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Human Exploration of the Moon and Cislunar Space (1)

Author: Mr. Jose Maria Ortega-Hernandez
United Kingdom

Dr. Jesus Martinez-Frias
Insituto de Geociencias, Spain
Dr. Jorge Pla-García
Space Science Institute, United States
Prof.Dr. Eva Sánchez Rodríguez
Spain

GREEN MOON PROJECT: ENCAPSULATED AND PRESSURISED HABITAT FOR PLANT ON
SPACE.

Abstract

Introduction: With multiple human missions to nearby planetary bodies planned for the incoming years, humankind will become an interplanetary species. That is why it is so important to inspire new generations through innovation and new space discoveries. Future human missions to the Moon, Mars and other planetary bodies will mandatorily need to grow plants for feeding astronauts. Will plants grow much more on the Moon where gravity is six times lower than Earth's gravity? The project importance is that it will help to achieve oxygen production, carbon dioxide removal, food production in future human bases on the Moon and on Mars. The Green Moon Project (GMP) is developed by using facilities in United Kingdom (Wrexham Glyndwr University and the University of Chester), China (laboratories of the Center of Space Exploration at the University of Chongqing) and the laboratories of the Instituto de Geociencias of Spain (IGEO) located in Madrid, Lanzarote (Canary Islands) and Chinijo Islands UNESCO global geopark and La Corona lava tube as well as the Innoplant laboratories located in Granada in Spain. The tests in Lanzarote are very important due to the recognised relevance of the archipelago as lunar and Mars analogue because of their volcanic origins.

Instrument: The GMP prototype has O₂, CO₂, temperature and humidity sensors together with a camera. A seed release system is also developed. Plant sprouts on an extraterrestrial body for first time on January 3rd 2019 thanks to the lunar micro biosphere experiment aboard China's Chang'e-4 lander. Due to similarities between the Chinese instrument and GMP capsule, both teams started a collaboration in 2019. After the agreement achieved, both GMP and Chinese teams collaborate to improve a joint instrument. Besides the systems from the original GMP capsule, the Spanish team will also include technical knowledge related to plant growth measurement system, capsule temperature, control radiation measurement system and image taken system. On the geological side, Earth soil and simulant of Lunar. On the biological side, *Polycarpaea Robusta* or *Rumex Lunaria*.

Summary: it will be possible to obtain scientific knowledge related to how Lunar gravity affects plant growth as well as cosmic radiation does too. This will head to understand how to naturally protect from cosmic radiation and how to grow plants on the Moon or Mars for crops (food), O₂ production and CO₂ removal. This will support the Moon Village (European Space Agencys concept) and future human missions to Mars.