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RESEARCH ARTICLE

PHYSICOCHEMICAL AND COMPARATIVE EVALUATION OF YAMUNA AND GANGA RIVER WATER WITH REFERENCE TO WATER POLLUTION

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ABSTRACT

The study was carried out at Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad. The aim of the study was to evaluate the physicochemical status of Yamuna water in relation to water pollution in Allahabad. In our study different analytical tests were done such as pH, Temperature, DO, COD, Alkanity, Chlorine, BOD, Total Bacterial count by SPC, TSS and TDS. The results were satisfactory according to the guidelines of Pollution Prevention and Abatement Handbook World Bank Group effectively from July 1998, in which all the standard readings are given.

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INTRODUCTION

Earth our planet is abundantly rich in water, which constitutes 70% of its entire surface. Besides, being an essential ingredient of plant and animal life, water forms the basis of human life. It constitutes about 65% of human body. Water is essential not only for the survival of human beings, animals and plants and all other living beings but it is utilized in large amounts in industries. Hence it is of great importance for all of us. Most of the water which is available is located in oceans i.e. 97.02%. The high concentration of salt makes it virtually unusable as source of water for municipal, agricultural, industrial needs. Hence we are left with only 2.98% of fresh water, out of which a considerable amount of water is present in the form of polar ice caps and many locked as such for thousands of years. Organic pollutants present in water leads to biological demand, high level of organic content in water leads to higher BOD (Hickey *et al.,* 1991). The waste water generated by the industries is mainly characterized by their high chemical oxygen demand (COD) content.

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The high COD content present in these waste water makes them especially process based on anaerobic technology, once nutrients and alkalinity have been supplemented (Webb, 1985). However, the presence of phenolic and tannin compounds, which can be toxic or recalcitrant to anaerobic bacteria, implies an additional challenge to the development of reliable biological process (Sierra *et al.*, 1994; Soto *et al.,* 1991). Waste water treatment requires careful management to ensure the protection of water body that receives the discharged. Trained and certify treatment plants operators' measure and monitor the incoming sewage, the treatment process and the final effluent.

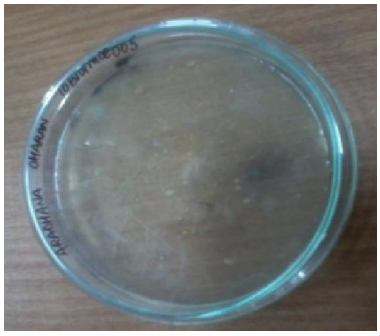
MATERIALS AND METHODS

The water sample was collected from Yamuna river in Allahabad at four different time periods in four months i.e. January 07, 2015, February 22, 2015, March 07, 2015 and April 20, 2015. Various parameters were tested for the water sample collected from Yamuna river during this time period like determination of pH, determination of Temperature (^{0}C), determination of Dissolved Oxygen (DO), determination of Chemical Oxygen Demand (COD), determination of Total Alkalinity, determination of Chlorine, determination of

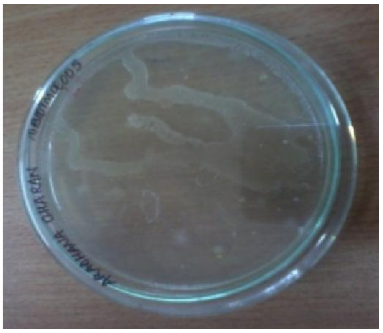
Biological Oxygen Demand (BOD), determination of Total Bacteria population by Standard Plate Count (SPC), determination of Total Suspended Solids (TSS) and determination of Total Dissolved Solids (TDS).

RESULTS AND DISCUSSION

During the time frame the following results were collected which are as follows. The range of pH was 6.2 to 8.0. The range of Temperature (^{0}C) was 7 to 33. Dissolved Oxygen (DO) increased from 7.8 to 8.2 mg/l. Chemical Oxygen Demand (COD) increased from 0.00112 to 0.00176 mg/l. Total Alkalinity also increased from 140 to 155 mg/l. Chlorine level also inclined from 207.675 to 275.125 mg/l. Biological Oxygen Demand (BOD) also got elevated from 3.7 to 4.0 mg/l. Total Bacteria population by Standard Plate Count (SPC) was also increased from 2,550,000 to 3,000,000. This illustration is also given in Figure 1 (A and B).



(A)



(B)

Figure 1. Petriplates showing Total Bacterial Count by Standard Plate Count (A and B)

Total Suspended Solids (TSS) also increased from 400 to 1400 mg/l and finally Total Dissolved Solids (TDS) also got elevated from 1375 to 1800 mg/l.

Conclusion

The flow of the Yamuna River varies significantly during monsoon and non monsoon seasons. The river constitutes maximum flow i.e. around 80% of the total annual flow during monsoon period. During non-monsoon period the Yamuna river cannot be designated as a continuous river but segregated into four independent segments due to the presence of three barrages from where almost the entire water is being diverted for various human activities.

The river water is used for both abstractive and in stream uses. Irrigation is the important use of Yamuna Water followed by domestic water supply, industrial and other uses. Hence the central pollution board is regularly monitoring the level of pollution in these water bodies. The Central Control Pollution Board has set water criteria. Thus, here a comparative analysis of pollution level in this water body was done by measuring the physiochemical properties i.e. DO, BOD, COD, TSS, TDS, total alkalinity, Total Bacteria count and Chlorine. The water sample was treated by using a specific standardization procedure of the parameters given above, so as to understand the contamination leveling of this water body. All the above mentioned parameters showed higher levels and it can be concluded that Yamuna river water is not fit for drinking purposes, whereas the other water bodies are also not fit for drinking until some purification methods are applied on them.

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