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Cyanophyceans as bioindicators of water quality in the Diyawannawa wetland, Sri Lanka

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Cyanophyceans, which is a group of phytoplankton, are important in maintaining the ecological balance in wetlands. The abundance of cyanophyceans is strongly influenced by environmental parameters. The objective of this study was to assess the abundance of cyanophyceans in relation to water quality and to identify possible bioindicator cyanophyceans in Diyawannawa wetland. Seven input streams to the Diyawannawa wetland were selected as study sites. At each site, pH, temperature, dissolved oxygen (DO), visibility, depth, salinity, conductivity, nitrate nitrogen (TN), dissolved phosphate (DP), total phosphate (TP), biochemical oxygen demand (BOD₅), chlorophyll-a (Chl-a) and abundance and diversity of phytoplankton of family Cyanophyceae were identified from May to September 2018 following APHA standard methods. Spatial variation of water quality and abundance of cyanophyceans were assessed using one-way ANOVA followed by Tukey's pairwise comparison. Pearson's correlation analysis and regression analysis were performed to identify possible relationships among cyanophyceans and water quality of the wetland. MINITAB-14 was used for statistical analysis. Total of 19659 members of Cyanophyceae belonging to 13 species were recorded. *Gloeocapsa* sp., *Merismopedia glauca*, *Microcystis aeruginosa*, *Microcystis incerta*, *Oscillatoria* sp. and *Spirulina* sp. were present in all the sites and showed significant variations in their distribution. *Anabaena* sp. and *Chroococcus limneticus* were also present in all sites, but did not show significant differences of abundance. Significant variations of TN, DP, TP, salinity, conductivity, DO, visibility, BOD₅ and Chl-a were recorded ($p < 0.05$). Pearson's correlation analysis was performed to assess the relationship between the abundance Cyanophyceans with water quality parameters. *Spirulina* sp. showed strong positive correlations with conductivity ($r=0.981$, $p=0.000$), salinity ($r=0.995$, $p=0.000$), TP ($r=0.962$, $p=0.001$) and DP ($r=0.996$, $p=0.000$). *Oscillatoria* sp. also showed strong positive correlations with salinity ($r=0.992$, $p=0.000$), conductivity ($r=0.982$, $p = 0.000$), TP ($r=0.967$, $p=0.000$) and DP ($r=0.996$, $p=0.000$). Further, both *Spirulina* sp. ($r=0.763$, $p=0.046$) and *Oscillatoria* sp. ($r=0.759$, $p=0.048$) showed strong negative correlations with TN. Linear regression analysis between the abundance of *Spirulina* sp. and *Oscillatoria* sp. with conductivity, salinity, TP, DP and TN indicated that abundance of both species are influenced by conductivity, salinity, TP and DP ($R^2 > 90\%$, $p=0.000$). The results of the present study suggest that there is a possibility of using *Spirulina* sp. and *Oscillatoria* sp. as biological indicators of high TP, DP, salinity and conductivity in the Diyawannawa wetland. It is recommended to conduct more biological assessments to determine the suitability of using these cyanophyceans as bioindicators in other wetlands in Sri Lanka.

Keywords: Blue green algae, *Oscillatoria* sp., *Spirulina* sp., Wetland biomonitoring