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EFFECTS OF HYPOMAGNETIC FIELD AND PEMF ON PLANTS FOR LIFE SUPPORT

Abstract

A need to understand the biochemical, molecular biology, geochemistry involved in Martian regolith drives space biology and astrobiology experiments in vitro on Earth's surface. Understanding the nano and micro-interactions between microorganisms, bacteria, and macro-oragnisms in regolith is imperative for the production of biomass, biofuels, and bioremediation to prepare regolith to sustain life and organisms on the Martian Surface. As eight simulants have been developed to replicate the regolith of four martian environments, most stimulants generally lack perchlorates, nitrates, and other inorganic compounds on the surface.

Before and during the 6-week Mars Studies Program in June 2022, participants develop RD projects with on-site equipment, materials, and resources. Participants will have access to up to 25-50kg of Mars Regolith Simulant. A series of hands-on labs and research projects provides a technical overview on the Mojave Mars Simulant (MMS-1) Mars Regolith Simulant (MRS) composition, material properties, and systems on-site. Participants learn how to conduct biological and abiotic experiments and testing with MMS-1 with an unsorted density of 1.25 g/cm$^3 or 1250 kg/m^3, with 3.17 mm (3170 - micron) grain diameter in addition to the av$

Equipment such as MinION NanoPore DNA/RNA Sequencer, clinostats for alternative gravity 3/8Gs, microelectromechanical systems (MEMS), microfluidic chips, and other imaging/sensor instruments are used for low cost data collection of the soil and plants in situ. Data analysis focuses on phenotypes most impacted during the experiment, interactions with regolith, bioavailability, biomarkers, and secondarily with alternative gravity, hypomagnetic field. Test results are compared with both control soils and Mars Analog field sites such as Antelope canyon, Grand Canyon, Canyons in Navajo Nation, USGS Astrogeology Science Center, and Meteor crater. Preliminary results will help guide future MarsU curriculum, in-person labs and testing, research, regolith synthesis, and an improved understanding on the metabolism, ion accumulation, and genetic pathways involved in plants and organisms tested.