonia

Ammonia is present in almost all waters to some degree. In many cases, it is deliberately added to chlorinated feed waters to reduce THM precursors. It is well removed by deionization processes but not by softening. The general approach to ammonia removal would be primary and polishing softeners. Ammonia is removed preferentially to sodium by cation resin, but is displaced by calcium and magnesium. Therefore, a single softener will remove ammonia during the initial part of its cycle but will then release the ammonia as it becomes exhausted with hardness.

Softening can be used effectively for ammonia removal if the primary softener is allowed to load to a hardness endpoint and a polishing case, the primary softener must not be operated softener is used to remove ammonia. In this to hardness breakthrough, as this would cause an ammonia spike and lead to elevated ammonia levels in the final product water.

3.4.11 Coliform

Coliform is a large group with many different kinds of bacteria. Most Coliform bacteria are harmless.

Various type of coliform leave un the soil and even on surface in your home,but they do not occure naturally in ground water. If coliform bacteria(sometimes reported as total coliform) are found in your well water,it is an indication that disease causing bacteria could get in the same way. If any coliform bacteria arefound, the lab does a second test to look for the special sub –group of coliform that leave in guts of mammals and birds. This test is for E.coli or feacal coliform. These bacteria indicates that your well water has come in to contact with animal waste- a very high risk for transmitting disease. Standard test to determine the safety of ground water for drinking purpose involves identifying wheather or not bacteria belonging to coliform group are present. Thereason feacal pollution of water source is indicated by the presence of coliform bacteria viz, Escherichia coli. The result of coliform test is reported in the terms of most propable number(MPN/100ml)of coliform group of organisms present in a given volume of water. The count must not be decantable inany 100ml sample.

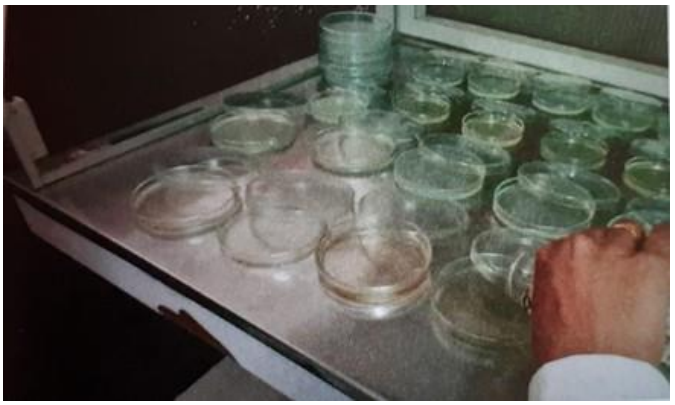

Fig 3.20, Petri Dish For Membrane Filter Technique

4. RESULTS AND DISCUSSIONS

RESULTS

The river water characteristics were tested before the commencement of the project and the various initial characteristics like pH, BOD, COD, Total suspended solids, total dissolved solids, alkalinity, chlorides, dissolved oxygen, nitrite, phosphate, iron, ammonia, temperature, fluride, turbidity etc. were tested and were compared with the potable water limit. The limits were not satisfactory but the water can be easily purified through simple methods of purification. Later the river water after being passed through adsorption column, by using low cost adsorbents. The results were shown in the table 4.1.

Table-4.1: Initial Water Quality Parameters ofBharathapuzha River Water before the Treatment

PARAMETERS	SAMPLE 1	SAMPLE 2	SAMPLE 3	UNIT	PERMISSIBLE LIMITS(IS 10500.2012)
pH	9.21	9.48	8.25		6.5-8.5
COD	1436	1587	1295	Mg/l	-
BOD	24.9	53.05	96.40	Mg/l	-
Turbidity	15.4	14.7	16.5	NTU	5
TDS	123.7	126.8	126.3	ppm	2000
E.coli	15	78	4	Mg/l	Shall not bedetectable in any 100 ml sample.
Temperature	34.7	34.6	35.2		-
Iron	1	3	3	Mg/l	No Relaxation
Phosphate	0	0	0	Mg/l	-
Nitrite	1	0	0	Mg/l	10
DO	3.1	4.5	6.5	Mg/l	-
Fluride	0	0	0	Mg/l	1.5
Ammonia	0.5	0.5	0.5	Mg/l	No Relaxation
chloride	40	50	40	Mg/l	1000
Residual chlorine	0	0.2	0	Mg/l	1
EC	212.4	209.6	208.2	ms	-

Temperature	34.7	34.6	35.2		-
Iron	1	3	3	Mg/l	No Relaxation
Phosphate	0	0	0	Mg/l	-
Nitrite	1	0	0	Mg/l	10
DO	3.1	4.5	6.5	Mg/l	-
Fluride	0	0	0	Mg/l	1.5
Ammonia	0.5	0.5	0.5	Mg/l	No Relaxation
chloride	40	50	40	Mg/l	1000
Residual chlorine	0	0.2	0	Mg/l	1
EC	212.4	209.6	208.2	ms	-

Table- 4.50: Surface Water Quality Criteria For Different Uses (Specified By CPCB, 1979 And TheBureau of Indian Standards, 1982)

SI NO	WATER QUALITY PARAMETER	CHARACTERISTICS OF WATER BODY				
		A*	B*	C*	D*	E*
1	Dissolved Oxygen (DO) Mg/L (Minimum)	6	5	4	4	3
2	Biochemical Oxygen Demand(BOD),Mg/L (Max)	2	3	3	-	-

3	Total Coliform Oraganisms**MPN/100ml(Max)	50**	500	500	-	-
4	Toatal dissolved solids(TDS)mg/l(max)	500	-	1500	-	2100
5	Chlorides(as Cl)mg/l(max)	250	-	600	-	600
6	Nitrates (as NO_3)mg/l (max)	20	-	50	-	-

7	Free ammonia (as NH_3) mg/l (max)	-	-	-	1.2	-
8	Conductivity at 250 C micromhos/cm (max)	-	-	-	1000	2500
9	PH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.5
10	Iron (as Fe)mg/l(max)	0.3	-	-	0.5	-
11	Fluride(as F), mg/l(max)	1.5	1.5	1.5	-	-

Note: * Classes of water use:

A – Drinking water source without conventional treatment but after disinfection

B – Out door bathing (organized)

from different region of Bharathapuzha river. The main physio chemical and bacteriological characteristic has been checked it was found that it was moderately polluted. After the application of thenatural adsorbents , it reduces the ranges of the parameters of the Bharathapuzha river water at the limit of permissible limits of WHO. There is no harmful effects of natural adsorbents on treating

Bharathapuzha river water. The treating water is C – Drinking water source with conventional treatment followed by disinfection.

D – Propagation of wild life, Fisheries

E – Irrigation, industrial cooling, controlled waste disposal.

There should be no visible discharge of domestic and industrial waste into class “A” waters. In case of classes “B” and “C” the discharge shall be so regulated / treated as to ensure maintenance of the stream standards.

5. CONCLUSIONS

Rivers are the back bone of the human civilization. The rise of the inflow of waste in river is clearly due to the rapid growth of residential and commercial activities in the study area. The bacteriological counts in river water make the water unfit for human consumption. The main aim of my work is to analye the Bharathapuzha river water and it is treated with the natural adsorbents like banana peel and jack fruitleaves. Here the study area has been selected for finding out the pollutant load in a particular region. The water sample is collected for experimental work using as the portable water and also

useful for other water use. This treatment is also conducted by other natural adsorbents.

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