

Impact of Seasonal Changes of Limnological Attributes in Indira Gandhi Canal Fresh Water at Saharni Village Area, Hanumangarh, Rajasthan, India.

Dr. Deep Mala Garg¹, Aayushi Karwa², Dr. Seema Koushal³

¹ Asst. Professor Zoology, Seth G.L. Bihani S.D. (P.G.) College, Sri Ganganagar, Rajasthan,

² Asst. Professor Zoology, Seth G.L. Bihani S.D. (P.G.) College, Sri Ganganagar, Rajasthan,

³ Asst. Professor Chemistry, Agarwal Girls College, Sri Ganganagar, Rajasthan, India.

Abstract - The recent study examines the physico-chemical aspects of Indira Gandhi Canal's non-saline water quality in Saharni, Hanumangarh district. The various physical-chemical factors like thermogenesis of water, hydrogen ion concentration, electrical conductivity (EC), turbidity, dissolved oxygen (DO), total alkalinity (TA), total hardness, total dissolved solids, chloride, and phosphate (PO_4^{3-}) were selected for the study. During the study, it was found that Indira Gandhi Canal's physico-chemical parameters in Saharni village fluctuate significantly with seasonal variations. A higher level of dissolved oxygen was analyzed during winter and that represents reciprocity against the thermogenesis of water, total dissolved solids, electrical conductivity which has higher levels in summer. The study shows that the water quality is extremely polluted and exceeds permissible limits..

Key Words: Physico-Chemical Parameters, Seasonal Variations, Water Quality, Pollution.

1. INTRODUCTION

Water is essential for the existence of life. It plays a crucial role in various aspects of life, such as economic growth, environmental stability, biodiversity conservation, food security, and health care. Clean drinking water is an important resource for the survival of all living beings. Moreover, humans depend on water for agricultural, industrial, and domestic uses, as well as cultural needs. Many parts of the country are facing a significant issue, not only due to scarcity of water but also because of its poor quality and high levels of pollution. Urbanization and industrial activities are main cause of water contamination. It's a serious problem nowadays. Analysis of the quality of water is essential to take safety measures to protect and preserve the natural ecosystem.

1.1 AIM

The main aim of this study is to analyze the physico-chemical properties of Indira Gandhi Canal in Saharni Village, Hanumangarh District and to assess the level of pollution.

2. REVIEW OF LITERATURE

Premasudha *et al.*, (2022) ^[1] evaluated the physico-chemical parameters of lake water quality in Hyderabad. Various parameters selected for the study were pH, total hardness, total dissolved solids, dissolved oxygen, chlorides, calcium, and bicarbonates.

Santhi *et al.*, (2023) ^[2] focused on physico-chemical parameters of lakes of Vellore (Tamil Nadu). Parameters like colour, odour, turbidity, electrical conductivity, pH, alkalinity, ammonia, nitrate, chloride, fluoride, phosphate, biological oxygen demand, and chemical oxygen demand were selected. The observations revealed the higher concentrations of ammonia, fluoride, and phosphate, indicating that the lakes are polluted.

Basavaraj and Kadadevaru (2024) ^[3] assessed the physico-chemical parameters and zooplankton community at Gopalaswamy tank of Chitradurga. High values of phosphate, sulphate and nitrate were found. The assessment of physico-chemical parameters showed unsuitability of water for potability.

Garg A. (2022) ^[4] studied the physico-chemical parameters of water of Taraori pond and Karna lake of Karnal (Haryana). Parameters like temperature, pH, carbon dioxide, dissolved oxygen, chloride, phosphate, alkalinity, nitrate, organic matter, salinity, etc. were measured monthly. The results revealed that pond water of Taraori was found to be much more polluted than water of Karna lake.

Nama and Raj (2018) ^[5] focused on the water quality using physico-chemical parameters of Palasani pond of Jodhpur (Rajasthan). Monthly change in parameters such as transparency, temperature, turbidity, pH, dissolved oxygen, phosphate, biological oxygen demand, total alkalinity, and total hardness was carried out. The study shows that only dissolved oxygen is exceeding permissible limits, and the water can be used for domestic purposes and fish culture.

Tharanitharan *et al.*, (2014) ^[6] analyzed the hydro-chemical water quality at Salem District of Tamil Nadu. In the study, many parameters like pH, temperature, total dissolved solids, alkalinity, hardness, chloride, sulphate, iron, dissolved oxygen, and biological oxygen demand were analyzed. The results of lake water samples were compared with the standard permissible values, and it was found that lake water samples from Attayampatti and Mathiyampatti lakes are highly contaminated compared to other lake water samples.

Thirumala and Kiran (2018) ^[7] studied the physico-chemical parameters of water samples in Shivamogga areas. Parameters such as pH, electrical conductivity, salinity, total alkalinity, total dissolved solids, chloride, iron, fluoride, total hardness, biological oxygen demand, and dissolved oxygen were analyzed, and it was concluded that water samples from selected areas are convenient for human consumption after treatment.

Murthy *et al.*, (2016) ^[8] examined physico-chemical parameters of Kamenahalli stream water in Chikmagalur. Parameters studied were temperature, pH, electrical conductivity, free carbon dioxide, chloride, total dissolved solids, dissolved oxygen, total alkalinity, and total hardness. The observation revealed that water was moderately oligotrophic in status and

was free of contaminants and served as a suitable habitat for aquatic life.

3. MATERIAL AND METHODS

The non-saline water body, Indira Gandhi Canal, is located near Saharni village of Hanumangarh District. In this research work, analysis is done according to seasons e.g. summer, rainy and winter. The research work is based on the physico-chemical standards such as thermogeneity of water, hydrogen ion concentration, transparency level, dissolved oxygen, total alkalinity, electrical conductivity, total hardness, total dissolved solid, chloride and phosphate. The current work was conducted during the years 2024-2025. The water samples were taken from Saharni village at monthly intervals from April 2024 to March 2025 between 8.00 am – 10.00 am in clean, uncontaminated plastic bottles. Temperature and pH were measured on site. Dissolved oxygen was analyzed by using Winkler's modification method.

3.1 Analysis of water quality parameters:

Water temperature is recorded *in situ* by a hand mercury thermometer, and pH is determined using an electronic pH meter (Systronics Type-335). Turbidity was measured using a turbidity meter, while electrical conductivity was recorded using a conductivity meter. The sample is taken to the laboratory for further analysis. The study of several physico-chemical parameters follows the standard methods given by APHA (2004) and Trivedi and Goel (1984).

4. RESULTS AND DISCUSSION

The table below shows the physico-chemical parameters of the non-saline water samples taken during the recent research period (April 2024–March 2025), together with their mean values and standard errors.

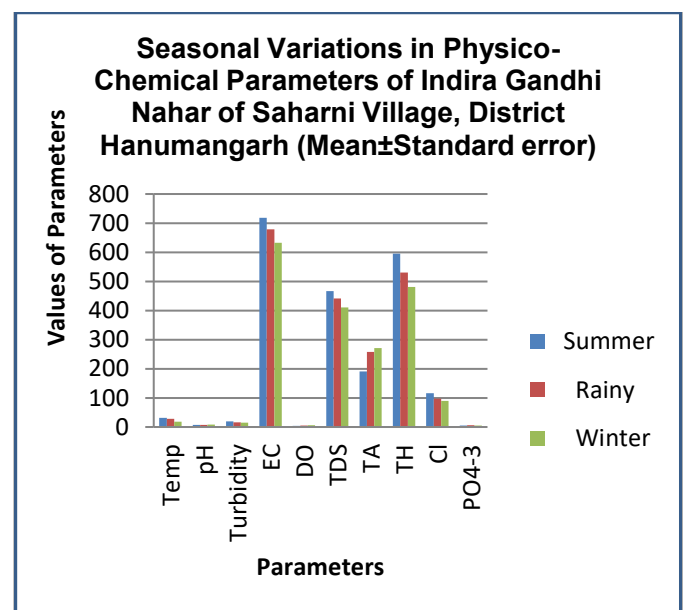
Table -1:
Physico-chemical parameters of fresh water samples.

Parameter	Summer	Rainy	Winter
Temperature (°C)	31.8±0.092	28.5±0.044	18.02±0.058
pH	7.3±0.120	7.5±0.1	8.4±0.086
Electronic Conductivity (µm cm-1)	718.0±1.302	678.7±0.902	632.3±0.706
Turbidity (NTU)	19.02±0.165	16.5±0.158	15.0±0.198
Dissolved Oxygen (mg/L)	4.2±0.102	5.5±0.106	5.9±0.070
Total Alkalinity (mg/L)	190.3±0.280	257.4±0.415	270.5±0.396
Total Dissolved Solids (mg/L)	466.7±0.845	441.1±0.589	410.9±0.444
Total Hardness (mg/L)	595.2±0.751	530.4±0.796	480.4±0.659
Chloride (mg/L)	116±0.342	97±0.330	90.1±0.276
Phosphate (mg/L)	4.8±0.115	6.3±0.174	5.2±0.150

The data on water quality reveals water temperature ranged from 18.9°C to 32.2°C. The thermogeneity of water was found to be lower in the winter season, while the summer season exhibited the higher thermogeneity of water. The high value of hydrogen ion concentration shows the considerable variations observed during the experimental period ranged from 7.3 to 8.5. So the pH of water was higher in the winter season and lower in the rainy and summer seasons. This variation in pH

can be caused by industrial waste coming into Indira Gandhi Canal from nearby industries. The EC of the sample was higher (720 mg/L) in the summer season and lower (680 mg/L) in the winter season. EC is a high capacity to conduct electrical current. The turbidity ranged from 16.5 mg/L to 21.0 mg/L. Turbidity in water is due to colloidal and extremely fine dispersions of suspended matter such as clay, silt. Finely divided organic and inorganic matter, plankton, and other microorganisms also contribute to turbidity. The dissolved oxygen (DO) ranged from 4.1 mg/L to 5.9 mg/L. The dissolved oxygen of the sample was higher during the winter season, while the monsoon season had less dissolved oxygen. High DO content can be due to increased photosynthetic activity of autotrophs.

Fig -1 Chart



The alkalinity values were maximum during winter (260 mg/L) and minimum during summer (195 mg/L). The alkalinity rise during the summer season and winter season was due to the concentration of elements in water, and it became less due to dilution caused by the rainwater, which is mixed with many pesticides during monsoon. TDS displayed a broad range of variations with a maximum value of 468 mg/L and a minimum of 442 mg/L. The TDS values were maximum during the summer season and least during winter. The hardness of non-saline water is mainly due to the content of calcium and magnesium bicarbonate and carbonate (temporary hardness) and sulphate, and chloride (permanent hardness). In the recent study, the range was 530-587 mg/L. Chloride content ranged from 87 mg/L to 109 mg/L. Chloride content was high in the summer season and less during the winter season. The presence of chloride in the water is from weathering and the natural breakdown of sedimentary rocks, as well as from municipal and industrial waste discharge, etc. Many organisms utilize both forms of phosphorus; however plants use more inorganic phosphate than organic phosphate. The value of phosphate ranged from 5.1 mg/L to 6.4 mg/L. Studies of physico-chemical characteristics have been supported by many workers.

5. CONCLUSION

The effect of seasonal changes on water qualities of Indira Gandhi Canal in Saharni village of Hanumangarh District was analyzed in this study. It was found that water in this research area is polluted because of industrial waste from various industries of Punjab. The present study provides baseline data for the conservation and monitoring of the Indira Gandhi Canal water quality. It was found that the Indira Gandhi Canal water has low suitability for drinking and irrigation purposes and limited usefulness for human and animal health.

5. ACKNOWLEDGEMENT

The author is thankful to the P.G. department of Zoology, Seth G.L. Bihani S.D. (P.G.) College, Sri Ganganagar for providing necessary laboratory facilities.

REFERENCES:

1. Premsudha R, Tirupathi G, Madhusudhan G, Swaroopa L, Reddy N, *et al.* Evaluation of physico-chemical parameters to assess Hussain Sagar and Saroor Nagar Lake water quality in Hyderabad, Telangana, India. *Int. J Adv Res Sci Commun Technol.* 2022;2(1):543-550.
2. Santhi K, Lakshmi NUC, Noornissa begum M, Lesley AN. A study of the physico-chemical parameters of two lakes in Vellore District, Tamil Nadu State, India. *J Survey Fisheries Sci.* 2023;10(3S):6707-6715.
3. Basavaraj SK, Kadadevaru GG. Assessment of physico-chemical parameters and zoo plankton community at Gopalaswamy tank, Chitradurga, Karnataka. *Indian J Sci Technol.* 2024;17(4):368-372.
4. Garg A. The physico-chemical parameters and planktons of water samples from Taraori pond and Karna Lake, Karnal (Haryana). *Int. J Res Eng Sci.* 2022;10(9):456-464.
5. Nama P, Raj D. Water quality assessment using physico-chemical parameters of Palasani pond, Jodhpur district, Rajasthan, India. *Int. J Res Anal Rev.* 2018;5(3):935-938.
6. Tharanitharan V, Ragul E, Nandhakumar D, Abith A, Keerthivasn K. Hydro chemical analysis of lake water quality at Salem District, Tamil Nadu, India. *Chem Sci Rev Lett.* 2014;3(10):148-155
7. Thirumala S, Kiran BR. Studies on physico-chemical parameters of water samples in Shivamogga area, Karnataka. *Res Rev Int. J Multi discip.* 2018;3(8):85-88
8. Murthy KN, Gujjar KN, Kiran BR. Physico-chemical parameters of Kamenahalli stream water in Chikmagalur, Karnataka. *Int. J Appl. Adv. Sci Res.* 2016;2(1):128-132