VOLUME 8 ISSUE 1 2022

ISSN 2454-3055

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 8, No. 1, 476-480 (2022)

International Journal of Zoological Investigations
Contents available at Journals Home Page: www.ijzi.net
Editor-in-Chief: Prof. Ajai Kumar Srivastav
Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Physico-chemical Analysis of Uppanar River Water Samples Near an Industrial Area in Cuddalore, India

Rajmohan K. and Vijayan P.*

Department of Zoology, Annamalai University, Annamalainagar 608 002, Tamil Nadu, India

**Corresponding Author*

Received: 14th March, 2022; **Accepted:** 10th April, 2022; **Published online:** 24th April, 2022

https://doi.org/10.33745/ijzi.2022.v08i01.054

Abstract: As the Uppanar River water is the major component of water system and contamination of this river results in pollution of various water bodies. In Cuddalore, at SIPCOT industrial areas such as Pachchyankuppam (Station 1), Kudikkadu (Station 2) and Sembankuppam (Station 3), have been reported to be contaminated by river water. Cuddalore is a well-known place for the production of many chemical fertilizers which pollute the water. Mostly, the pollutants are industrial chemicals, effluents and other wastes. In this study samples were taken from three different stations areas from Uppanar river water. Chemical parameters vary between Station 1, Station 2 and Station 3 depending upon quality and quality of effluent and river water with regard to pH, temperature, TDS, chloride, sulphate, DO, ammonia, calcium, magnesium, COD and total iron. The water in Cuddalore is being polluted therefore, we have to be aware of polluted water in Cuddalore district and precautions should be taken while using Uppanar river water for human use.

Keywords: Uppanar river, Pollution, Contamination, Cuddalore, Pollutants, Physico-chemical parameters

Citation: Rajmohan K. and Vijayan P.: Physico-chemical analysis of Uppanar river water samples near an industrial area in Cuddalore, India. Intern. J. Zool. Invest. 8(1): 476-480, 2022.
https://doi.org/10.33745/ijzi.2022.v08i01.054

Introduction

The SIPCOT chemical industrial estate in Cuddalore is one among many polluting industries in India. The needs of communities and workers in such areas are remarkably different from those of communities not living in polluted places. In unpolluted places, the health of communities would be the responsibility of the municipality and/or the health department. In pollution-impacted communities, the causes and sources of pollution are often within the jurisdiction of agencies such as the Pollution Control Board and the Factories Inspectorate, whereas the health of the workers outside the factory and residents comes under the purview of the District Administration and the public health system. Given the peculiarities of this situation, it is important that any approach to addressing health issues in such areas is done in coordination among these bodies (Rajarajan and Vetrivel, 2014). In the present study, an attempt has been made to evaluate the quality of Uppanar river water in the industrial areas [Station-1 (Pachchyankuppam), Station-2 (Kudikkadu), Station-3 (Sembank-uppam)] and thereby to analyze correction and

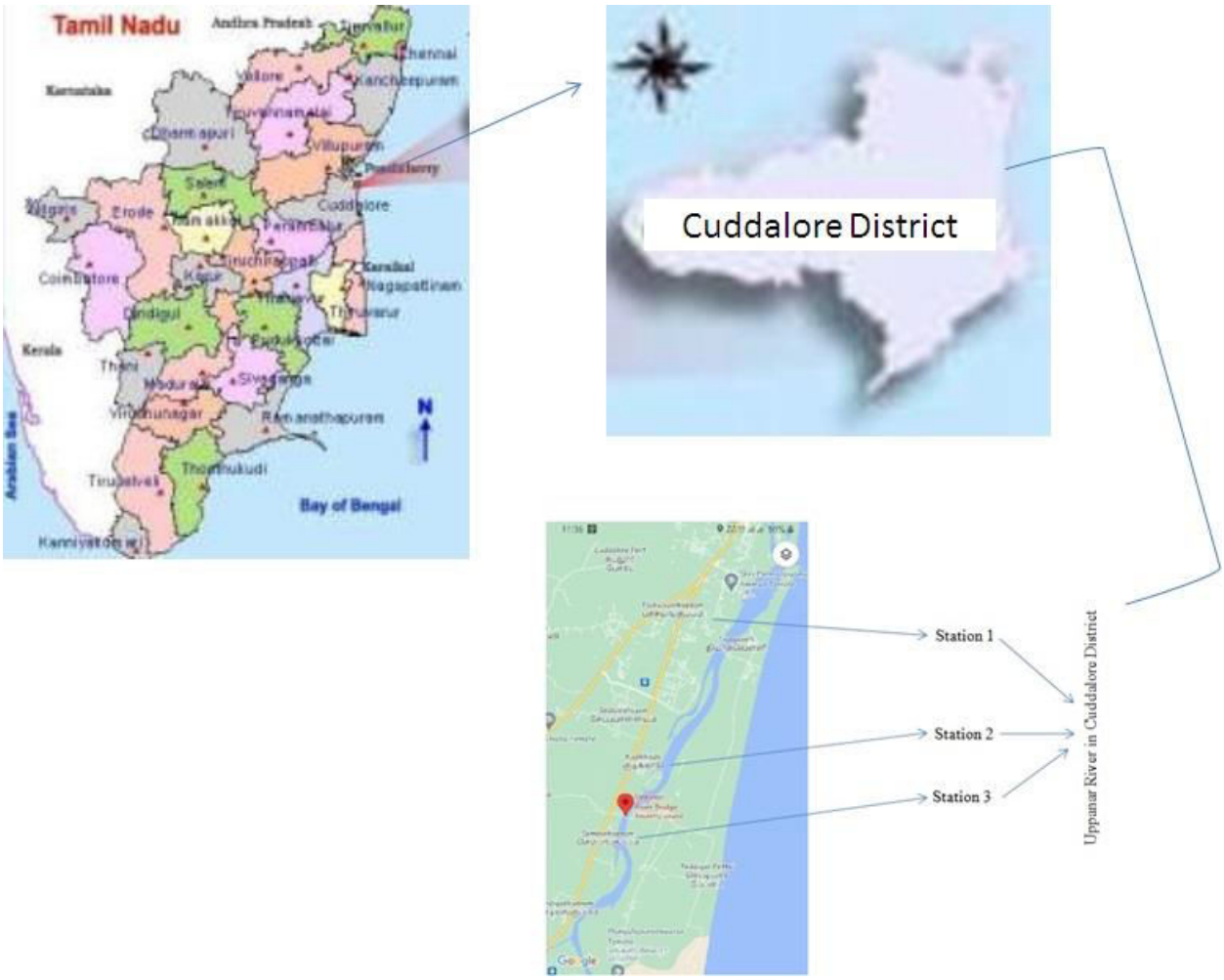

Fig. 1: Sampling locations at Uppanar River, Cuddalore District.

regression study of various physico-chemical parameters.

Materials and Methods

Study area and collection of sample:

The water samples were collected from three different sampling stations from January to December 2020. The water samples were collected with the help of a glass sampler which consisted of a glass bottle and a cork tied to a lid. The sampling locations are S1 (Pachchyank-uppam) (11º69'N latitude and 79º75'E longitude), S2 (Kudikkadu) (11º66'N latitude and 79º74'E longitude) and S3 (Sembankuppam) (11º64'N latitude and 79º73'E longitude) (Fig. 1). Samples were protected from direct sunlight and immediately transported to the laboratory of the Department of Zoology, Annamalai University, India.

Physico-chemical analysis:

Samples were analyzed for different physico-chemical parameters such as pH, TDS (Tamizhazhagan and Pugazhendy, 2015), chloride (Argentometric method) (APHA, 2005), DO (Winkler's method), and calcium and magnesium (EDTA).

Results and Discussion

The physico-chemical parameters for samples collected from January to December 2020 from Uppanar river water are presented in Tables 1 to 4.

Hydrogen ion concentration (pH):

pH is a term used universally to express the intensity of the acid or alkaline condition of a solution. In S1 area followed by S2 and S3, the pH

Table 1: Physico-chemical analysis of Uppanar river water at selected stations at January to March 2020

Parameters	January 2020 Sampling Stations			February 2020 Sampling Stations			March 2020 Sampling Stations		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
pH	8.2	7.6	6.0	8.4	7.7	7.4	8.8	8.0	7.3
TDS mg/L	233	321	289	302	308	258	307	298	414
Chloride mg/L	30	53	31	36	37	35	41	40	76
Sulphate mg/L	5.2	9.3	4.2	3.5	6.7	28	16	15	10
D.O mg/L	7.8	8.2	7.5	7.4	7.6	8.7	8.0	7.4	5.1
Calcium mg/L	29	38	34	32	40	41	27	32	48
Magnesium mg/L	16	20	25	18	15	20	21	16	18

Table 2: Physico-chemical analysis of Uppanar river water at selected stations at April to June 2020

Parameters	April 2020 Sampling Stations			May 2020 Sampling Stations			June 2020 Sampling Stations		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
pH	7.4	7.6	7.71	7.6	7.82	7.38	7.91	8.12	8.30
TDS mg/L	271	280	356	299	328	372	321	358	418
Chloride mg/L	31	30	58	39	48	69	46	63	93
Sulphate mg/L	20	7	17	18	11	15	16	14	8
D.O mg/L	5.15	7.3	6.6	4.5	7.6	5.0	5.14	5.11	8.2
Calcium mg/L	25	31	19	22	32	28	36	35	30
Magnesium mg/L	21	15	20	20	16	14	18	16	17

value ranged from 6.8 to 8.8. Natural water has pH values between 6.5-8.5. The pH is the most important parameter of water quality. The normal drinking water pH range mentioned by WHO and NDWQS guide lines is between 6.8 and 8.5 (Kavitha *et al*., 2021).

Total Dissolved Solids (TDS):

TDS of Uppanar river water ranged from 157-458 mg/L. TDS less than 500 mg/L is not considered desirable for drinking water supplies, but in unwanted cases 2000 mg/L is allowed (Shrinivasa Rao and Venkateswaralu, 2000).

Dissolved Oxygen (DO):

DO is important parameter in water quality assessment. DO in water is replenished through photosynthesis, dissolution from the atmosphere and addition of oxygen-rich water such as through runoff. Simultaneously, DO is consumed during heterotrophic oxidation of organic matter and respiration by aquatic flora and fauna as well as oxidation of some naturally occurring constituents in water. In the present study DO values varied from 4.5 to 8.7 mg/L. Dissolved Oxygen (DO) is of considerable importance in water quality investigations as its concentration in water indicates ability of a water body to support a well-balanced aquatic life (Hynes and Greib, 1970).

Chloride (Cl^-), Sulphate (SO_4^{2-}), Calcium ($Ca^2)^+$ and Magnesium (Mg^{2+}):

In the present analysis, chloride concentration was found in range of 136 mg/L to 418 mg/L at

Table 3: Physico-chemical analysis of Uppanar river water at selected stations at July to September 2020

Parameters	July 2020 Sampling Stations			August 2020 Sampling Stations			September 2020 Sampling Stations		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
pH	7.24	8.01	7.15	7.10	7.27	6.83	6.7	6.5	7.3
TDS mg/L	312	458	362	185	215	211	136	267	210
Chloride mg/L	61	204	71	63	41	64	38	24	31
Sulphate mg/L	9.2	16	14	6.4	7.8	13.6	6.2	10.5	4.2
D.O mg/L	6.8	7.1	5.2	6.4	5.7	7.0	5.8	4.9	6.1
Calcium mg/L	23	35	25	43	62	50.6	32	78	24
Magnesium mg/L	21	35	23	26	31	38	30	76	73

Table 4: Physico-chemical analysis of Uppanar river water at selected stations at October to December 2020

Parameters	October 2020 Sampling Stations			November 2020 Sampling Stations			December 2020 Sampling Stations		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
pH	7.6	7.3	7.4	7.2	6.8	7.7	7.8	7.1	8.1
TDS mg/L	165	278	161	214	157	175	223	341	289
Chloride mg/L	21	24	23	28	19	35	46	28	49
Sulphate mg/L	24	45	25	13	18	15	10	20	21
D.O mg/L	6.1	6.3	6.5	6.2	6.4	6.2	6.8	7.2	6.7
Calcium mg/l	45	34	50	63	48	74	51	98	80
Magnesium mg/L	34	54	29	50	44	41	70	101	60

the S1, S2 and S3 areas. All the values are within the limit, except at S3. The highest calcium values were observed during the study at station 2 (Bhavani) (Shrinivasa Rao and Venkateswaralu, 2000). SO_4^{2-} concentration ranged from 3.5 to 25 mg/L and found within the prescribed limit. SO_4^{2-} occurs naturally in water as a result of leaching from gypsum and other common minerals (Manivaskam, 2005). $Ca^{2+}$and Mg^{2+} are directly related to water hardness. Ca^{2+} concentrations ranged between 22 mg/L to 98 mg/L, and found below permissible limit. Mg^{2+}content in the Uppanar river water samples ranged from 25 mg/L to 101 mg/L. Calcium concentration ranged between 0.1mg/L to 42.4 mg/L and found below permissible limit. Devi and Premkumar (2018) reported magnesium content in the investigated water samples which ranged from 0.8 mg/L to 6.4 mg/L. The physico-chemical parameters studied showed values significantly higher than the standard limits on account of pollution of the river water by industrials activities (Hema *et al*., 2010).

Conclusion

The study showed that the Uppanar river water in the investigated areas is not fit for drinking purpose. This experimental analysis may give sufficient information about the contamination in Cuddalore district Uppanar river water.

Acknowledgements

Authors are grateful to Head, Department of

Zoology, Annamalai University, Annamalainagar for providing laboratory facilities.

References

APHA (1998) Standard methods for the examinations of water and wastewater. American Public HealthAssociation, Washington, DC, 18th ed.

APHA (2005) Standard methods for the examination of waters and wastewater analysis. 21th ed. Washington. D.C.

Devi S and Premkumar R. (2018) Physico-chemical analysis of water samples near industrial area, Kurinjipadi Block, Cuddalore District, Tamilnadu. India. Int J Chem Tech Res. 1: 69-78.

Hema S, Subramani T and Elango L. (2010) GIS study on vulnerability assessment of water quality in a part of Cauvery River. Int J Environ Sci. 1: 1-17.

Hynes HB and Greib NB. (1970) Movement of phosphate and other ions from and trough lake muds. J Fish Res Bd. 27: 653-668.

Kavitha I, Vijayan P and Pandian RM. (2021) Assessment of physico-chemical analysis of Cauvery river water at selected stations. J Xi'an Univ Architech Technol. 8: 185-194.

Manivaskam N. (2005) Physicochemical examination of water sewage and industrial effluent, 5th ed., Pragati Prakashan, Meerut.

Rajarajan M and Vetrivel M. (2014) Pollution impacted communities in the manufacturing of SIPCOT industries in cuddalore. Asian Pac J Res.1: 157-164.

Shrinivasa Rao B and Venkateswaralu P. (2000) Physicochemical analysis of selected groundwater samples. Indian J Environ Protec. 20: 161.

Tamizhazhagan V and Pugazhendy K. (2015) The toxicity effect of Monocrotophos 36% EC on the hematology, *Labeo rohita* (Hamilton, 1882). Int J Curr Pharmaceut Res. 4: 92-95.