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Impact of Anthropogenic Activities on Fresh Water Lake Taal Salona

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ABSTRACT

The pristine waters of District Azamgarh (U.P) are showing signs of deterioration due to several reasons. The present study researches the causes of deteriorating water quality in the Taal Salona, one of the main lentic water bodies of district Azamgarh. There are several thousand people are depending on the Taal Salona for livelihood. This water body is affected by anthropogenic activities. A total of 12 water quality parameters were analyzed over a period of two years during month June 2019- June 2021. Water sampling was done at 6 different sites along the length of the Taal. This fresh water body is connected with River Ghaghara through canal. It was observed that water quality degraded during the months of January and April that coincides with the peaks of agricultural activities. Total phosphorus, orthophosphate phosphorus, nitrate-nitrogen, ammoniacal nitrogen showed higher concentrations in the month of October-January-April while the DO decreased in the same time slightly, resulting in degradation of water quality. In addition to this, the extensive use of fertilizers and pesticides in the agriculture is also responsible for the degrading water quality of Taal Salona.

Key words: Anthropogenic activity, Water quality parameters, Land use, Visual image interpretation

Water is an indispensable natural resource on earth. All life including human beings depends on water. Water is essential for the development and maintenance of the dynamics of every facet of the society. This is because of its bio-chemical and physical properties. Water chemistry deals with the fundamental chemical properties of water itself, the chemical properties of other constituents that dissolve in water and the countless chemical reactions that take place in water [1]. Lakes and ponds are inland depressions containing standing water. They vary in size from small ponds of less than one hectare to large seas covering thousands of square kilometers. They range in depth from 1 meter to over 2000 meters. Many lakes and ponds are formed by the activities of two mammalian species-beavers and humans. Beavers dam up streams to make shallow but often extensive ponds. Surface water originates mostly from rainfall and is a mixture of surface runoff and ground water. It includes large rivers, ponds, lakes and the small upland streams which may originate from springs and collect the runoff from watersheds. The quality of surface water is governed by its content of living organism and by the amounts of mineral and organic matter which it may have picked up in the course of its formation. Today there is a great problem of surface water pollution. These problems created due to anthropogenic activities. Surface waters are most exposable to pollution due to their accessibility for disposable of waste waters [2].

In India during 20th-21th century there is a tremendous increase in industrialization and urbanization. Due to this reason, there is a large amount of waste material discharge in lake and rivers. Assessment of the surface water conditions will give an insight into the relationship between the organism and their environment and can be used in determining water quality, productivity of the water body, understanding of the structure and function of a particular body and its relation to its inhabitants. Anthropogenic influences are known sources of water pollution and include urban, industrial and agricultural activities, increasing exploitation of water resources as well as natural processes, such as precipitation inputs, erosion and weathering of crust materials degrade surface waters and damage their use or drinking water, recreational and other purposes [3-8]. Human activities contribute further to the impurities in the form of industrial and domestic wastes, agricultural chemicals and other less obvious contaminants. As the earth's population continues to increase rapidly, the growing human need for freshwater is leading to a global water resources crisis. There is a growing consensus that if current trends continue, water scarcity and deteriorating water quality will become critical factors limiting the future economic development, the increase of food production, the provision of basic health and hygiene services to millions of disadvantaged people in the developing countries. Domestic sewage reduces dissolved oxygen and increases biochemical oxygen demand levels in water bodies due to presence of excessive quantities of

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organic matter. Dissolved oxygen is an important factor that determines the quality of water in surface waters like lakes and rivers. The higher the concentration of dissolved oxygen the better is the better quality. Dissolved oxygen is an important indicator of ability of a water body to support aquatic life. Oxygen enters the water by absorption directly from the atmosphere or by aquatic plants and algal photosynthesis. Oxygen is removed from the atmosphere or by aquatic plants and algal photosynthesis. Oxygen is removed from the water by respiration and decomposition of organic matter [9]. However, in most instances surface water is subject to pollution and contamination by pathogenic organisms and cannot be considered safe without treatment. It should be remembered that clear water is not necessarily fit for human consumption and that one cannot depend wholly on self-purification to produce potable water.

According to survey conducted by NEERI, it was revealed that more than 80% of available water in India is polluted. Under such conditions we can say that shallow and small water bodies such as ponds are more vulnerable to change in water quality through input of nutrients. Nutrient enrichment due to excessive loading has increased the productivity rate, which result consequently in eutrophication. Eutrophication occurs rapidly under condition when abnormally high amount of nutrients from sewage, fertilizers, animal wastes and detergents enter the water bodies causing excessive growth of phytoplankton and other aquatic plants [10]. Currently. One of the visible problems with the Salona Taal is high pollution load contributed by domestic, agricultural sectors. Some religious activities are also responsible for pollution. The main impact of anthropogenic activities is responsible for accelerated flow of nutrient from terrestrial to aquatic portion. In this context, the present study was taken.

MATERIALS AND METHODS

The study area is Taal salona which lies North to Azamgarh district with geographical coordinates of 26°9'54'' N latitude and 83°22'47" E longitude. The Taal Salona is 3660meters long and 2750 meters broad and its depth being some 6 meters long. It is situated near town area Azamgarh. It is an important tourist place of Azamgarh. There are approximately 50000 people depend for livelihood on this Taal. The Taal is connected to Chhoti Saryu. The climate of this region is mild, generally warm and temperate. The summer have a good deal of rainfall while the winter have a good deal of rainfall while winter have very little. The average temperature is 25°C and annual rainfall is 1140 mm. Taal Salona serves as a drinking water source to a huge population. Taal is important for agriculture as it serves a source of irrigation for the same. It is also a rich source of fisheries. Hence the Taal is socioeconomically important for population.

Six water sampling sites were taken along the length of the lentic water bodies of Taal Salona for physicochemical analysis. With consideration of the sources of inflow to the lakes, 6 different sampling sites were selected in the lakes. Before collecting the water samples, all the sample bottles were washed with Laboline and rinse with distilled water. Water sampling was done during morning hours from 8:30 am to 12:00 noon. The samples were collected in airtight glass jars of 3-l capacity. Separate samples were collected in 250-ml glass bottles for the estimation of dissolved oxygen (DO). All the samples were transported to the S.N.P.G College laboratory for refrigeration and were analyzed within 48 h. Twelve physicochemical parameters were analyzed in the present study which includes pH, electric conductivity, dissolved oxygen, biological oxygen demand, total chlorides, total solids, total suspended solids, total dissolved solids, ammoniacal nitrogen, nitrate nitrogen, total phosphorus, and orthophosphate phosphorus. Analysis was done for all the four seasons viz. spring, summer, autumn, and winter during 2019-2021. Analysis of physicochemical parameters were done priority wise. pH, conductivity, DO, nitrates and phosphates were determined immediately follows by others. The physicochemical parameters were analyzed as per standard methods [11]. Dissolved oxygen was estimated by modified Winkler's method, total chlorides by argentometric method [12], ammoniacal nitrogen and nitrate nitrogen by salicylate method [13] and total phosphorus and orthophosphate phosphorus by Stannous Chloride method [11]. The main objective of this study was to determine the impact of anthropogenic activities on the surface water body of Taal Salona.

RESULTS AND DISCUSSION

The results of water quality analysis are summarized in (Table 1). Water was alkaline with pH value ranging from 8 to 9.6. pH of different sites is related to increasing pressure of pollution because agricultural activities and domestic wastes. Dissolved oxygen vary from 9.2-11.5 mg/L. The maximum concentration of dissolved oxygen was recorded in June month. This show there is no significant effect of high temperature on value of oxygen. Difference of 2 mg/l was observed in some months. This is an indicator of heavy organic pollution leaches to flushing of sewage into the lake. BOD value ranges from 17 mg/l to 21mg/L. The value of BOD is maximum in month of June and minimum in April. Total chlorides concentration ranged from 28-34.3 mg/L. Chlorides are distributed as salts of sodium, potassium and calcium. It is also leached from rocks into soil and water by weathering. The concentration of total chlorides increased into lake due to the waste inflow in the form of domestic sewage. The value of TDS was ranged 109-128 mg/L. TDS was maximum during month of June which can be attributed to human activities. But their value is not worst.

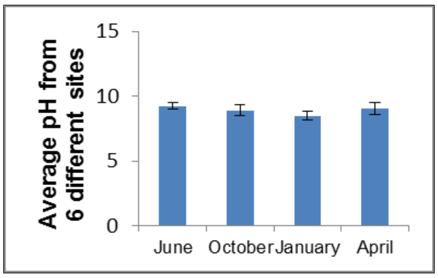
Nitrate nitrogen increased significantly. It is related to the entry of nitrogenous wastes due to human activities (bathing and other domestic activities). The value of nitrate nitrogen ranged from 12.1-14.2 mg/L. Excessive use of nitrogenous fertilizers in its catchment which ultimately find their way in lake. Ammonaical nitrogen total phosphorus, orthophosphate phosphorus showed almost similar trend like nitrate nitrogen. Because these parameters are directly related to anthropogenic activities. Phosphorus contamination is due to high pressure of human activities.

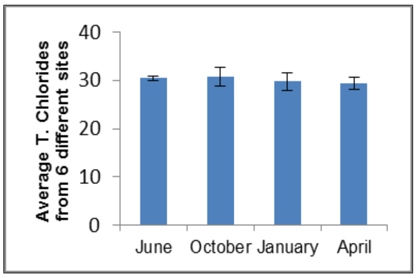
CONCLUSION

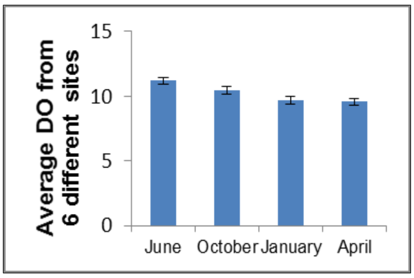
Various land use practices and anthropogenic activities affect the quality of water of Taal has tremendous ecological and socioeconomic importance represent the way we are treating our fresh water ecosystems. The physicochemical analysis shows an increase of the water quality parameters. After analysis and discussion, it is concluded that the main reasons for the degradation of the water quality of lake are eutrophied due to the use of fertilizers and pesticides. The direct discharge of sewage from surrounding village increase the nutrient loading which causes drop in the dissolved oxygen content. This causes many harmful effects on the aquatic fauna and flora. The water of this lake serves agriculture, irrigation and for drinking. Hence, there should be proper management and disposal of wastes from agricultural, domestic and commercial sectors. An action developed for conservation of this lentic bodies.

Table 1 Physicochemical analysis of Taal Salona across different seasons

		Basantpur	Azmatgarh Town	Raghunandanpur	Ahirauli	Kadipur	Chhota Talab Tal Salona	Average
Parameters	**Month**	**site I**	**Site II**	**Site III**	**Site IV**	**Site V**	**Site VI**	
Ph	June	9.5	9.3	9.6	9	8.9	9.2	9.25
	October	8.1	8.9	9	9.1	9.1	9.3	8.916666667
	January	8.3	8	8.5	8.6	8.5	9	8.483333333
	April	9.1	8.2	9.3	9.4	9.3	9.1	9.066666667
EC	June	209	210	198	199	205	201	203.6666667
(µS/cm)	October	164	199	195	189	203	204	192.3333333
	January	188	188	179	185	198	199	189.5
	April	195	192	182	179	189	190	187.8333333
DO	June	11	11.2	11.5	10.9	11.1	11.5	11.2
(mg/L)	October	10	10.3	10.4	10.6	10.7	10.8	10.46666667
	January	9.2	9.9	9.7	9.8	9.6	9.9	9.683333333
	April	9.8	9.7	9.9	9.5	9.2	9.5	9.6
BOD	June	20	21	21	20.5	19.5	21	20.5
(mg/L)	October	19	19	19.5	19.3	18.9	19	19.11666667
	January	17	18	18.6	18.9	18.6	18.5	18.26666667
	April	19	17	17.9	18	18.1	18.9	18.15
Total Solids	June	180	163	168	141	163	146	160.1666667
(mg/L)	October	173	174	186	175	179	171	176.3333333
	January	179	150	177	161.5	158	144	161.5833333
	April	144	147	153	161	151	145	150.1666667
TDS	June	123	125	119	121	125	121	122.3333333
(mg/L)	October	121	120	128	123	121	120	122.1666667
	January	119	119	125	121	119	119	120.3333333
	April	110	117	115	125	120	116.5	117.25
TSS	June	57	38	39	40	38	36	41.33333333
(mg/L)	October	52	54	58	52	58	62	56
	January	56	51	42	37	39	33	43
	April	34	30	38	36	31	30	33.16666667
Total chlorides	June	30.2	30.5	31.2	30.6	29.8	30.2	30.41666667
(mg/L)	October	34.3	30.3	29.5	30.2	29	31.5	30.8
	January	28	28.5	30.2	30.3	28.5	33	29.75
	April	29	29.4	30.3	29.5	27.3	31	29.41666667
Nitrate	June	12.2	12.1	12.5	13.1	13.2	13.4	12.75
Nitrogen	October	13.1	13.5	14.2	12.9	13.5	13.6	13.46666667
(mg/L)	January	13.6	13.2	13.9	13.4	13.6	13.2	13.48333333
	April	12.1	13.4	13.4	14.1	14.2	13.9	13.51666667
Ammoniacal	June	1.9	2.1	2.8	2.9	2.6	3.2	2.583333333
Nitrogen	October	2.9	2.9	2.7	2.8	2.9	3.4	2.933333333
(mg/L)	January	3.5	3.6	2.6	3.2	3.1	3.3	3.216666667
	April	3	3.4	3.1	3.4	3.5	3.8	3.366666667
Orthophosphate	June	12	16	16	17	20	22	17.16666667
Phosphorus	October	24	38	37	38	40	40	36.16666667
(µg/L)	January	26	23	25	26	26	28	25.66666667
	April	10	12	14	19	17	19	15.16666667
Total	June	16	16	16	17	20	22	17.83333333
phosphorus	October	30	38	37	38	40	40	37.16666667
(µg/L)	January	32	26	25	26	26	28	27.16666667
	April	14	15	14	19	17	19	16.33333333







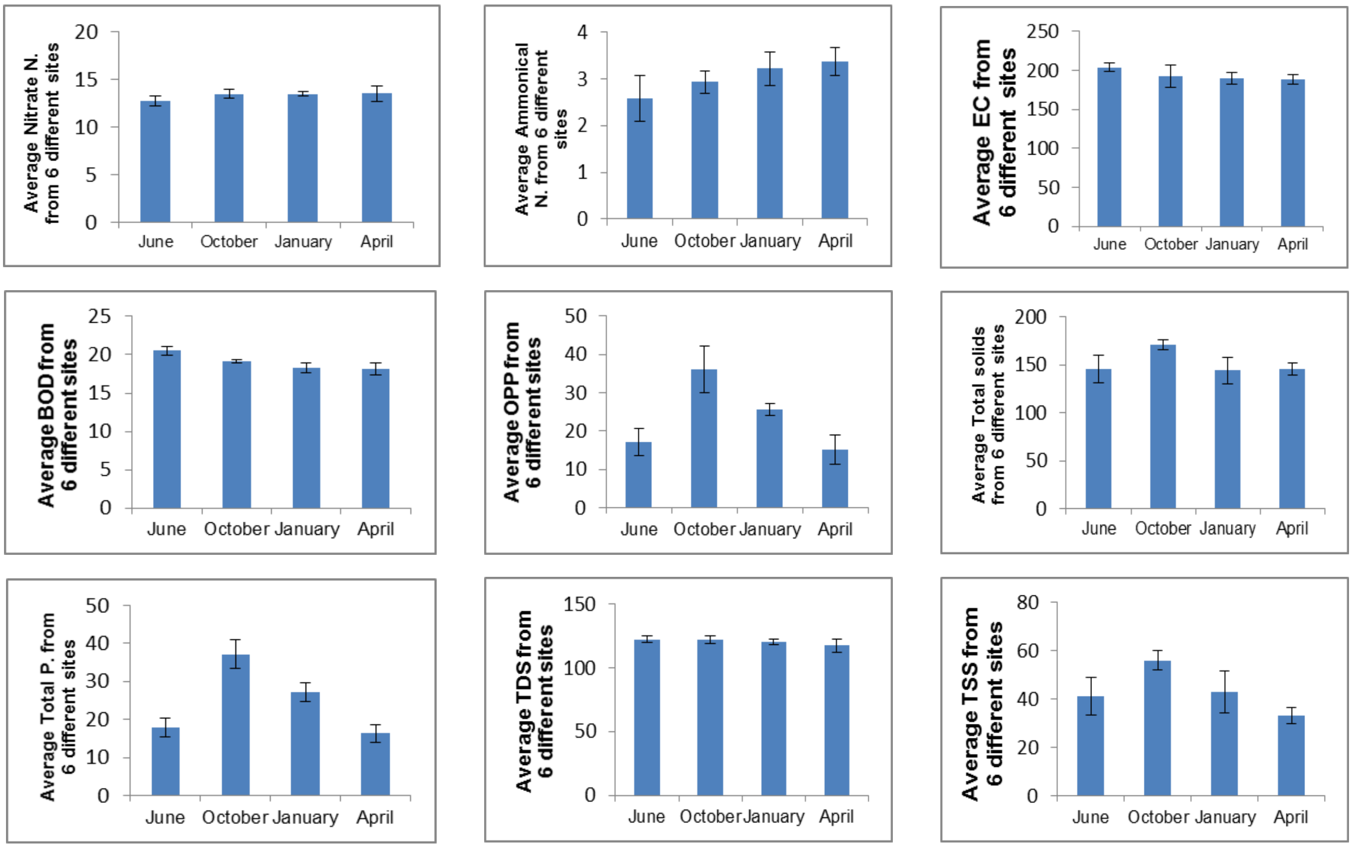


Table 1 Physicochemical analysis of Taal Salona across different seasons

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