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Studies on Different Physicochemical Parameters of Water Sample of Narayani (Gandaki) River

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Abstract: Fishing and fish farming sectors currently face major challenges related to the lack of knowledge of data on the physicochemical quality of water bodies from Narayani (Gandaki). This investigation intended to determine the physicochemical parameters of Narayani (Gandaki). The physiochemical parameters are atmospheric temperature (AT), water temperature (WT), pH, electrical conductivity (EC), total dissolve solid (TDS), acidity (acid), alkalinity (alk), carbon dioxide (CO_2), dissolve oxygen (DO), were mentioned on monthly basis for period of one time annual cycle that is January 2021 to December 2022. The result revealed that the reservoir water is useful for human use.

Key words: Irrigation · Parameter · Physicochemical · Water bodies

ITRODUCTION

Water is essential for all forms of life and is a fundamental resource that plays a crucial role in various aspects of our planet. In the last two decades, there has been a growing necessity for conservation of our resources, especially water. At the same time, growing populations, progressive industrialization and intensification of agriculture have led to increased pollution of surface waters. Water is vital for human health and survival. Our bodies are composed of a significant amount of water and it is essential for various bodily functions, including digestion, circulation, temperature regulation and waste elimination. Dehydration can lead to serious health issues and even death. Zooplankton play a vital role in maintaining the health and balance of river ecosystems. These small, drifting organisms are primarily found in aquatic environments and serve as a critical link in the food chain. Their interactions with other organisms and their impact on nutrient cycling contribute to the overall functioning of river ecosystems. Here are some key roles that zooplankton and other organisms play in maintaining river ecosystems. This induces ecological imbalances, deleterious for sustained development of fisheries resources, which has necessitated the suspension of the beneficial uses of these water bodies in some places [1]. Never- the less, an increasing number of specially created environmental agencies arebeing assigned the task of conserving water quality for all uses within one river or lake basin. In conserving water quality for multipurpose use, a holistic approach was recommended [2-5] in which all-immediate and potential interests in the water basin are considered simultaneously. Experience has shown that only an ecologically healthy fresh water ecosystem fulfils this goal and the ecology of the flora and fauna of the ecosystem best measure this [6]. Water quality monitoring is of immense importance in the conservation of water resources for fisheries, water supply and other activities; it involves the assessment of physicochemical parameters of water bodies. Impacted changes in the quality of water are reflected in the biotic community structure, with the vulnerable dying, while the most sensitive species act as indicators of water quality [3]. The Chhoti Gandak River, also known as the Narayani River, is a significant river in Nepal and India. It's a tributary of the larger Gandak River and plays an important role in the region's geography and economy. Here's some information about the Chhoti Gandak (Narayani) River. The Chhoti Gandak River originates in the highlands of the Himalayas in Nepal and flows southward through Nepal before entering the Indian state of Bihar. It eventually joins the Gandak River in India, which further flows into the Ganges River. The Chhoti Gandak River has several tributaries that

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contribute to its flow. It gathers water from various streams and rivers as it descends from the mountains. The river has significant cultural, economic and ecological importance for the people living along its course. It provides water for irrigation and agriculture in the fertile plains of Bihar, contributing to the region's agricultural productivity. The Chhoti Gandak River flows through a flat floodplain, which is prone to seasonal flooding during the monsoon season. These floodwaters enrich the soil with nutrients, making the area suitable for agriculture. Historically, rivers like the Chhoti Gandak served as important transportation routes. While their role in transportation has diminished with the growth of road and rail networks, they still play a role in moving goods and people. The river nd its surrounding areas provide habitats for various aquatic and terrestrial species. These ecosystems are important for biodiversity conservation. Rivers like the Chhoti Gandak hold cultural significance for the people who live along their banks. They often have religious and traditional importance in local communities.

It's important to note that river information can change over time due to various factors like land use, development and environmental changes. For the most accurate and up-to-date information about the Chhoti Gandak (Narayani) River, I recommend consulting reliable local sources, government websites, or geographic databases.

The present study was conducted for one year that is Jan 2020 to Dec 2021 through the monthly sampling of Chhoti Gandak (Narayani) river. The density of diversity of zooplanktons is depending on water quality of reservoir. The zooplankton is microscopic free-living floating organism, which occupy a central position between the autotrophy and other heterotrophs and from an important link in aquatic food web. Human life is living pattern without the presence of aquatic animals. All over the world, all fresh water habitats, lakes, ponds, reservoir, dams etc. The present paper deals with the result of water analysis of Chhoti Gandak (Narayani) river.

MATERIALS AND METHODS

Area for the Study: District Kushinagar is situated in the north-east "Tarai" region of U.P. (India) and lies between 26° 54' 9″ N, 83° 58' 55″ E Study area and sampling sites The Narayani (Gandaki), a key tributary of the Ganga River system in eastern India has been selected for this study. It is endowed with rich aquatic biodiversity of flora and fauna. The study was conducted to achieve the objective covering a 10 km stretch from Chhitauni Bagaha Rail Bridge 27°8'25.53″N and 83°59'21.49″E about 3 km away from the Valmiki National Park and Tiger Reserve to Chhitauni Ghat 27°5'29.33″N and 84°0'13.06″E of Gandak River at an elevation of 81 m msl. Data collection Field surveys were conducted during January 2021 to December 2022. Water samples were collected from two sites within 10 km river stretch of Gandak River viz., Site 1- Chhitauni Bagaha Rail Bridge and Site 2- Chhitauni Ghat.

The temperature of sample water was measured with the help of a mercury thermometer, transparency with secchi disc, conductivity with pen type DIST 3 model and pH with pen type pH meter model 600, depth using meter scale and water current by flow mate Model 2000 Marsch-McBirney, INC. Alkalinity was determined by titrating a known volume of water sample with 0.02MHCl. Dissolved oxygen (DO) was determined by Winkler's titration. Total dissolved solid (TDS) was determined gravimetrically by evaporating a known volume of water to dryness in a pre-weighed crucible on a steam bath. Total hardness was determined by titrating with EDTA using Eriochrome black T as indicator while the rest were analysed in the laboratory using standard [6]. Each sample was analysed in duplicate and the mean result reported [7].

RESULTS AND DISCUSSION

The present investigatory study of Narayani (Gandaki) river reveals all parameters are in favorable range for aquatic life, irrigation and domestic use. Present studies showed pH range favorable for aquatic life, irrigation and domestic use. The investigated results are as follows.

Atmospheric temperature of surface water ranges from 24.6°C to 43.5°C during the study period. Minimum (24.6°C) and maximum (43.5°C) atmospheric temperature (AT) were recorded during winter and summer season respectively. The water temperature was maximum during summer (43.5°C) and minimum during winter (24.6°C) (as shown in Table 1 and Table 2). The results show that water temperature varies with the atmospheric temperature. During the summer season, solar radiations are and clear sky condition enhanced the atmospheric temperature. Where the during monsoon season, rainfall and cloudy-skies brought down the atmospheric temperature and subsequently the water

pH value of all sample lies in the range of 7.2 to 8.6 are slightly alkaline and suitable to irrigation purpose that is there is no alkalinity hazard (7.2-8.1) during winter and

Table 1: Physicochemical Parameters of Narayani (Gandaki) River (Jan2021 to Dec. 2021)

Month	AT°C	WT°C	pH	Ec µs/cm	TDS mg/l	ACID mg/l	Alk mg/l	CO_2 mg/l	DO mg/l
Jan	24.6	23.5	7.8	181	113	11.1	237	1.8	4.1
Feb	26.9	25.9	8.2	190	125	9.8	261	1.97	4.26
Mar	31.5	28.9	8.6	199	133	8.9	274	1.83	4.37
Apr	38.5	37.6	8.5	205	156	8.6	284	2.15	4.61
May	40.9	40.1	8.1	254	145	9.6	276	2.27	3.56
Jun	42.2	41.2	8.2	265	169	6.5	240	2.3	3.47
Jul	42.1	40.6	8.3	294	140	18.2	243	3.1	3.4
Aug	31.5	29.7	7.6	250	133	19.5	231	3.22	3.95
Sep	30.1	28.4	7.5	236	110	18.9	218	2.11	4.01
Oct	27.6	25.4	7.2	221	112	17.1	215	1.92	4.03
Nov	25.6	23.6	7.6	192	110	18.2	223	1.9	4
Dec	26.9	24.5	7.8	189	105	15.1	234	182	4.05

Table 2: Physicochemical Parameters of Narayani (Gandaki) River (Jan 2022 to Dec. 2022)

Month	AT°C	WT°C	pH	Ec µs/cm	TDS mg/l	ACID mg/l	Alk mg/l	CO_2 mg/l	DO mg/l
Jan	23.4	22.4	7.6	180	116	10.9	234	1.6	4.35
Feb	25.5	24.6	8.4	191	121	9.4	265	1.92	4.01
Mar	29.9	28.9	8.7	192	137	8.2	278	1.85	4.40
Apr	39.1	38.4	8.5	201	151	8.7	281	2.20	4.58
May	41.8	39.6	8.3	251	141	9.3	272	2.24	3.59
Jun	42.7	41.2	8.4	262	162	6.1	246	2.33	3.49
Jul	41.4	40.6	8.1	293	146	18.5	241	3.16	3.44
Aug	32.7	29.9	7.7	255	131	19.1	237	3.32	3.98
Sep	30.6	29.4	7.6	231	120	18.2	219	2.16	4.06
Oct	27.5	25.4	7.4	228	119	17.5	216	1.89	4.01
Nov	25.3	23.2	7.8	197	121	18.6	225	1.94	4.01
Dec	26.7	24.8	7.6	182	114	15.4	238	1.79	4.07

higher value (8.1 to 8.6) during summer (see Table 1 and Table 2). Higher pH is normally associated with a high photosynthetic activity in water [7-9]. The pH of the water appears to be dependent upon the relative's quantities of calcium carbonate and bicarbonates, being alkaline when disposal of wastes also bring about changes in the pH [10, 11] (See Table 1 and Table 2).

Electrical conductivity (EC) is a measure of the salt content of water in the form of ion. EC value ranges from 189 µS/cm to 294 µS/cm with an average of 235µS/cm (see Table 1 and Table 2). The month wise value shows the mini- mum during December. The concentration of EC increases during summer and reaches maximum in July. The increase in EC during pre-monsoon period may be due to evaporation. This is in agreement with result obtained by Goel *et al.* [12], Pearsall [13], Zafar [14] and Shankar *et al.* [15].

Total Dissolve Solid (TDS) are various kinds of minerals substances present in water. Some dissolve organic matter may also contribute to total dissolve solid. TDSA value ranges from 105 mg/l to 169 mg/l (see Table 1 and Table 2). The season wise value shows the minimum during winter. The concentration of TDS in water gives an idea about suitability of this water for various uses including potable water. All the values of TDS were within the (500 mg/l) highest desirable limit [16, 17].

From the obtained results, it could be seen that maximum acidity was found during winter and minimum during summer. Acidity values of all sample lies in the ranges of 17.1 mg/l to 34.2 mg/l (see Table 1 and Table 2). Acidity of water is its quantitative capacity to react with a strong base to designated pH. Value of the acidity is about 200 mg/l [16] and observed values are far less than this, indicating that acidity of sample water is a safe range.

Total Alkalinity shows seasonal variation in the study. Alkalinity value ranges from 215 mg/l to 284 mg/l. The values were high during the summer and low during winter. The fall in values during monsoon may be due to dilution of water. The high value of alkalinity indicates the presence of weak and strong base such as carbonate and hydroxide in the water body [18-20].

The carbon dioxide level fluctuated between 1.8/l to 2.5mg/l. The seasonal value was 3.82 mg/l in winter, 2.27 mg/l in summer and 3.22 mg/l in rainy season (Table 1 and Table 2). Low value of free CO_2 as observed during summer are mainly because of CO_2 is utilized in the polysynthetic activities [20].

The dissolve oxygen is most important factor in fresh water life. In present study DO is ranged between 3.4 mg/l to 4.3 mg/l. The average DO value were 3.56 mg/l in summer, 4.05mg/l in winter and 3.95 mg/l during rainy season The value of DO was obtained as following order, winter> rainy> summer season in present study.

The phenomenon of re-oxygenation of water during monsoon may be due to the circulation and mixing by in flow water monsoon rains [21-25]. It further progressed in winter may be due to the circulation by cooling and draw down the DO in water [26-34].

CONCLUSION

The present study concluded that the higher values of some parameters of the samples of Narayani (Gandaki) clearly indicate that it directly affects the floral and faunal population. They minimize the suitability of these samples for drinking purposes without treatment. However, after the filtration and disinfection, naturally present impurities can be removed in water, which provide its suitability for drinking and domestic purposes. People depend on this water are often prone to health hazards due to polluted drinking water. Therefore, some effective measures are urgently required to enhance the drinking water quality by delineating an effective water quality management plan for the region.

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REFERENCES

1. Barbour, M.T., J. Gerristen, B.D. Synder and J.B. Stribbling, 1999. Rapid Bio-assessment protocols for use in streams and wadeable rivers. Periphyton, Benthic Macro invertebrates and Fish, Second edition EPA 842-B-99-002 USEPA, office of water, Washington D.C.
2. Ogbogu, S.S. and A.T. Hassan,1996. Effects of sewage on physicochemical variables and Ephemeroptera (Mayfly) larvae of a stream reservoir. Journal of Aquatic Sciences, 11: 43-55.
3. Ogbogu, S.S., 2001. Fundamentals of Ecology, W.B. Saunders Ltd. Philadelphia, USA, pp: 610.
4. APHA, 1998. Standard methods for examination of waters and wastewaters, 20th ed. American public health authority, Washington D.C. USA 2112.
5. Wetzel, R.G. and G.E. Likens, 1979. Limnological Analysis, W.B. Saunders Philadelphia USA, pp: 357.
6. Singh, M.R., A. Gupta and K.H. Beeteshwari, 2010. Physico-chemical Properties of Water Samples from Manipur River System, India. Journal of Applied Science Environtal Management., 14(4): 85-89.
7. APHA, 2005. Standard Methods for the Examination of Water and Wastewater. 21st Edition, American Public Health Association/American Water Works Association/Water Environment Federation, Washington DC.
8. Singhai, S., G. M. Ramani and U. S. Gupta,1990. Seasonal variation and relationship of different physiochemical characteristics in newly made Tawa Reservoir, Limniological (Berlin), Poll. Res. J., 21(1): 293-301.
9. Govindaswamy, C. and K. Kannanm, 1991. Rotifer of the pichavarammangoves (Southeast coast of India) Hydrobiological approach, Mahasagar, Bull. Natl. Inst. Ocenogr., 24: 39-45.
10. King, D.L., 1970. The role of carbon in eutrophication. Ecology. Res. J., 42: 2035-2081.
11. Olsen, R.D. and M.R. Sommerfeld, 1977. The physiochemical limnology of desert reservoir. Hydrobiologia, 3J(2): 117-129.
12. Goel, P.K., R.K.Trivedi and S.V. Bhave, 1985. Studies on the Limnology of few fresh water bodies in southwestern Maharastra, India. Res J. Environ, Pract, 5(1): 19-25.
13. Pearsall, W.H., 1930. Phytoplanktons in the English lake1, The production in the water of some dissolves substances of Biological importance. Journal of Ecology, 18: 306-320.
14. Zafar, A.R., 1966. Limnology of Hussiansagar Lake, Hydrabad, India phykas. Poll Res. J., 5: 115-126.
15. Shankar, P., P.R. Jayaraman and T. Ganga Devi, 1996. Studies on the Hydrography of the lotic ecosystem 'Killiar' Thiruvanthapuram, Kerala, India. Poll. Res J., 21(2): 113-118.
16. Olsen, R.D. and M.R. Sommerfeld,1977. The physiochemical limnology of desert reservoir. Hydrob. J., 3(2): 117-129.
17. WHO, 1971. International standard for drinking water. Third edition, WHO, Geneva.
18. Dwivedi, P. and S. Sonar, 2004. Evaluation of physiochemical and characteristics of water samples in water reservoir around Rono Hills, Doimukh (Dist. Papum pare), Arunachal Pradesh. Poll. Res J., 23(1): 101-104.
19. Jain, C.K., K.S. Bhatia and T. Vijay, 1997. Ground water quality in coastal region of Andra Pradesh. Indian Journal of Environ. Hith., 39(3): 182-192.
20. Sahai, R. and A.B. Sinha, 1969. Investigations on Bioecology of Inland of Gorakhpur (U.P.) India 1, Limnology of Ramgarh Lake, Hydrobiologya, 34: 433-447.

21. Hannam, H., 1979. Chemical modification in reservior regulated Streams In: The ecology of regulated streams (Eds) Ward, J.W. and Stanford. J.A. Edition plenum corporation publication, pp: 75-94.
22. Ranjan, G., N.P. Singh and R.B. Singh, 2007. Physicochemical characteristics of Ghariyarwa pond of Birganj, Nepal in relation to growth of phytoplankton. Nature Environment and Pollution Technology, 6(4): 629-632.
23. Dwivedi, B.K. and G.C. Pandey, 2002. Physiochemical factors and algal diversity of two ponds (Girijakund and Maqubara pond) Faizabad, India. Poll Res J., 21(3): 361-369.
24. Tiwari, F., 2013. Limnological Studies of Ramgarh lake in Eastern Uttar Pradesh, India. African Journal of Basic and Applied Sciences, 5(3): 145-148.
25. Gupta, N., P. Pandey and J. Hussain, 2017. Effect of physicochemical and biological parameters on the quality of river water of Narmada, Madhya Pradesh, India. Water Science, 31(1): 11-23.
26. Jannat, N., A. Mottalib and M. Nur Alam, 2019. Assessment of Physicochemical Properties of Surface Water of Mokeshbeel, Gazipur, Bangladesh. Journal of Environmental Science: Current Research, 2: 014.
27. Javed, N., D.K. Prajapati, J. Singh, R.K. Gangwar and R. Deval, 2020. Assessment of Physico-chemical Properties of River Ramganga Water Quality in Moradabad and Bareilly Region of Uttar Pradesh, India. International Journal of Pharmaceutical Science and Research, 11(11): 5741-46.
28. Mishra, S. and A. Kumar, 2021. Estimation of physicochemical characteristics and associated metal contamination risk in river Narmada, India. Environmental Engineering Research, 26(1): 190521.
29. Tiwari, F., 2021. A General Study on the Evaluation of Physico-Chemical Factors of Ramgarh Lake. International Journal of Food Science and Agriculture, 5(2): 322-325.
30. Balcha, D.A., Seid, T. Doja and T. Hailu, 2023. Comparative Study of Physico-Chemical and Microbiological Water Quality of Sebeta and Sululta Towns, Oromia Regional State, Ethiopia. International Journal of Water Resources and Environmental Sciences, 12(2): 54-60.
31. Machale, R.G., S.E. Shinde and T.S. Pathan, 2012. Seasonal Variation and Water Quality Analysis of Tisgaon Dam, District Aurangabad, India. International Journal of Water Resources and Environmental Sciences, 1(2): 67-72.
32. Bhuyan, M.S., S.M.B. Haider, M. Kunda, S.A. Husain and E. Chowdhury, 2023. Challenges in Cultivation of Seaweed: A Recent Experience from RezuKhal, Cox's Bazar Coast, Bangladesh. Journal of Oceanography & Marine Environmental System, 7(1): 01-09.
33. Mbuka-Nwosu, I.E., E.E. Nkwocha, C.G. Onwuagba, L.C. Izunobi and I.O. Egbuawa, 2019. Evaluating a Multifactorial Model for the Predication of Relationship Between Sea Water pH and its Major Elemental Constituents. Journal of Oceanography & Marine Environmental System, 2(1): 01-09.
34. Eyankware, M.O., A.O.I. Selemo, P.N. Obasi and O.M. Nweke, 2019. Evaluation of Groundwater Vulnerability of Fractured Aquifer at Oju, Southern Benue Trough, Nigeria. Using Geoelectric Layer Susceptibility Indexing. Research Journal of Earth Sciences, 11(2): 14-21.