

DEVELOPMENT OF A MICROALGAE CULTURE MONITORING SYSTEM ON-BOARD THE ATOM III ROCKET PAYLOAD

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Abstract

The present work presents a methodological proposal for the evaluation of microalgae cultures to be shipped into the payload of the ATOM-III rocket, a 3km high apogee rocket of the Rio de Janeiro Rocket Group (GFRJ). Therefore, the objective was to develop a compact equipment to carry out the real-time monitoring of *Chlorella vulgaris* cultures to be used in a CubeSat loaded on a rocket payload or a weather balloon at high altitudes. So, in addition to the development and construction of a compact spectrophotometer equipment, it was necessary to verify the accuracy of the equipment measurements. The equipment was calibrated by evaluating seven samples of microalgae culture at different densities (between 10^6 and 10^7 algae/mL). The methods used in the calibration of the constructed spectrophotometer were: spectrophotometry in commercial equipment; and counting of microalgae cells in a Neubauer chamber under an optical microscope (Nikon, 400x). Based on the calibration results, it can be considered that the spectrophotometer built in LARISA (Laboratory of Industrial Networks and Automation Systems), whose main component was the light sensor OPT101, and calibrated by the research group BIOTEMA (Biotechnologies in Treatment of Effluents and Environmental Monitoring) proved to be suitable for use in a CubeSat with real-time monitoring, as it showed high correlation with spectrophotometric measurements ($r^2=0.9996$) and with the microalgae cell count ($r^2=0.988$). It is noteworthy that there are advantages in developing an own spectrophotometer, such as: developing the electronics to be more efficient, being able to meet the analytical needs of the project more precisely; be versatile and light due to its reduced size; and be economically more viable. Finally, we hope that the results obtained can open new doors for other biological experiments aboard payloads, in addition to highlighting the importance of encouraging research that includes the aerospace sector.

Keywords: *Chlorella vulgaris*, Real-time measurement, Spectrophotometer.