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Radiation Fields, Effects and Risks in Human Space Missions (5)

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ANALYSIS OF COMPOSITION OF MARTIAN REGOLITH FOR VIABILITY OF FUNGAL CELLS TO ASSIST IN PLANT GROWTH AND BIOREMEDIATION OF RADIATION THROUGH MYCO-FILTRATION.

Abstract

The Martian surface/near surface regolith have been prone to bombardment of SEPs and GCR particles due to less shielding of atmosphere for the incoming particles or radiation. Future human settlements and activities on Mars will rely on the effective ISRU and food production which directly extrapolates to making use of the available regolith for plant production. Untreated soil many contain several toxins(perchlorates), making it unfit for plant growth. This is where fungi(mycelia) comes into the picture. The main aim of this research is to initiate vegetation by treating Martian regolith by specific form of analyzed mycelia and cleaning radiation particles through microfiltration. Fungi have been proven to decompose organic compounds (carbon rich components) of ecosystem by biological degradation. Various fungi species have been recorded to have grown in extreme conditions which are similar to conditions present in Space and in other planets. Radiotrophic fungi use radiation as an energy source to stimulate growth and have been found in extreme environments such as in the Chernobyl Nuclear Power Plant and on the exteriors of Low Earth orbit spacecraft. It is hence proved that fungal species with the presence of pigment Melanin can help clean radiation or tend to eat up the radiation to facilitate its growth. In addition to initiating plant growth, fungi are the most diverse species and one of the earliest eukaryotes to form, which makes them a potable candidate to use in biofuel production, waste mitigation, micro-food production, etc., Fungal network can initially help to ignite the organic production through myco-filtration by specific mycelial network. For the mycelial network to clean the regolith obtained by ISRU from the Martian surface/subsurface, the fungi can be trained initially to eat up the perchlorate present in the regolith, which initially serve as a food for it to expand. The extended process involves analysis of soil structure for efficient plant growth through on-board testing by astronauts or automation. The treated regolith could serve as the source of food cultivation and future utilization. Searching for life in space has been the ultimate goal of Space exploration but it is just a thought on “growing life in space”, abiding the planetary protection policies.