

## Wastewater treatment potential of cyanobacteria isolated from fresh waterbodies of Sri Lanka

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It is well known that organic and inorganic substances released to the environment from domestic, agricultural and industrial activities lead to organic or inorganic pollution. The present study was carried out to investigate the potential of using fresh water cyanobacteria of Sri Lanka for wastewater treatment.

Fresh water samples were collected from the photic zone of four water bodies *i.e.*, Chandrikawewa, Huruluwewa, Maligaswewa and Ambewela tank. Collected water was filtered using 20  $\mu\text{m}$  planktonic net and the retentate was cultured into BG11 and GO media with frequent sub-culturing. Isolates were identified as *Lyngbya* sp., *Oscillatoria* sp., *Planktolyngbya* sp. and *Phormidium* sp. under microscope (400X magnification). Wastewater samples were collected from four different places *i.e.*, Wellawatte, Kelaniya, Kolannawa and Beira Lake and were filtered through 20  $\mu\text{m}$  planktonic net. The filtrate was analyzed for alkalinity, pH, electric conductivity (EC), biological oxygen demand (BOD<sub>5</sub>), dissolved oxygen (DO), NH<sub>4</sub><sup>+</sup>, NO<sub>3</sub><sup>-</sup>/N, NO<sub>2</sub><sup>-</sup>/N, total organic carbon (TOC), PO<sub>4</sub><sup>3-</sup>, Total bacterial count (TBC), Total coliform count (TCC) and Total fecal coliforms (TFC). Cyanobacteria was cultured using wastewater as the growth media. After 21 days of culturing, the biomass was harvested and same parameters were analyzed.

Out of the four waste water sample, Wellawatte had the highest alkalinity (390.52), NH<sub>4</sub><sup>+</sup> (109 X 10<sup>5</sup>  $\mu\text{g/ml}$ ), NO<sub>3</sub><sup>-</sup>/N (43.1  $\mu\text{g/ml}$ ), NO<sub>2</sub><sup>-</sup>/N (0.994  $\mu\text{g/ml}$ ), TBC (0.82 X 10<sup>-2</sup> cfu/ $\mu\text{l}$ ), TFC (1.2 X 10<sup>-2</sup> cfu/ $\mu\text{l}$ ) and BOD<sub>5</sub> (137.35). At the same time the lowest PO<sub>4</sub><sup>3-</sup> (4.15  $\mu\text{g/ml}$ ) and TOC (1.30  $\mu\text{g/ml}$ ) were recorded in Wellawatte. Also DO was lowest in Kolannawa (4.65) followed by Wellawatte (5.64) and the lowest EC was recorded in Kelaniya (20.92) followed by Wellawatte (59.2) whereas TCC was highest in Beira Lake (0.7X10<sup>-2</sup> cfu/ $\mu\text{l}$ ) followed by Wellawatte (0.62X10<sup>-2</sup> cfu/ $\mu\text{l}$ ). In the present study, increased values for alkalinity, pH and EC and decreased values for BOD<sub>5</sub> and DO were recorded in all samples after culturing with cyanobacteria. Of the cyanobacteria species *Phormidium* sp. was found to be the most efficient in removing highest amounts of NH<sub>4</sub><sup>+</sup> (66.89X10<sup>5</sup>  $\mu\text{g/ml}$ ), NO<sub>3</sub><sup>-</sup>/N (29  $\mu\text{g/ml}$ ), NO<sub>2</sub><sup>-</sup>/N (0.569  $\mu\text{g/ml}$ ), TOC (0.73  $\mu\text{g/ml}$ ) and PO<sub>4</sub><sup>3-</sup> (2.15  $\mu\text{g/ml}$ ). A significant (< 0.05) reduction of microbial growth was also reported. The lowest TBC (0.01 X 10<sup>-2</sup> cfu/ $\mu\text{l}$ ) and TCC (0.03 X 10<sup>-2</sup> cfu/ $\mu\text{l}$ ) were recorded for the samples cultured with *Lyngbya* sp. followed by *Phormidium* sp. (0.05 X 10<sup>-2</sup> cfu/ $\mu\text{l}$  and 0.14 X 10<sup>-2</sup> cfu/ $\mu\text{l}$  respectively). The lowest TFC (0.07 X 10<sup>-2</sup> cfu/ $\mu\text{l}$ ) was recorded for *Planktolyngbya* sp. followed by *Phormidium* sp. (0.09 X 10<sup>-2</sup> cfu/ $\mu\text{l}$ ).

The study reveals that *Phormidium* sp. has a great potential to remove organic pollutants of waste water. Further studies are needed for molecular identification of the isolates and their heavy metal removal potential.