



Responses of eukaryotic photosynthetic organisms to simulated M-dwarf star light.

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Recently discovered Earth-like exoplanets are orbiting the Habitable Zone of M-dwarf stars, the most abundant and long-lived stars known in the Milky Way. Such stars have different spectral characteristics respect to the Sun, being less luminous and generating a light spectrum with a major component in far-red and infrared, while emitting very low in the visible. Many researchers discussed the possibility of oxygenic photosynthesis in these worlds, as the characteristics of M-dwarf stars do not seem suitable for most oxygenic photosynthetic organisms evolved on Earth to absorb the only visible light. However, no experimental research has been done testing organisms under simulated M-dwarf spectra. At the university of Padova, a collaboration between the Department of Biology, the Astronomical Observatory (INAF) and the Institute of Photonics and Nanotechnology (IFN-CNR) led to the construction and the development of a new experimental tool. The setup is composed by two main components: a Star Light Simulator, able to generate different light intensities and spectra, including those of M-dwarf stars and an Atmosphere Simulator Chamber where different gas compositions can be set, allowing to grow photosynthetic organisms under selected non-terrestrial conditions. We initially focused on cyanobacteria as target microorganisms, due to their extraordinary capacities to withstand every kind of environment on the Earth as well as their ability to acclimate to Far-Red light. We are now testing the responses of different species of microalgae and mosses by analysing their ability to acclimate to Far-Red light and M-dwarf simulated spectra.