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ANALYSIS OF PHYSICOCHEMICAL STATUS AT VARIOUS COLONIES NEAR GALTA JI IN JAIPUR

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In this investigation, ground water samples were collected and characterised from several sites close to Galta Ji in Jaipur, India, with the goal of evaluating the physicochemical contamination. The following physicochemical characteristics were examined in the current work: turbidity, pH, total hardness, chlorides, dissolved solids, calcium, sulphate, nitrate, fluoride, and total alkalinity. Groundwater physico-chemical characteristics varied significantly, however most of these metrics for the water samples were within the maximum desirable limit (HDL) recommended by the WHO for consumption.

Keywords: Physicochemical properties, chemical properties, BOD and COD

Introduction

All life on Earth depends on water, which is an essential resource. A decline in the amount and quality of freshwater resources that are accessible to people and ecosystems throughout the world is what leads to the problem of water scarcity (Gökçekuş et al. 2022).

Due to the flow of residential sewage and industrial effluents into freshwater bodies, around 70% of the water in India becomes contaminated. In India, a scarcity of clean, untainted water claims the lives of 0.4 million people per year, according to the WHO. The clear absence of adequate sanitary infrastructure and sewage water treatment capabilities in developing nations leads to the pollution of the environment and drinking water sources (Farkas et al., 2020). The deterioration of home sewage and industrial effluents into freshwater basins causes eutrophication and causes water quality to change continually. Globally, the demand for water is rising quickly as a result of increased urbanisation, industrialisation, and population growth. To avoid infections and enhance quality, it is necessary to have access to water of the highest quality (Anon 2022).

Different amounts of chemical and microbiological components in released wastewater effluent put extra stress on already-stressed freshwater resources in many developing nations, in addition to having a negative impact on the ecosystem (Agoro et al. 2018).

This inquiry focuses on the findings from investigations on the ground water characterization of numerous sites close to the Galta Ji (Keshav Nagar, Vivek Vihar, Green Park, Krishna Nagar, Karni Vihar and Gulab Vihar Jamdoli, Agra Road, Jaipur). Since groundwater is not entirely clean, it frequently has some dissolved mineral ions. The use of the water for various purposes will depend on the kind, concentration, and quantity of ions present. A geochemical analysis of the groundwater is essential for understanding water use. In addition to providing knowledge about the restrictions on total development and permit planning for appropriate treatment that may be required as a result of future changes in the quality of the water supply, this research also helps to improve understanding of the quality and development processes in the area.

2. Methodology

2.1. The description of the study area

In the Indian state of Rajasthan, around 10 kilometres from Jaipur, is the ancient Hindu pilgrimage site of Galtaji. Around the Galta temple, there are a few springs and natural reservoirs (Kunds). Galta Ji, which has a total area of 530.3 square kilometres and is bordered by Aravali hills that range in height above mean sea level from 569 to 597 metres, is located between latitude 72°52'15" and longitude 26°55'15". The ground water sample was obtained by manual pump and bore well from several settlements close to the Galta Ji.

2.2. Sample collection

The American Public Health Association, 23rd Edition and Indian Standard Methods IS 3025 (Part 1) were both utilised to collect 400 cc of water samples from the two lake sites (2017). The samples were taken in sterile 500 mL vials that measured 43 mm, 69 mm, and 208 mm in size. Using a bucket sampler and the grab sampling technique, water samples were collected from each location at a depth of around 1 m below the water's surface. Within eight hours of being collected, the bottles were brought to the research facility after being sealed and fastened to keep air out. Before further processing, the materials were kept for four hours in a dark room. Samples were analysed in the laboratory using established procedures (APHA, 1998).

2.3. Physiochemical characterization

The analytical procedure utilised to determine various physicochemical characteristics for ground fluids from close to Galta Ji is provided in Table 1. In order to prevent unforeseen changes in various physicochemical characteristics, water samples were collected from various locations in plastic bottles and transported to the lab in icebox jars. The chosen parameters, such as Water pH, Turbidity, Total Alkalinity (TA), Total Dissolved Solids (TDS), Total Hardness (TH), NO_3, and SO_4^{-2} were examined on a regular basis. The World Health Organization's standard drinking water recommendations (WHO, 1993) were compared to the measured values of several physicochemical properties of water samples. Apart from these variables, the Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) for 5 days were assessed using Winkler's technique (Zhang et al., 2019). Another indicator of contamination in aquatic habitats is COD. It calculates the organic matter's carbonaceous component.

3. Results and Discussions

A.) Hydrogen Ion Concentration (pH):

The current study also indicates that the pH is generally alkaline and ranges from 6.42 to 7.75 in samples. The pH range of the various samples under investigation falls within the maximum desired limit (HDL), which is set at 6.5 to 8 by the World Health Organization. Although the pH of water can change within a range that has no direct impact on human consumption, other physicochemical characteristics of water are known to be governed by it and are associated with altering the biotic composition of the system (Sharma et al., 2014).

B.) Turbidity:

In the pond water of all states, turbidity is a significant issue. The average groundwater turbidity in our research is BDL.

C.) Colour

According to our research, the typical colour of ground water is pleasant.

D.) Chloride ion

The range of the chloride ion value in the ground water studied in this study is 250.0 to 277.68 mg/l, with 260.51 mg/l being the average. Water that contains more than 100 mg/1 of chloride salts tastes salty and may become more corrosive when combined with calcium and magnesium (Tatawat and Singh-Chandel, 2007).

E.) Total Alkalinity:

According to our findings, the alkalinity range for ground water is 190.12–240.87 mg/l, with 203.577 mg/l being the average.

F.) Total Hardness:

In our analysis, the hardness value of ground water ranges from 274.8 to 682.69 mg/l, with 642.905 mg/l being the average. Kiran (2010) states that water may be categorised as soft (0-75 mg/L), moderately hard (75-150 mg/L), hard (150-300 mg/L), and very hard (above 300 mg/L).

G.) Total Dissolved Solids:

In our analysis, the TDS levels in ground water ranged from 1456 to 1586 mg/l, with an average TDS level of 1549.353 mg/l. TDS concentrations increased throughout the study, indicating increased conductivity that might be brought on by building activities, leaky septic systems, road salt runoff, fertilisers, or other contaminants **(**Das *et al*., 2014).

H.) Total Solids

According to our findings, the total solids concentration of groundwater ranges from 1458 to 1589 mg/l, with 1553.66 mg/l being the average total solids content. Natural water bodies in the tropics often display a wide variety of fluctuations in their alkalinity value depending on the location and season (Hulyal and Kaliwal, 2011).

I.) Sulphate:

In our research, groundwater SO4-2 concentrations ranged from 49.10 to 196.80 mg/l, with an average of 167.557 mg/l. According to Njoku et al. (2015), the use of soaps and detergents by locals may be the cause of the high sulphate value. Furthermore, the SO4-2 values reported in ground water are far lower than the maximum permissible concentration of sulphate ions in drinking water, 250 mg/l, stipulated by the WHO.

J.) Nitrate:

According to the current study, NO3 levels are below 45 mg/l. The NO3 value of groundwater ranges from 26.18 to 37.88 mg/l, with an average of 32.746 mg/l. Wastewater discharges, which include human waste, sewage, industrial effluents, and urban runoff combined with agricultural runoff that may potentially contain fertilisers, pose the greatest threat to nutrient pollution (Dubey et al., 2012).

K.) COD

Our research indicates that the average COD value of the ground water was 5.824 mg/l, with a range of 2.20 to 9.20 mg/l.

L.) Dissolve Oxygen (DO)

In our analysis, the DO value of the ground water ranges from 1.80 to 9.0 mg/l, with an average DO value of 5.36 mg/l. Because of the high concentrations of BOD and COD, the waste water sample has very little dissolved oxygen.

M.) BOD

Our research indicates that the typical BOD level for groundwater is BDL. According to Singh et al., low oxygen solubility in water may be the source of poor dissolved oxygen, which would subsequently have an effect on BOD (2006). The considerable quantities of bio-oxidizable organic compounds in the water are indicated by the high value of BOD.

High quantities of organic matter, such as leaves and dead plants, dead animals, industrial effluents, wastewater treatment facilities, food processing factories, woody debris, animal manure, and urban storm water runoff, are the main source of BOD in aquatic systems (Joshi et al. 2022).

Conclusion

As indicated in (Table-1), the water quality parameters of the ground water close to the Galta Ji area were determined to be within legal limits, however the findings of the current study clearly showed that the TDS and total soluble solids of the ground water are outside of these limitations. Therefore, high salinity water should not be utilised untreated for drinking, irrigation, residential purposes, or fish culture. Therefore, to further management and conservation, frequent examinations of water quality indicators are necessary. The investigation's findings show that the water is not fit for ingestion by people, who are also fighting for their own lives. As a result, it is urgently important to put into practise a variety of goals and policies that are both helpful to and compatible with people, as well as advances and breakthroughs in waste water treatment procedures.

References

Agoro, Mojeed A., Omobola O. Okoh, Martins A. Adefisoye, and Anthony I. Okoh. 2018. "Physicochemical Properties of Wastewater in Three Typical South African Sewage Works." Polish Journal of Environmental Studies 27(2):491–99.

Anon. 2022. "Physicochemical and Microbial Properties of Emergency Departments ' Water at General Hospitals." 10(January):1–4.

APHA. Standard Methods for the Examination of Water and Waste Water, 20th Ed., APHA, AWWA, WEF. Washington DC, 1998.

Das, B.K., Boruah, P. and Kar, D. (2014). Study of seasonal variation of water quality of river Siang in Arunachal Pradesh, India. IOSR Journal of Environmental Science, Toxicology and Food Technology, 8(2): 11-20.

Dubey, V. K., Srivastav, A. L., Singh, P. K., & Sharma, Y. C. (2012). The nutrients level in middle Ganga Basin, India. Journal of Applied Technologies in Environmental Sanitation, 2, 121–128.

Farkas, K., Walker, D.I., Adriaenssens, E.M., McDonald, J.E., Hillary, L.S., Malham, S.K., Jones, D.L. 2020. Viral indicators for tracking domestic wastewater contamination in the aquatic environment. Water research. 115926.

Gökçekuş, Hüseyin, Youssef Kassim, Augustine Gbollie George, and Ruth Filla Morrison. 2022. "Physicochemical Properties of Wastewater Effluents from Selected Wastewater Treatment Plants." Future Technology 2(1):62–70.

Hulyal, S.B. and Kaliwal, B.B. 2011. Seasonal variations in physico-chemical characteristics of Almatti reservoir of Bijapur district, Karnataka state, International Journal of Environment and Pollution, 1(1): 58-67.

Joshi P, Chauhan A, Dua P, Malik S, Liou YA. 2022 Physicochemical and biological analysis of river Yamuna at Palla station from 2009 to 2019. Sci. Rep. [Internet]. Nature Publishing Group UK;12(1):1–19.

Kiran, B. R. 2010. Physico-chemical characteristics of fish ponds of Bhadra project at Karnataka, Rasayan Journal of Chemistry, 3(4): 671-676.

Njoku O.E., Agwa O.K., Ibiene A.A. 2015 An investigation of the microbiological and physicochemical profile of some fish pond water within the Niger Delta region of Nigeria. African Journal of Food Science. 9 (3), 155.

Sharma, M. K., Jain, C. K., & Singh, O. (2014). Characterization of Point Sources and Water Quality Assessment of River Hindon Using Water Quality Index. Journal of Indian Water Resources Society, 34(1), 53–64.

Singh, K.P., Malik, A., Mohan, D., singh, V.K. and Sinha, S. 2006. Evaluation of groundwater quality in northern Indo-Gangetic alluvium region. Environmental Monitoring and Assessment, 112: 211-230.

Tatawat R.K., and Singh Chandel C.P. 2007 Quality of Groundwater of Jaipur City, Rajasthan (India) and its Suitability for Domestic and Irrigation Purpose. Applied Ecology and Environmental Research.6 (2), pp 79-88.

World Health Organization, Guidelines for drinking water quality-I, Recommendations, 2nd Ed. Geneva WHO,1993

Zhang, S.X., Jiang, R., Yun, N., Peng, R., Chai, X.S. A simple high-throughput headspace gas chromatographic method for the determination of dissolved oxygen in aqueous samples. Journal of chromatography. 2019; 1608, 460399.

Table1 Different physicochemical parameters and their permissible range used for waters samples analysis and compare with ground water.

S.r. No.	Parameters	Unit	IS 10500 : 2012 Requirement Acceptable Limit	Ground Water sample Mean ± SEM	Range of parameters of ground water collected (Max-Min. value)	Protocol
1	pH	-	6.5-8.5	6.665±0.0162	6.42-7.75	IS: 3025 (pt-11)-1983, Reaff.2017
2	Turbidity (NTU)	NTU	5	BDL	BDL	IS: 3025 (pt-10)-1984, Reaff.2017
3	Odor	-	-	Agreeable	Agreeable	IS: 3025 (pt-5)-1983, Reaff.2017
4	Color	HZN	5	Agreeable	Agreeable	IS: 3025 (pt-10)-1984, Reaff.2017
5	Chloride (as Cl)	mg/l	250	260.51±0.396	250.0-277.68	IS: 3025 (pt-32)-1988, Reaff.2019 (Argentometric Method)
6	Alkalinity	mg/l	200	203.577±0.660	190.12-240.87	IS: 3025 (pt-23)-1986, Reaff.2019
7	Total Hardness (as $CaCO_3$)	mg/l	200	642.905±4.703	274.8-682.69	IS: 3025 (pt-21) Reaff.2019 (EDTA Titrimetric Method)
8	Total Dissolved Solids	mg/l	500	1549.353±4.10	1456-1586	IS: 3025 (pt-16)-1984, Reaff.2017
9	Total Solids	mg/l	500	1553.66±4.127	1458-1589	IS-3025(Pt-15)1984,Reaff.2019
10	Sulphate (SO_4)	mg/l	200	167.557±1.449	49.10- 196.80	IS: 3025 (pt-24)-1986, Reaff.2019 Turbidity Method
11	Nitrate (NO_3)	mg/l	45	32.746±0.244	26.18-37.88	IS: 3025 (pt-34)-1988, Reaff.2019 (Chromotropic Acid Method)
12	COD	mg/l	30	5.824±0.098	2.20-9.20	IS: 3025 (pt-58)-2006, Reaff. 2017
13	Dissolve Oxygen (DO)	mg/l	4.00-6.00	5.36±0.087	1.80-9.0	IS: 3025 (pt-38)-1989, Reaff. 2019 (Titrimetric Method)
14	BOD	mg/l	5(ICMR)	BDL	BDL	IS: 3025 (pt-44)-1993, Reaff.2019

(Mean ± SEM of 150 Samples)