Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol 50 2025

Colloquium on Applied Sciences 1 2025
20-24 January 2025, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Endogenous Metabolite Profiling of *Chlorella vulgaris* Subjected to Ultra-Violet (UV) Irradiation

Sherrinin Anak Tikong[a], Mohd Izwan Mohamad Yusof[a*]

Structured Abstract

Background: The study explores the potential of *Chlorella vulgaris* for producing photoprotective metabolites, especially Mycosporine-like amino acids (MAAs), under UV-B irradiation. The growing need for sustainable and eco-friendly alternative solutions to synthetic UV filters in sunscreens, due to their impact on the environment and negative consequences, highlights the significance of this research. *C. vulgaris* is a green microalga known for its rapid development and ability to synthesize beneficial secondary metabolites under stress, making it an exciting potential candidate for manufacturing natural UV-protective compounds.

Methods: This study involved growing *C. vulgaris* in BG11 medium before subjecting it to UV-B irradiation while maintaining controls under normal conditions. Growth dynamics were monitored through optical density and cell counting, followed by metabolite profiling conducted using LC-MS analysis. The survival rates were determined using a cell viability test, and qualitative growth tests were performed to assess the impact of UV-B stress on agar plates.

Results: UV-B irradiation significantly impacted the metabolite profile of *C. vulgaris*, resulting in the synthesis of distinctive MAAs such as Shinorine, Mycosporine-GABA, and Porphyra-334, that were absent in the control. Growth curves illustrated a decrease in survival rates and viable cell counts with prolonged UV-B exposure. LC-MS analysis revealed greater abundances of photoprotective compounds in UV-B irradiated samples, proving *C. vulgaris* responses in adapting to stressful conditions. Meanwhile, control samples had higher levels of primary metabolites including carotenoids, chlorophylls, and fatty acids than UV-B stressed samples.

Conclusion: The findings support the possibility of *C. vulgaris* for producing natural UV-absorbing compounds under UV-B stress, presenting a sustainable alternative to synthetic sunscreens. The results help contribute to the comprehension of microalgal responses to UV-B exposure while creating opportunities for biotechnological applications in cosmetics and environmental conservation. Additional improvements of metabolite extraction and production methods should be considered for commercial viability.

Keywords: *Chlorella vulgaris*, UV-B exposure, Mycosporine-like amino acids, Metabolite profiling, LC-MS

*Correspondence: izwanyusof@uitm.edu.my

[a] School of Biology, Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Malaysia