Water Quality and Pollution Status of Parvati River at Atru Region of Baran District, Rajasthan (India)

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Abstract

Every living thing needs water to survive, and it is essential for the health of the world and every living thing. All forms of living life on earth depend on rivers. The purpose of the current investigation was to evaluate the Parvati River's water quality status in the Atru area of the Baran District in Rajasthan (India). Temperature, Transparency, Flow Rates, Turbidity, Electrical Conductivity TDS, pH, DO,BOD, COD, Free CO2, Chloride, Calcium, Total Hardness, Total Alkalinity, Nitrates, Nitrites, and Sulphate Phosphate are some of the physico-chemical parameters. Ammonia, magnesium, sodium, and potassium were used to analyse the Parvati River's contamination index at specific locations in the Atru region of the Baran District in Rajasthan.

Key word: Water Quality, Pollution, Parvati River, Baran

Introduction:

Water is a necessary part of existence. It is a special liquid in that life cannot exist without it. A significant source of irrigation and drinking water is river water. The modern world's industrialisation, urbanisation, and population growth have caused our surface water quality to rapidly deteriorate. India is equipped with a crisscross network of rivers that can accommodate the country's various water needs, making it wealthy in water resources. The need to fulfil the rising demands brought on by urbanisation, industry, and contemporary agricultural operations is depleting the existing water supplies, and the quality of the water has declined. Due to the discharge of untreated sewage, industrial effluents, and agricultural runoff, Indian rivers are contaminated. In the nation, the monsoon season lasts for four months, during which time rivers flow at their highest levels. Rivers have very little or no flow during lean seasons. Numerous types of water storage facilities, including anicuts, check dams, small and big dams, etc., have been built across the nation on the main stems of river streams to supply the need for water for drinking, household, agricultural, and industrial use during dry spells. The physiography, geology, geomorphology, hydrogeology, demographics, land use pattern, and human habitation of the area under consideration all affect the water quality. Because water is the most vital element in our ecosystem, any imbalance brought about by the presence of various contaminants can have a severe influence on the entire ecosystem. This contaminated surface water will also have a negative impact on ground water. The Parvati River is crucial in shaping a basin's biological environment by integrating and arranging the landscape.

They are the main determinants of the global water cycle and the most dynamic transporters in the hydrologic cycle. demographics, land use, and human habitation in the region are of concern. (Gupta et al. 2015) considered the water quality at the Jhunjhunu location, a modern area of the down valley, and discovered that a grouping of calcium, magnesium, and phosphate were present in normal waters throughout much of the area. The waterways and channels confirmed the increased contamination brought on by technological development. A significant amount of modern waste is dumped in water sources because the study area is a mechanical area. We know that mechanical waste contains a lot of toxic metal particles, which raise the level of water parameters. The level of water contamination rises as a result of the mixing of commercial waste from manufacturing operations, sewage, household waste, and horticulture emissions into water sources. The nature of the physiochemical parameters present in water is diminished as a result of this mechanical pollution. (2017) Gupta et al high concentrations of nitrate in ground water, which decreased with increasing water table depth and increased with all out-hardness calcium and magnesium, have been accounted for. R. K. Chouhan and others (2018) reported on the microbiological evaluation of different Chambal River points in the Kota district. Continuous addition of industrial and municipal pollutants to water bodies affects the physiochemical quality of the water, rendering it. In order to determine the level of pollution in the Parvati River in the Ataru region of the Baran District of Rajasthan, an attempt has been made to assess the water quality on a physico-chemical basis. This is the first study to be conducted in the area chosen for this paper. Water bodies that are regularly added to lose their physiochemical quality, making them unsuited for use by animals and other creatures.

Methodology:

The Parvati River in Rajasthan's Baran District's Ataru region has been chosen as the study's study location. Atru is a town in Rajasthan, India's Baran district. The pertinent study region is located between latitudes of 24° 48′ 36′′ north and 76° 37′ 48′′ east. It is situated in Rajasthan, a state in northern India, to the southeast. It is in the Baran Tehsil. It is around 30 kilometres south of the Baran neighbourhood. The largest tehsil in the Baran district is called Atru, and it oversees 141 villages. There are numerous amenities, including a train station, a hospital, schools, stores, and well-equipped traffic rods. For three years, from April 2021 to June 2021, water samples were taken only during the premonsoon season. Integrated sampling was carried out to obtain a sample that was actually representative. S-1, S-2, and S-3 are three different identifiable places from which samples were taken. One litre screw-capped polypropylene bottles with pre-cleaned caps were used to collect the samples. For the quantitative estimation of the parameters affecting water quality, the accepted methods and practises were employed. There was a pH measurement done on-site. Samples were transported to the lab to be subjected to normal physico-chemical parameter analysis (APHA 1995). The following parameters were examined from the data on the quality of the water: temperature, transparency, flow rates, turbidity, electrical conductivity, TDS, pH, DO,BOD, COD, free CO2, chloride, calcium, total hardness, total alkalinity, nitrates, nitrites, sulphate phosphate ammonia magnesium sodium potassium, and pesticide residue.

Result and Discussion:

The physico-chemical properties give a good indication of the water quality in any body of water. Table 1 summarises the Parvati River in the Ataru region of the Baran District of Rajasthan's physico-chemical properties. Fundamentally, temperature matters because of how it affects various chemical and biological processes that occur in water and in aquatic animals (Shrivastava et al 2002). It is based on the time of year, the season, and the temperature of the effluents being fed to the river at the time of sampling. Table 1 displays the temperature in the Parvati River in the Ataru region. The summer season saw the highest. Singh et al. (1999) found a similar seasonal change in the temperature of the river Ghaghara. The amount of sunshine, suspended soil particles, turbid catchment area water, plankton density, etc. all affect transparency or light penetration (Kulshrestha and Sharma, 2006). Water transparency in rivers is further impacted by total solids, organic matter that has partially or completely decomposed, silts, and turbulence brought on by currents, waves, human, and animal activity (Singh et al., 1999). Water transparency was also affected by the seasons throughout the summer. Late post-monsoon saw a high value of transparency, which has also been noted by (Singh et al 1999). In the river Ghaghara, a temperature was noted by Singh et al. (1999). Water bodies' flow rates typically rely on both the volume of water present and their depth. The Parvati River's flow rate was found to be minimum (49 cm/sec-1) at S-2 and maximal (56.00 cm/sec-1) at S-1 in the Ataru region. S-1- recorded the lowest turbidity (76.00 NTU), while S-3 recorded the highest turbidity (140.00 NTU). The ability of a substance or solution to transmit an electrical current via water is measured by its conductivity. In the current investigation, S-r had the lowest conductivity value (390.00 S cm-1) and S-3 had the greatest conductivity value (600 S cm-1). Total dissolved solids are made up of salts, organic materials, bicarbonates, chlorides, sulphates, phosphates, and nitrates of Ca, Mg, Na, K, and Mn (Mishra and Saksena, 1991). S-1 reported the lowest total dissolved solids (490 mgl-1), whereas S-3 recorded the highest value (500 mgl-1). According to Ellis (1937), the growth of aquatic biota is best suited to a pH range of 6.7 to 8.4. Throughout the study period, the water of the Parvati River in the Ataru region remained consistently alkaline. While (Verma 1998) detected acidic nature of water of Subernarekha river due to discharge of copper industry effluents in thie river, (Shaikh and Yeragi 2004) observed alkaline pH in river Tansa during entire study period. At S-1 in the, the pH value was measured at its lowest (10.25), while at S-3, it reached its highest (12.80).

One of the key factors in determining the quality of water is the amount of dissolved oxygen. The maintenance of a range of biological life forms in the water depends on its presence, and the impact of waste discharge in a water body is greatly influenced by the oxygen balance of the system. Dissolved oxygen regulates biological activity, which controls the metabolism of the entire biological population. It also serves as a gauge for the tropic status of a body of water (Saksena et al 1994). The reduction of oxygen in water typically results from biota respiration, the breakdown of organic materials, an increase in temperature, wastes that require oxygen, and inorganic reductants such hydrogen sulphide, ammonia, nitrites, ferrous iron, etc (Sahu et al., 2000). Hydrogen sulphide, ammonia, nitrite, ferrous iron, and several oxidizable compounds are examples of inorganic reducing agents that tend to lessen the amount of dissolved oxygen in water. According to Tarzwell (1957), healthy fish and other aquatic organisms require a dissolved oxygen concentration of at least 3 mgl-1. In the current investigation, the minimum value of dissolved oxygen was measured at S-1 at 11.00 mgl-1, and the maximum value was measured at S-3 at 12.80 mgl-1. The river's oxygen concentration should be sufficient to maintain healthy fauna and vegetation. Similar findings in the Ganga River were noted by Singh et al. in 1999. In aquatic ecosystems, the pH, alkalinity, and free carbon dioxide all interact. The majority of the free carbon dioxide in water is produced by the respiration of organisms and the breakdown of organic waste (Singh, 1999). The amount of free carbon dioxide is typically high in contaminated water. Free carbon dioxide levels in the Parvati River at Ataru region ranged from non-traceable levels at all stations to a maximum value of 10.10 mgl/1 at the river at S-2. According to (Ganapati 1943), variations in the bicarbonate readings are related to the rate of photosynthetic activity. According to Klein (1959), Shrivastava and Patil (2002), the amount of phytoplankton that can break down bicarbonate into carbonates and carbon dioxide directly correlates with the alkalinity. Thus, photosynthesis makes use of the carbon dioxide that is released. According to (George et al. 1966), water bodies with a pH range of 7.0 to 9.0 nevertheless have a significant bicarbonate concentration. The Parvati River in the Ataru region has a total alkalinity level that ranged from 285.00 mgl-1 at S-1 to 311.0 mgl-1 at S-S-3. Similar information was gathered in Varanasi's Ganga River by Singh et al. in 1999. The hardness of water is influenced by the cat ions of calcium, magnesium, iron, and manganese (Shrivastava and Patil, 2002). According to Barrett (1953), from the perspective of fisheries, hard waters are more productive than soft waters. Total hardness of the river ranged from 110.00 mgl-1 at S-1 to 165.0 mgl-1 at S-3, with S-1 having the lowest value. Water with a high chloride concentration likely contains organic waste, primarily of an animal origin (Thresh et al., 1949). It grows thanks to ammoniac nitrogen, which is also mostly derived from animal excrement. Chloride concentrations in the Parvati River in the Ataru region range from 71.50 mgl-1 at S-2 to 76.00 mgl-1 at S-1. The river's chloride concentration was quite low, indicating that little to no industrial and municipal waste, as well as very little organic animal waste, were released into the environment. Calcium is one of the most common naturally occurring compounds since it is present in huge quantities in rocks. Sewage treatment plants and industrial waste sites are additional important calcium sources. The calcium concentration in the river ranged from 31.10 to 39.08.08 mgl-1. According to (Alderfer et al. 1977), inorganic nitrogen concentrations above 0.03 mgl-1 accelerate algal development to the point that water may not be safe for human consumption. Nitrate levels ranged from 0.011 mgl-1 at S-3 to 0.015 mgl-1 at S-2 in the river under study. The current analysis discovered very little nitrate-N, which indicates that the river does not get any waste water.

From 0.001 mgl-1 at S-3 to 0.021 mgl-1 at S-1, the nitrite concentration in the river changed. Sulphate concentrations in the river range from 38.40 mg/l at S-2 to 41 mg/l at S-3. A pollution indicator called biochemical oxygen demand (BOD) showed that the river's level ranged from 0.5 mgl-1 at S-1 to 5.80 mgl-1 at S-2. Low BOD levels suggested that there was no organic pollution along the riverine stretch. According to (Fokmare et al 2002), the river Purna had a high biochemical oxygen demand (BOD) value of 20.00 mgl-1 and was extremely polluted as a result of organic enrichment, decaying plant and animal debris, and other factors. Chemical oxygen demand (COD) provides a trustworthy metric for determining the level of water pollution (Shrivastava and Patil, 2002). The amount of oxygen needed for the chemical oxidation of organic materials is measured by COD. The river's COD concentration peaked at S-3 (17.00 mgl-1) in this river. Additionally, this offers a precise indicator of the level of water body contamination (Kulshrestha et al 2006).

Table : 1 Physico chemical Parameters studied at various locations of Paravti River Near Ataru region of Baran District Rajasthan

S. No.	Parameter Studied	Unite	S-1	S-2	S-3
1.	Water temperature	0_C	30.72	35.50	33.10
2.	Transparency	Cm	112.00	110.0	120.00
3.	Flow rate	cm sec^{-1}	56.00	49.00	50.00
4.	Turbidity	NTU	76.00	90.00	140.00
5.	Electrical conductivity	µs cm^{-1}	390.00	450.00	600.00
6.	Total dissolved solids	mgl^{-1}	490.00	440.00	500.00
7.	pH	-	10.25	9.50	9.80
8.	Dissolved oxygen		11.00	11.60	12.80
9.	BOD	mgl-1	5.00	5.80	5.00
10.	COD	mgl-1	23.00	24.50	17.40
11.	Free carbon dioxide	Mgl^{-1}	6.00	6.50	10.10
12.	Chloride	mgl^{-1}	76.00	71.50	75.94
13.	Calcium	mgl^{-1}	31.10	35.40	39.08
14.	Total hardness	mgl^{-1}	110.00	134.00	165.00
15.	Total alkalinity	Mgl^{-1}	285.00	297.00	311.00
16.	Nitrates	mgl-1	0.019	0.015	0.011
17.	Nitrites	mgl-1	0.021	0.014	0.01
18.	Sulphates	mgl-1	39.00	38.40	41.10
19.	Phosphates	mgl-1	0.020	0.051	0.056

20.	Ammonia	mgl-1	0.11	0.38	0.45
21.	Magnesium	mgl-1	9.50	10.80	13.11
22.	Sodium	mgl-1	42.50	40.49	39.30
23.	Potassium	mgl-1	5.50	6.10	6.40

Conclusion:

The Paravti River Near Ataru region of the Baran District of Rajasthan can be classified as oligosaprobic based on the numerous factors examined. When several research data were compared to Indian standards (IS, 1974, 1991) for irrigation, fish culture, and public water supply, it became clear that all of the study's parameters fell within acceptable ranges. A number of aquatic animals, including endangered species, can thrive in the clean river water in the Paravti River Near Ataru area of Baran District, Rajasthan, according to criteria taken into account for the study.

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