Impact of Anthropogenic Activities and Variation in Physio-chemical Aspects of Water Quality in Heritage Water Bodies in Walled City of Jodhpur: A Study

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Abstract— **India is one of the fastest developing countries in South Asian region having flourishing fresh water resources in the form of rivers, Kunds, Bavdis, Ponds, and Lakes. Water is a critical resource in the lives of people who both benefit from its use and who are harmed by its misuse and unpredictability (flooding, droughts, salinity, acidity, and degraded quality). The developments, urbanization and load of the various pollutant sources lead to deterioration of these heritage water bodies. Scarcity of water in Jodhpur is well established fact. With growing urbanization, fast rising population, and industrial growth has increased pollution load on heritage water bodies of walled city of Jodhpur, which has drawn a significant attention in last decade for proper management of these famed water resources. In the present work five heritage water resources from different location of famed blue city of Jodhpur city were studied for their physical and chemical parameters, like pH, total dissolve solids (TDS), turbidity, conductivity, hardness, dissolved oxygen (OD), Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD) following standard methods. The results of the study helped us in classifying heritage water bodies into three board categories namely Mild contaminated water resources, contaminated water resources, and Highly contaminated water resources. The important water quality parameters studied were very high in some cases were as compared to the permissible limit of drinking and irrigation water quality standard. Consequently, consumption of polluted water puts lives and livelihoods at risk because water has no substitute. This study also found that the major contributor of the deterioration in water quality of these heritage water bodies is various ritual activities, festival waste, municipal waste water discharge, street washing discharge, animals waste, and other materials.**

Keywords—Waste Water, BOD, COD, TDS, TSS, Contamination, Effluents, Pollutants

I. INTRODUCTION

Water is the most important component of our life. We cannot live without water. Any variation from normal composition leads to water pollution. In Jodhpur the main reservoirs of raw water in the city are Kaylana-Takht Sagar Lake, Balsamand Lake, Padamsar Pond, Fatehsagar Pond, and Gulab Sagar Pond. All these lakes receive water from Rajiv Gandhi Canal whereas most of the water in the ponds comes through rainfall. Increased population, seepage, urbanization, addition of effluents, and festival waste etc are making this water unsafe due to impurities. The lakes and ponds in city which were constructed for meeting the drinking water supply however they are now being used as dumping places for waste and waste / sewage water. The old civic discipline to avoid the contamination has now disappeared. Therefore, the continuous and periodical monitoring of water bodies for water quality is necessary. The wide range of contamination source is one of the main factors contributing to the need of water quality assessment. The need of proper management and conservation of water resources is essential to avoid future water problems and water borne diseases.

II. MATERIALS AND METHODS

The selection criteria of water resources in the present study are based on their environment and usefulness to fulfill the daily needs of Jodhpur city people. 100 water samples from five different sites were collected from different areas of Jodhpur region. These water sources are extensively used for drinking and other domestic purpose. The samples were collected in labeled BOD bottles and plastic jerry canes and brought to the laboratory with necessary precautions. Grab sampling was generally applied during the sampling. Some parameters like temperature, velocity, pH and dissolved oxygen were measured on site. Water samples were analyzed by standard methods. The samples were analyzed for following physicochemical parameters: Water Temperature (°C), pH, total suspended solids (TSS), total dissolve solids (TDS), total solids (TS), turbidity, conductivity, hardness, dissolved oxygen (DO), Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD) following standard methods(1,2,3,4). It is an established fact that the more harmful a given pollutant is, the smaller is its standard permissible value recommended for drinking water. The water samples collected for the study and numbers are given in Table 1 whereas the physio-chemical parameters determined are presented in Table 2.

TABLE I. SAMPLE CODES OF WATER SAMPLES

S.No.	Water Sample	Sample Code
1.	Kailana – Takath Sargar Lake	S1
2.	Balsamad Lake	S2
3.	FatehSagar Pond	S3
4.	Padamsar Pond	S4
5.	Gulab Sagar Pond	S5

TABLE II. PHYSIO-CHEMICAL PARAMETER OF WATER

Sample	S1 (ppm)	S2 (ppm)	S3 (ppm)	S4 (ppm)	S5 (ppm)
Water Temperature (ºC)	30ºC	30 ºC	27 ºC	25ºC	25ºC
pH	7.7	7.5	7.6	7.6	7.5
Total Dissolve Solids (TDS)	272	276	456	568	632
Turbidity (NTU)	20	4	8	10	6
Conductivity (µs/cm)	705	920	1200	1000	870
Hardness	170	190	300	356	390
Dissolved Oxygen (DO)	7	5	4.6	5	6
Biological Oxygen Demand (BOD) (mg/l)	1.8	1.2	1.4	1.5	1.5
Chemical Oxygen Demand (COD) (mg/l)	450	490	576	662	438

III. RESULTS AND DISCUSSION

A comparison of physico-chemical characteristics of ground water samples has been made with drinking water standards. The results of drinking water samples collected five heritage water resources were analyses. Physical parameters of all five water samples are ok but not very satisfactory. Of the samples, Samples S1, S2 are found least or mild contaminated where as S3, S4 and S5 are highly contaminated. The observations revealed that pH, turbidity conductivity, TDS, dissolved oxygen, BOD, and COD in almost all samples were reported outsides or slightly higher than the acceptable limits of Indian standards of drinking waters.

IV. CONCLUSION

The results of physio-chemical characteristics of water samples collected from Kaylana Lake, Balsamand Lake, Fatehsagar Pond, Padamsar Pond, and Gulab Sagar Pond are given in table 2 above. Results of physico-chemical parameters of various lakes and ponds at Jodhpur as studied in the present investigation clearly shows that the water is not good for human consumption and also struggling for their existence. This can pose serious threat to the health of human life. Therefore proper treatment of water should be done to prevent various diseases. So there is an immediate need of restoration, improvement and proper management of these secret water bodies for the human and environment.

V. REMEDIES AND MEASURES

There is a need of awareness among the local people to maintain the ponds and lakes at least their optimum quality and purity levels. The onset of monsoon helps in diluting the pollutants but awareness and proper management practices such as planting trees around ponds, regularly recharging during summer period, removal of sediments from the bottom of pond, removal of floating debris from the pond surface, diversion of sewage discharge to proper disposal site and proper enforcement of law and policy might be very successful.

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