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Author: Ms. Lisa Stojanovski

International Space University (ISU)/University of South Australia, Australia, stojanovski.lisa@gmail.com

ENVIRONMENTAL REQUIREMENTS FOR PLANT GROWTH ON MARS

Abstract

The ability to grow plants on Mars is essential for long duration human missions and eventual colonisation. Plants may have a dual role in Martian Environmental Control and Life Support Systems (ECLSS) as both a source of oxygen through photosynthesis, and production of food. The current environmental conditions present on Mars are unsuitable for plant growth, therefore a purpose-built plant growth chamber or 'Martian Greenhouse' will need to be designed. The requirements for this greenhouse, however, are changing as new data on Martian environmental conditions becomes available. For example, Martian soil was shown to be devoid of nitrates until new data from the Mars Science Laboratory found levels greater than 70 ppm. Advancements in plant biology research are exploring the role of elevated ambient CO₂ concentrations (up to 0.1 kPa) in increasing photosynthesis and water use efficiency. This shows promise for plant growth in Martian atmosphere (PCO₂ = 0.5 kPa). This study will review the current literature available on both Martian environmental conditions and plant biology to determine a detailed list of environmental conditions required for plant growth on Mars.