



## Phytoplankton Diversity of River Ganga in and Around Hardwar, Uttaranchal

Surender Kaur

Pranveer Singh Institute of Technology, Kanpur, U.P., India.

### ARTICLE INFO

#### Article history:

Received: 21 March 2017;

Received in revised form:

19 April 2017;

Accepted: 27 April 2017;

#### Keywords

Aquatic system,  
Hardwar region,  
Phytoplankton.

### ABSTRACT

Phytoplanktons are primary producer of the aquatic ecosystem and constitute the base of food chain in any aquatic ecosystem. The qualitative and quantitative fluctuation of phytoplankton has a great effect on the aquatic life. The present region of Hardwar lies between approximately between approximately latitude 29°58' North and longitude at 78°13' East. There are six aquatic bodies have been selected for study because all of the study areas are situated along the Ganga river bank and due to anthropogenic activities they were heavily polluted. Phytoplankton were observed in the first and third week of each month for two years for six different study areas. It was recorded that phytoplankton found in River Ganga mainly consisted of Bacillariophyceae, Chlorophyceae and Cyanophyceae. It was recorded that phytoplankton were maximum in winters and minimum in monsoon period almost in every study areas.

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### 1. Introduction

The phytoplanktons are primary producers of aquatic ecosystem and constitute the base of food chain in any aquatic ecosystem. Phytoplankton are photosynthesizing organism. They are agents for "primary production" the creation of organic compound from carbon dioxide dissolved in the water, a process that sustains the aquatic food web. (Ghosal; Rogers; Wray, S.; M.; A) Phytoplankton growth depends on the availability of carbon dioxide, sunlight, and nutrients. Other factors also influence phytoplankton growth rates, like water temperature, salinity, water depth, wind, and what kinds of predators are grazing on them. Like plants on land, phytoplankton growth varies seasonally. Phytoplankton is increasingly being used to monitor the ecological quality and health of the water environment and also to measure the effectiveness of management or restoration programmes or regulatory actions. In India the fresh water constitutes rivers, streams, lake, wetlands, ponds and reservoirs. These fresh water bodies directly help in the growth of human civilization. The freshwater resource is becoming deteriorated at the faster rate. Deterioration of the water quality is now a global problem. (D.R. Khanna and Rakesh Bhutiani) This paper reports the finding of a survey carried out in six aquatic system of Hardwar region of Uttaranchal on the basis of composition and abundance. The work was carried out to generate information on the freshwater aquatic system to help develop a tool kit to manage the freshwater system using the ecosystem approach.

### 2. Materials and Methods

#### 2.1. Study Area

The present region of Hardwar lies between approximately latitude 29°58' North and longitude at 78°13' East. The city of Hardwar is situated at the foothills of Shivaliks (Himalayas) along the bank of River Ganga at an elevation of 965 ft from sea level. There are six aquatic bodies have been selected for study because all of the study

areas are situated along the River Ganga and due to anthropogenic activities they are heavily polluted such as Har Ki Pauri, Jageetpur, Kangri Village, Jwalapur, Saptrishi Ashram and Raiwala.

#### 2.2. Sampling and Analytical Experiment

For the seasonal study of River Ganga in and around Hardwar the water samples were taken in the first and third week in each month from six different sampling sites during July 2012 to July 2014 in morning hours. Ganga River at Hardwar mainly consisted of Bacillariophyceae, Chlorophyceae and Cyanophyceae.

**Table 1. Monthly mean variation in Phytoplankton (unit/l) of River Ganga at Six Selected stations.**

Months	1	2	3	4	5	6
January	1869	1804	1453	1842	1902	1716
February	1399	1641	1286	1453	1364	1565
March	1117	1285	1152	1225	1193	1202
April	985	876	1025	788	845	897
May	784	611	720	657	754	802
June	408	338	629	410	519	480
July	168	226	211	166	177	254
August	239	403	263	304	324	365
September	483	574	494	409	549	500
October	946	971	985	884	943	945
November	1099	1167	1077	1063	1072	1067
December	1282	1376	1189	1411	1433	1474

### 3. Results and Discussions

#### 3.1. Har ki Pauri

All the three above mentioned groups have been found in **Har ki Pauri**, although they showed varied in abundance according to the seasonal variations. Maximum mean value of phytoplankton was 1869 unit/l in the month of January and minimum 168.0 unit/l in the month of July. (Table 1). Phytoplanktonic concentration was dominated by bacillariophyceae 741.67 unit/l followed by the Chlorophyceae 137.58 unit/l and blue green Algae 19.0 unit/l

**Table 2. Annual mean values of the phytoplankton at six sampling stations (unit/l).**

Groups	1	2	3	4	5	6
Bacillariophyceae	741.67	765.83	723.33	733.33	763.33	794.17
Chlorophyceae	137.58	146.83	125.67	131.42	138.08	124.42
Cyanophyceae	19.0	26.67	24.67	23.33	21.50	28.67

(1)Har ki Puri (2)Jagjeetpur (3) Kangri Village (4)Jwalapur (5)Saptrishi Ashram (6)Raiwala

(Table-2). Similar observations of result were done by Khanna et al., (1998)

### 3.2 Jagjeetpur

Phytoplanktons were maximum 1804 unit/l in the month of January and minimum 226.0 unit/l in the month of July (Table 1). Same trend was found at this site, Bacillariophyceae was found 765.83 unit/l followed by green algae 146.83 unit/l and blue green algae 26.67 unit/l (Table-2). Similarly Seth et al., (2000) recorded that the phytoplankton mainly consisted of Bacillariophyceae, Chlorophyceae and Cyanophyceae.

### 3.3. Kangri Village

The phytoplankton concentration was found maximum 1453.0 unit/l in the month of January and minimum 211.0 unit/l in the month of July.

Bacillariophyceae was dominated 723.33 unit/l followed by Green algae 125.67 unit/l and Cyanophyceae 24.67 unit/l

### 3.4. Jwalapur

The phytoplankton concentration was found maximum 1842.0 unit/l in the month of January and minimum 166.0 unit/l in the month of July. Bacillariophyceae was dominated 733.33 unit/l followed by chlorophyceae members 131.42 unit/l and cyanophyceae 23.33 unit/l. Joshi et al.,(1996) recorded that phytoplankton group chiefly of Bacillariophyceae members in Ganga Canal at Jwalapur.

### 3.5 Sapt rishi Ashram

Similar results were observed at this site, the concentration was maximum 1902.0 unit/l in the month of January and minimum 177.0 unit/l in the month of July. Sharma (1985) observed the highest phytoplankton in January with decreasing trends onwards and reached lowest in August in the Bhagirathi River, Grahwal Himalaya. Bacillariophyceae was dominated 763.33 unit/l followed by Green algae 138.08 unit/l and Blue green algae 21.50 unit/l

### 3.6. Raiwala

It was found that the maximum phytoplankton 1716.0 unit/l in the month of January and minimum 254.0 unit/l in the month of July. Bacillariophyceae was dominated by 794.17 unit/l followed by Green algae 124.42 unit/l and Cyanophyceae 28.67 unit /l

### Conclusion

In present investigation of different aquatic systems in and around Hardwar region of Uttaranchal, India, it was recorded that the phytoplankton found in Ganga River in and around Hardwar mainly consisted of Bacillariophyceae, Chlorophyceae and Cyanophyceae. Silimilarly Seth et al., (2000) recorded the pattern that the phytoplankton consisted of Bacillariophyceae, Chlorophyceae and Cyanophyceae in the River Ganga at Hardwar.

It was found that all groups are recorded maximum in the winter months and minimum in monsoon period. Maximum mean value of phytoplankton 1902.0 unit/l was observed at Saptrishi site in the month of January and minimum mean value was 166.0 unit/l in the month of July at Jwalapur site among all the six sampling sites. It was concluded that the physiochemical parameters effect the growth of phytoplankton. Winter months are observed to provide most propitious conditions for abundance of phytoplankton, where as in the monsoon months, river was loaded with pollution resulting to lower phytoplankton growth. Kumar et al., (1995) and Joshi et al., (1996) also recorded the same results.

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