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REVIEW ON POLLUTION CONCENTRATION AND PHYSICOCHEMICAL CHANGES OF CAUVERY RIVER

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Abstract- Rivers are the most important resource for mankind. In recent years, pollution has become a major concern due to rapid urbanization. The quality of surface waters suffers increasingly of severe degradation due to industrial, domestic and agricultural activities. A review of water quality of Cauvery River is done here by knowing the quality of water samples that are collected and tested seasonally and also at various points in the Cauvery basin. Assessment of quality of water is important to have best utilization of water resource and also to keep a check on pollution levels which has direct impact on human and the surface water flowing. Industrial, agricultural and domestic areas are surrounding Cauvery River which could possibly cause of pollution of Cauvery River. The physical and chemical and biological characteristics are studied for the tested samples collected by standard methods. Agricultural sources are non-point sources of pollution while industrial and domestic wastewater discharges are point sources of pollution.
Keywords –Cauvery River, Water pollution, Water Quality, Industrial, Domestic, Waste water

1. INTRODUCTION

The Cauvery River is one of the major rivers in the south India and is also termed as "Dakshina Ganga". It is an interstate river extending over states of Karnataka, Tamil Nadu, Kerala and union territory of Pondicherry and is fourth largest river in the southern India. River Cauvery originates in the Brahmagiri hills of Western Ghats in Kodagu district of Karnataka. It leaves the mountain regions of Karnataka to enter Mandya district through KRS dam. Further it continues its flow from KRS reservoir east wards to enter Srirangapatna. The water quality management is one of the many challenges for natural resource management. Increasing demand of water for human consumption, irrigation and growing industrial activities has impacted the water quality of rivers. Water quality monitoring is an important exercise, which helps in evaluating the nature and extent of pollution control required, and effectiveness of pollution control measures already in existence. It also helps in drawing the water quality trends and prioritizing pollution control efforts.

2. OBJECTIVE OF STUDY

Objective of the study is to know the pollution concentration levels of Cauvery River and to understand the physio chemical changes caused due to point and non-point source pollution.

3. REVIEW OF LITERATURE

(1)Appaji Gowda et al. (2016) conducted study on the impact of anthropogenic activities on water quality for monsoon and post monsoon season (2015-16) around KRS dam of Cauvery River. The locations such as Sagara Katte, Venugopalaswamy Temple, KRS Dam, Balamuri, Yedamuri, Belagola, Pump House, Ranganathitthu, Srirangapatna, Mahadevapura, Gendehosahalli, Rangasamudra, Bannur, Somanathapura and T.Narasipura were the sampling stations. It was found that turbidity was exceeding the permissible limit in all the samples. Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) was found to be high at T.Narasipura and the Biological oxygen demand value of T.Narasipura sample was exceeding the standards. DO was maximum in Ranganathitthu sample and was found to be minimum in pump house sample. Highest level of Phosphate was recorded at T.Narasipura (6.8mg/l) and the Bannur sample showed the minimum concentration (0.9mg/l). The percentage of Sodium revealed that all the samples were unsuitable for irrigational purpose. It has been reported that Lead and Chromium were detected in T.Narsipura, the zinc concentration was exceeding the Food and Agriculture Organization (FAO) standards in both the seasons due to mismanagement of fertiliser in the agricultural land of river basin, also the concentration of Iron and copper was found in higher rates due to sewage discharge from locality and corrosion of water supplying pipes. The author, through primary, secondary indexes and correlation analysis, has concluded that water quality of the river was moderately damaged due to anthropogenic activities like agriculture and urbanization

(2) Umamaheshwari (2015) said that the River Cauvery is the source of irrigation system and also for hydroelectric power in Talakadu. The Water Quality Index (WQI) of Cauvery river basin during religious festival "Panchalingadarshan" in Talakadu, Mysore district was studied. The Canadian Council of Ministers of the Environment (CCME) WQI of Cauvery is 48.49, which indicates the water level as marginal, i.e., frequently impaired and conditions departed from desirable level. Biological

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Parameters such as total bacterial count and MPN were found to be higher than normal value. H2S test was positive indicating faecal contamination. Extra care is to be taken to prevent water getting locally polluted during festivals since there can be a source of bacterial diseases. In this study CCME WQI provides information on the quality of water and helps in planning and executing for protection, management and making lifestyle adaptations for the benefit of the environment and to preserve the precious water resource.

(3) Susheela (2015) conducted the study around KRS dam and downstream of the river. Study area is mentioned as a huge irrigation, agricultural and industrial basin around the dam and river. The study was performed in nine stations – KRS Dam, Reservoir, dam Gate. Near dike of garden, first bridge after dam, Balmuri, Birds sanctuary, Srirangapatna Bridge, Sangama/ Nimishamba Temple. The results showed the lead concentration was observed in the range of 19.19% to 28.9% in the carbonate fraction, whereas in the oxides of iron and manganese oxide it was 26.01% to 40.96. For the organic matter fraction it was 17.50% to 25.90% and in the residual fraction with the range of 1.20% to 42.81%. In the study the heavy metals concentration is nearer to maximum levels in the sediments of Cauvery River. Once the concentration of heavy metals reaches the maximum level in the river basin, it is said that it will circulate among the aquatic organisms and results in bioaccumulation in the nature. From the different processes of the industries, release of toxic chemicals, waste water, dumping of untreated solid waste to the surrounding environment leads to release of heavy metals. All these above said pollution problems are arising from the increased industrial activities/process and more usage of chemical fertilizers in the agricultural field.

(4) Anima Upadhyay et al. (2014) have analysed water quality parameters such as temperature, pH, Electrical conductivity, Total Dissolved solids, total hardness, permanent hardness, temporary hardness, turbidly, chlorides, alkalinity, concentration of calcium and magnesium ions for samples collected near coorg and tourist spot near Mysore city. They found that Alkalinity to be 172 mg/L near Mysore city and 189mg/L near Coorg city exceeding the World Health Organization (WHO) standards, concentration of Magnesium ions was reported to be 36 and 46 mg/L near Mysore and Coorg city respectively exceeding Indian Standards (ISI) standards and calcium ions was found to be 80 and 92 mg/L near Mysore and Coorg city respectively exceeding both WHO and ISI standards, otherwise the water quality at two stations were in accordance with the standards and was acceptable for drinking and other purposes. They have also stated the possible source of contamination to be wastes disposed by tourists, extensive use of fertilisers and insecticides in order to increase crop yield, hotel industry and weathering of rocks which could lead to higher concentration of calcium and magnesium ions and result in higher pH and alkalinity.

(5) Susheela et al. (2014) has Conducted study in and around the KRS dam .it is mentioned that major land uses in the basin are agriculture (36%) and forests (38%), with the remaining areas being developed areas and some are wetlands. Samples were collected during three seasons i.e. monsoon, post monsoon and pre monsoon. The sampling locations are divided into upstream and downstream of KRS Dam with two sampling station in the former location and eight sampling station in the later location. When large amounts of water is released from the KRS dam it is said to have caused massive downstream flooding. In the rainy season, floods caused by water releases from the dam, has damaging effect on agricultural crops and flooding in villages occur along the Cauvery river stretch. The downstream has impact by water level fluctuations. Massive surges of water over 2m high causes large amounts of riverbank erosion. During the dry season activities like fishing has been severely disturbed since there is a lesser quantity of water. The study provides simple representation complex of variables (physical, biological and chemical) that govern the overall water quality of surface water that are intended for potable use. It indicates that during monsoon few of the water quality parameters like phosphate, nitrate (in upstream), EC, total hardness and TDS (in downstream) is more, which is due to release of agricultural runoff, domestic waste water and industrial effluents into the river. It was concluded that the major sources of pollution of the Cauvery River are the industrial effluents, return flows, agricultural runoff, municipal and domestic sewage besides pedogenic background contributions. During the study period, the sediment samples during monsoon season showed significantly lower values than pre- monsoon and post-monsoon season samples. The main reason behind the lower concentration during the Monsoon season is the dilution of the pollutant. The physico-chemical analysis of sediment samples of Cauvery River showed an optimum pH in the suitable range for most of the biological life because the reactions in the neutral range to slightly alkaline is most favorable.

(6) Ramya et al. (2014) has assessed the effect of municipal waste-water on river Cauvery, assessment was done at 12 locations for about 2.5km starting from the upstream of municipal sewer discharge point near the fort of Srirangapatna up to Sangama. Analysis of physical and chemical parameters during the month of April, 2011 at the time of low flow conditions during summer and May, 2011 when high stream flow occurs suring pre-monsoon. From the study it was found that DO varied form 2.61-6.57 mg/l during low flow conditions and 3.016-8 mg/l during high stream flow, COD varied from 22.2-170.77 mg/l during summer and 21.04-80.77mg/l during pre-monsoon, BOD varied from 0.88-10.65 mg/l during summer and 1.026-20.66 mg/l during pre-monsoon, phosphate and nitrate were reported to be in range of 0.74-1.69 mg/l and 0.24-0.32 mg/l during summer respectively and during pre-monsoon it was 0.23-2.63 mg/l and 1.46-1.79 mg/l respectively. Total coliform varied from 400-2800MPN/100ml and 600-2000MPN/100ml during April and May month of sampling respectively. It is concluded in this study that dissolved oxygen was less with the increase in biochemical oxygen demand and total

coliform count because of human activities and unauthorized wastewater discharge from nearby residents. Some recommendations such as treatment of wastewater prior to its discharge to the river and to ban unauthorized wastewater discharge to the river etc.

(7) Sudevi Basu et al. (2014) has conducted a study on health impacts due to pollution in Cauvery river stretch in Srirangapatna by utilizing statistical techniques, multiple linear regression model and MANOVA. The stations were selected for sampling in such a way that it helps to understand water quality of natural flow of river without intervention of anthropogenic activities, with intervention of anthropogenic activity and a downstream point on river respectively. The Multiple Linear Regression analysis and MANOVA were applied to the parameters BOD, COD, TDS, TC and FCat six different sampling stations in Srirangapatana. In the study through multiple linear regressions was used and found that 60.8% of health impact level was dependent on BOD, COD, TDS, TC and FC count. COD and TDS were found to be significant through graphical analysis and the same was shown by t-statistics and their associated 2-tailed p-values that COD and TDS produced health impacts compared to Biological oxygen demand, total coliform and faecal coliform count.
In this study it was concluded t h a t anthropogenic activities were the common source of pollution since a highly significant positive correlation was obtained by Pearson correlation Matrix amongst the parameters across all the stations in the river course of Srirangapatna.

(8) Shiva Kumar et al. (2014) conducted study on water quality of Cauvery River at Kodagu district. Water samples were collected from six places of Kodagu district, Karnataka. It was found that pH varied from 6.55-7.26, the range of Electrical conductivity was 40-150 (µs/cm), turbidity was 0.15-4.1 NTU, TDS was 10-25mg/l, alkalinity was 50-106 mg/l, hardness was 20-87 mg/l, calcium was 4.2-15.5 mg/l, magnesium was 3- 8mg/l and Chloride was 16-55mg/l. Phosphate varied from 4-12mg/l, DO from 5.1-7.2 mg/l, COD from 4.5-15 mg/l, Sulphate from 2-25mg/l and coliform varied from 93 to >1100 MPN/100ml. Water was non-alkaline in nature and was reported to be suitable for domestic purposes. The concentration of nitrate, phosphate, sulphates and e-coli form was well within the standard limits. The water was transparent due to very less turbidity level. Sulfate concentration was very less and water can pass through the pipe line without corrosion.
It was concluded that water quality of Cauvery River was safe for drinking, fishery, irrigation, and industrial purposes, as the parameters were found within the permissible limits. It was also said to have indicated that the Cauvery River was in the purest water quality form. It was observed that the impact and entry of waste was very less in Kodagu District, Karnataka.

(9)Jomet Sebastian et al. (2013) conducted a study to check water quality of Cauvery and Kapila rivers and at their confluence at Tirumakudalu, Narasipura through water quality index. For two years from June 2009-May 2011, 21 physiochemical characteristics were analyzed. It was followed by performing water quality index.
It was concluded that WQI of 58.86 was obtained and hence it was said Cauvery River was moderately polluted whereas Kapila River with WQI of 90.50 and the confluence site of Cauvery and Kapila River was highly polluted with WQI of 78.43. Kapila River had comparatively more pollution load than at the rivers confluence site.
Venkatesharaju et al. (2013) conducted a study on the heavy metal concentration in the cauvery river water, on sediment and on soil samples of 25 selected sampling stations along 310km stretch of river Cauvery from
Talacauvery to Arkavathy Sangam at Kanakapura, samples were collected and prediction of spatiotemporal variations in heavy metal concentrations was done between 2007 and 2009 for pre- monsoon and post monsoon season. In the river water Iron was found to be major metal component. The sequence of metal concentration in river water during pre-monsoon was found to be Fe >Zn> Mn> Ni> Cr> Cu> Pb> Cd> Co whereas, in the post-monsoon the order was Fe >Zn> Mn> Ni> Cr> Pb> Cu> Cd> Co. In sediment samples the metal concentration sequence was similar to river water sample sequence of heavy metals for pre and post-monsoon season. The sequence of Concentration of heavy metals in river bank soil during pre-monsoon season was Fe> Mn> Zn> Ni> Cr> Cu> Co> Pb> Cd and during post-monsoon the heavy metals were in the order of Fe> Mn> Zn> Ni> Cu> Cr> Co> Pb> Cd.
The Line diagrams with standard deviation at p=0.05 were plotted for individual heavy metals of the seasonal samples to understand the seasonal variations. Results showed that all the heavy metals in water, the mean concentration was within the limits of BIS and WHO standards. Except Ni and Cd, the heavy metal concentrations in sediment samples were below the limit of sediment quality guidelines. It is stated in this study that due to entry of pollutants, in the downstream stations of Cauvery had resulted in concentration of heavy metals. The study concluded that throughout the river stretch, in addition to nonpoint source pollution, point sources such as agricultural and storm water run-off was responsible for metal influx. Author has mentioned that the seasonal fluctuation and transportation of metals at downstream stretch was due to manual and mechanical sand dredging activity. It was also evinced through spatial metal analyses that compared to upstream stations; the metals were accumulated in significant level at downstream stations of the river stretch.

4. CONCLUSION

[1] Water pollution is a major cause of concern due to anthropogenic activities in river cauvery.
[2] The cauvery river in Mysore Mandya region passes through several religious places where rituals and bathing is done in water source which is also contributing largely as source of pollution

[3] Pollutional sources can be classified into point and non-point source of pollution
[4] A model can be developed using land use land cover data , seasonal variations in water quality
[5] A prediction model can be developed giving details on water pollution due to point and non-point source pollution.

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