

# BIO DIVERSITY AND DENSITY OF PHYTOPLANKTON IN POND OF KIRTIPUR

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## Abstract

*The density of the phytoplankton during the study period was recorded 1420112 No. / L with the average value of 100150.3 No. / L fortnightly. All the four groups of phytoplankton were noted with low diversity of only 12 genera. The maximum density was found on 16th June 1992 (summer period) and the minimum on 25th Dec. 1991 (winter period). Among the four major groups, Chrysophyta (Bacillariophyceae) constituted 42.1 % followed by Cyanophyta (Myxophyceae) 32.6% , pyrrophyta (Desmidaceae) 18.5% and Chlorophyta (Chlorophyceae) 6.8% respectively.*

*The free CO<sub>2</sub> was positive coefficient value of phytoplankton in relation to temp., PH but dissolved oxygen had negative value of coefficient correlation.*

## Keywords

Population, Diversity, Density, Phytoplankton, Kirtipur, Nepal.

## Introduction

Kirtipur is a very famous place of Nepal. It is a small town and historical place of Kathmandu district. It is situated in south-west of Kathmandu city at a distance of about 6 km. Kirtipur lies on the hill near "Tribhuvan University". The town is famous for temples, shrines, University and people with their old

traditional customs.

There are about 8 ponds situated in Kirtipur, the present man-made village pond named " Kirtipur Pukhu" is one of them. It is an old pond and its all four banks are bounded by stones. Kirtipur village pond is not so deep and was constructed for the multi-purposes such as bathing, drinking water for livestock,

cloth washing and may be for irrigation of crops and vegetable field.

The name "Kirtipur Pukhu" has come from Newari language "Pukhu" means pond. It is more or less rectangular in shape having the length of about 20-30 meters and breadth about 12.10 meters with an area of 245.63 sq. meters. This pond has not been well maintained. The bottom of the body is sandy clay.

Pond is a small and shallow body of water in which aquatic plants usually grow in abundance. It is different from the reservoir or lakes which is comparatively much bigger in size and depth. The accumulation of the water in natural manner forms a lake while it may be reservoir if created artificially. Similary a pond may have any dimension, although, a depth of more then 30 feet in a pond is rare to find. An ideal depth may be between 6 – 7 feet from planktonic production point of view.

The phisico-chemical constituents such as light, depth, temperature, turbidity, CO<sub>2</sub>, DO, P<sup>H</sup>, alkalinity, hardness, nitrogen, carbohydrate, protein, fat, vitamins etc. of the water of a pond are very important for plankton production in the ponds which influence aquatic life in various ways.

Phytoplanktons are minute microscopic chlorophyll bearing organism or non-photosynthetic plants or saproplanktons passively floating in water and multiply rapidly which includes diatoms (Bacillariophyceae), blue green algae (mixophyceae), green algae (Chlorophyceae) and Desmidaceae.

In present study, the population density and diversity of phytoplankton and physico-chemical parameters are carried out to contribute further knowledge about the phytoplanktonic production of pond.

## Methods and Materials

The data was collected fortnightly. The

standard methods after APHA ( 1976 ), Boyd ( 1979 ) and Adoni ( 1984 ) were followed for analysis of Physico-chemical parameters. For sampling and quantitative study Lacky's drop method ( Microtransect ) method of APHA ( 1976 ) was followed. The quantitative analysis of phytoplankton was done with the help of Smith ( 1950 ), Edmondson ( 1959 ), Needham & Needham ( 1962 ), Phillipose ( 1967 ) and some Chinese books.

## Results and Discussion

The physico-chemical parameters observed in the field is presented in Table 1. The different genera and their forthrightly fluctuation is given in Table 2. During the study period, 2 genera of chlorophyta, 2 genera of cyanophyta, 1 genus of pyrrophyta and 7 genera of chrysophyta, Total 12 genera were recorded ( Table 2 ). The bimonthly densities of all phytoplanktons were recorded. The total density and composition of chlorophyta, cyanophyta, chrysophyta and pyrrophyta phytoplankton is shown in Figure – A.

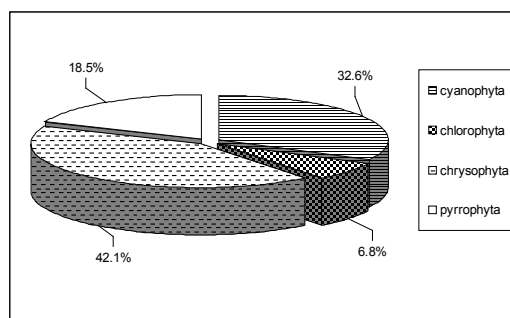


Figure – A

Pie-diagram showing phytoplankton density

The Chrysophyta (Bacillariophyceae) formed the major component of phytoplankton in the present study which contributed 42.1% of the total density. Similar type of dominancy of Bacillariophyceae over groups was also reported by Chackraborty ( 1959 ) in river Yamuna and Shrestha ( 1982 ) in the upstream dam of Chisapani, Karnali river. The Phytoplanktonic density was peak in

Table - 1

MEAN FORTNIGHTLY VARIATION OF PHYSICO-CHEMICAL PARAMETERS OF KIRTIPUR VILLAGE POND

(25 Dec. 1991 to 16<sup>th</sup> June 1992)

PARAMETERS

A. PHYSICAL PARAMETERS.

1. Air temperature ( °C )

2. Water temperature

3. Depth (cm)

4. Velocity m/sec.

5. Colour

	25-ec	11-Jan	24-Jan	11-Feb	1-Mar	17-Mar	3-Apr	17-Apr	1-May	14-May	28-May	16-Jun	Max	Avg
20	18	19	19	19	18	23	24.5	26	26.1	25.6	27	30.3	18	23
10.5	11.8	11.8	11.8	13.8	13.5	16	16.3	18	19	18.6	24	27.3	10.5	16.7
10	12	12	12	12	16	15	15	16	17	17	22	23	10	16
0.9	1	1.1	1.1	1.3	1.3	1.5	1.7	1.9	1.3	1.17	1.25	1	0.9	1.29
Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	-	-

B. Chemical parameter

1. PH

2. Dissolve Oxygen (PPM)

3. Free Carbon dioxide (PPM)

4. Total Alkalinity (PPM)

5. Total hardness (PPM)

6. Calcium ( PPM )

7. chloride ( PPM )

6	6.5	6	6	7	7	6.5	6.5	6.5	6.5	6.5	6.5	6.8	6	7	6.5
11.6	10.8	9.7	10	10	10.2	9.3	9.3	9.8	8.7	9.2	8.3	7.6	7.6	11.6	9.5
4	-	-	3	3	1.3	1.3	1.5	2.8	2.5	1.5	1.7	1.7	1.3	4	1.8
48	41.4	50.2	50.3	51.7	45.6	51	43.6	44	44	40.5	43	44.8	40.5	51.7	46.1
19	89.6	88	81.3	92	96	89.7	73	76	76	70.3	61.7	80.3	61.7	119	84.75
19.2	23	19.4	21	21.4	20.4	19.2	1.6	16.8	16.8	15.2	16.8	14.6	1.2	23	18.55
13.6	12	12.5	11.6	10.65	11.8	10.4	10.4	10.4	10.7	11.1	10.8	12.3	10.4	13.6	11.5

## Mean Fortnightly Distribution of Phytoplankton No./ Liter of Kiripur Village pond

(25<sup>th</sup> December 1991 to 16<sup>th</sup> Jun 1992)

Phylum	Gems	28 <sup>th</sup> 1 6 <sup>th</sup> h														G.Total	Average	Max	Min	Percentage		
		25 <sup>th</sup> Dec	1 <sup>st</sup> Jan	24 <sup>th</sup> Jan	1 <sup>st</sup> Feb	1 <sup>st</sup> Mar	17 <sup>th</sup> Mar	3 <sup>rd</sup> Apr	17 <sup>th</sup> Apr	1 <sup>st</sup> May	14 <sup>th</sup> May	May	June									
1. Cyanophyta																						
	1. Chroococcus	3264	3808	4352	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	5440	
	2. Microcystis	6528	5440	4352	5168	5984	826	10869	24480	30464	36446	40256	38532	43248	40256	40256	40256	40256	40256	40256	40256	
<b>Total</b>		<b>9792</b>	<b>9248</b>	<b>8704</b>	<b>10608</b>	<b>12512</b>	<b>18762</b>	<b>2503</b>	<b>54400</b>	<b>66568</b>	<b>78334</b>	<b>83504</b>	<b>82960</b>	<b>43248</b>	<b>40256</b>	<b>40256</b>	<b>40256</b>	<b>40256</b>	<b>40256</b>	<b>40256</b>	<b>40256</b>	<b>40256</b>
2. Chlorophyta																						
	1. Korshikoviella	1088	1088	1088	1360	1632	1904	2176	2720	3132	3544	4080	4616	4080	4080	4080	4080	4080	4080	4080	4080	4080
	2. Scendesmus	1088	1632	2176	2720	3264	3808	4352	5440	5984	6528	7072	7616	8160	8704	9248	9792	10336	10880	11424	11968	12512
<b>Total</b>		<b>2176</b>	<b>2720</b>	<b>3264</b>	<b>4080</b>	<b>4896</b>	<b>5712</b>	<b>6528</b>	<b>8160</b>	<b>9116</b>	<b>10072</b>	<b>12784</b>	<b>15332</b>	<b>12784</b>	<b>10072</b>	<b>8160</b>	<b>6528</b>	<b>5088</b>	<b>3808</b>	<b>2720</b>	<b>1632</b>	<b>1088</b>
3. Chrysophyta																						
	1. Navicula	3264	3808	4352	5712	7072	8160	9248	10880	14144	17408	21760	26112	26112	26112	26112	26112	26112	26112	26112	26112	26112
	2. Amphora	2176	2720	3264	4080	4896	5168	5440	6528	7964	9400	11228	13056	13056	13056	13056	13056	13056	13056	13056	13056	13056
	3. Fnglaria	7616	6528	5440	6256	7672	8800	6528	8160	10869	13578	16336	19104	21872	24640	27408	30176	32944	35712	38480	41248	44016
	4. Synedra	1088	1632	2176	2448	2720	2448	2176	3264	4080	4896	5712	6528	7344	8160	8976	9792	10608	11424	12240	13056	13872
	5. Cymbella	2176	2720	3264	4080	4896	5440	5984	7072	8508	10044	11580	13116	14652	16188	17724	19260	20796	22332	23868	25404	26940
	6. Surirella	1088	2176	2176	2720	3264	4080	4896	5440	5984	6528	7072	7616	8160	8704	9248	9792	10336	10880	11424	11968	12512
	7. Melostira	2176	2720	2176	3264	3808	4352	5440	5984	7072	8160	9248	10336	11424	12512	13600	14688	15776	16864	17952	19040	20128
<b>Total</b>		<b>19584</b>	<b>22304</b>	<b>22848</b>	<b>28560</b>	<b>34328</b>	<b>36448</b>	<b>39712</b>	<b>47328</b>	<b>60982</b>	<b>74092</b>	<b>90951</b>	<b>126632</b>	<b>126632</b>	<b>90951</b>	<b>74092</b>	<b>60982</b>	<b>47328</b>	<b>36448</b>	<b>30464</b>	<b>22021</b>	<b>15332</b>
4. Pyrrophyta																						
	1. Peridinium	4352	4896	5440	5712	5984	10064	14144	29376	38080	46784	48416	50048	50048	50048	50048	50048	50048	50048	50048	50048	50048
<b>Grand Total =</b>		<b>35904</b>	<b>39168</b>	<b>40256</b>	<b>48960</b>	<b>57720</b>	<b>70986</b>	<b>85397</b>	<b>139264</b>	<b>174546</b>	<b>209282</b>	<b>243755</b>	<b>274872</b>	<b>274872</b>	<b>209282</b>	<b>174546</b>	<b>139264</b>	<b>85397</b>	<b>40256</b>	<b>39168</b>	<b>48960</b>	<b>57720</b>

summer month of June. This type of finding was also reported by Chacko and Srinivasan (1955) in Godavari river of India. Further, they also noted the low diversity of phytoplankton which supports the present study.

The summer maxima or pick value of phytoplanktonic density is found to be maximum in June. It could be concluded from above results and discussion that lowest density was of Korshikoviella (Chlorophyta) and maximum of peridinium (pyrrophyta) in the bimonthly variation but in groupwise finding the Bacillariophyceae dominated other groups.

The low diversity of the phytoplankton may be due to the effect of different chemical and physical parameter of the pond water.

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