Paper ID: 76975
oral
student

26th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Human Exploration of Mars (2)

Author: Ms. Busi Swathi Priya
Indian Institute of Space Science and Technology (IIST), India, swathi.busi2001@gmail.com

Mr. Dhruva Anantha Datta
Indian Institute of Space Science and Technology (IIST), India, ananthadattad@gmail.com
Mr. Anand Nagesh
Big Dipper Exploration Technologies, India, anand.nagesh@bigdipperexploration.space

PAVING THE WAY FOR PLANETARY TERRAFORMING: AN INNOVATIVE APPROACH TO SOWING ALFALFA SEEDS ON THE RED PLANET

Abstract

Humanity's quest to colonize Mars has been driven by the increasing population growth and demand for resources on Earth, as well as our specie's natural curiosity and migratory nature. This can be achieved by terraforming. One of the most crucial aspects of terraforming Mars is the ability to successfully grow plants on the planet. Recent research has uncovered a promising candidate in the form of alfalfa, which has been found to be able to survive in the simulated Martian regolith without the need for fertilizers which makes it an ideal candidate to be the first plant grown by automated robots on Mars.

This paper proposes an innovative design for a mechanism that can sow alfalfa seeds on the new landscapes of Mars. The mechanism includes the preparation of martian lands for agriculture, the preservation of seeds for space travel, and the sowing of seeds in the Martian regolith. The design was developed for Earth-based testing, taking into account the physical properties of Martian soil, such as texture, structure, and density, while fundamentally considering certain known chemical properties of the soil and atmosphere of Mars. The design positively puts a pre-requisite regarding the availability of freshwater using the cyanobacteria process and takes into prime consideration space travel size and weight constraints.

The paper conducts a thorough literature review of alfalfa plants grown in simulated Martian regolith, identifying areas on Mars where soils are suitable for plants, studying the physical challenges with martian soils and evaluating various existing machines, and taking learnings from mechanisms currently in use on Earth.

In conclusion, by making trade-off decisions between different innovative designs, this study aims to provide a comprehensive approach to sowing alfalfa seeds on Mars and to pave the way for a self-sustaining human colony on the red planet. The design shall add value to the field of Martian agriculture systems and shall also serve as a playbook to approach interplanetary agriculturalmechanisms design.