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Physico-Chemical And Bacteriological Analysis Of ground Water In Mathura-Vrindavan City corporation area Of Uttar Pradesh

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Abstract

In the present investigation, an attempt has been made to analyse the quality of ground water in Mathura-Vrindavan city corporation area during January 2022 to June 2022. The various water parameters analysed during the study were pH, Temperature, TSS, TS, DO, BOD, Alkalinity, Chlorides, Hardness and MPN. The results revealed that all water samples have neutral pH except S8 sample which was found slightly acidic nature. Samples S1, S2, S3, S4, S5,S6 , S7 and S8 require some primary treatment before their use for drinking purpose.

Keywords: Physico-chemical, Bacteriological, Ground Water, Water Parameters.

Introduction

Water is one of the most important natural resources for the development of agriculture, industries, navigation etc. The relentless increase in demand for water for various purposes brought about by population growth, agriculture, industries and economic development, combined with poor efficiency in water use has raised serious problems in its availability and quality (Saranya *et al.* 2011). Ground water mainly causes from the seepage and is held in the sub soil and pervious rocks. This water is precious and most widely distributed mineral source of the earth. It is also a fact that due to pollution load, the availability of good quality fresh ground water is becoming scarce day by day. As the quality of ground water plays an important role in maintaining sound health, so regular monitoring of drinking water from various sources has become essential. Safe drinking water is one which is free from faecal contamination and confirms to the limits on chemical contamination (Murugesan *et al.*,2004; Chakraborty *et al.*, 2022).

Some noteworthy studies on ground water quality of Mathura district are those of Tripathi and Thawkar (2013). Ground water quality assessment for agriculture and domestic purpose in Hindustan college of science and Technology campus Farah, Mathura India, *Ahmed et al.*(2018) Hydro chemical appraisal of ground water quality and its water quality Index: A case study in Mathura district, India ; *Ahmed et al.*(2020) statistical analysis and water quality index development usingGIS of Mathura city, Uttar Pradesh, India and Mishra et al. (2022) study on quality of water and WQI of Radhakund at Mahtura district(U.P.)

The legendary birth place of the Hindu God Lord Krishna, Mathura-Vrindavan city sees Krishna-Bhakts or devotees in large numbers, all through the year. One the tranquil bank of river Yamuna, Mathura features as a major destination among pilgrims and history and culture buffs. Reunite with the almighty in the pious air of the several temple here, being a rapidly developing area, the demand for drinking water supply has increased. However, till date drinking water supply has not been facilitated by Nagar-Nigam authority in all parts of Mathura- Vrindavan area. In most parts, people used dug well, tube well, handpump, deep well etc. as source of drinking water.

Materials and Methods

For the present study in the entire area of Mathura-Vrindavan Nagar-Nigam following eight different sampling station were selected for physico-chemical and bacteriological analysis ofgroundwater:

S1: Bhakti Vedanta Swami Marg, Vrindavan
S2:Atala Chungi Kishor Marg,Vrindavan
S3: Pathak Coaching Road Patthar Pura, Gopinath Bagh,Vrindavan
S4 : Gotam Nagar,Vrindavan
S5: Chawk Bazar, Mathura
S6 : Janm bhoomi area, Mathura
S7: BPCL Complex area, Mathura
S8:Gita mandir area, Mathura

The Physico-chemical and bacteriological ground water from 8 different areas of Mathura-Vrindavan Nagar-Nigam were studied during January 2022 and June 2022 for a period of six months. The water samples were collected in polythene bottles without any air bubbles. The collected samples were stored at 4ºC . The pH of the water samples was measured at the spot with the help of pH meter. The other physico-chemical parameters were analysed by standard methods of APHA,1995. The number of bacterial colonies was measured by most probable number (MPN) method. All samples were analysed within 24 hour and quantified by taking three replicants.

Result and Discussion

The physico-chemical and bacteriological characteristics of ground water samples of different locations of Mathura-Vrindavan Nagar-Nigam are presented in the Table-1. A brief discussion of the findings is an under :

From the Table-1, it is evident that the pH values of ground water of all samples were within the permissible limit.According to ISI the permissible limit of pH of the water is 6.5 to 8.5. The Temperature of all the groundwater samples analysed were found within the limit. The concentration of oxygen dissolved in water is related to temperature. It was ranged between 29.3 32.2ºC.

Total solids (TS) are the combined weight of both total dissolved solids (TDS) and total suspended solids (TSS). Its permissible limit is 500 ml/l in drinking water. TDS in ground water is due to decay of vegetable, disposal of effluents and evaporation while TSS is due to discharge of domestic and industrial wastes on ground surfaces (Roy and Kumar, 2009). In the present study T.S. ranged from 442 to 1792 ml/l as minimum and maximum values respectively.

The permissible limit of alkalinity in the water sample is 600 mg/l (ISI). It is a buffering property caused by the presence of bicarbonates and carbonates. In the present investigation alkalinity value ranged from 743 to 3915 mg/l (Table-1) which is within the permissible limit. The high amount of alkalinity leads to hardness of water. The values of alkalinity in water indicate the presence of natural salts in water due to discharge of waste water in natural sources.

Chloride content in fresh water is influenced by evaporation and precipitation. In nature, it is widely distributed in the form of sodium, potassium and calcium. In the present study the value of chloride content in all samples were found within the permissible limit (Table-1).

According to Gautam (1990) hardness of water is due to the presence of calcium, magnesium, strontium, nitrate, silicates, carbonates, bicarbonates and sulphates. The permissible limit of total hardness in water is 200 mg/l. In the present study, the value of total hardness in the analysed samples ranged from 229 to 3995 mg/l (Table-1). The higher value of total hardness has negative impact on the health of human beings which will lead to accumulation of salts on the skin and breakdown of tissues of organs.

Dissolved Oxygen is an indicator of healthy state of water and values below 3 mg/l are harmful to human beings. The dissolved oxygen in the collected samples of water in the present study were found more than 3 mg/l shows that the water is fit for human consumption. The values recorded were ranged from 5.35 to 10.71 mg/l (Table-1).

Biochemical oxygen demand (BOD) is an important parameter to decide the quality of water. Its value entirely dependent on the value of dissolved oxygen. The permissible limit of BOD in water is 20 mg/l. The BOD values in all samples collected were within permissible limit. It was ranged between 3.2 to 12.15 mg/l (Table-1).

The Canadian maximum acceptable amount of bacteria in the drinking water is 500 colonies per ml. The bacteriological analysis of water determines the potability of water. The reason for more number of bacterial colonies above the permissible limit in few areas of the present study might be due to inadequate maintenance of water in the reservoirs and percolation of polluted water in ground water (Table-1).

Conclusion

The values like pH, Temperature, BOD, Chloride, Alkalinity and DO were found within the permissible limit in the ground water samples analysed whereas total hardness of water and MPN count recorded more than the permissible limit. Therefore, it was concluded that ground water of a few areas of Mathura- Vrindavan NagarNigam needs treatment prior to its use/consumption by human beings of the area.

Fig.-1: Variation in Physico-chemical parameter so fall samples

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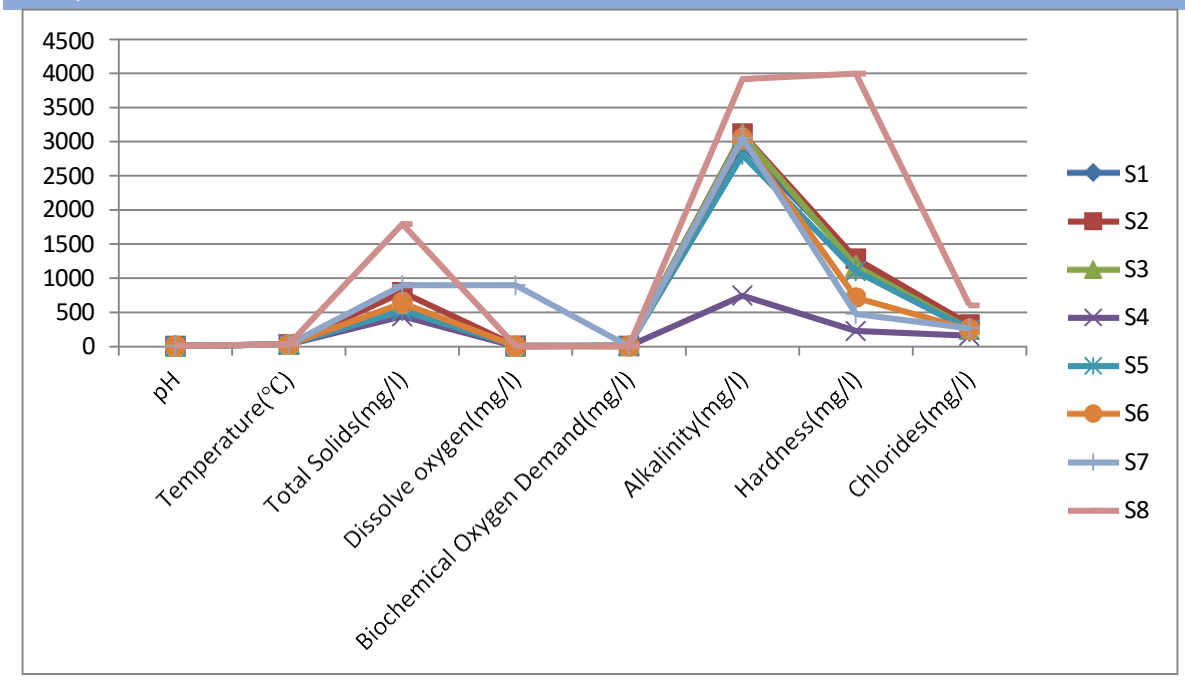

Fig.-2:Variation in MPN Colonies/ml of all samples

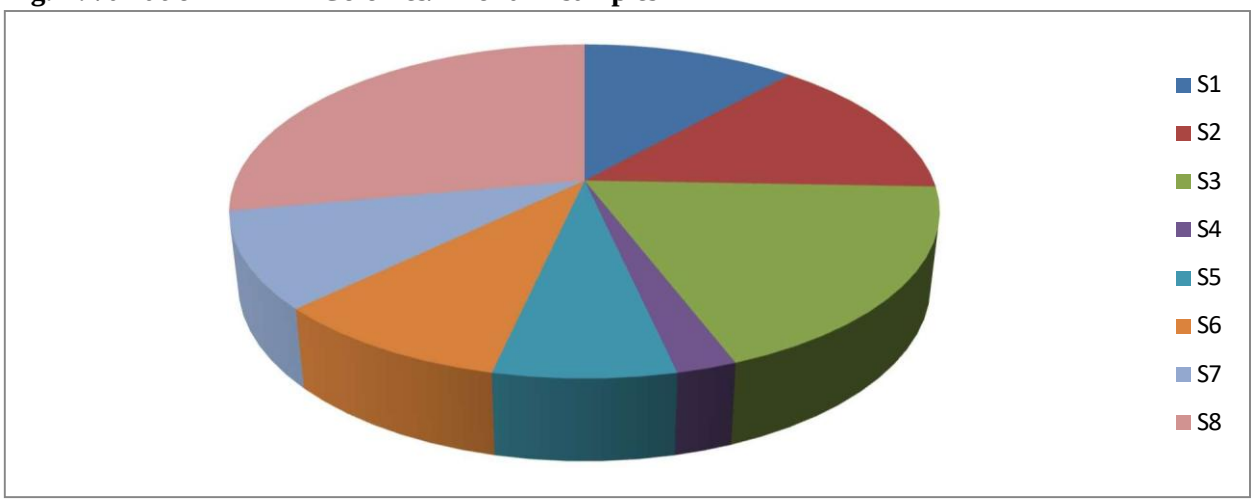

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Table-1: Physico-Chemical and bacteriological analysis of Ground water of Mathura-Vrindavan Nagar-Nigam

S.N.	Parameters	S1	S2	S3	S4	S5	S6	S7	S8
1	pH	7.02	7.03	7.02	7.01	7.03	6.93	7.02	6.90
2	Temperature(ºC)	30.06	30.06	32.2	30.06	30.5	29.3	30.6	32.0
3	Total Solids(mg/l)	535	795	549	442	522	635	895	1792
4	Dissolved Oxygen (mg/l)	6.07	10.71	7.11	5.35	10.3	4.55	8.95	8.55
5	Biochemical Oxygen Demand (mg/l)	10.15	6.7	12.15	8.07	12.15	4	4.65	3.2
6	Alkalinity(mg/l)	2935	3117	3100	745	2807	3041	3055	3915
7	Hardness(mg/l)	1267	1287	1176	229	1105	713	475	3995
8	Chlorides(mg/l)	225.7	321.7	255.6	154.6	246.4	245.4	262. 4	599.7
9	MPN Colonies/ml	250	300	400	50	150	200	200	600

MPN=Most Probable Number