# Farming on Mars: Potential Bioremediation Strategies Using Natural Resources for Sustainable Agriculture (Phase III)

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Exploration of Mars involves compelling reasons: to understand climatic changes, to understand ancient environments conducive to life's origin, and to find a new home for the rise of population on Earth. For Mars Mission, in near future, food will be a critical requirement. However, Martian conditions render the planet unfit for farming. To raise availability of food on Mars, plant growth was investigated under simulated Martian conditions [basalt-type regolith soil, high CO2 atmosphere and briny (high salt) water]. In simulated Martian soil, growth of Turnip was poor, however Alfalfa (rich in nutrients), grew healthily. Application of powder of those Alfalfa plants boosted the growth of Turnip, Radish and Lettuce in simulated Martian soil. In simulated Martian CO2 atmosphere, Turnip co-cultivated with Alfalfa showed a significant increase in biomass and chlorophyll content relative to Turnip grown alone. Thus, Alfalfa served as a bioremediator in both simulated Martian soil and CO2 atmosphere, and thereby sustained the growth of crop plants. Simulated Martian briny water inhibited seed germination in simulated Martian soil. Cyanobacteria strain PCC 7002 efficiently grew in simulated Martian briny water under sunlight and white light, and reduced salinity indicating efficient biodesalination. Filtration of the biodesalinated briny water using basalt-type volcanic rocks efficiently removed biomass of strain PCC 7002 and significantly reduced the salinity. Purified biodesalinated (simulated Martian) briny water boosted the growth and biomass of Turnip and Radish in simulated Martian soil. Thus, using natural resources, I identified energy and cost-efficient biotechnology strategies for sustainable agriculture for NASA’s Mars Mission.