Paper ID: 70787
oral
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IPB)

Author: Ms. Luz Miranda Atilano Herrera
Universidad Popular Autónoma del Estado de Puebla, Mexico

Mr. Erik Ricardo Contreras
Mexico

EFFICIENCY IN OBTAINING CROPS AND ENERGY FOR LUNAR MISSIONS

Abstract

Long-term lunar exploration will depend heavily on self-sufficiency strategies for food supply. This is critical to reducing costly payload from the ground. Plant growth on the lunar surface poses significant technical and biological challenges. The plant species chosen for human consumption in Extraterrestrial expeditions must have such biological properties to meet the significant challenges of growing vegetables in an extraterrestrial environment. The seedlings of Amarantus sp. and many other species of the genus Chenopodium have nutritional characteristics of great value, this species has a high content of vitamin C, reduces the content of cholesterol and glucose in plasma, high blood pressure and relieve anemia. Heat-popped seeds are considered a pseudo-cereal because of the similar nutritional value comparable to cereals. The cultivation of short-cycle vegetables is one of the main importance since the length of lunar daylight is only two weeks. The time required from when it sprouts until it is edible. the seedling stage is about 25-35 days. Seedlings will need supplemental artificial lighting to complete the second half of the growth cycle. It is a well-known fact that ultraviolet (UV) radiation, it is one of the most important limiting factors when living organisms are exposed to extraterrestrial conditions. Ultraviolet radiation in the lunar atmosphere will represent a major obstacle to vegetable production for human consumption. This project proposes an airtight polycarbonate container greenhouse that have an upper chamber saturated with ozone gas. This sealed upper chamber containing ozone, wich will serve providing protection to plants against harmful UV radiation. This airtight chamber will provide water and all the necessary minerals for the nutritional needs of the seedlings. Likewise, this container is intended to be energized with microbial fuel cells, specifically from Azotobacter vinelandii, which will function as energy producers and in turn in symbiosis with the roots of the plants in question, as this helps to better fix nitrogen. This bacterium also builds a carbon and energy reserve material that can be used in periods of nutrient limitation in the medium. Having limited resources in space, this will be of great help, as well as causing higher yields of plant biomass for long space missions.