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## ECOLOGICAL STATUS OF SITAPUR POND AT HARDWAR (UTTARANCHAL), INDIA

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### ABSTRACT

The physico-chemical characteristics of the aqueous phase influence on the types and distribution of aquatic biota. Conversely, they are also influenced by the activity of the aquatic biota. Normally water is never pure in chemical sense. It contains gases (Dissolved oxygen, free CO<sub>2</sub>, N<sub>2</sub> etc). Dissolved minerals (Ca, Mg, Na salts etc.), suspended matter (clay, silt, sand etc.), and even microbes. These are natural impurities derived from atmosphere catchment areas and the soil. Thus the importance of the study of water quality is obvious. In the present study an attempt has been made to quantify the present ecological status of Sitapur pond also efforts has been made to find out the indicators of water quality in terms of planktonic studies.

**Keywords:** *Ecological status, Pond, Phytoplankton.*

### INTRODUCTION

Water is a very essential and vitally important substance. It is the medium which gave birth to the first primitive molecule and without it no life can exist. Ponds are small bodies of water in which the littoral zone is relatively large and the limnetic and profundal regions are small or absent.

The village Sitapur is situated near Jwalapur in the district Haridwar of Uttaranchal and situated about 4 km far from Haridwar. The pond is completely filled with water for the whole year. The pond receives waste water from the nearby houses and also tube well water mixes in to it. Sitapur pond contains a number of phytoplankton including Diatoms, blue green algae, green algae etc. In the present study an attempt has been made to find out the ecological status of Sitapur pond.

### MATERIALS AND METHODS

The samples were collected monthly during morning hours (7.00 a. m. to 11.00 a. m.) the study was conducted for one year (1999-2000). The physico-chemical and biological parameters were analyzed according to the standard methods of APHA (1998), Trivedy and Goel (1986) and Khanna (1993).

## RESULTS AND DISCUSSION

The results of various physico-chemical and biological parameters are tabulated in table 1-4. The average value of water temperature recorded for Sitapur pond was 17.41°C. The average value of total solids was observed as 558.89 mg/l. It shows an increase after winter due to increase in turbidity. Turbidity ranged between 27.65 JTU to 42.35 JTU, turbidity increases during monsoon season. The annual average of transparency was recorded as 42.48 cm. The value of pH ranged between 7.10 to 8.10, a very little variation in pH was recorded. The values of alkalinity, hardness and DO fluctuated between 215.70 mg/l to 367.30 mg/l, 239.61 mg/l to 293.67 mg/l and 5.97 mg/l to 9.67 mg/l, respectively. The other chemical parameters i. e. free CO<sub>2</sub> and BOD were continuously increasing from winter to monsoon.

Chlorophyceae and Cyanophyceae were recorded highest in winter while Bacillariophyceae were recorded highest in monsoon season.

Table 1. Seasonal variation in physico - chemical parameters of Sitapur pond.

Parameters	Winter	Summer	Monsoon	Average
Temperature (°C)	12.6 ± 0.80	22.30 ± 0.63	17.34 ± 0.91	17.41 ± 3.96
Transparency (cm)	57.70 ± 0.13	39.80 ± 0.41	29.95 ± 0.02	42.48 ± 11.48
Turbidity (JTU)	27.65 ± 0.26	19.80 ± 0.42	42.35 ± 0.33	29.93 ± 9.34
Velocity (m/s)	01.12 ± 0.31	01.31 ± 0.29	01.97 ± 0.39	01.46 ± 0.36
Total solids (mg/l)	402.73 ± 10.76	473.36 ± 7.86	800.60 ± 13.20	558.89 ± 173.32
pH	07.10 ± 0.08	08.10 ± 0.05	07.90 ± 0.12	07.70 ± 0.43
Alkalinity (mg/l)	367.30 ± 5.32	231.61 ± 1.79	215.70 ± 1.69	271.53 ± 68.02
Free CO <sub>2</sub> (mg/l)	03.01 ± 0.38	04.80 ± 0.20	05.88 ± 0.35	04.56 ± 1.18
DO (mg/l)	09.67 ± 0.90	06.54 ± 0.32	05.97 ± 0.04	07.39 ± 1.62
BOD (mg/l)	04.97 ± 0.14	05.30 ± 0.11	05.89 ± 0.19	05.38 ± 0.37
Hardness (mg/l)	293.67 ± 1.66	247.00 ± 3.61	239.61 ± 0.51	260.09 ± 23.93

± = Standard Deviation.

Table 2. Seasonal variation of Chlorophyceae at Sitapur pond..

Parameters	Winter	Summer	Monsoon	Average
<i>Clostrium</i>	118.0 ± 2.50	88.0 ± 5.20	0.00 ± 0.00	68.66 ± 50.07
<i>Ankistrodesmus</i>	140.0 ± 1.36	92.0 ± 2.70	0.00 ± 0.00	77.33 ± 58.08
<i>Ulothrix</i>	189.0 ± 18.25	85.0 ± 9.05	87.0 ± 7.24	120.33 ± 48.56
<i>Cosmarium</i>	130.0 ± 5.25	81.0 ± 4.12	88.0 ± 1.25	99.66 ± 21.66
<i>Cladophora</i>	123.0 ± 0.70	82.0 ± 0.96	0.00 ± 0.00	68.33 ± 51.13
<i>Chaetophora</i>	128.0 ± 0.86	90.0 ± 3.25	0.00 ± 0.00	72.66 ± 53.67
<i>Euglena</i>	0.00 ± 0.00	60.0 ± 0.98	71.0 ± 0.66	43.66 ± 18.40
<i>Microcystis</i>	0.00 ± 0.00	0.00 ± 0.00	88.0 ± 8.45	29.33 ± 41.48
<i>Oocystis</i>	0.00 ± 0.00	48.0 ± 8.76	84.0 ± 8.75	44.00 ± 34.40
<i>Volvox</i>	0.00 ± 0.00	0.00 ± 0.00	72.0 ± 0.85	24.00 ± 33.94
<i>Stigeocolonium</i>	0.00 ± 0.00	0.00 ± 0.00	60.0 ± 1.84	20.00 ± 28.28

± = Standard Deviation.

Table 3. Seasonal variation of Bacillariophyceae at Sitapur pond.

Parameters	Winter	Summer	Monsoon	Average
<i>Desmidiium</i>	87.0 ± 4.27	87.0 ± 1.27	118.0 ± 3.13	97.33 ± 14.61
<i>Nitzschia</i>	82.0 ± 8.24	88.0 ± 3.34	96.0 ± 0.56	88.66 ± 5.73
<i>Navicula</i>	63.0 ± 0.96	95.0 ± 0.95	0.00 ± 0.00	52.66 ± 39.46
<i>Cymbella</i>	49.0 ± 3.36	0.00 ± 0.00	115.0 ± 8.25	54.66 ± 47.11

± = Standard Deviation.

Table 4. Seasonal variation of Cyanophyceae at Sitapur pond.

Parameters	Winter	Summer	Monsoon	Average
<i>Oscillatoria</i>	94.0 ± 4.50	89.0 ± 2.24	96.0 ± 1.35	93.00 ± 2.94
<i>Nostoc</i>	57.0 ± 3.40	55.0 ± 0.96	0.00 ± 0.00	37.33 ± 26.41
<i>Anabena</i>	89.0 ± 3.70	64.0 ± 1.75	92.0 ± 3.90	81.66 ± 12.55

± = Standard Deviation.

The unity of organism and its environment is a basic principle of ecology. The organism cannot exist without the environment, any organism, population or species lives at the expense of its environment without this interaction it cease to exist (Nikolski, 1963). The aquatic life of Sitapur pond have direct effect on ecological condition of water.

In the present study temperature showed an inverse relationship with dissolved oxygen in all the seasons similar kind of relationship was also reported by (Khanna *et al.*, 1997). At high temperature during summer and monsoon seasons due to high rate of decomposition of organic matter, resulted in decrease of pH, release of CO<sub>2</sub> as also reported by Husmani and Bharti (1980), Yadav *et al.* (1987).

Monawar (1970), Jindal and Vashist (1985) have also reported that free CO<sub>2</sub> influence the alkalinity and pH of water. Maximum DO was recorded in water but it reduces onwards due to turbidity Maximum DO was due to phytoplankton activity as also reported by Gautam (1990). Total solids, turbidity and dissolved matters are found closely interrelated with one another and cause common effect upon the pond and its aquatic life as also reported by Khanna (1993). The similar decreasing trend in transparency rate was also reported by Swaroop and Singh (1979). Turbidity was found minimum in summer and maximum in monsoon same type of results were given by Khanna (1993). The fluctuations of pH lies in alkaline range same results were observed by Bagde and Verma (1985). Alkalinity showed a decreasing tendency during the course of study Khanna (1993). Hardness ranged between (234.8 mg/l to 170.16 mg/l) same results were observed by Paka and Narsingh Rao (1997). In the present study Chlorophyceae was found to be dominating group as also reported by Verma and Mohanty (1995) and Khanna and Singh (2000). Chlorophyceae was recorded highest in winter and lowest in monsoon season, among Chlorophyceae total 11 genera were recorded as *Ankistrodesmus*, *Chaetophora*, *Cladophora*, *Clostridium*, *Euglena*, *Cosmarium*, *Microcystis*, *Oocystis*, *Volvox*, *Stigeocolonium* and *Ulothrix*.

Among Bacillariophyceae the highest count was recorded in monsoon while lowest in summer, a total of 4 genera were recorded as *Cymbella*, *Desmidium*, *Navicula* and *Nitzschia*.

The Cyanophyceae were represented by only 3 genera which are *Oscillatoria*, *Anabena* and *Nostoc*, these were recorded highest in winter and lowest in monsoon season.

The genera observed in study probably show high organic pollution according to Algal Genus index, Palmer (1980). The number of plankton were also affected by the turbidity.

The increased turbidity reduces the phytoplankton production as also reported by Das and Upadhyaya (1979) and Khanna *et al.* (1997).

At last we must conclude that some physico-chemical and biological parameters of Sitapur pond are within the range and some parameters crosses the limits and this pond was more high osmotic pollution probable due to high organic pollution so at last we must conclude that water of Sitapur pond is not usable for drinking purposes.

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