Implementation of Hydroponic Systems on Moon Analogs and Comparison with Traditional Cultivation Systems. M. F. Cecchi,[1] S. Wurtz-Pra[1], Bertrand Goldman[1,2], Bernard Foing[3], [1]International Space University, Strasbourg, France , [2]Université de Strasbourg, CNRS, Observatoire Astronomique de Strasbourg, UMR 7550, F-67000 Strasbourg, France, [3]EuroMoonMars/LUNEX.

Introduction: A long term space mission on Moon, Mars and other planets would not be possible without green space gardens. The initial goal is to supplement astronauts with fresh food that provides easily absorbed nutrients, vitamins, biomass, oxygen and carbon dioxide, and to reduce storage times for prepared food, which deteriorates over time.

This challenge faces major obstacles because plants must grow exposed to space radiation and with a limited amount of water and nutrients. In addition, the development of living beings can also be affected by restricted spaces and reduced gravitational regimes on Moon. Among the different types of cultivation systems, the hydroponic and the soil-based ones are the most promising for future missions.

Taking into account the previous studies on these systems, this project aims to critically analyze and compare the evolution of different plant species in both hydroponic and soil-based systems on Moon analogs under different light and radiation conditions. This research can provide fundamental information on the type of agricultural techniques that could be implemented during future planetary missions [1].

Additionally, the plants are subjected to high energy radiations at the Aerial Structure in Strasbourg, in order to understand the effects of cosmic radiation on the growth of plans in space.

Methodology: In this project an experimental approach is used, and the two types of agricultural systems are implemented in the Self-deployable Habitat for Extreme Environments (SHEE) at the International Space University (ISU), in Strasbourg, France.

In addition, we apply a quantitative approach with data gathered from an Ocean optics USB 4000 spectrometer, provided by LUNEX, humidity and probe thermometers, photometers, and pH meters.

A microscopic analysis will be eventually conducted at the University of Naples Federico II, in order to better address the quality of the final product and determine the best agricultural technique for future missions.

Methods: The project is characterized by two sets of experiments, based on three different plant species: the Iceberg Batavian Leafy Lettuce and the Jardinier for the first set, and Chamomile for the second.

The experiments have been carried out in the SHEE environment at ISU, where the sprouting, growth and adaptability of the plants have been analyzed simultaneously on the hydroponic systema based on the Nutrient Film Techniquea and in traditional pots with regolith EAC-1a soil, provided by EAC [2].

The seeds have been irradiated at different levels: 0.1 Gy, 0.5 Gy, 1.0 Gy and 2.0 Gy, and they have been exposed to blue, red or blue+red wavelengths (ranging from 380 nm to 800 nm).

The implementation of the hydroponic system has been followed by experiments in the EMMPOL mission analogue, that took place in Poland on February.

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