



Health, Medicine and Biotechnology

Farming in Space

A series of technologies developed to grow plants in microgravity

Currently the Veggie Plant Growth System is being used on the International Space Station. The system provides nutrients to seeds and eventually plants germinated and grown in specially designed root mats and pillows. Several techniques have been developed to support this system including a Seed Delivery System, a Bungee Tool, Microgreens Mower and a Passive Porous Tube Nutrient Delivery System.

The Seed Delivery System enables dozens of seeds to be placed in a manner that prevents them from dislodging and floating off in the micro-gravity environment. The seeds are encased in a tape using existing polymers used in the pharmaceutical industry that dissolve in water. Once the seeds are planted in the Veggie's pillows and mats, bungees are used to hold the system in place. The Bungee Tool is a small fork-shaped tool with indentations that hold the small bungees and allows the user to manipulate the bungee onto anchors with ease. The Bungee Tool is very effective at reaching into the tight spaces and reducing the installation and removal time of the bungees.

Status

- Free Technology

BENEFITS

- Plants can be consumed as food
- Plants can provide a refreshing atmosphere
- Plants produce oxygen and control cabin humidity
- Growing plants may provide a psychological benefit to spaceflight crews

APPLICATIONS

- Vertical Farming
- Green walls

technology solution



THE TECHNOLOGY

A concept for a Microgreen Mower is in development to harvest plants in a microgravity environment. Microgreens are small, young plants which can be eaten when harvested. Harvesting microgreens generally means cutting the plant stem and collecting the top portion of the plant, which usually contains a few small tender leaves. The concept is based on a toy - a bead sweeper which uses its gear mechanisms from wheel contact motion and hand force to collect beads in a bin. The Microgreen Mower would function similarly, mowing the microgreens and depositing them into a collection bin.

The Passive Porous Tube Nutrient Delivery System is a plant growth technique that delivers a nutrient solution to the roots of plants via capillary action. The system was designed for use in microgravity. Current nutrient delivery techniques proposed for space involve the use of a medium for the roots to penetrate, such as arcilite. This new system utilizes a ceramic porous tube and water/nutrients bags connected in a loop. No electricity or moving parts are required. Instead, the nutrients are pumped in through a combination of capillary force and evapo-transpiration from the plant. The porous tube supplies the plants with the water and nutrients needed to germinate and grow. This system provides an autonomous plant growth apparatus that is simple to assemble, plant and harvest, minimizing the amount of intervention needed in micro-gravity.



Passive porous tube irrigation system

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