Phycodiversity of the Bon Hooghly Lake and adjoining water bodies in Kolkata – status and potential applications

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Executive Summary

The unexplored semi-urban **water bodies of Bon Hooghly and Baranagar area** have been carefully explored for micro algal species and the **Phycodiversity was analyzed**. Microscopic examination of phytoplankton revealed **5 groups consisting 113 species** of phytoplankton in order **Cyanophyceae(17), Chlorophyceae (52), Euglenophyceae (27), Bacillariophyceae (15) and Dinophyceae (3).** All taxa have been recorded and listed along with their monthly abundance. The phytoplankton density of Bon-Hooghly Lake ranges between 254-872cells/ml and in Baranagar Lake the phytoplankton density ranges between 922-314 cells/ml. from the data it was observed that phytoplankton density of Bonhooghly Lake was slightly less than Baranagar Lake. Both the lakes show a similar pattern of monthly variation in phytoplankton density. Cyanophycean members were present in higher numbers (98-382cells/ml. in Bon Hooghly lake and 126-478cells/ml. in Baranagar Lake respectively) than other groups of phytoplankton. The sequence of different phytoplankton groups according to their density was **Cyanophyceae>Chlorophyceae>Bacillariophyceae>Dinophyceae**.

On analyzing the physico-chemical characteristics of these water bodies with respect to various parameters it was found that variation in **chloride** content was irregular as it decreased from August'15-December'15 and from January'16 to March'16 its increased and increase during a short period of April'16 to May'16 and since then its slowly falls downwards. The higher value of chloride content in water is an index of water pollution of animal origin. **BOD** level varies from 2.86-6.115 mg/L & 3.2-5.662mg/L in Baranagar and Bon Hooghly lake respectively. **DO** value only increased during October'15-February'16 and gradually decreased from May'16-July'16 in both waterbodies, **DO** value ranges from 5.14-8.44mg/L & 4.02-7.88mg/L in Baranagar and Bon Hooghly lake respectively. The **nitrite** value increased consistently from August'15 to January'16 and since then it decreased. Higher **nitrate conc**entration was found during the pre-monsoon and monsoon period. Phosphate is a key nutrient which cause eutrophication of water. According to our data **phosphate** level increased during summer to rainy period. **Ammonia** increase is often concomitant with decrease in DO and increase in CO2 .There was less **free CO2** concentration during post monsoon and pre monsoon season than monsoon. Dissolved silica concentration was found highest in March and lowest during July. **Chlorophyll a** concentration which reflects the algal biomass present in the water bodies gradually decreased from February'16 to July'16. It was found that the **Chlorophyll a** concentration was generally low during rainy season which due to the dilution of nutrients that prevented the algal biomass to flourish.

Pearson's correlation coefficients were calculated to determine a relationship between Chlorophyll and physicochemical parameters of water of Bon-Hooghly Lake and Baranagar Lake.
Chlorophyll a of Bon-Hooghly Lake displayed correlation with 9 parameters (6 high negative and 3 high positive). Alkainity exhibit highest negative correlation (r=-0.8197221) and Hardness exhibit highest positive correlation (r=0.8323955)with chlorophyll a.
Chlorophyll a of Baranagar Lake displayed correlation with 10 parameters (5 high negative and 5 high

positive). Here, Alkainity exhibit highest negative correlation (r=-0.7096) and Nitrite exhibit highest positive correlation (r=0.895573).

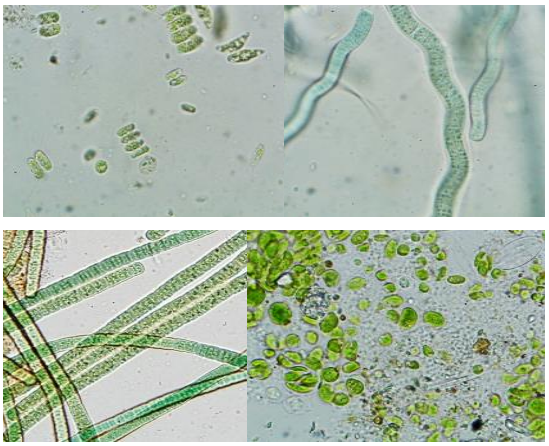
For analysis of cost-effective methods for the **lipid extraction and quantification** for the rational application of microalgae-based biofuel, the gravimetric method of the lipid extraction using solvents and lipid quantification were achieved by recording the weight of extracted lipids after evaporating the extracting solvents. The total lipid content was always found to be higher from a mixed culture than that extracted from a monoculture. Algal species investigated for lipid extraction were ***Phormidium, Hydrodictyon,Lyngbia*** and ***Chlorococcum spp***.

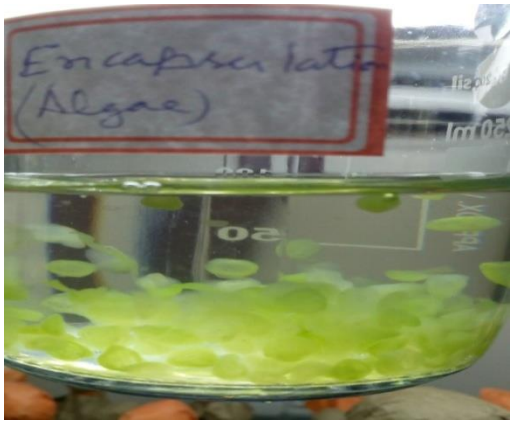
Studied the **growth pattern of phytoplankton** species ***Chlorococcum*** and ***Phormidium*** to find out the growth stage where the rate of lipid metabolism will be maximum or higher for maximum yield of lipid.

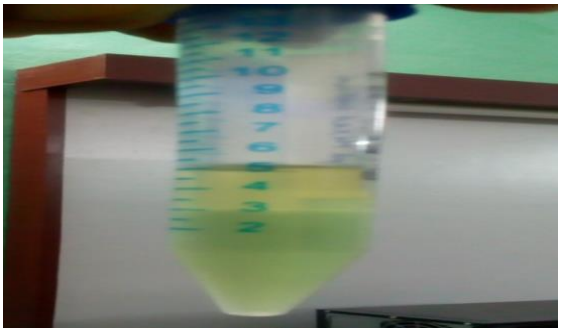
The identification and quantification of fatty acids in extracted lipids was also done to evaluate the quality of microalgae-derived biofuel, during which transesterification are involved in the preparation of **FAME.** Further quantification and composition analysis of FAMEs will have to be done by GC.

Contribution to the society

In response to the energy crisis, global warming, and climate changes, microalgae have received a great deal of attention as a biofuel feedstock. Due to high lipid content in micro-algal cells, microalgae presents a promising alternative source for the production of biodiesel. Various biofuels can be produced based on the chemical composition of the algal biomass feedstock. Lipid extraction is an extremely important process for the production of microalgal biodiesel. When produced in huge quantities, extraction of lipid for biodiesel production from strains containing even around 10% lipid content will be feasible. Biodiesel can serve as a cheaper source of renewable energy. Moreover, it is environmental-friendly, so it can help to reduce global warming and climate change by CO2 sequestration.







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