Colonizing Mars: Will Hydroponic Tower Gardens Suffice?

Marianna Pezzella, Megan Parker, Mikayla Dutkiewicz; Embry-Riddle Aeronautical University Student Research Symposium 2022

H.A.R.T

Hydroponic & Aquaponic Research technologies

Research Team

Collaborators: Project HART, Office of Undergraduate Research, and the College of Engineering, Student Government Association

Advisor: Dr. Taylor Joy Mitchell

Background

As NASA aims to launch astronauts to Mars in the next few decades, astronauts will need a sustainable method for growing food on long-duration space missions. Astronauts will also need to:

- Monitor pH balance and nutrient input
- Regulate environmental factors to mitigate disease and maximize yield
- Automate hydroponic systems to maintain harvest

Further Research to Simulate Mars

In the next two years, our team will research the temperature differences between Mars and Earth by periodically lowering the temperature inside the room and measuring how well the plants grow under those conditions.

Experimental Research

- Conduct research on growing strawberries in one hydroponic tower garden and tomatoes in another hydroponic tower garden

Independent Variable

- The type of crop will be varied

Dependent Variable

- Crop yield at harvest will be measured by weight and plant height

Control Variables

- Regulate atmospheric temperature using air conditioning
- Regulate humidity levels using a monitoring system
- Regulate nutrient input by measuring the added nutrients
- Regulate lighting by using an LED timer system

Advantages of Hydroponics

- Eliminates the use of potentially toxic Mars regolith
- Requires less labor to set up and maintain the systems
- Recycles water throughout the systems
- Maximizes space by growing vertically
- Incorporates a simple design
- Increases self-sustainable system with solar power use
- Uses ice deposits on Mars for water supply
- Regulates conditions allowing for varied crops regardless of seasonality

Literature Cited

Davidhydro, & Davidhydro. (2012, July 26). *Hydroponics to play an integral role in the 2030 mission to Mars!* Atlantis Hydroponics Blog. Retrieved November 9, 2022, from https://atlantishydroponics.wordpress.com/2012/07/26/hydroponics-to-play-an-integral-role-in- the-2030-mission-to-mars/

Flowers, A. (2020, August 3). *How to build your own hydroponic tower garden*. Garden Season. Retrieved November 9, 2022, from https://gardenseason.com/hydroponic-tower/

Weiss, A. (2022, November 4). *NASA optimistic about upcoming Artemis Launch*. FLYING Magazine. Retrieved November 9, 2022, from https://www.flyingmag.com/nasa-optimistic-about-upcoming-artemis-launch/#:~:text=The%20Artemis%20missions%20are%20designed,late%202030s%20or%20early%202040s.