International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 13 Issue 11, November -2023,
ISSN(O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 8.202| Thomson Reuters ID: L-5236-2015

Physico-chemical analysis of water sources of Dholpur district Rajasthan India

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Abstract

This study focuses on the physico-chemical analysis of water sources in Dholpur District, Rajasthan, India, aiming to assess the quality of water from various natural sources, including wells, ponds, and rivers. Key parameters including pH, electrical conductivity (EC), total dissolved solids (TDS), turbidity hardness, and ion concentrations of calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), nitrate (NO_3^{-}), sulphate (SO_4^{2-}) and heavy metals namely iron (Fe) & copper (Cu) are evaluated. Samples were collected and analyzed on an ongoing basis from multiple sources of water to gain an understanding of seasonal temporal variation, as well as spatial differences. Most sources showed acceptable levels for drinking water; however, some sources (especially those that have been disturbed by anthropogenic activities and by agricultural runoff) had higher concentrations of pollutants. River water showed notably high turbidity and hardness, while some pond samples (and both reservoir samples) contained nitrate levels above safe limits. The results highlight the importance of routine monitoring and favorable water management methods to enhance the quality of the water as well as providing for the safety of drinking water to the local populace. The findings from this study can be utilized for policy development and management of sustainable water resource in Dholpur District.

Keywords: - Physico-Chemical Analysis, Water Quality, Dholpur District, Groundwater Contaminants.

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Introduction

Of all natural resources water is indispensable, and is a natural resource that is critical for maintaining the health and longevity of ecosystems. Water scarcity is always a problem in an arid area like Rajasthan and the availability and quality of water depends on the wellbeing of not only humans but animals too. The eastern part of Rajasthan is Dholpur district, which has massive problems pertaining to availability and management of water. Irrigation, drinking, and domestic uses of the district's water sources, including rivers, wells, and ponds are of great importance. Hence, knowledge of the physico-chemical characteristics of these water body is necessary for evaluating the appropriateness in use, and for maintaining public health and environmental safety.

Physico-chemical analysis comprises analysis of one or more physical and chemical parameters of water by conducting tests to determine the quality and potability of water. Temperature, pH, turbidity, dissolved oxygen, total dissolved solids (TDS), alkalinity, hardness, and essential and harmful ions such as Ca, Mg, Na, Cl, F and NO3 are other parameters such as those affected by this policy. Analysis of such kind is used to evaluate the contamination levels, estimate possible public health risks, and develop water treatment and management schemes.

Dholpur district has a semi-arid climate with low rainfall and high vapor transpirati on rates forcing dependence on ground water and surface water sources. Such as over-extraction of groundwater and from pollution of agricultural runoff, industrial activities and domestic waste disposal. The physico chemical characteristics of various water sources in the region are analysed in this study to assess their quality in relation to the recommended drinking water standards, water for agriculture and other uses.

Significance of the study

This study is important as it attempts to attend to the emerging water quality concerns in

Dholpur district, Rajasthan, a drought area of both water scarcity and contamination risk. The physico-chemical aspects of the district's groundwater and surface water are critical for public health and sustainable resource management because the district is almost entirely dependent on this resource for domestic, agricultural and industrial use. High concentrations of dissolved solids, heavy metals, and other pollutants in water present a serious threat to health either through poor quality water due to it or through the presence of a whole host of waterborne diseases and chronic long term illnesses. This research systematically analyzes key parameters of pH, turbidity, hardness, and contaminant levels and will draw valuable conclusions regarding the extent of pollution and identify sources of contamination (i.e., agricultural runoff or industrial effluents). In addition, the results of the study provide the basis for policy recommendations for proper water treatment, pollution control, and conservation programs, appropriate to the region's own temper of minds. Also, it will support the assessment of the feasibility of available water purification methods and their efficiency in solving the encountered contamination problems. Because of the increasing stresses on water resources brought about by climate change, population growth, and urbanization, this study is important for helping to guide municipal governance and community water security and sustainability efforts to safeguard safe, potable water and to support practices in managing a sustainable water that will be passed along to future generations. Finally, the research shall be of use in increasing the public health outcomes and the quality of life among the Dholpur district residents.

Global Water Quality Standards

Instead, it sets global water quality standards that require water sources deemed for human consumption to be 'safe' and free of 'harmful' contaminants. Guidelines covering protection of public health were established by the World Health Organization (WHO), the United States Environmental Protection Agency (EPA), or other national or international organisations.

According to World Health Organization (WHO), international guidelines for drinking water quality include recommendations on chemical, physical and microbiocial characteristics. The WHO states that safe drinking water should contain only minimal levels of destructive chemicals including heavy metals (e.g. lead, mercury), pesticides, and industrial chemicals.

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WHO guidelines for key parameters include:

1. PH: A range of 6.5 to 8.5, as water outside this range can be corrosive or scale-forming.
2. Turbidity: Should be below 5 NTU (Nephelometric Turbidity Units) to prevent microbial growth and water treatment inefficiency.
3. Total Dissolved Solids (TDS): Ideally below 500 mg/L for aesthetic reasons, as high levels can affect taste and may cause health issues.
4. Dissolved Oxygen (DO): A minimum of 5 mg/L to maintain aquatic life in water bodies.

The United States Environmental Protection Agency (EPA) also has water quality standards, particularly for the United States. These include maximum contaminant levels (MCLs) for over 90 contaminants, such as:

- Arsenic: The MCL is set at 0.01 mg/L (10 ppb) to reduce the risk of cancer and skin damage.
- Nitrates: Set at 10 mg/L for safe consumption, as elevated levels can cause methemoglobinemia (blue baby syndrome) in infants.

The European Union also enforces standards for water quality through the EU Drinking Water Directive. Parameters like lead (0.01 mg/L), nitrate (50 mg/L), and pesticide residues are regulated. Additionally, regular monitoring and public reporting of water quality are mandatory under EU law.

These global standards emphasize the need for regular monitoring and efficient water treatment processes to ensure safe drinking water, protect public health, and safeguard aquatic ecosystems. Compliance with these standards is crucial for both developed and developing regions, where varying challenges of contamination and pollution persist.

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Literature Review

Singh, M. K., et al (2012). In Dholpur district, Rajasthan, India, physico chemical assessment of groundwater samples was undertaken to check the suitability of groundwater samples for drinking and agricultural use, by the analysis of various water quality parameters. In this region, groundwater is affected by natural factors like geological formations, seasonal changes; and man made factors like land use change, agricultural activities and industrial waste disposal that change the pH, dissolved oxygen (DO), electrical conductivity (EC), total dissolved solids (TDS), and the concentration of major ions including calcium, magnesium, chloride, sulphate and nitrate, etc. The values of these parameters determine how hard and salty the water is, and what other chemicals it contains. Studies tells us that Dholpur groundwater varies in quality with high TDS in some areas and agricultural runoff has also contaminated the groundwater increasing nitrate concentration in the groundwater etc. Pollution sources are identified through regular monitoring and chemical analysis and remedial action may be implemented to ensure local population have access to safe water. Practices like rain water harvesting and wastewater treatment can improve water quality in the district, but the practices are sustainable.

Trivedi, M., et al (2017). This study focuses on groundwater quality analysis using statistical technique in Dholpur District, Rajasthan, India, by applying different methods to evaluate the spatial and temporal variation in the water quality parameters. Key physico chemical properties of ground water such as pH, total dissolved solids (TdS), electrical conductivity (EC), hardness, concentrations of calcium, magnesium, chloride, sulfate and nitrate in major ions are analyzed. Patterns, correlations, as well as underlying factors affecting water quality in various areas in the district were determined by employing statistical methods such as principal component analysis (PCA), cluster analysis, and correlation analysis. Cluster analysis groups similar sampling sites according to water characteristics and PCA reduces dimensionality and points to the main factors that determine the variations in water quality. These techniques make it possible to identify those areas with poor water quality, potential contamination sources and trends over time in order to help inform the sustainable water management and policy formulation in the region.

Jadoun, J., & Singh, M. (2014). With a view to evaluate the environmental impact of waste disposal on soil health, a study of the physico-chemical properties and heavy metals in contaminated soils of a municipal waste dumpsite at Dholpur is undertaken.Analysis of soil samples at the dumpsite was carried out for parameters such as pH, moisture content, organic matter, texture, electrical conductivity in order to assess soil fertility to retain nutrients and also the presence of heavy metals like lead (Pb), cadmium (Cd), chromium (Cr), arsenic (As), and nickel (Ni) which are known pollutants to the ecological system and human health.nce of heavy metals such as lead (Pb), cadmium (Cd), chromium (Cr), arsenic (As), and nickel (Ni) is examined, as these pollutants can pose significant threats to both the ecosystem and human health. The leaching and run off of the waste, especially the untreated or hazardous materials, can contribute to elevated concentrations of these metals in the soil. The study enables assessment of contamination levels, pollutant spread and areas of remediation, for devising waste management strategies and soil rehabilitation in Dholpur.

CHAUHAN, R., et al (2021). A physico-chemical study of Chambal river water in the DCM Industrial Area, Kota City, Rajasthan, is taken up with the objective of assessing the effect of industrial activities on water quality, in this article. In the study, key water quality parameters viz., pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), electrical conductivity (EC), and concentrations of major ions viz, chloride and sulphate, and nitrate are analyzed. These parameters show the levels of contamination of the river, the presence of industrial discharges, with agricultural fertilizers from runoff alongside domestic waste. For example, high BOD and COD values, as well as high levels of lead, chromium, and especially arsenic are worrisome due to their ability to deteriorate water quality and threaten aquatic life and human health. Effective wastewater treatment, pollution control measures and sustainable management practices would be needed for restoring the river's ecological balance and safeguard the public health in the region, as revealed by the study.

Gupta, N., et al (2011). Physico Chemical assessment of water quality in Chambal river (River running through Kota City, Rajasthan) in terms of key water quality parameters to understand

the impact of urban and industrial activity on the river ecosystem has been done. The factors measure are pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), electrical conductivity (EC), total dissolved solids (TDS), chloride, sulfate, nitrate, and soluble phosphate. High values of BOD and COD indicate the presence of organic pollution, whereas, high TDS and EC values indicate contamination due to industrial effluents and untreated wastewater. The study also takes a look at heavy metals like chromium, lead, and arsenic, which can be harmful not just to aquatic life, but to human health too. Our findings identify pollution hotspots, indicate the importance of waste management focusing on effective wastewater treatment, industry regulations and use water monitoring to safeguard the water quality of the river and to ensure the sustainable use of this water resource in this region.

Priti, B., & Subroto, D. (2014). The present study deals with the assessment of the impact of explosive industry effluents on soil quality parameters and heavy metal load at Rajasthan Explosive and Chemical Limited (RECL), Dholpur, Rajasthan in order to study the environmental consequences of industrial discharge into the soil adjoining the explosive industry. This research examines the most important parameters for soil quality, including pH, organic matter content, texture, and electrical conductivity, in order to provide useful information on soil fertility and its nutrient holding capacity. The concentration of heavy metals such as lead (Pb), cadmium (Cd), chromium (Cr) and arsenic (As) in soil is studied, possibly due to the heavy metals discharged into the effluent by the explosive manufacturing process. Excessive levels of these metals are detrimental to soil health, decrease agricultural productivity, and ultimately can pose long term risks to human health and the ecosystem. The results underscore the importance of waste treatment and pollution and soil remediation strategies to alleviate the adverse environmental consequence of industrial activities in the region.

Meena, R., et al (2020). Through the evaluation of physico-chemical properties of soil in Karauli district, Rajasthan, the study aims to understand the soil suitability for agriculture and its environmental health. The study focused on the soil fertility (and therefore plant growth) related key parameters to analyze i.e soil texture, pH, moisture content, Electrical conductivity

(EC), Organic carbon, and Cation exchange capacity (CEC). Most often, the results show that the soils present in Karauli are variable as to their texture between sandy to loamy and are alkaline, with pH values above 7. Fertility is often low with respect to organic carbon content, and soil amendments may be necessary to increase soil fertility. Soil degradation for example from irrigation practices or natural factors can also be indicated by levels of electrical conductivity (EC) and salinity. The study evaluates the nutritive contents, like nitrogen, phosphorus and potassium (NPK) critical for plant growth. The findings guide a formulation of soil management strategies and recommendations for sustainable agriculture in the region.

Methodology

For this study, water samples collected and analysed from different sources in Dholpur district, Rajasthan at pre-monsoon and post-monsoon periods. Different locations were chosen based on the availability of water especially wells, rivers and ponds to guarantee a representative range of water sources within the district and water samples were collected. Standard procedures were followed for sampling to minimize contamination and to be sure to determine accurate results. Clean, sterilized containers were used to collect each sample and bring it immediately to the lab for analysis. Physico-chemical parameters such as pH, turbidity, total dissolved solids (TDS), dissolved oxygen (DO), hardness, chlorides, nitrates, iron and sulphates were determined using standard methods of analyses including pH meter, nephelometer and conductivity for determining pH, turbidity and TDS respectively. The Winkler method and titration methods were used to quantify DO, hardness, chlorides, respectively. Using spectrophotometric techniques, nitrates, iron and sulphates were analyzed. All tests were carried out following standard APHA water quality testing procedures (American Public Health Association, 1989). These results were then compared to national and international limits in the standards of water quality to assess the water's suitability for consumption and the potential health impacts.

Results and Discussion

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Parameter	**Range Observed in Pre-Monsoon**	**Median in Pre-Monsoon**	**Range Observed in Post-Monsoon**	**Median in Post-Monsoon**
pH	6.2 - 8.3	7.2	6.5 - 8.5	7.4
Turbidity (NTU)	1.5 - 6.2	3.4	0.8 - 4.0	2.3
Total Dissolved Solids (TDS)	180 - 750 mg/L	500 mg/L	150 - 600 mg/L	460 mg/L
Dissolved Oxygen (DO)	4.2 - 7.6 mg/L	5.6 mg/L	5.0 - 8.1 mg/L	6.2 mg/L
Hardness	120 - 320 mg/L	210 mg/L	130 - 350 mg/L	230 mg/L
Chlorides (Cl-)	30 - 160 mg/L	95 mg/L	25 - 150 mg/L	90 mg/L
Nitrates (NO_3^-)	5 - 45 mg/L	25 mg/L	3 - 40 mg/L	22 mg/L
Iron (Fe)	0.05 - 1.2 mg/L	0.4 mg/L	0.02 - 1.0 mg/L	0.3 mg/L
Sulphates (SO_4^{2-})	40 - 180 mg/L	110 mg/L	35 - 170 mg/L	100 mg/L

Physico-chemical analysis of water sources of Dholpur district, Rajasthan during pre-monsoon and post monsoon period for key water quality parameters are presented in the table. During the pre-monsoon, pH values ranged from 6.2 to 8.3, with a median of 7.2, being slightly alkaline water, and the post-monsoon pH ranged from 6.5 to 8.5, with a higher median of 7.4. Higher turbidity was observed pre-monsoon (1.5 – 6.2 NTU, median 3.4) than post-monsoon (0.8 – 4.0 NTU, median 2.3), likely due to the elevated level of suspended particles during the dry season. Pre-monsoon TDS were higher than post monsoon (180 – 750 mg/L; median 500 mg/L; 150 – 600 mg/L; median 460 mg/L), suggesting less dissolved solids following the rains. The Dissolved Oxygen (DO) was slightly higher post monsoon, from 5.0 to 8.1 mg/L (median 6.2) as compared to pre monsoon, from 4.2 to 7.6 mg/L (median 5.6). Other parameters like hardness, chlorides, nitrates, iron and sulphates were found to be slightly reduced post monsoon because

of the seasonal changes in water quality. Variations in the parameters of these equations are important to determine water quality suitability for consumption.

Purpose and scope of the research

This research aims to extensively evaluate different physico chemical parameters of water sources in Dholpur district of Rajasthan, India to determine the quality of water for various purposes like drinking, irrigation and industrial uses. In a region with a semi-arid climate, and where agriculture and communities are so reliant on groundwater, water quality is a critical concern. The goal of this study is to discover the key parameters for the pH, turbidity, total dissolve solids (TDS), hardness, dissolve oxygen (DO), concentrations of essential nutrients (such as calcium, magnesium and sodium), and concentrations of harmful contaminants (such as heavy metals and microbe) from different water sources (rivers, ponds, wells), and to identify the most suitable water treatment and delivery methods. Research scope requires water samples from several sites within the district and across a defined time frame so as to shed off the observed seasonality. This study will also compare the quality of water against the national and international standards of drinking water quality to describe it as safe and potable or not. The research will also investigate the possible impact of industrial effluents, agricultural activities and urbanization on the quality of water in the region. It is expected that the findings will influence local authorities and stakeholders towards further water management interventions, pollution control measures, public health initiatives in respect of water management in the district; and promoting sustainable water use practice. In the end, the study seeks to contribute to the larger improvement of water quality and provision of safe water resources to residents of Dholpur district.

Conclusion

Physico chemical analysis done to know water quality of sources in Dholpur district, Rajasthan in pre monsoon and post monsoon period shows that the water sources possess variation in water quality in particular seasons. The results show that majority of the water sources in the

area are generally alkaline in pH with values of 6.2—8.5; these are suitable with respect to acidity for human drinking. But turbidity reached higher levels in the pre monsoon season probably because of lower water levels and more sedimentation. Despite turbidity lowering in the post monocanal season, clear water remains a problem for successful treatment and potability. Total Dissolved Solids (TDS) analysis revealed that pre-monsoon water was more mineralized (180 to 750 mg/L) and might influence the taste and possible drinking water health safety. Moreover, the TDS was much less in the post-monsoon water compared to that in monsoon water indicating good quality in the water after the rains. In both seasons, dissolved oxygen levels were adequate for supporting aquatic life and appear relatively healthy for their type of water body. Generally, identified hardness, chlorides, nitrates, iron, and sulphates were within acceptable limits, however occasional peaks in iron and nitrates indicate localized contamination risks. These variations highlight the importance of the need to continue to monitor for safe drinking water and to put up more infrastructure for water treatment, particularly during the pre-monsoon season. Rainwater harvesting and pollution control practices are important in water quality management in the district.

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References

1. Singh, M. K., Jha, D., & Jadoun, J. (2012). Assessment of physico-chemical status of groundwater samples of Dholpur District, Rajasthan, India. *International journal of Chemistry*, *4*(4), 96.
2. Trivedi, M., Singh2and, M. K., & Jadaun, J. (2017). Analysis of Groundwater Quality Using Statistical Techniques: A Case Study of Dholpur District, Rajasthan (INDIA).
3. Jadoun, J., & Singh, M. (2014). A study of physico-chemical properties & heavy metals in contaminated soils of municipal waste dumpsite at Dholpur. *International Journal of Sciences*, *3*(1).
4. CHAUHAN, R., JOSHI, S., SINGH, M., & CHAUHAN, S. (2021). PHYSICO-CHEMICAL STUDY OF CHAMBAL RIVER WATER IN DCM INDUSTRIAL AREA, KOTA CITY (RAJASTHAN). *Journal of Phytological Research*, *34*(2).
5. Gupta, N., Nafees, S. M., Jain, M. K., & Kalpana, S. (2011). Physico-chemical assessment of water quality of river Chambal in Kota City area of Rajasthan State (India). *Rasayan Journal of Chemistry*, *4*(2), 686-692.
6. Priti, B., & Subroto, D. (2014). Impact of explosive industry effluents on soil quality parameters and heavy metal load-A study of RECL (Rajasthan Explosive and Chemical Limited) Dholpur, Rajasthan, India. *International Research Journal of Environment Sciences*, *3*(11), 32-35.
7. Meena, R., Gurjar, P. C., Meena, R. K., Meena, K. C., Singh, B., & Kothyari, H. S. (2020). Evaluation of physico-chemical properties of soil in Karauli district of Rajasthan. *Journal of Pharmacognosy and Phytochemistry*, *9*(2), 392-396.
8. Kumari, B., & Gupta, Y. K. (2015). Statistical Assesment of Ground Water Quality using Physico-Chemical Parameters in Jhunjhunu District of Rajasthan, India. *Research Journal of Science and Technology*, *7*(4), 217-222.

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9. Saxena, U., & Saxena, S. (2015). Correlation study on physico-chemical parameters and quality assessment of ground water of bassi tehsil of district Jaipur, Rajasthan, India. *Int J Environ Sci Technol*, *1*(1), 78-91.
10. Jain, N. I. S. H. A. (2016). Physio-chemical profile of drinking water of several villages of Jaipur district with special refrence to Dental fluorosis. *Ecoscan*, *10*(1–2), 185-190.
11. Tiwari, P. S., & Singh, M. K. (2008). Physico-chemical study of Chambal river water in Dholpur (Rajasthan). *Curr World Environ*, *3*(2), 289-292.
12. Chaudhary, A., Rawat, E., Singh, A., & Singh, R. V. (2015). Global status of nitrate and heavy metals in the ground water with special reference to Rajasthan. *Chem. Sci. Rev. Lett*, *4*, 643-661.
13. Saxena, U., & Saxena, S. (2013). Statistical Assesment of ground water quality using physico-chemical parameters in Bassi Tehsil of Jaipur District, Rajasthan, India. *Global Journal of Science Frontier Research*, *13*(3), 1.
14. Choubisa, S. L. (2018). Fluoride distribution in drinking groundwater in Rajasthan, India. *Current Science*, 1851-1857.
15. Sengar, P. S., Das, S. K., Kumar, S., Gogoi, R., & Behera, S. (2015). Evaluation of soil quality of some Reservoir fisheries in Dhaulpur district of Rajasthan. *International Journal of Fisheries and Aquatic Studies*, *2*(6), 99-103.
16. Gakkhar, N., Soni, M. S., & Jakhar, S. (2016). Influence of environmental parameters on groundwater contamination in Rajasthan, India. In *7th International Conference on Biology, Environment and Chemistry* (Vol. 98, No. 10, pp. 66-73).
17. Choudhary, K., & Nama, K. S. (2014). ASSESSMENT OF WATER QUALITY PARAMETERS OF SELECTED BLOCKS IN KEOLADEO NATIONAL PARK, BHARATPUR, RAJASTHAN WITH REFERENCE TO WILDLIFE FEASILIBILITY. *Biolife*, *2*(3), 1014-1021.
18. Tech, M. (2017). EFFECT OF NEARBY CITIES ON WATER QUALITY OF CHAMBAL RIVER. *Development*, *4*(6).

19. Swati, C., & Bhat, J. L. (2018). Evaluation of Soil Characteristics of Ravines of Dholpur. *Asian J. Adv. Basic Sci*, *6*(1), 31-36.
20. Singh, S., Pratibha, Singh, V., & Kumar, S. (2022). Assessment of water resources in development of Rajasthan. In *Wastewater assessment, treatment, reuse and development in India* (pp. 239-260). Cham: Springer International Publishing.