A Method of Utilizing Nutrients from Martian Resources for Use in a Hydroponic Plant System

Lefler, Isaiah (School: Brevard Senior High School)

In the near future, humans will begin to explore and colonize Mars. As a result, methods of in-situ resource utilization must be developed and tested to increase the likelihood of survival on the planet. Martian soil and urine are two resources which could be utilized to grow plants on Mars. In this study, Martian regolith simulant and urine simulant were used as nutrient sources for hydroponic spinach plants and compared to a stock nutrient solution. An additional treatment of commercial mycorrhizae was made to half of the plants in each nutrient treatment, intended to increase nutrient absorption. Mycorrhizal treatments generated increased plant growth in both nutrient sources, however plants grown in Martian resources and mycorrhizae greatly underperformed those grown in stock nutrient solution without mycorrhizae. The combination of Martian soil simulant and urine simulant utilized in this research did not sustain long term growth in spinach plants comparable to the growth caused by the stock nutrient solution. Due to nitrogen and potential phosphorous deficiencies, the spinach plants grown in Martian resources experienced little to no growth, leaf tip necrosis, and a loss of pigmentation. Nutrient monitoring showed large amounts of ammonium present in the Martian resources hydroponics system. In future research, bacteria which can convert ammonium to nitrate could be added. This could eliminate nutrient deficiency by making nitrogen more available to the plants. With this modification, spinach plants could be hydroponically grown utilizing Martian resources.

Awards Won: