

## COMPARISON OF WATER QUALITY OF EIGHT RIVERS AROUND DEHRADUN DISTRICT OF UTTARAKHAND DURING NOVEMBER AND DECEMBER 2021

Sandeep Negi<sup>1</sup>, Monojit Ray<sup>2\*</sup>, Harshvardhan Pant<sup>3</sup>, Harish Chandra Joshi<sup>4</sup>

<sup>1</sup>Associate Professor, Chemistry, SGRR PG College, Dehradun, India.

<sup>2</sup>Principal and Professor of Chemistry, BRSC, Barrackpore, Kolkata 700120, WB, India.

<sup>3</sup>Associate Professor, Chemistry, SGRR PG College, Dehradun, India.

<sup>4</sup>Assistant Professor, Chemistry, SGRR PG College, Dehradun, India.

Email: monojit1972@gmail.com



Date of Received

26 July, 2022



Date of Revised

19 August, 2022



Date of Acceptance

23 September, 2022



Date of Publication

30 September, 2022

DOI : <https://doi.org/10.51514/JSTR.4.3.2022.32-35>



*"together we can and we will make a difference"*

# COMPARISON OF WATER QUALITY OF EIGHT RIVERS AROUND DEHRADUN DISTRICT OF UTTARAKHAND DURING NOVEMBER AND DECEMBER 2021

Sandeep Negi<sup>1</sup>, Monojit Ray<sup>2\*</sup>, Harshvardhan Pant<sup>3</sup>, Harish Chandra Joshi<sup>4</sup>

<sup>1</sup>Associate Professor, Chemistry, SGRR PG College, Dehradun, India.

<sup>2</sup>Principal and Professor of Chemistry, BRSC, Barrackpore, Kolkata 700120, WB, India.

<sup>3</sup>Associate Professor, Chemistry, SGRR PG College, Dehradun, India.

<sup>4</sup>Assistant Professor, Chemistry, SGRR PG College, Dehradun, India.

Email: monojit1972@gmail.com

## ABSTRACT

The important rivers within and around Dehradun district of Uttarakhand are Asan, Tons, Jakhan, Song, Suswa, Rispana, Chandrabhaga and Yamuna. In this work we tried to find out the rivers water quality with respect to physico-chemical parameters, biological significant few ions. Pollution river level of any river can be conclude from pH, Conductance, Salinity, TDS, DO and BOD data. It is found that for Suswa conductance, TDS values are high and pH, DO values are low than all other river waters. High DO and low BOD values are found for Chandrabhaga river water. From Physico-chemical parameter data it is clear that Suswa is the most polluted river and Chandrabhaga is the most clean river among these studied eight rivers around Dehradun District of Uttarakhand.

*Keywords: Physico-chemical parameters, Ions, Rivers, Dehradun District*

## INTRODUCTION

Song, Tons, Suswa, Jakhan, Rispana and Asan are the main rivers of Doon Valley. Dehradun town is situated in Doon Valley at the Himalayas foothills of the nestled between Song river, which is a tributary of Ganga on the east and the Asan river, a tributary of Yamuna on the west. Asan river is the stream fed river of Dehradun District of Uttarakhand, flows into Yamuna River in the Jaunsar Bawar Region at Kalsi. Asan River has been identified with the Asmanvati of the Rig Veda era that is in the time of Early Vedic Period. Report of census 2011 shows that population of Dehradun is 578,420 and Doiwala is 8709. Except the urban settlement, along the Suswa river 11 villages are also located. Dehradun and Doiwala are two prime urban settlement situated in catchment of Suswa river. A tributary of Suswa river, which in turn is a tributary of the Ganges, it originates as spring-fed stream in the southern slopes of the Radi Top of Mussoorie ridge of the Himalayan range and runs from Dhanaulti towards Narendranagar. Song is one of the largest rivers that drain the Doon Valley traversing 190 km (120 ml), and its tributaries includes, Kali Gad, Bindal River and Rispana River. The Suswa river which originated from the southern

Shivalik range separating the Doon valley from Saharanpur district and Haridwar district, collecting water from several small streams, including the once perennial river Rispana. The river flows westwards to Doiwala and travels through thick forest between Haridwar and Dehradun. Then the river flows through the forest of Kansrao before its confluence with the Ganges at Raiwala. The largest tributary of the Yamuna is the river Tons which flows through Garhwal region, Uttarakhand, touching the Himachal Pradesh. The Asan River is also a tributary of the Tons river. The Chandrabhaga River emerges out of Banali-Kashmalidhar, nearly 1800 m from sea level, in district Tehri, Uttarakhand, India. It first flows South West about 15 km then from Gujrada towards south, then around 5 km North-East and ultimately South-East when it merges with river Ganges at Mayakund near Rishikesh. River Suswa originates in the midst of the clayey depression near the source of the Asan, towards the East of the Asarori – Dehradun Road. Suswa river drains the Eastern part of Dehradun city and flows into river Ganga after merging with river Song. Song and Suswa rivers are two main tributaries of river Ganga. Dehradun and Doiwala are two major

urban settlement situated in catchment of Suswa river. Rispana and Bindal rivers are two principal drainage networks which carry urban drainage of Dehradun town and joins river Suswa at Mothrawala.[1,2] We had studied these eight rivers to find out the water quality status which directly or indirectly indicate the pollution status of the rivers and also affect the bio-diversity and river eco-system.[3,4,5] Sodium and Potassium ions are responsible for signal regulations, acid-base equilibrium, osmotic pressure regulation etc. for the living systems within the river. Nitrate ions provide a good source of nitrogen for living organisms for river eco-system. [6,7] Since calcium is a bulk metal, it is also important for any eco-system. Bi-carbonate ions are a good source of carbondioxide for aquatic plants and algae. We had chosen sodium, potassium, calcium, nitrate, carbonate and bi-carbonate ions as all these are important for the growth and development of aquatic living systems.

### SAMPLING

Sampling was done in different locations of these eight rivers from at least three sampling sites for each river. Some on site measurements were carried out and water samples were collected from mid-depth of river using expert assistant. [8,9,10]

The concentrations of sodium ions and potassium ions were measured at the ECR Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, WB, with the help of Systronics (India) made Flame photometer 128  $\mu$ C. Nitrate and calcium concentrations were measured by Systronics (India) Limited made ion meter model number SYS-460 at ECR Laboratory, Barrackpore Rastraguru Surendranath College, Barrackopre, North 24 Parganas, WB. Total Dissolved Solid (TDS), pH, Temperature, conductance and salinity were measured using Multi-parameter PCSTestr 35 on site. Ion free, Redistilled, ion free water made at laboratory were used for all analysis. All the experiments were carried out between 18° - 25°C.

### RESULTS

**Table 1:** Average Physico-chemical Parameters of Studied eight rivers

Parameters	Asan	Tons	Jakhan	Song	Suswa	Rispana	Yamuna	Chandrabhaga
Temperature (°C)	24°C	18.3°C	21.6°C	20.2°C	22.4°C	20.3°C	18.1°C	21.7°C
pH	7.58	8.56	8.40	8.55	7.63	8.46	8.40	8.48
Conductance ( $\mu$ S)	335	625	214	664	818	687	247	230
Salinity (ppm)	161	313	103	320	397	335	118	111
TDS (ppm)	238	458	152	470	578	490	176	164
DO (mg/lit)	8.5	8.9	8.9	9.0	3.4	9.4	9.1	10.6
BOD (mg/lit)	1.9	1.9	2.3	1.8	2.4	2.3	2.1	1.7
Hardness (ppm)	92.872	243.048	88.92	207.48	183.768	450.528	84.968	92.872
Total Alkalinity(ppm)	101	134	54	100	172	177	107	59
Carbonate Alkalinity(ppm)	8	10	10	10	12	12	36	4
Bicarbonate Alkalinity(ppm)	93	124	44	90	160	165	71	55
Turbidity (NTU)	1.7	1.5	7.6	2.7	41.5	1.45	2.3	3.4

**Table 2:** Average Biologically Significant Ion Concentrations of Studied eight rivers

Parameters	Asan	Tons	Jakhan	Song	Suswa	Rispana	Yamuna	Chandrabhaga
<b>Sodium (ppm)</b>	17.85	14.38	8.89	4.49	18.29	4.67	15.64	9.23
<b>Potassium (ppm)</b>	1.90	1.32	1.53	1.92	2.45	1.48	1.15	1.46
<b>Calcium (ppm)</b>	227	432	421	562	270	0.005	147	802
<b>Nitrate (ppm)</b>	324	417	134	513	420	48	122	370
<b>Carbonate ION (ppm)</b>	4.8	6	6	6	7.2	7.2	21.16	2.4
<b>Bicarbonate ION (ppm)</b>	113.46	151.28	53.68	109.8	195.2	201.3	86.62	67.1

## DISCUSSION

The physico-chemical parameters and ions found at different sites are shown in Table 1 and 2. The low hardness in upper tributaries is due to low calcium and magnesium carbonates and bicarbonate salts within dissolve water [11, 12]. This is also evident from calcium, carbonate and bicarbonate ions concentration reported in Table 2. Results obtained from TDS measurements indicate low level of sewage, industrial waste and pollutants discharge within the rivers [13, 14, 15-20]. The Song River is a river in Dehradun district that drains the central and eastern part of the Doon Valley, in the state of Uttarakhand, India. Suswa river drains the Eastern part of Dehradun city and flows into river Ganga after merging with river Song. Song and Suswa rivers are two main tributaries of river Ganga. The Tons thrust is named after this river. Its source lies in the 20,722 feet (6,316 m) high Bandarpunch Mountain, and is one of the most major perennial Indian Himalayan rivers. In fact, it carries more water than the Yamuna itself, which it meets below Kalsi near Dehradun, Uttarakhand. The Suswa and Rispana suffers from extreme pollution levels. After the cremation of the deceased at different ghats the bones and ashes are thrown into the Suswa and Rispana. Apart of this a large number of household garbage and sewages are drained into the Suswa and Rispana rivers.

## CONCLUSION

Except Asan and Suswa all river waters are highly alkaline. The dissolved oxygen level of Chandrabhaga is very high and ideal for flora and fauna of any river. Nitrate pollution is prominent in all rivers except Rispana. TDS and salinity values reflect that none of

these river water is suitable for drinking. From Physico-chemical parameter data it is clear that Suswa is the most polluted river and Chandrabhaga is the cleanest river among these studied eight rivers around Dehradun District of Uttarakhand. Considering the importance of the tributaries of Ganga river in Indian scenario, the study shows a great concern and particularly the lower basin tributary of river Ganga is widely polluted. Hence, Governments and policy makers have to be highly aware to minimize the pollution level of the river.

## ACKNOWLEDGEMENT

The authors thanks Research monitoring committee, Governing Body, Barrackpore Rastraguru Surendranath College, Shri Guru Ram Rai PG College, Dehradun and University Grant Commission, India for financial assistance to Barrackpore RastraguruSurendranath College under CPE scheme.

## REFERENCES

- [1] "India and pollution: Up to their necks in it". *The Economist*, 27 July 2008.
- [2] Abraham, Wolf-Rainer (2011). "Megacities as Sources for Pathogenic Bacteria in Rivers and Their Fate Downstream". *International Journal of Microbiology*, **2011** (798292): 1–13.
- [3] APHA, AWWA, WEF, (2005). Standard Methods for the Examination of Water and Wastewater (21th Ed). Washington, DC: American Public Health Association.
- [4] Allen, D.J.; S. Molur; B.A. Daniel, eds. (2010). *The Status and Distribution of Freshwater Biodiversity in the Eastern Himalaya*. IUCN. p. 23. ISBN 978-2-8317-1324-3

- [5] Sengupta, C., Sukumaran, D., Barui, D., Saha, R., Chattopadhyay, A., Naskar, A., & Dave, S. (2014). Water health status in lower reaches of river Ganga, India. *Appl. Ecol. Environ. Sci*, 2, 20-24.
- [6] World Health Organization (WHO). Guidelines for Drinking—Water Quality, 2nd ed.; World Health Organization (WHO): Geneva, Switzerland, 1998; Volume 2. Available online: [https://www.who.int/water\\_sanitation\\_health/dwq/2edaddvol2a.pdf](https://www.who.int/water_sanitation_health/dwq/2edaddvol2a.pdf). (accessed on 10th march, 2021).
- [7] Evans, A.E.V.; Hanjra, M.A.; Jiang, Y.; Qadir, M.; Drechsel, P. (2012). Water Quality: Assessment of the Current Situation in Asia. *Int. J. Water Resour. Dev.* 28, 195–216.
- [8] Chaudhary, M.; Walker, T. R. (May 2019). "River Ganga pollution: Causes and failed management plans". *Environment International*. **126**: 202–206.
- [9] Ray M, Seasonal Variation of Physico-chemical Parameters of Jalangi River water: Relation with Water Uses and Water Pollution, *MS-Academic*, 5(1), 82-87, 2015.
- [10] Ray M, Sengupta K, Sarkar D and SarkarG, Primary Productivity, Algae and Physico-chemical Parameters of River Churni, *MS-Academic*, 2016. **6**(2).78-82.
- [11] Dwivedi and Dwivedi, 2010. River Pollution and Solution, NCBC, and references therein.
- [12] Ray M, Bacteriological Studies of Jalangi River Water in different seasons with Special reference to Human Uses, *OPEN EYES* (ISSN: 2249-4332) vol.13 No.02, December, 2016. 89-92
- [13] Ray M, A Pleasant Habitat of Asian Openbill and little black Cormorant is River Jalangi Tuned by ion concentrations and Physico-chemical parameters of river water, *MS-Academic*, 4(2), 1-5, 2014.
- [14] Ray M, Sengupta K and SarkarP, Farakka Lock-Gate Damage: A Threat to Bio-Diversity of River Jalangi, *Academic Spectrum*, 3, 50-52, December 2012.
- [15] Singh, Nitu, Jyoti Bamne, Chandi Charan Jana, Aarti Malhosia, Kajol Taiwade, Vivek Chandel, and Fozia Z. Haque. "Photoluminescence based humidity sensing characteristics of potassium doped magnesium ferrite nanoparticles." *Materials Today: Proceedings* 65 (2022): 2676-2682.
- [16] Meshram, Kundan, Nitu Singh, and P. K. Jain. "Estimation of swelling characteristics of expansive soils with influence of clay mineralogy." *Acta Agriculturae Scandinavica, Section B—Soil & Plant Science* 71, no. 3 (2021): 202-207.
- [17] Sarkar P, Ray M & Sengupta K, Effect of Ion Concentration, pH, Hardness on Aquatic Micro flora of Ganga & Jalangi River in Krishnanagar–Nabadwip area (Nadia, WB): A Comparative Study. 2011. Proceedings of UGC sponsored Seminar Biodiversity in India: Perspective, Management and Conservation, D L College, Kirshnanagar, Nadia, WB, India, pp 18-23, and references therein.
- [18] Singh, S. P., Dharmendra Singh, Nitu Singh, and M. N. Shukla. "Study of elastic properties of prototype solids under high pressure." *Computational Condensed Matter* 30 (2022): e00626.
- [19] Singh, Nitu, Neha Singh, Jyoti Bamne, K. M. Mishra, Vivek Chandel, and Fozia Z. Haque. "Gas Sensing through Photoluminescence Method Using Cr<sub>2</sub>O<sub>3</sub> Nanostructures for NH<sub>3</sub>" In *Advanced Microscopy*, pp. 143-166. Apple Academic Press, 2023.
- [20] Ray, M. "Seasonal Variation of Physio-Chemical Parameters of River Churni Nadia during 2019-2020." *Journal of Science and Technological Researches* 3, no. 1 (2021): 1-5.

