F26.24 Improving Soil Fertility of Martian regolith using Green Compost Amendment

Overview

As human missions to Mars become increasingly possible, ensuring sustainable food production for astronauts remains a considerable challenge. In situ resource utilization (ISRU) offers a promising solution by utilizing local Martian resources, particularly the native regolith, to grow essential crops. However, the lack of organic matter and the alkaline pH of Martian regolith analyzed present significant obstacles to plant growth. This study explores the use of an amendment to enhance the pH, improve drainage, reduce compaction, and increase nutrient availability of Martian regolith simulant (MGS-1) to promote plant cultivation. The selected plants are kale (Brassica oleracea), chicory (Cichorium intybus), and watercress (Nasturtium officinale). It is hypothesized that a higher ratio of compost to MGS-1 regolith simulant would improve structure, fertility, and overall soil health thereby creating a more conducive environment for plant growth. Using a controlled environment with LED lighting and a carefully controlled watering schedule, the three crops shall be planted in regolith-compost mixtures (100:0, 80:20, 60:40, 40:60, and 20:80). Temperature of the soil, pH, humidity, light intensity, and biomass yield shall be monitored throughout the experiment.

What the student will DO and LEARN

This project aims to improve the student's' skills in research, data collection, analysis, and scientific writing. The student will prepare to present at the NAU Undergraduate Research Symposium and publish a research paper. This project is primarily student-led, and the intern is expected to take initiative throughout the entire process. They will determine the procedures and materials used with the help of their mentor. Caring for plants is time-consuming, so this project will be a daily commitment. The plants will need to be watered daily, and conditions such as the pH and temperature need to be monitored closely. The intern will also have to spend time on presentation preparation, research, and writing. This requires them to learn efficient time management skills. Students will also learn basic data analysis and some coding skills. Alfalfa (Medicago sativa) will be grown first and will then be used as compost to amend the Martian regolith to make it more suitable for more species of crops. The students choose the species of crops and help design the experiment, which will help them gain independence and prepare them for a future career in STEM fields.

Additional benefits

N/A

Additional qualifications

N/A

Time commitment

6 hrs/week for 30 weeks