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# Assessment of heavy Metals of Bhavani River in the Erode Region, Tamilnadu, India

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**Abstract:**

Aquatic habitat is one of the major natural habitats on earth. Water plays very crucial role in cycling the various inorganic and organic substances required to perform and sustain life on earth. For last few years environment is highly polluted by many pollutants that affect our fresh water bodies. Bhavani River is one of the vital River in Tamil Nadu. A study has been undertaken to analyze the water quality of Bhavani River, because many industries mainly Textile, Tanneries, Sugar factories are situated on the Banks of Bhavani River. The untreated effluents were let out into the river which is the main cause for pollution of water. The pollutant from the Industries, Agricultural runoff and domestic sewage has the histopathological effects of heavy metals on bioaccumulation of fishes in the river. As result water borne diseases have become common in the area and it water cannot be used by human beings also. In order to rectify study was done to analyze the physicochemical parameters.

**Key Words:** Bhavani River, Effluents, Histopathological effects, Bioaccumulation and Physicochemical Parameters.

## Introduction:

Water is needed by all living organisms. It plays an important role in many natural processes and is essential in countless physical and chemical reactions. Water is the most abundant and renewable resource, which helps to maintain the earth climate and dilute environmental pollution. Majority of water available on earth is saline in nature; only a small quantity exists as fresh water.

Rivers are vital component of the biosphere that contains less than one percent of the world's fresh water with their higher ecological and social significance which are being polluted by indiscriminate disposal of sewerage, industrial waste, and by excess of human activities affecting their physicochemical characteristics and leads to various deleterious effects on aquatic organisms (Murhekar, 2011, Annalakshmi and Amsath, 2012). Contamination of water primarily influences its chemical nature and also damages the community alarming the delicate food web. Miscellaneous uses of water reservoirs are seriously diminished because of contamination and pollution. Pollution of water is a universal

 

problem, so its active ensuring is required (Altaf *et.al.,*2004, Dhirendra, 2009). Both physical and chemical properties of water are frequently changed when it is contaminated with heavy metals and other pollutants, which makes water inappropriate and inconvenient for plant growth and other activities. pH, Organic matter, clay minerals, redox potential, temperature and interrelationships between heavy metals are all themselves physicochemical factors which affect the relationship between microorganisms and toxic metals (Mlitan, 2015).

Enormous number of grief's and deaths occur because of infections, and diseases related to open water supplies in the tropical developing countries. In unindustrialized countries there are many people who drink contaminated water, which result in water borne diseases (Ruma 2014).

Water quality analysis:

Water quality degradation world-wide is due to many anthropogenic activities which release pollutants into the environment thereby having an adverse effect upon aquatic ecosystems. Quality of water can be regarded as a network of variables such as pH, oxygen concentration, temperature, etc. and any changes in these physical and chemical variables can affect aquatic biota in a variety of ways. Since the quality water is directly related to health and is important for determination of water utility, it is very essential and important to test the quality of the water before it is used for drinking, domestic, agricultural or industrial purposes. The utility of river water for various purposes is governed by physicochemical and biological quality of the water (Singh et al., 2013).

The water of these fresh water bodies is used for various human activities and so it becomes necessary to check the physico-chemical characteristics of the same. Monitoring the quality of water is important because clean water is necessary for human health and for the integrity of aquatic ecosystems. The study of physicochemical properties of an aquatic ecosystem is important as fluctuations in water quality have an influence on the biotic communities (Aher *et al.,* 2007).

**Geographical Study Area:**

The study area is Bhavani River in the erode district. The Bhavani River Originates in the Western Ghats and it flows across the states of Karnataka, Tamilnadu and Kerala. There are more than 100 textile units, 110 leather processing units which either directly (or) indirectly discharge their effluents into the Bhavani River. This has become the major ecological and biological problem for human and also the organism in water. The area near the Industries along the bank of Bhavani River was taken for the study. This study was conducted to determine the water quality in the stretch along the banks of river. So, this study will help us to rectify the problems which human and the organism in Bhavani River faces today. It will also help the researchers to understand the importance of stress faced by Organism due to the pollutants.

 


**Materials and Methods:**

The Water samples were collected from the river banks of Bhavani River near the Industries. The samples were collected in 1-litre polythene bottles. The samples were filtered for Chemical analysis. To analyze the heavy metals at ppm and ppb levels ICP-OES equipments were used. The samples were analyzed for determining the concentrations of various Chemical constituents like calcium, Chloride, Iron, lead Zinc and Mercury. The Physicochemical parameters were determined by spectrophotometric technique.

**Results**

**Analysis of water quality parameters in Bhavani River**

| S.No | Parameters | Normal Value | $B_1$ | $B_2$ | $B_2$ | $B_3$ | $B_4$ |
|---|---|---|---|---|---|---|---|
| 1 | Appearance | - | Coloured | Coloured | Coloured | Coloured | Coloured |
| 2 | Colour (Pt.Co-Scale) | - | Greenish | Greenish | Greenish | Greenish | Greenish |
| 3 | Odour | - | None | None | None | None | None |
| 4 | Electrical Conductivity Micro mho/cm | 300 | 190 | 180 | 320 | 310 | 320 |
| 5 | pH | 6.5-8.5 | 6.98 | 7.28 | 7.73 | 7.38 | 7.56 |
| 6 | BOD(mg/L) | 2-8 | 7 | 8 | 8 | 15 | 17 |
| 7 | COD(mg/L) | 25-50 | 21 | 23 | 24 | 60 | 56 |
| 8 | Calcium (Ca)mg/L | 75 | 18 | 21 | 29 | 24 | 27 |
| 9 | Choride (Cl)mg/L | 250 | 35 | 68 | 74 | 92 | 86 |
| 10 | Iron (Fe) mg/L | 0.7 | 0.02 | 0.0075 | 0.1 | 0.38 | 0.42 |
| 11 | Lead (Pb)µg/L | 2.8 | 0.0060 | 0.0008 | 0.005 | 0.005 | 0.05 |
| 12 | Zinc (ZN)ppm | 5-10 | 0.0032 | 0.0032 | 0.015 | 0.035 | 0.1 |
| 13 | Mercury (Hg) mg/L | Less than 0.5 | 0.0067 | 0.0067 | 0.005 | 0.0005 | 0.05 |

 

## Discussion

The health of aquatic ecosystems and biodiversity are directly related to the health of almost every component in the ecosystem (Kakati, 2010). In most freshwater bodies nutrient enrichment causes eutrophication and excess growth of macrophytic vegetation also an indication of the eutrophication status of water body (Garg *et al.,* 2010). Due to tremendous development of industry and agriculture the water ecosystem has become perceptibly altered in several respects in recent years as such they are exposed to all local disturbances regardless of where they occur. Water is a prime natural resource, so for conservation and management basic human needs appropriate planning, development and management. Therefore, it is necessary to study the physico-chemical characteristics of water and significant in monitoring the water quality, yet the Physico-chemical conditions are primary concerns. The quality of water is designated as per its, physico-chemical characteristics.

### pH:

The pH affects most of the biological processes and biochemical reactions in water body. The samples collected from the study area show the pH value from 6.98 to 7.73. This shows that samples are slightly alkaline. The alkalinity is due to effluents of Industrial waste. Usually the pH values of natural waters lie between 6.0 and 8.5 (De, 2003). Changes in pH along with the conductivity of a water body are indicative of the presence of certain effluents, when it is constantly monitored. Any pH values of waters which are more than 9.6 or less than 4.5 are not suitable for most of the life forms and also for most other uses. According to Verma et al.,(1978) and Sharma et al.,(1981) most of the Indian fresh water bodies are alkaline in nature.

### BOD and COD

The values of BOD and COD exceed the limit. A high COD, a measure of the inorganic and partly organic non-biodegradable content of the effluents, has effects on the receiving water body similar to that of a high BOD.

### Calcium:

Calcium is directly related to the hardness of water. The water samples collected from the study area ranges between 18-29 mg-lit. It is found to be within the prescribed limit of 75 mg/lit specified by IS 10500 and WHO.

### Chloride:

Chloride as chloride ion is essential for both animals and plants. Generally unpolluted water contains low concentration of chlorides, lower than 10 mg/l. The concentration of chloride present in water is mainly due to the mixing of Tannery waste. The water sample containing chloride ranges from 35 mg/lit to 92 mg/lit. The concentration of Chloride is found be within the IS and WHO limits.

Iron

 

Iron is the second most abundant metal and fourth most abundant element in the Earth's crust (Taylor, 1964), but its concentration in water is quite low because of low solubility (Molot *et.al.,*2003, Shaked *et.al.,*2004). Generally, iron concentrations in natural freshwaters do not exceed 1 mg L-1 (Wang and Dou,1998). The Iron of the water samples varied from 0.0075mg/L to 0.42mg/L throughout the study site.

**Lead:**

Lead is mainly a dissolution from lead plumbing. It leaches out from lead pipes in industries. The water samples collected from study area containing lead ranges between [$LO^{\theta\theta}$=0.005 to $LO^{\theta\theta}$=0.05] mg/lit. The samples are within the limits as per IS 10500 and WHO standards.

**Zinc**

Zinc is an essential nutrient for body growth and development; however drinking water containing high levels of zinc can lead to stomach cramps, nausea and vomiting. The samples are within the limits as per IS 10500 and WHO standards.

**Mercury**

Mercury is the major polluting factor. It is mainly the effluents from the industries. Mercury is mutagenic in nature. The water sample collected from the study area for mercury ranges between [$Lo^{\theta\theta}$= 0.0005 mg/lit to $Lo^{\theta\theta}$= 0.05 mg/lit].

**Conclusion**

It has been concluded from the present study that the water quality of Bhavani river is slightly polluted due to the effects of heavy metals discharged from the industries which has an impact on fishes in that area. If the industrial effluents continue to be discharged at the present level, pollutants will increase both in volume and concentration . It will affect the organisms and also the humankind in Bhavani River. If the proper remedial or alternative measures are not taken immediately the whole system of this may get affected in future. A consented action on the part of enforcing agencies as well as industrialist is an hour to protect the river Bhavani , Erode from deterioration.

There is also an urgent need for public awareness on the state of the water and apply legal and relevant laws regarding proper treatment of industrial and domestic discharge before entering to the river course. The contaminants and the self cleansing capacity of the river indicate the river health, extent of human impacts and present status of health of the river has to be identified and suitable remedial measures like reuse of waste water has to be implemented so as to preserve the natures gift for the future generations to enjoy without paying the cost of our misbehaviors.

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