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HYDRO CHEMICAL ASSESSMENT AND WATER QUALITY INDEX OF WATER FROM DIFFERENT SOURCES IN ALIGARH DISTRICT (U.P.)

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Abstract

One of the most crucial natural resources on the planet is water. The majority of ecological systems, human health, food production, and economic progress depend on it, as do all living things. It is crucial for health that drinking water be safe. The safety of drinking water is impacted by a variety of pollutants, including chemical and microbiological ones. These toxins have detrimental effects on health. The quality of the drinking water degrades as a result of these impurities. The quality of the water must be checked for both chemical and microbiological contaminants since occasionally, such low-quality water can lead to a variety of illnesses in humans. It was discovered during the investigation that the majority of the physical and chemical parameters were within the ideal limit, as recommended by WHO and BIS. The purpose of the current study is to debate whether potable water and pond water (habitat) are suitable for human consumption by presenting information on their physicochemical properties and thorough ecological assessments. To evaluate the quality of the water, physicochemical and biochemical properties have been studied. The biotic communities and primary productivity of the water bodies in various parts in Aligarh District are directly impacted by changes in the physicochemical qualities of water samples.

Keywords: daily use water and pond water, Aligarh, Hydro-chemical and analysis, environmental studies.

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Introduction:

One of the most significant natural resources on planet is water. All living things, ecological systems, human health, food production, and economic growth depend on it. The health benefits of drinking water safety are significant. Various pollutants, including chemical and microbiological ones, have an impact on the safety of drinking water. These pollutants have negative health effects. The drinking water's quality deteriorates as a result of these contaminants. Sometimes, such low-quality water leads to a wide range of human illnesses, so it is important to analyse it for both chemical and microbiological contaminants.

Pond water is often utilized for recreational activities, irrigation, or wildlife habitat. Pond water quality can be influenced by various factors, including pollution, nutrient runoff, and the presence of harmful substances. Contact with contaminated pond water to harmful algal blooms can pose health risks, such as gastrointestinal illness or allergic reactions. Ponds require regular maintenance, including monitoring water quality, managing vegetation, and preventing the buildup of excessive algae or invasive species. Poorly managed ponds can negatively impact surrounding ecosystems by contributing to nutrient pollution, habitat degradation, or the spread of non-native species.

Hydro energy domestic uses, farming, industrial applications, and commercial purposes are the five main use of water. The primary water quality factors examined in this study were pH, odour, taste, colour, degree of turbidity, the amount of total dissolved solids (TDS), BOD, COD, Turbidity, Conductivity, metals and metalloids, total hardness, and alkalinity.

Sample Collection:

- Potable water samples were collected from five different Blocks of Aligarh: Processed water (Danipur Block, Iglas Block, Akarabad Block, Gonda Block, Gangiri Block),
- Habited water samples were collected from five different Ponds of Aligarh: Tallaiya (Chherat) Pond, Nai Basti Pond, Clinical Pond, Sarsol Pond, Chautal Pond.

Material and Methods:

The current investigation was conducted in Aligarh city's five various areas and five various Ponds. All water samples for the current investigation were gathered in polyethylene bottles and sampled early in the morning. For the purpose of collecting a sample of Pond water, a closed container was lowered to a depth of 0.7 to 0.9 meters, opened inside, and then brought back to the surface. An integrated sample was created by combining the three separate samples that were taken. Many physical and chemical interactions would alter the quality of the water sample between the time of sample collection and the actual analysis; therefore, to reduce this change, the sample was kept shortly after it was collected. By reducing the temperature and adding chemical preservatives, the water samples were kept intact. After the sample was collected, the following parameters were immediately analysed: water temperature, flavour, smell, and TDS. The remaining parameters were analysed at a lab. The study was conducted from January 2023 to April 2023 across a four-month period. A necessary evaluation was conducted on the water samples that were gathered in the lab. Turbidity is measured with a turbidity metre, same as pH was found using a pH meter. In accordance with the table (Verma Pradeep et al., 2012), the following parameters were measured: alkalinity, magnesium, total hardness, dissolved oxygen, dissolved carbon dioxide, copper, and sulphate.

Result:

Potable Water result table 3.1

Sr. No.	Test	Dhanipur Block Water Sample	Akrabad Block Water Sample	Iglas Block Water Sample	Gonda Block Water Sample	Gangiri Block Water Sample
1	Temp. (°C)	29	29	28	29	28
2	pH	8.2	7.6	7.8	7.4	7.7
3	Turbidity	1.9	1.8	1.5	1.2	1.8
4	E. Cond. (µS/cm)	1543	991	1076	889	1123
5	TH	324	398	385	598	454
6	Alkalinity(mg/L)	953	942	939	765	568
7	TDS (mg/L)	798	778	699	987	754
8	Fluoride(mg/L)	1.4	1.7	1.3	0.98	1.5
9	TSS	1.5	1.8	1.5	1.25	1.8
10	PO_4^{2-}	0.75	0.83	0.79	0.89	0.61
11	SO_4^{2-}	457	125	125	293	43.8
12	NO_3^-	49	36	3.9	5.9	12.5
13	Fe(mg/L)	0.308	0.12	0.23	0.384	0.71
14	Cu (mg/L)	0.023	0.026	6.7	9.6	1.28
15	Mn (mg/L)	0.017	0.028	0.045	0.023	0.023
16	Ni (mg/L)	1.875	0.727	0.029	0.027	0.016
17	Pb (mg/L)	0.377	0.245	0.727	1.775	1.865
18	Zn (mg/L)	0.34	0.28	0.42	0.35	0.29

Pond Water result table 3.2

Sr. No.	Test	Tallaiya (Chherat) Pond Sample	Nai Basti Pond Sample	Clinical Pond Sample	Sarsol Pond Sample	Chautal Pond Sample
1	Temp. ($^{\circ}$C)	29	30	27	28	31
2	pH	8.8	8.7	8.9	8.7	8.8
3	Turbidity	3.42	3.13	3.85	4.34	3.32
4	E. Cond. (µS/cm)	1298	1250	1270	1278	1198

5	TH	879	850	834	789	867
6	Alkalinity(mg/L)	1234	1239	1223	1182	1200
7	TDS (mg/L)	1280	1288	1224	1300	1282
8	Fluoride(mg/L)	1.35	1.85	1.89	1.28	1.77
9	TSS	0.33	1.84	1.43	0.79	1.52
10	PO_4^{2-}	0.79	0.86	0.79	0.84	0.76
11	SO_4^{2-}	280	278	304	289	267
12	NO_3^-	76	86	89	85	76
13	Fe(mg/L)	0.43	0.49	0.58	0.34	0.23
14	COD (mg/L)	285	267	289	265	278
15	BOD (mg/L)	2.38	2.29	2.22	2.51	2.27

Water Quality Index (WQI):

The Water Quality Index (WQI) is a vital method for analyzing groundwater quality and its suitability for consuming and other purposes. To calculate the Quality Index of water, the permissible values of various hydro-chemical parameters are used for ingesting water used on this have a look at is suggested with the aid of WHO, BIS and ICMR. The WQI value can be calculated using the subsequent equation

$$WQI = \frac{\sum QnWn}{\sum Wn}$$

Where Qn = the quality rating scale of the n^{th} water quality parameter;

Wn = the unit weight of the n^{th} water quality parameter.

For computing WQI, we first calculate the Q value by using the following formula-

$$Qn = 100\,\frac{Vn - Vi}{Sn - Vi}$$

Where Vn =amount of nth parameter present, Vi = ideal value of the parameter i.e. $Vi = 0$,

Sn= recommended standard value for n^{th} parameter calculated by the following equation-

$$Wn = \frac{K}{Sn}$$

Where K=proportionality constant and it is calculated by the following equation-

$$K = \left[\frac{1}{\sum \frac{1}{Sn}}\right]$$

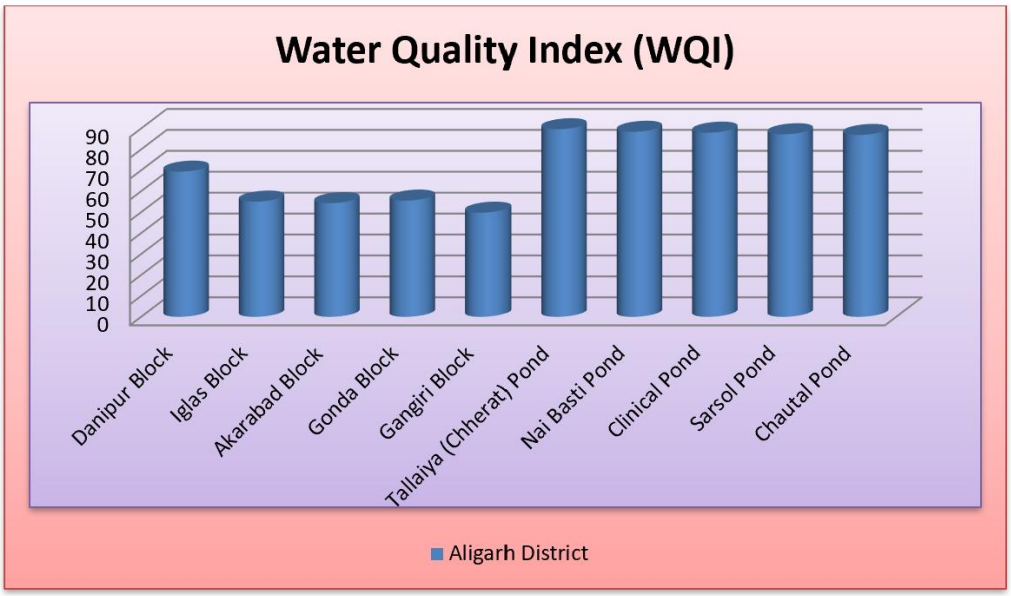
The water quality based on the quality index (WQI) value and their possible uses

Table 3.3: The WQI range is used to classify the quality of groundwater.

WQI Value	Water Quality	Possible uses of water samples
0-25	Excellent	Drinking, irrigation and industrial purposes
26-50	Good Water	Drinking, irrigation and industrial purposes
51-75	Poor Water	irrigation and industrial purposes
76-100	Very Poor Water	irrigation purposes
Above 100	Unsuitable for drinking	Proper treatment required for any kind of usage

Table 3.4: Water Quality Index of various Blocks and Pond water

S.No.	Area	WQI	Use of water
1.	**Danipur Block**	69.35	Irrigation and industrial purposes
2.	**Iglas Block**	55.03	Irrigation and industrial purposes
3.	**Akarabad Block**	54.30	Irrigation and industrial purposes
4.	**Gonda Block**	55.52	Irrigation and industrial purposes
5.	**Gangiri Block**	49.75	Drinking, irrigation and industrial purposes
6.	**Tallaiya (Chherat) Pond**	89.61	Proper treatment required for any kind of usage
7.	**Nai Basti Pond**	88.402	Proper treatment required for any kind of usage
8.	**Clinical Pond**	87.98	Proper treatment required for any kind of usage
9.	**Sarsol Pond**	87.21	Proper treatment required for any kind of usage
10.	**Chautal Pond**	86.88	Proper treatment required for any kind of usage



Discussion:

Potable and pond water have appealing physical characteristics including temperature, odour, taste, and colour. Turbidity in drinking water must not exceed 5.0 NTU according to the BIS standard. Unhealthy turbidity is defined as >5 NTU. Aligarh Blocks water have turbidities in various locations that range from 1.2 NTU to 1.9 NTU. Turbidity levels in Dhanipur Block Water were greater than the other areas. Drinking water's pH range should be between 6.5 and 8.5, and Block water's pH is often between 7.4 and 8.2.Therefore, it met the requirements for acceptable pH range and was determined to be safe for human consumption. Water sample's TDS fell below 2000 mg/l and met the requirements of the Indian standard. The total hardness and alkalinity of drinkable water should be less than or equal to 600 mh/l respectively. The results were within the bounds of both tests. Season, location, and sample time can all affect the water temperature. Aquatic life finds it more challenging to obtain the necessary amounts of oxygen as water temperature rises. The community structure of aquatic organisms can change as a result of thermal pollution. The Pond's turbidity fluctuates from 4 NTU to 11 NTU. Some environments are inherently very turbid, however due to human activity; many habitats now have higher suspended solids levels. Total dissolved solid measurements in the Pond range from 1224 mg/l to 1300 mg/l. High levels of suspended solids can sometimes almost completely remove algae and other macrophytes, reducing the primary Productivity of the system. Animal, avian, and aquatic life health may be impacted by the disruption of this biological and ecological system. After doing a physicochemical investigation, we discovered that the some potable water samples were near to poor quality and use for irrigation and industrial purposes. They need proper treatment for drinking purpose. Gangiri Block water is found in good quality so it use for drinking and other purposes.

Conclusion

The study's conclusion was evaluated according to BIS and WHO standards. Water that poses little risk of short-term or long-term harm is referred to be potable water. In general, animals, birds, and aquatic life need habitat water. The health of animals, birds, and aquatic life may be impacted by the disruption in this biological system and ecological system. Following physicochemical testing, the study

discovered that the some samples of potable water are clean and environmentally balanced and some pond water quality is near to poor quality so without any treatment they become harmful for living being.

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