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Comparative Investigation of the Effect of Electromagnetic Radiation at Frequencies of 51.8 and 53 GHz on *Arthrospira platensis* and *Parachlorella kessleri*

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ABSTRACT

Electromagnetic radiation (EMR) plays a significant role in telecommunications, medicine, science, and technology, and affects natural processes and human health. The impact of extremely high-frequency EMR on microorganisms is currently a prominent area of research, as microorganisms in various ecological environments are exposed to differing levels of EMR. This study examines the effects of low-intensity EMR at frequencies of 51.8 GHz and 53 GHz on growth parameters, including cell morphology, growth rate, biomass yield, and the composition of photosynthetic pigments, of cyanobacterium *Arthrospira platensis* Pc-005 and green alga *Parachlorella kessleri* MDC6524 (Microbial Depository Center, NAS, Yerevan, Armenia). Exposure to EMR at frequencies of 51.8 and 53 GHz increased biomass yield in both cultures by ~40% compared to non-irradiated control cells. This indicates that EMR can notably enhance *A. platensis* and *P. kessleri* productivity, potentially leading to more efficient and cost-effective cultivation. EMR exposure also increased the content of pigments such as chlorophyll *a*, phycocyanin, and carotenoids in *A. platensis*, as well as chlorophylls *a* and *b*, and carotenoids in *P. kessleri*, compared to the control samples. Morphological analysis revealed that short-term EMR exposure increased filament size and caused slight curvature in *A. platensis*, whereas a 60-minute exposure predominantly resulted in short, wrinkled trichomes and a loss of structural definition. In the case of *P. kessleri*, short-term irradiation caused no noticeable changes; however, after 60-minute exposure at 53 GHz, the cells appeared larger and exhibited a bright green color. These morphological changes correlate with increased pigment content and biomass, indicating enhanced photosynthetic activity under EMR exposure. Thus, the results suggest that extremely high-frequency EMR can serve as an effective tool for optimizing microalgae cultivation and increasing their productivity.

Keywords: extremely high frequency electromagnetic irradiation, microalgae, growth properties, photosynthetic pigments, morphology

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