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Study of certain physico-chemical characteristics of water and plankton diversity of Sola Beel

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Abstract

This communication deals with the water quality and plankton diversity of Sola beel located in Guwahati City proper. Some water quality parameters are found suitable for growth and development of plankton population. The present study identified 25 phytoplankton and 21 protozoans in the beel . The density of phytoplankton is directly proportional to the growth of macrophytes and as the two-third of the beel is full of macrophytes which stimulates the growth of phytoplankton and help in recycling of organic matter.

Keywords : Sola beel, water quality, plankton diversity.

1. Introduction

Sola beel, is centrally located wetlands of Guwahati city. It has been identified as a large storm water storage beel (lake). The beel once provided a habitat for a large number of flora and fauna and receives rainwater from the surrounding hills and plains. At present sola beel receives domestic , community and municipal waste water of Guwahati city . As a result the beel has turned into a most polluted wetland in the city. The study on water quality and plankton diversity of wetlands under Indian condition is limited in comparison to the temperate region. Purthi (1933) may be regarded as the pioneering worker for his contribution on the physico-chemical and biological studies of fresh water water bodies . Some significant contributions have been made by several workers on the hydrobiology of various lentic water bodies of India. Michael, 1968, 1980; Ganapati & Sreenivasan, 1970; Das 1970, 1978; Zutshi & Vass, 1978, Goswami 1985). In the present study an attempt has been made to investigate some water quality characteristics and plankton diversity of sola beel.

2. Materials and method

Physico chemical characteristics of Sola beel are studied from December 2010-December2011and maximum and minimum values are shown here. Water samples from surface (max depth, 10 cm) were collected monthly with necessary precautions in plastic bottles from different sites of the Beel . Samples for biological oxygen demand were collected in BOD bottles .Samples are analyzed as per standard methods recommended by APHA (1995).The plankton samples were collected monthly with a plankton net of no 21 having a diameter of 30 cm and length of 60 cm in lower narrow end of net a glass tube of 50ml capacity was fixed. Hundred liter of pond water was carefully passed through the net and samples collected were persevered in 5%of formalin and some drops of glycerin. Numbers of plankton were counted with the help of Sedgwick-Rafter plankton counting cell and were expressed as

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organism per liter. Plankton identification was done with the help of standard books and published taxonomic articles (Edmonson1959)

3. Result and Discussion

The results of the present study is presented in Table-I , II and III. As regards Physico-chemical parameters are concerned pH is an important factor in chemical and biological system of natural water as the toxicity of many compounds are greatly affected with change in PH .Physico chemical parameter shows that pH was towards alkaline side without much marked fluctuations in the beel. According to Venkateswarlu's classification (1969) the beel under study is categorised as alkaiphilous (i.e. pH ranged from 7.5 to 9.00).

Total alkalanity is observed above 110mg/l during all the months of study period. Moyle (1946) stated that water bodies having total alkalinity more than 200mg/lwere highly productive .Similarly Alikunhi (1959) noticed that highly productive waters have to be 100.0ppm alkalinity.

Hardness is observed higher in both calcium hardness and total hardness. Jhingran(1985) found direct relationship between hardness and plankton production, and stated that hard water enhance the productivity than soft water. Based on Venkateshwarulu's classification (1969), Sola beel is categorized as moderately high.

Phosphate concentration is fairly good indication for beel productivity. Moyle (1946) opined that optimum concentration of phosphorous for sustainable and a moderate production was found to be between 0.1 to0.2ppm. Banarjee et al., (1990) stated that, about 0.2 to 0.5 ppm of phosphate in water column is a good sign for productivity.

Nitrate concentration is fairly high which is ideal for fish culture, as beel water containing more than1.0 ppm nitrate nitrogen is considered to be good for optimum production of fish. As one third portion of Sola beel lacks intense growth of macrophytes, this supports the reports of Dykyjova *et al.*, (1978), which stated that intense macrophyte growth is the indicator of low nitrate content in the beel. Presence of Ammonical -N may be due to the degradation of organic matter (Wetzel,1983),which is rapidly taken by phytoplankton and other hydrophytes(Toetz,1989).

High value of Chloride may be due to organic wastes of animal origin and domestic waste primarily carried by drains and is one of the main factors of water pollution in Sola beel.

High total solids and total dissolve solids indicates that the water is highly mineralized, which could be due to the sewage and solid waste disposal in this natural beel. Due to high dissolved solid contents the water is unsuitable for domestic and industrial purpose. The concentration of dissolved solids over 2000 mg/l can produce a laxative affect which corroborates the findings of Dhembare *et al.*, (1988) and Jain (1996).

Though the level of Arsenic and Fluoride is below detection level but the level of lead and manganese indicate the deposition of waste from cottage and small scale industries of surrounding areas.

Table –I Physico-chemical characteristics of water of Sola beel.

Parameter	Minimum	Maximum
pH	6.44	7.71
Temp	15^0c	27^0c
Iron	0.1	1.4
Alkalinity	106	270
Turbidity	5	8.2
Calcium hardness	60	110
Chloride	76	104
Total hardness	148	248
Total dissolved solids		272
Sulphate	88	298
Arsenic	BDL	BDL
Nitrite	0.04	10
Flouride	BDL	BDL
Ammonical Nitrogen	0.3	O.9
Lead	0.21	0.62
Phosphate	1.2	2.3
Electrical conductivity	-	0.06

BDL=Below Detection Level

* Except PH and Temperature all parameters are expressed in mg/l

Phytoplankton diversities represented by 21 number of species of Protozoa, following by 6 species of Baccilariophycea, Five species of Desmidacea, Zygmatales and others. A total number of 47 species are recorded of which Protozoans was observed as a dominant one. (Tables –II & III)

The density of phytoplankton is directly proportional to the growth of macrophytes and as the two third of the beel is full of macrophytes, it stimulates the growth of phytoplankton and help in recycling of organic matter. Palmer (1969) has reported the genera like Scenedesmus, Oscillatoria,Microcystis,Navicula, Nitzchia,and Euglena were found in organically polluted water. Again, certain diatoms like Navicula, is an excellent indicator of water pollution (Round 1965). Pearshall (1932) also showed the correlation between organic pollution with blue green algae and centric diatoms. Present study also recorded dominance of diatom in Sola beel water which confirmed the status of beel as organically polluted one.

Table II Algae identified during the study in Sola Beel.

A Class – Chlorophyceae	
I. Order-Volvocales	
Family- chalamydomonadaceae	*Chlamydomonas sp.*
Family -Spharellaceae	*Gonium sp.*
Family- Volvocaceae	*Volvox sp.*
II Order- Chlorococcales	
Family-Oocystaceae	*Ankistrodesmus sp.* *Pediastrum sp.*
Family-Nostocaceae	*Nostoc* *Spirulina*
Family- Scenedesmaceae	*Scenedesmus sp.*
Family- Ulotrichles	*Ulothrix sp.*
Family- Cladophoraceae	*Cladophora sp.*
Family- Zygnemataceae	*Spirogyra,* *Zygnema p.* *Mougeotia sp.*
Family- Demidiaceae	*Closterium sp.* *Staurastrum sp.* *Mesoraenium* *Microsterias* *Desmidium*
Family_Xanthophyceae	*Tribonema*
Family- Bacillariophycea	*Diatoma* *Asterionella* *Synedra* *Nitzschia* *Frustulia* *Navicula*

Table: III Protozoans identified during the study in Sola Beel.

I)*Astasia*
ii)*Gonium*
iii)*Ceratium*
iv)*Chlamydomonas*
v)*Chilomonas*
vi)*Euglena*
vii)*Pandorina*
viii)*Paranema*
ix)*Peridinium*
x)*Phacus*
xi)*Polytoma*
xii)*Synura*
xiii)*Volvox*
xiv)*Amoeba*
xv)*Difflugia*
xvi)*Euglypha*
xvii)*Actinophrys*
xviii)*Porodon*
xix)*Coleps*
xx)*Lacrymaria*
xxi)*Ichthyophthrius*

*As all Algae and all Protozons are not clearly divided simply into plants and animals so some flagellated forms such as Chlamydomonas, Volvox are included here as both Algae and Protozons(Ward and Whipple, Fresh water Biology,1959,pp 7-15)

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