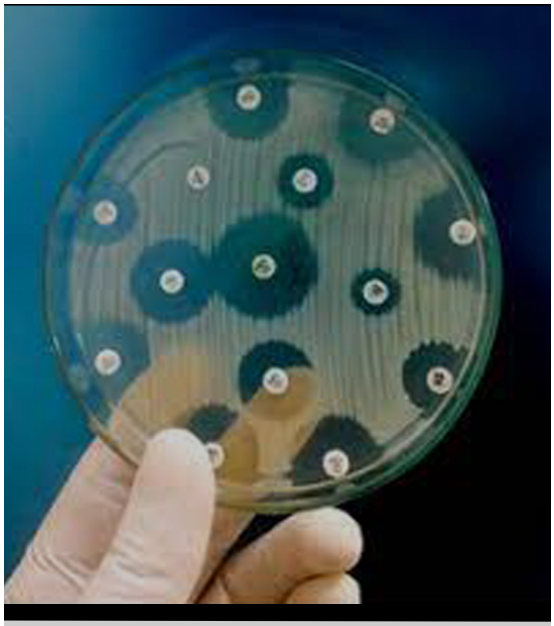
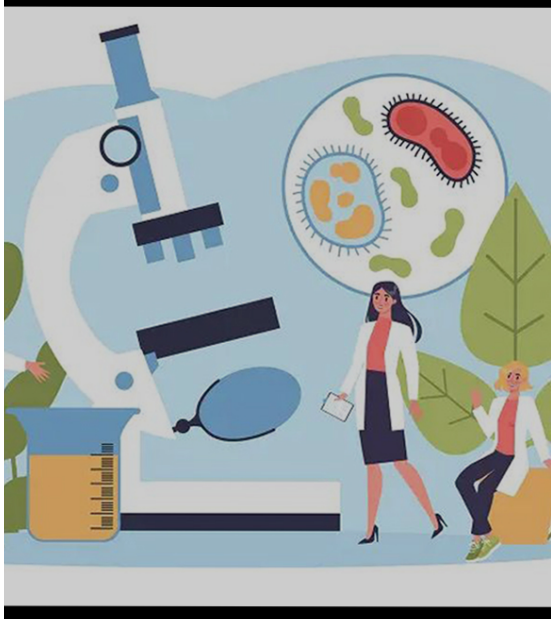
12TH ANNUAL CONFERENCE AND SCIENTIFIC SESSIONS

SRI LANKAN SOCIETY FOR MICROBIOLOGY (SSM)

E-Bulletin





27TH OCTOBER 2023

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BOOK OF ABSTRACTS

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Effect of light intensities on the stress responses and toxin production of selected Microcystin producing Cyanobacteria

HMSAT Gunathilaka[1], WRP Wijesinghe[2], DN Magana-Arachchi[1*]

[1]*Molecular Microbiology and Human Diseases Programme, National Institute of Fundamental Studies, Kandy*
[2]*Department of Botany, Faculty of Science, University of Peradeniya*

*Email: dhammika.ma@nifs.ac.lk

Introduction and Objectives: Low to moderate light intensity is a crucial determinant in cyanobacterial proliferation. This study aims to assess the comparative effects of two different light intensities on microcystin production and stress responses in five different cyanobacterial species.
Methods: Cyanobacterial isolates (*Microcystis* sp, *Fischerella* sp., *Nostoc* sp., *Pseudoanabaena* sp., *Leptolyngbya* sp.) were exposed to 0 µmol m^{-2} s^{-1} and 50 µmol m^{-2} s^{-1} light intensities. Samples in 50 µmol m^{-2} s^{-1} were exposed to cycles of 12 h light : 12 h dark. Total soluble Protein Content (TPC), Ascorbate Peroxidase activity analysis (APX), and Microcystin (MC) toxin content were analyzed over 20 days. The TPC was measured using the Bradford method; absorbance was measured at 595 nm using a microplate reader (FLU Ostar Omega). For the APX assay, 1 mL of extract supernatant was measured for absorbance at 290 nm for 3 minutes. For MCs, the extracted toxin was analyzed by High-Performance Liquid Chromatography (Ultimate 3000 HPLC system; VWD detector; C_{18} column) with reference to the MC standard (SIGMA ALDRICH 33578). An Analysis of Variance was conducted to assess the statistical significance of the data.
Results: TPC levels of each condition were nearly the same as the initial (501.14+154.30 µg/ml) (p> 0.05). APX activity was significantly increased in high-light intensities (9.75+ 2.28 nmol min^{-1} mg^{-1}) compared to lower intensities (1.24+2.05 nmol $min^{-1}mg^{-1}$) (p< 0.05). The total MC concentration shows a significant 35.8% rise in high-light intensities than the lower intensities (p< 0.05). In high-light intensity, the highest concentration was recorded from *Fischerella* sp. (0.9206+0.08 mg/l), and the lowest from *Microcystis* sp. (0.2563+0.12 mg/l). In low-light intensity, only the MC-LR variant was detected from *Fischerella* sp. (0.2591+0.09 mg/l) and *Pseudoanabaena* sp. (0.3430+0.16 mg/l). Both MC-YR and MC-LR toxin variants are present in high-light-intensity conditions.
Conclusions: The results indicate APX activity and MC production increase with high-light-intensity. *Fischerella* sp. shows the highest toxin production under high-light, while *Microcystis* sp. exhibits the lowest. MC-YR and MC-LR toxin variants are present in high-light conditions. Hence, cyanobacterial toxin production under light intensity can be used to predict their health risk in freshwater bodies.

Keywords: Cyanobacteria, cyanotoxin, light intensity, oxidative stress