Exogenous Niacin and Zeaxanthin Treatment To Increase the Stress Tolerance and Light Absorbance Capacity of Microalgae Chlorella vulgaris Under an Engineered Martian Environment

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According to NASA Transition Authorization Act of 2017, the first human will be sent to Mars by 2033. Oxygen generation will be a vital part of any human expedition to Mars, however, current oxygen machines are inefficient and dangerous as they release byproducts of hydrogen and methane. This project aimed to improve the stress tolerance and light absorbance capacity of Chlorella vulgaris under an engineered Martian environment in an effort to find a more efficient source of oxygen. C. Vulgaris was treated with niacin and zeaxanthin to enhance the process of photosynthesis. 3, 5, and 6 grams of niacin and zeaxanthin were added to individually prepared algal cultures; the 5g niacin and 3g zeaxanthin treatments outperformed the control. To produce the best oxygen production possible, algal cultures were treated with both 5g niacin and 3g zeaxanthin. The algae were grown and tested inside a vacuum chamber, which simulated the Martian environment and oxygen production was recorded for 30 minutes and 2 hours and these were recorded. The results showed that it is possible to modify the photosynthesis rate of C. Vulgaris. The treated algae had a 26.14% increase in oxygen production compared to the untreated control algae. At last, it was shown that by exogenously treating C. Vulgaris with niacin and zeaxanthin it can survive under the conditions of a Martian environment while producing life supporting oxygen.

Awards Won:

University of Arizona: Renewal Tuition Scholarship