

Water quality, primary productivity and carbon capture potential of microalgae in two urban manmade lakes, Selangor, Malaysia

ABSTRACT

The impact of climate change and weather conditions in small urban manmade lake is less understood. Most studies are done bimonthly or monthly without reference to weather conditions. The contribution of these small manmade lakes to carbon sequestration was largely ignored. There is not much study about water quality and primary production in relation to weather conditions and weekly observations in tropical lakes. Therefore, this study investigates the potential of using microalgae in freshwater bodies to mitigate global warming through carbon dioxide fixation in urban small manmade lakes. A comparative study for water quality and primary productivity in two manmade lakes was done from September 2014 to July 2015. Weekly sampling in triplicate for 500 ml water samples were done for phytoplankton biomass analysis, alkalinity and nutrient analysis, from the surface of the lake at 0.5m depth. Three sets of 4 BOD bottles were used to measure biological oxygen demand and primary productivity. Physical parameters were measured from surface water by Yellow Spring Instrument multi parameter probe model (YSI-556 MPS). Water transparency was measured by Secchi disk and rain rainfall using rain gauge. Daily recording of weather was done at three times a day, then the weather was classified into three weather conditions. Statistical analyses were done by one-way ANOVA, and principal component analysis (PCA). The average water quality parameters of the lake during all weather conditions were : water temperature (28.95 °C) & (29.43 °C), pH(7.14) & (7.11), electrical conductivity (0.15 mScm⁻¹) & (0.41 mScm⁻¹), dissolved oxygen (5.5 mg L⁻¹) & (4.5 mg L⁻¹), alkalinity (43.8 mgCaCo₃/L) & (148.2 mgCaCo₃/L), rthophosphates (0.02mg L⁻¹) & (0.42 mg L⁻¹), nitrate-itrogen (0.20 mg L⁻¹) & (0.07 mg L⁻¹), ammonium- nitrogen (0.06 mg L⁻¹) & (0.96 mg L⁻¹), trophic status index (20.6) & (37.5) in Engineering lake and Seri Serdang Lake respectively. High averages of chlorophyll -a concentration were (0.71± 0.10 μ g L⁻¹) & (3.47 ± 0.96 μ g L⁻¹) during dry weather conditions in Engineering lake and Seri Serdang Lake respectively. Temporal fluctuations of primary production occurred in Engineering lake and Seri Serdang Lake with average of (0.57± 0.09 mg C L⁻¹ h⁻¹) & (2.86 ± 0.37 mg C L⁻¹ h⁻¹) respectively. A principal component analysis extracted two components after Varimax rotation and they contributed (22.50 % & 15.56 %) and (28.95% & 18.14%) in Engineering lake and Seri Serdang lake respectively. The weather conditions such cloud covers and rain fall that significantly influence light intensity and water quality which in turn influence primary productivity in both lakes. Water quality, primary productivity and carbon capture potential of microalgae in two urban manmade lakes, Selangor, Malaysia.

Keyword: Primary productivity; Trophic lakes; Climate change; Phytoplankton biomass; Weather change