

Temporal Variation of Surface and Groundwater Quality in Manipal Region – A Case Study

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ABSTRACT: The seasonal changes on the physico-chemical characteristics of water quality in Manipal region has been investigated for a period of post monsoon and pre monsoon season during 2014- 2015 with an objective to assess the water quality status in the study area and its potability. The water quality parameters like pH, Electrical Conductivity, Total Hardness, Chlorides, Dissolved Oxygen, and B.O.D were analyzed. The results were tabulated along with discussion against the drinking water quality standards laid by BIS 1991 and WHO 1996, and it was found out that most of the water quality parameters were well within the permissible limit.

KEYWORDS: drinking water quality standards, physico- chemical characteristics, Water quality.

I. INTRODUCTION

Water being a dynamic resource which gets recharged annually, mainly from rainfall, is susceptible to various developmental activities and is prone to deterioration in quality and quantity. This vulnerability is high in specific areas while in other areas it is comparatively stable. A proper understanding of the hydrochemistry and other factors that affect the chemical composition of water would significantly assist in the competent management of surface water and groundwater. The quality of water is a vital concern for mankind since it is directly linked with human welfare. The importance of water quality in human health has recently attracted a great deal of interest. As in developing countries like India around 80% of all diseases are directly related to poor drinking water quality and unhygienic conditions.

II. MATERIALS AND METHODOLOGY

The present study has been carried out in the Manipal region of Udupi district located in the Karnataka state as shown in the fig 2.1. The Manipal has a geographical area of 26 sq.km and is located between the North latitudes 13°19' 11'' & 13°22' 37.24'' and East longitudes 74°47'24.88'' & 74°47'37.54''. The Udupi district is divided into three taluks namely Udupi, Kundapur and Karkala. The study area falls under Udupi taluk. As per the 2011 census, total population of Manipal is 34,369 with a population density of 1300 person per sq.km. It is a suburb within Udupi city and is administered by the Udupi City Municipality.

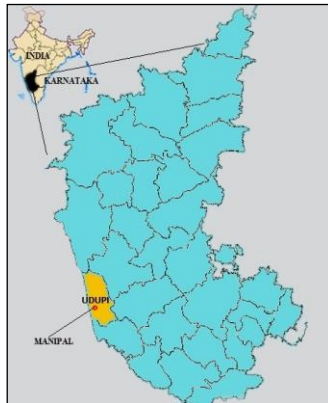


Fig 1: Study area

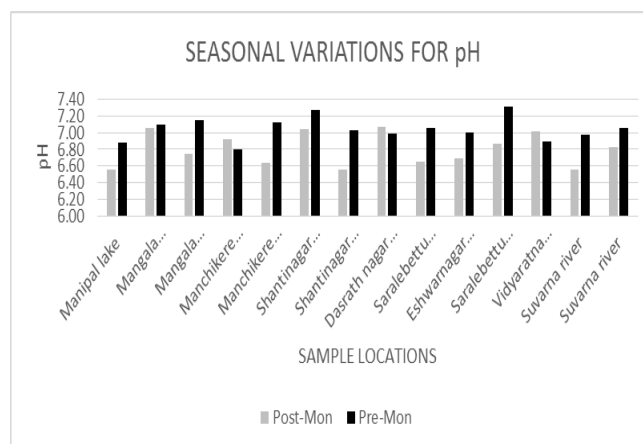
SAMPLE COLLECTION

The water samples from 14 sampling points in the Manipal region were collected from October 2014 to march 2015 from various abstraction sources covering river, lake industrial area, and residential colonies. All the samples were brought to the laboratory for detailed analysis and stored at 4°C. The water samples were then analysed for various physico-chemical parameters like pH, Electrical Conductivity, Total Dissolved Solids, Total Hardness, Chlorides, Dissolved Oxygen, and B.O.D.

METHODS

pH of the water samples were measured by electrometric method by using pH meter. Conductivity of the water samples were measured in the laboratory using Conductivity TDS meter 308. The total hardness and chloride concentration of the water samples were measured by using Ethylene Diamine Tetracetic Acid (EDTA) method and argentometric method respectively. Whereas the dissolved oxygen (D.O) was measured in the laboratory within 2-4 hours from sampling time using Winkler method.

III. RESULTS AND DISCUSSION



pH - pH is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkaline. The pH values of all the samples are well within the limits prescribed by BIS (1991) for various uses of water including

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drinking. High value of pH may results due to waste discharge, microbial decomposition of organic matter in the water body.

Conductivity - It is the ability of water to carry an electrical current which mainly depends on the presence of anions and cations in water. The conductivity values in water samples of the Manipal region vary from 71 $\mu\text{S}/\text{cm}$ to 570 $\mu\text{S}/\text{cm}$ and are well within the limits prescribed by BIS (1991).

Total Hardness - Total Hardness in water is caused by dissolved calcium and, to a lesser extent, magnesium. The total hardness values in the study area varies from 49mg/l to 183mg/l which are well within the limits prescribed by BIS (1991). The desirable limit for total hardness in drinking water is 300mg/l, in the absence of alternate source permissible limit is 600mg/l as per BIS 10500:1991.

The degree of hardness in water may affect its acceptability to the consumer in terms of taste and scale deposition.

Chlorides - Most of the samples are well within the desirable limit except the suvarna river samples. The concentration of chlorides for the water samples of Manipal region varies from 48mg/l to 597mg/l. A limit of 250mg/L chloride has been recommended as desirable limit and 1000mg/L as the permissible limit for drinking water (BIS, 1991). An increase in the normal chloride content of water may indicate possible pollution from human sewage, animal manure or industrial wastes. High concentrations of chloride give a salty taste to water.

Dissolved Oxygen- Dissolved oxygen is important parameter in water quality assessment. The DO values indicate the degree of pollution in the water bodies. The D.O values varies from 4.06mg/l to 8.72mg/l during post monsoon and from 3.95mg/l to 6.48mg/l during pre-monsoon.

B.O.D – B.O.D is the amount of oxygen required for microbial metabolism of organic compounds in water. The B.O.D values varies from 0 to 1.9mg/l for post monsoon and 0 to 2.53mg/l for pre monsoon. The B.O.D values for pre-monsoon are slightly higher than post monsoon. High BOD in pre monsoon might be due to high rate of organic decomposition and the entry of agricultural runoff and high concentration of dissolved and suspended solids in water.

Fig 2(a): Temporal variations of Ph

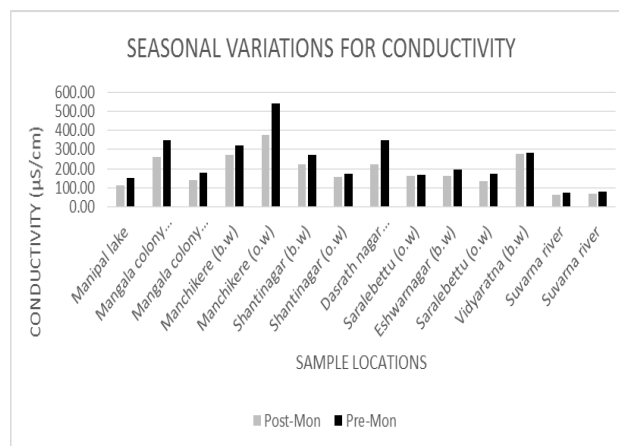


Fig 2(b): Temporal variations of Conductivity in $\mu\text{S}/\text{cm}$

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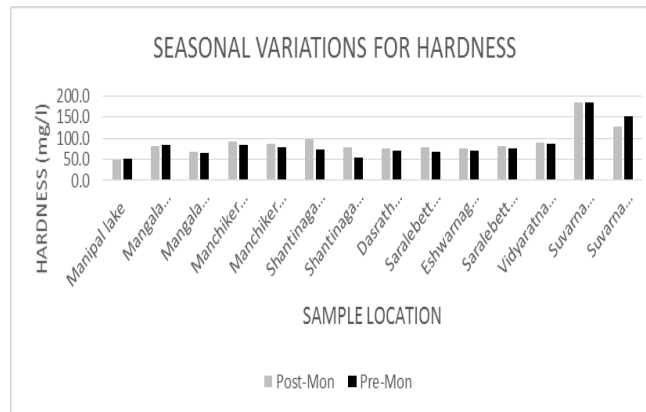


Fig 2(c): Temporal variations of Hardness in mg/l

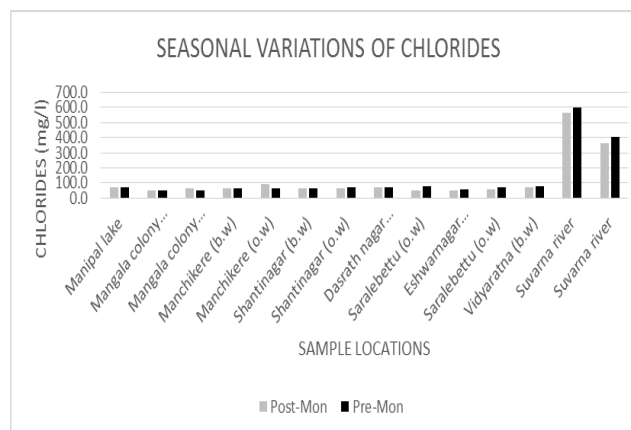


Fig 2(d): Temporal variations of Chlorides in mg/l

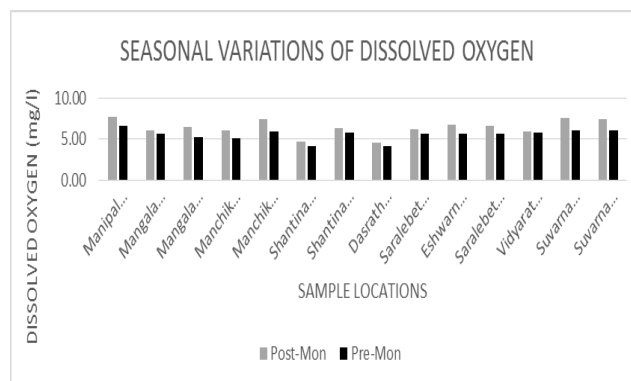


Fig 2(e): Temporal variations of D.O in mg/l

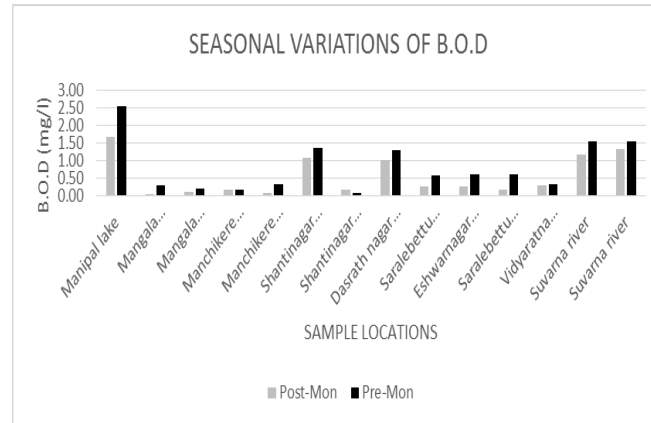


Fig 2(f): Temporal variations of B.O.D in mg/l

IV. CONCLUSION

The present study was undertaken with an aim to analyze certain physico- chemical parameters in the surface and ground water samples in Manipal region. All the parameters for drinking water analyzed were found to be within the permissible limit except for the chloride content in Suvarna river water river water samples. However it is suggested to monitor the surface and ground water quality regularly to ensure sustainable usage.

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