Farming on Mars: Potential Strategies for Sustainable Agriculture

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There are many compelling reasons to explore Mars: to understand climatic changes, to understand ancient environment conducive to life's origin, and to find a new home for the rising population on Earth. The need to pursue research by physically present scientists on Mars in the near future urges to explore strategies for availability of food on Mars. However, the Martian atmosphere renders the planet unfit for farming. To find efficient methods to raise crops on Mars, it is imperative to investigate plant growth under mimicked-Martian conditions. Hence, plant growth was analyzed in basalt-type regolith soil and in a combination of basalt-type regolith soil and high CO2 atmosphere that mimicked Martian conditions. In mimicked-Martian soil, turnip seeds germinated, but plants were unhealthy due to poor nutrient content of the soil. Alfalfa plants grew very healthily in the mimicked-Martian soil, and application of powder of those alfalfa plants significantly increased the growth and biomass of turnip, radish and lettuce plants in the mimicked-Martian soil. Turnip plants co-cultivated with Alfalfa in the basalt-type regolith soil (supplemented with reduced amount of alfalfa powder) and high CO2 atmosphere showed a significant boost in biomass production and chlorophyll content relative to turnip plants grown alone. Alfalfa thus served as a potential biofertilizer and sequestered excess CO2 for efficient crop plant growth in the mimicked-Martian conditions. This study thus identified potential bioremediation strategies for sustainable agriculture in Martian conditions, and thereby contributes to the VEGGIES program of the National Aeronautics and Space Administration.

Awards Won:
Serving Society Through Science: Second Award of $500
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