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Effect of Different Irradiation Time Exposure of *Cyanobacteria* sp. To UV-B

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Structured Abstract

Background: Cyanobacteria are Gram-negative, photosynthetic prokaryotes that play a crucial role in carbon fixation and biomass production. They inhabit diverse environments and have applications in biotechnology, including biofuels and pharmaceuticals. However, ozone layer depletion caused by chlorofluorocarbons (CFCs) has increased ultraviolet (UV) radiation exposure, leading to harmful effects such as DNA and protein damage in cyanobacteria. To counteract this, cyanobacteria produce photoprotective secondary metabolites, typically during the stationary phase when exposed to UV stress. This study focuses on investigating the timing and conditions under which *Cyanobacteria* MA7 activates these photoprotective mechanisms. Understanding these responses can provide insights into their adaptive strategies and potential applications in biotechnology.

Methods: Cultures were grown under constant light, and OD_{750} was measured daily for 10 days. Viable and non-viable cells were counted using a haemocytometer. For UV-B exposure, log-phase cultures were irradiated for up to 96 hours. OD_{750} and cell viability were assessed to determine survival percentages.

Results: This study investigates the survival percentage of *Cyanobacteria* MA7 under UV-B exposure. The control group, exposed only to photosynthetically active radiation (PAR) light, maintained high viability, with survival percentages above 90% even after 96 hours. In contrast, UV-B exposure significantly reduced cell viability over time. After 24 hours, 94.86% of cells remained viable, but survival declined to 58.29% after 96 hours, indicating increasing cellular damage. The decline is attributed to DNA lesions, such as cyclobutene pyrimidine dimers (CPDs) and pyrimidine photoproducts, which impair replication and cellular function. While *Cyanobacteria* MA7 produce photoprotective compounds during the stationary phase, their effectiveness diminishes with prolonged UV-B exposure. The findings suggest that while *Cyanobacteria* MA7 can initially tolerate UV stress, extended exposure significantly impacts their viability.

Conclusion: In conclusion, the findings of this study highlight the potential of *Cyanobacteria MA7* in producing photoprotective compounds to withstand UV irradiation over 24-hour intervals and prolonged UV-B exposure significantly decreased their survival. These findings emphasize the limitations of these photoprotective mechanisms.

Keywords: Cyanobacteria MA7, UV-B Exposure, Photoprotective Mechanisms, Cell Viability

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