

## Research Article

# Physico-Chemical Characterization of Water Parameters of River Hiran

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DOI-10.55083/irjeas.2025.v13i04019

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**Abstract:** Present work was carried out to investigate the physico-chemical characterization of different water parameters of River Hiran. Samples were collected from five sampling stations, namely Kundeshwar, Khitola, Ghat Simariya, Khinni and Hirapur for two consecutive years. Physico-chemical profile of the river showed the variation in the water temperature from 15.0° to 31.2°C, pH 7.4 to 8.2, conductivity 95.6 U Mhow to 152 U Mhow, DO 4.03 to 7.00 mg/l, total alkalinity 164 to 210 mg/l, hardness 120 to 186 mg/l phosphate 0.01 to 0.15 mg/l were observed. Their relation with fish and fishery has been discussed in this paper carried in past two years.

**Keywords:** River Hiran, Physico-chemical parameters Kundeshwar, Khitola, Ghat Simariya, Khinni and Hirapur.

## 1. INTRODUCTION

The assessment of water quality of any aquatic resources is based mainly on physical, chemical and Biological methods. The change in physical conditions of water can be reflected directly in the Biotic community of ecosystem. River water receives a variety of organic and inorganic materials from natural and man-made sources. These materials

through physical, chemical and Biological interactions are transported, rendered, converted, respired, incorporated, deposited and thus assimilated by the system. However, not all aquatic systems can receive and assimilate the same quantity or kinds of waste materials. Considering ecological, economical and recreational promise of the water body, present work has been undertaken to assess

seasonal diversity in the physico chemical parameters of river hiran. In the present study, attempt has been made to study eco-sustainability assesment of river hiran water flowing in Jabalpur District of M.P, This river has its origin from kundeshwar at Jabalpur and ends in Berman ghat Narsingpur District where it confluent with river Narmada.

## 2. MATERIALS AND METHODS

Five sampling stations were selected from origin and joining places with the Narmada River. These station are Kimdeshwar, Khitoula, GhatSimariya, Khinni and Hirapur.

**Kundeshwar:** This station is one km from Kundam, which has old temple of God Shankar. The HiranRiver originates from a kund located at "Cow Mukh". Here HiranRiver is very thin stream and extends forward, it becomes three feet wide. No Fish Fauna werelocated. Only in rainy season few small fishes can be seen depth of water and are also very less.

**Khitoula:** This Sampling station is located two km from Sihora. Here water is used for drinking purpose, beside this there is a bathing ghat. Here the river Hiran becomes 160 feet wide and depth is 12 feet/7000 gallons water are supplied to Sihora and 5000 gallons to Khitoula.

**GhatSimariya:** This station is 5 km from Simariya, which is a Sandy area. Small stream like river Banne joins to River Hiran.

**Khinni:** This station is 10 kms from Gosalpur, which is also a sandy area. Total width is 110 feet and depth is 11 feet. Water is utilized for drinking, Pisculture, Agriculture, Bathing and also for the use for Cattles.

**Hirapur:** This sampling station is last station no.-5, which is 5 km from Belkhe located at Jabalpur – Bhopal National Highway, Route

No.-12. Hirapur is located at interior, where Hiranriver Joins the Narmada river at SankalDhar.

## 3. COLLECTION OF WATER SAMPLES

Water samples were collected seasonally from the selected site of above mentioned water body for a period of two years started from (April, 2022 to March, 2024).

The water parameters such as temperature, conductivity, total dissolved solids, pH, free carbon dioxide, total alkalinity were measured at the sampling site itself. Other parameters such as dissolved oxygen, total hardness, BOD and COD were done in the laboratory. All the water parameters were analyzed according to the method of Golterman, et al. (1978), Boyd (1979) and APHA (1992).

## 4. RESULTS AND DISSUSION:

In the present work, a number of physico-chemical parameters of water were studied of Hiran river, such as temperature, dissolved oxygen, pH, alkalinity, nutrients, mineral composition etc. Fluctuation in these parameters often create an adverse environment to organisms limiting their production. These also interfere their physiological processes which reduce their ability to compete with the other populations within the environment. Present investigation revealed a water temp. range from 15.0° to 31.2°C near the confluence area of S3 and S5 during April 2006 to March 2008. Chakraborty *et al.*, reported a temp. range of 19.2 to 32°C in river Yamnua. Chacku & Sreenivasan (1951) reported temp. ranges of river Godavari 86 Kavei-i as 27.5°C to 36.4°C and 26.0 to 30.9°C respectively. Maximum temp. occurred in the month of May in both these rivers. David (1963) reported a range of 19.5 to 22.9°C in river Gandak. Chacko and Ganpati (1949) reported that the pattern of water temp. followed the environmental and seasonal fluctuations. Trivedi (1979) reported a

temp. range of 23.6 to 40.6°C in the polluted zones of Charnbal river at Nagda. The temp. range suggested for river Hiran (15°C- 31°C) may be considered as the winter and spring temp. and the summer temp. is likely to be more.

A pH value of 7.4 to 8.2 was found. The least pH value was recorded in October while the maximum value occurred in March at S<sub>3</sub> and S<sub>5</sub> stations. In view of the organic contaminations at S<sub>3</sub> and corpse burning at S<sub>4</sub> the Hiran river water gets nutrient enrichment in this area hence shown an increase level of pH. Chacko and Sreenivasan (1955) reported pH range of 7.2 to 8.3 and 7.6 to 9.5 in rivers Godavari and Cauvery respectively. Chakraborty *et al.* (1959) reported a pH value of 8.0 Throughout the year with fluctuation +2 in river Yamuna at Allahabad. Earlier records in river Chambal by Khare (2002), and Trivedi (1979) reported pH range of 3.4 to 6.1 and 2.4 to 8.5 in the polluted zones of river Chambal at Nagda. However, Dad (1981) reported a range of 6.5 to 7.5 from the same locality showing culturable improvement in water quality. In general the pH values are dependent on the pollution levels they contain. The pH range of this river shows good water quality, when compared to several other Indian rivers.

The conductivity values studied in Hiran river ranged from 95.6  $\mu\text{Mhos}$  to 152  $\mu\text{Mhos}$ . The maximum conductivity was recorded in January at S<sub>2</sub> station. David *et al.*, (1969) had shown conductivity values in the range of 125-213 and 225 to 662  $\times 10^6$   $\mu\text{Mhos}$  in Tungbhadra reservoir. It may be concluded that conductivity values of western zone of this river are moderate when compared to the reservoir data.

The dissolved oxygen of 4.03 to 7.00 at the five study sites of Hiran river was seen. The highest value of 15.2 mg/l was recorded in the month

of December at S<sub>2</sub> and S<sub>3</sub> stations. The lowest value of 7.6 mg/l was recorded at S<sub>3</sub> station in March. Dad (1981) recorded a range of 7.2 to 9.4 in the polluted zones of Chambal river. Chacko and Sreenivasan (1955) recorded a Dissolved oxygen range of 3.5 to 8.5 mg/l in the polluted zones of river Yamuna. David (1963) recorded 6.2 to 7.4 mg/l of Dissolved oxygen river Gandak. The present values obtained from Hiran river show the high water quality of the river waters with least contamination, least organic and inorganic contaminants and high water velocity show several zones of super saturation of oxygen. Highest Oxygen concentration was recorded in this river in the winter season when the oxygen holding capacity in river water increases.

The B.O.D. values reported in the present study from Hiran river ranged from 4.4 to 7.6 mg/l. The maximum B.O.D. value was recorded from study site S<sub>2</sub> near confluence area of S<sub>1</sub>. B.O.D. levels in Chambal ranged from 3.2 to 272 mg/l showing a long stretch of polluted zone. The low levels of B.O.D. in this river shows a better water quality.

The C.O.D. values reported in this investigation ranged between 14.2 to 20.0 mg/l. The least value was recorded in the month of October at S<sub>3</sub> study site while the maximum value of 20.0 mg/l was recorded from S<sub>1</sub> study site. C.O.D. range of 6.6 to 569 mg/l was reported from Chambal river by Dad (1981). Similar reports were made from various Indian rivers by Ray and David (1966). The low C.O.D. value recorded in the present study shows a better water quality.

No free CO<sub>2</sub> contents could be recorded in this river at the five study sites. The carbonate alkalinity levels have range from 12 to 36 mg/l at all the five study sites. The maximum values of 36 mg/l occurred at the S<sub>1</sub> study site in December, while the least value of 12 mg/l at

S3 study site in the month of October and November. Dad (1981) could not record carbonate alkalinity at three stations, which are polluted. 9 to 24 mg/l of carbonate alkalinity was recorded from river Cauvery by Chacko and Sreenivasan (1965) and 1.2 to 10.2 mg/l from December to May in river Harwah.

The Bicarbonate alkalinity levels in this study have recorded a range of 164 to 186 mg/l in the western zone of this river. The highest value of 186 mg/l was recorded at S1 and S2 study sites. While the least value of 165 mg/l was recorded in October at S3 station. From river Godavari, Chacko and Sreenivasan (1955) reported the bicarbonate alkalinity range of 48.5 to 192 mg/l from river Godavari and a level of 23.18 to 336 mg/l from Caurvery. In river Krishna Chacko and Sreenivasan (1955) reported a range of 81.9 mg./l to 105.4 mg./l. Chakraborty *et al.*, (1959) reported a range of 85 to 270 mg/l in river Yamuna while David (1963) reported a range of 84 to 220 mg/ l in river Ganga. The present levels of 164 to 186 mg/l show moderate bicarbonate alkalinity levels.

The total alkalinity range in Hiran raiver as observed in the present study ranged from 164 to 210 mg/l with the least value at S3 and the maximum value at S2. The higher value at S2 may be due to the increased human activity at the study site.

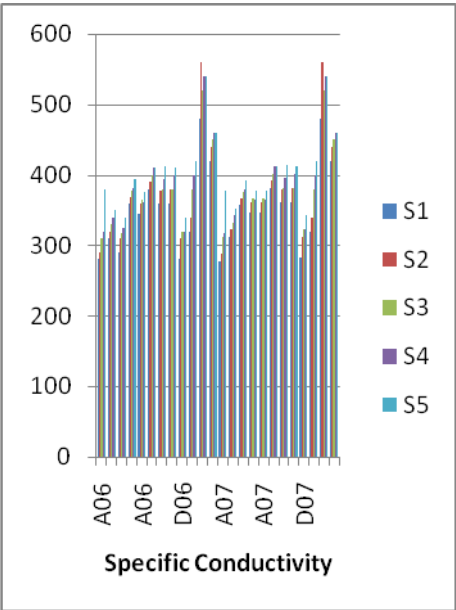
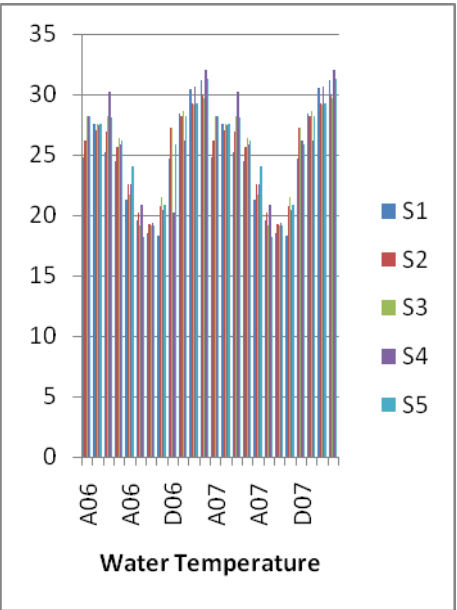
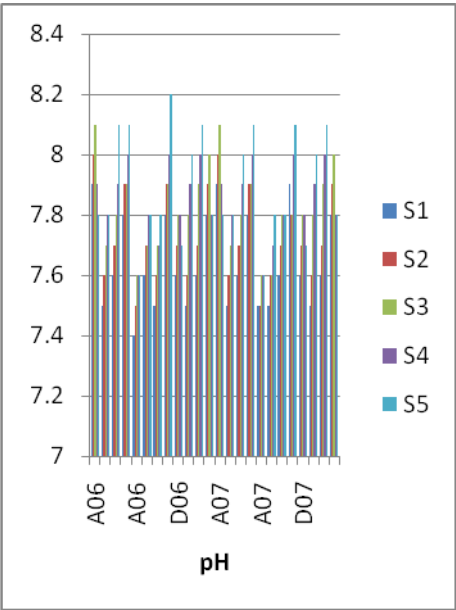
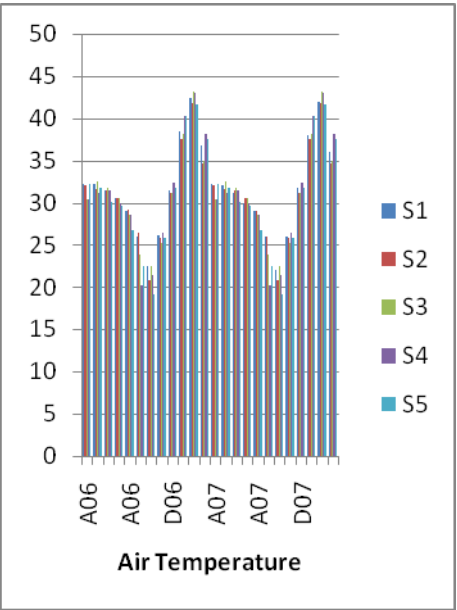
The maximum value of 17.98 mg/l at S1 and S3 in the month of February and January, while the minimum value of 8.98 mg/l was recorded in October at S3 station. High Chloride values were reported by several authors in the polluted zones of various Indian rivers. 46.3 mg./l in river Chambal by Dad

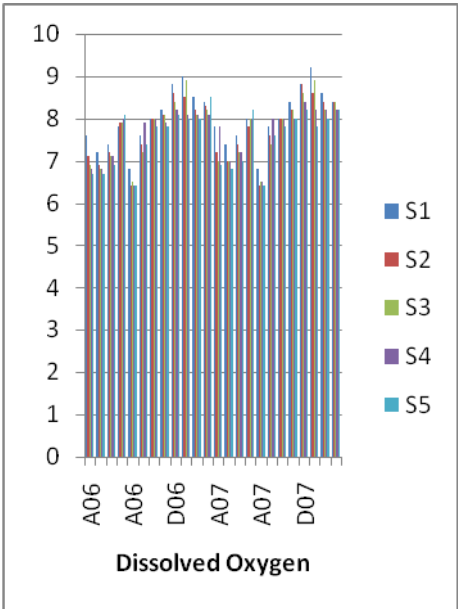
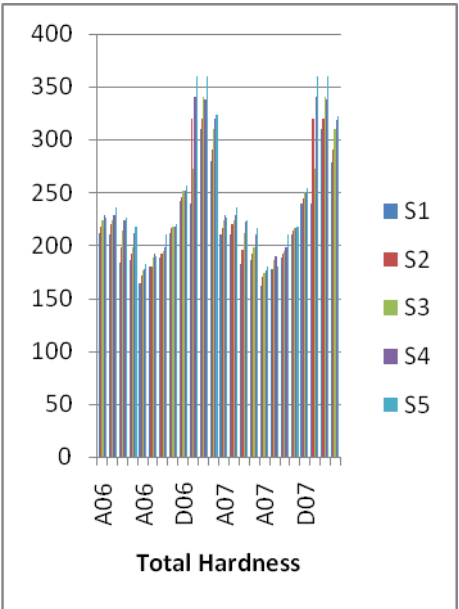
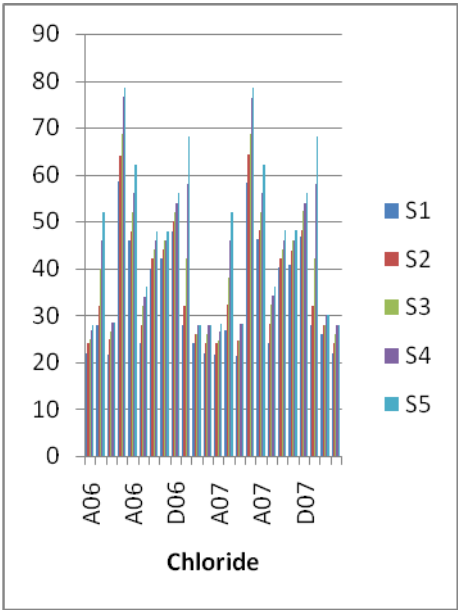
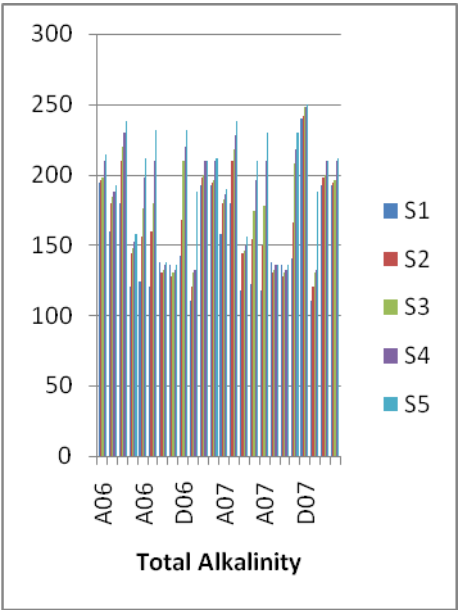
(1981), Chacko and Sreenivasan (1965) in river Krishna, David (1963) in river Ganga, Chakraborty *et al.*, (1959) in river Yamuna at Allahabad. The present chloride ranges of 8.98 to 17.98 mg/l show a better water quality of the Hiran river water.

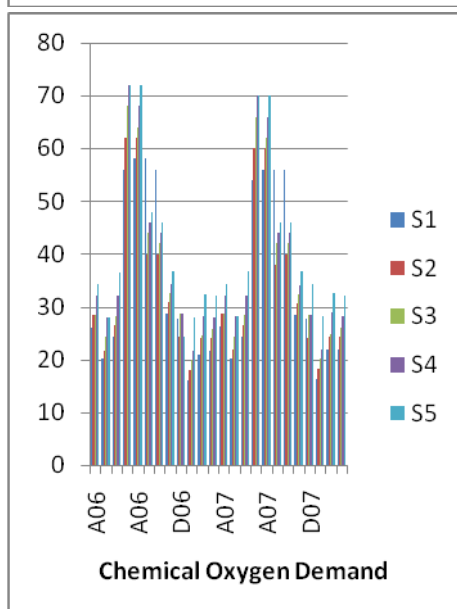
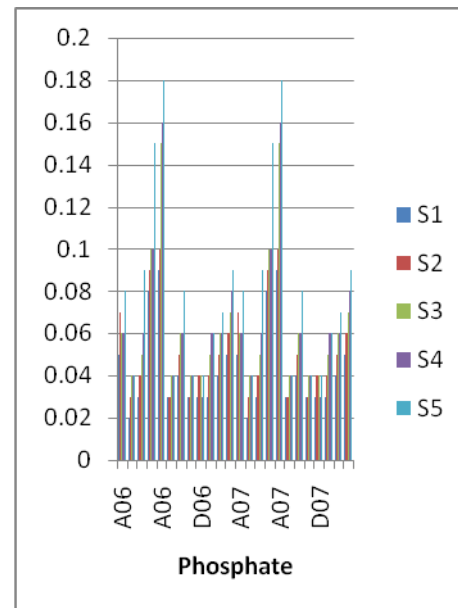
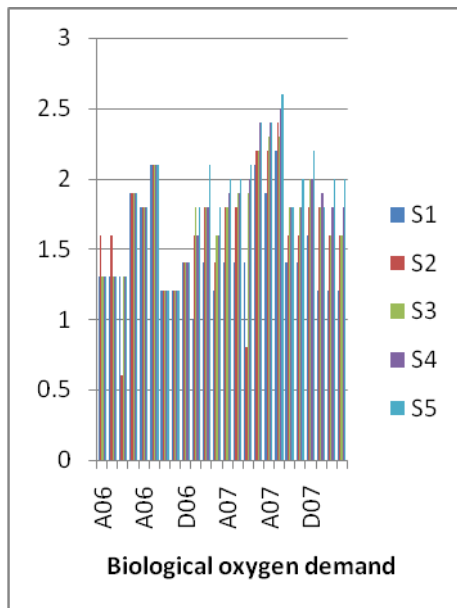
Water hardness value from 120 to 186 mg/l were studied in the present work. Maximum value of 186 mg/l was recorded from S1 and least value of 120mg/l from S5 station. Chakraborty *et al.*, (1959) reported a hardness range from 35 to 185 mg/l in river Yarnuna. David (1963) reported a range of 92 to 136 mg/l in river Ganga. Dad (1981) reported A range of 90 to 339.5 hardness values in the polluted zones of Chambal river. The present range of hardness values from this river show a moderate hardness levels.

In this case the phosphate values ranged from 0.01 to 0.15 mg/l in this river. The maximum value was recorded from S1 in March, while the least value was recorded from S2, S3, S5 in the month of January. Chakraborty (1969) reported phosphate range of 0.05 to 0.21 and 0.03 to 0.09 in river Yamuna. Chacko and Sreenivasan (1965) reported phosphate values range from 0.24 to 0.5 mg/l in river Krishna. High phosphate value was reported by several authors in the polluted zones of several Indian rivers like Dad (1981) from river Chambal.

Our finding reveal that the Physico-Chemical parameters may suit for the development of primary and secondary productivity. Our results are in close vicinity of the reported by Khatovakar *et al.* (2004), Kohli *et al.* (1998), Chavanet *et al.* (2003), Lendhe *et al.* (2004), Kumar *et al.* (2007), Tripathi *et al.* (2008), Shukla *et al.* (2012).







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#### Cite this Article

Dr. Yogendra Kumar Payasi, Suresh Kumar Kol, J. P. Shukla, Dr. Jyotsna Mishra. Physico-Chemical Characterization of Water Parameters of River Hiran. International Research Journal of Engineering & Applied Sciences (IRJEAS). 13(4), pp. 219-226, 2025. <https://doi.org/10.55083/irjeas.2025.v13i04019>