Life cycle of tomato under the microgravity

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I have been studying the effects of gravity in order to provide food for people living in extraterrestrial environments. I investigated the growth of tomatoes under pseudo-microgravity generated by my self-made 3D-clinostat. The distribution of main components in tomatoes under pseudo-microgravity was different from that of tomatoes grown under the ground. Here, I will discuss those results together with other results.

Keywords: Microgravity, Tomato

Food functions and cooking recipes to several species as food material for habitation in space

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We have been studying useful life-support systems in closed bio-ecosystems to provide food for habitation in space such as Mars. We have already indicated that several species as food material; cyanobacteria and the Japanese cherry tree. Here, we will show food function of several species as candidates of space food material and will propose cooking recipes used their species.

Keywords: habitation in space, health, food material, food functions, cooking recipes

Analysis of amino acid in a terrestrial cyanobacterium, *Nostoc* sp. HK-01, under the harsh environment

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Habitation in extraterrestrial environments such as on Mars is one of our challenges. We have been studying future space agriculture to provide food and oxygen for habitated areas in extraterrestrial environments. A cyanobacterrium, *Nostoc* sp. HK-01, is highly tolerant to extraterrestrial environments. We have already confirmed that *Nostoc* sp. HK-01 was able to grow for long time on Martian regolith simulant in a laboratory experiment. We have already reported that *Nostoc* sp. HK-01 produces a high level of amino acids but the amount of each amino acid has not yet been analyzed under harsh environments. Here, we investigated the relationship between the amount of amino acid and the intensity of light in *Nostoc* sp. HK-01 for future extraterrestrial agricultural purposes.

Keywords: Amino acid, light environment, Nostoc sp. HK-01, Space Agriculture

Analysis of proteins involved in processes of desiccation and rehydration in a terrestrial cyanobacterium, *Nostoc* sp. HK-01.

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Nostoc sp. HK-01 is one of terrestrial cyanobacterium having a tolerance to desiccation stress and it has several abilities, photosynthesis, nitrogen fixation and usefulness as a food, it is thought that it can be used for bio-chemical circulation in a closed ecosystem, including space. In this study, we searched for the genes that would play an important role in the desiccation stress response.

Initially, to investigate expression changes of genes in *Nostoc* sp. HK-01 during dehydration, proteins extracted from *Nostoc* sp. HK-01 cells on the way the dehydration were analyzed by SDS-polyacrylamide gel electrophoresis. The cells were dried in a desiccator. Next, proteins extracted from the cells during rehydration were analyzed.

In the course of desiccation and rehydration of the cells, the expression level of some proteins changed. Some of them were insoluble proteins, and others were soluble proteins. These proteins could be involved in desiccation tolerance of *Nostoc* sp. HK-01.

Keywords: cyanobacteria, desiccation tolerance, stress protein

