

Russian Scientists To Develop a Project For a Lunar Mushroom Farm

SibFU researchers have proposed the design of interplanetary station modules that will be able to supply astronauts with mushrooms which are included into their recommended diet. According to the scientists, their farm will provide the most efficient yield per 1 m². The results were published in Heliyon.



One of the crucial problems of modern astronautics is the need to constantly supply astronauts with food. According to experts, in most cases ready-made food is delivered from Earth. Each crew member needs an average of one and a half kilograms of food per day.

However, the farther from the planet the astronauts are, the more time and effort goes into their life support. Therefore, the issue of plant food farming is relevant not only for flights to the nearest space objects, but also for longer trips.

The scientists said that part of the Russian renewed lunar program is a basic infrastructure planned to be built on the Moon by 2035-2040. The arrangement of a habitable space station involves construction of premises for growing food directly on board.

To date, one of the most promising concepts for supporting astronauts during missions on inhabited stations is the use of a bioregenerative life support system. The experts explained that it provides the possibility of long-term autonomous living of people by processing organic wastes into media for growing food.

SibFU scientists together with their colleagues from the Institute of Biophysics, SB RAS, developed a farm project for successful cultivation of oyster mushrooms.

These mushrooms contain a large amount of protein and some vitamins, as well as a significant amount of antioxidants that mitigate the effects of charged particles on astronauts. Oyster mushrooms are unpretentious, and their cultivation technology is quite simple and feasible and does not put sanitary and hygienic standards at risk.

"The farm includes two modules connected to the greenhouse. The first module is used for preparation of plant material (substrate) for cultivation of oyster mushrooms. The second one is for sowing mushrooms on a plant substrate placed in cultivation vessels and harvesting", explained **Sergey Trifonov**, co-author of the publication, assistant professor of the Department of Biophysics, SibFU

According to Sergey, the straw, which is formed after threshing wheat grown in greenhouses at the station, can be used as a substrate. In general, any non-food plant waste can serve as substrate components for oyster mushrooms, but the type of substrate will affect their growth rates.

The scientists noted that the effective use of the area of any space station is a key design factor. Therefore, the researchers presented a calculation of farm productivity depending on three parameters: the volume

of the cultivation vessel, the density of the substrate, and the number of flushes. They also calculated the rate of processing of the nutrient substrate into plant fertilizers.

As a result, the scientists managed to find the optimal ratio of all conditions for growing 311 g of fresh oyster mushrooms per day from 1 m² of the fruiting chamber.

One technological cycle for growing oyster mushrooms lasts 66 days. When the farm is operating at full capacity, it is necessary to use 86 kg of plant waste as a substrate, where 28 kg of mushrooms will grow in two months. This will meet the needs of 14 crew members.

“It should be borne in mind that the physical conditions on the Moon and the Earth are significantly different — the Moon’s gravity is about 6 times less, and there is no dipole magnetic field. It is necessary to test the cultivation of oyster mushrooms using a small climate chamber on the Moon”, noted **Sergey Trifonov**.

He added that the data obtained during the study can become a starting point for the development of technology for growing oyster mushrooms on a lunar farm.

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