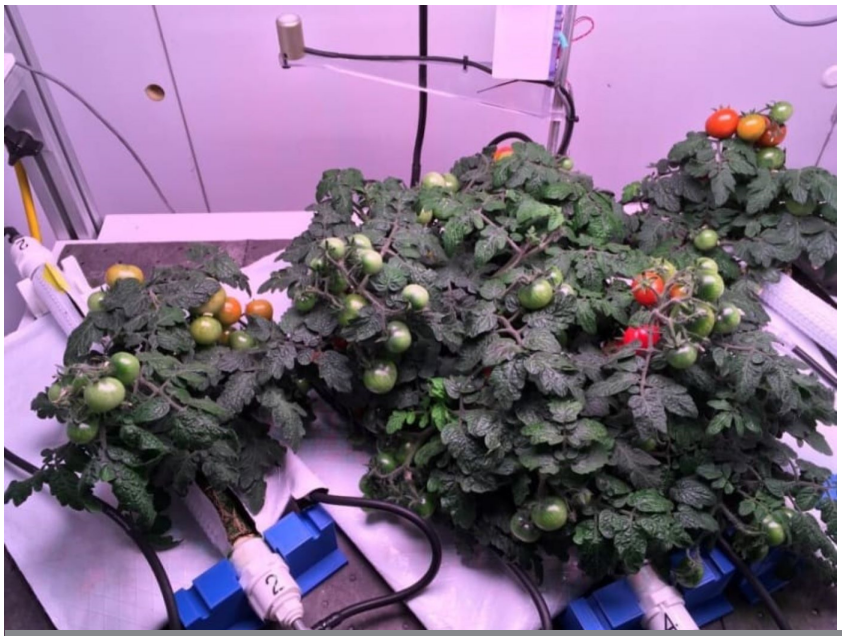

National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Health, Medicine and Biotechnology

Passive Porous Tube Nutrient Delivery System

A technology developed to grow plants in microgravity

A primary challenge to growing plants in microgravity is the delivery of adequate air, water and nutrients to a plant's roots. Microgravity alters convection and thus the behavior of root zone aeration which plants are evolutionarily reliant upon to grow. Current nutrient delivery techniques proposed for space involve the use of a medium for the roots to penetrate, such as arcilite, and power or frequent astronaut intervention is typically required to actively pump water to the roots. When water is actively pumped to the roots, the user must carefully calibrate the amount of water and nutrients being pumped in order to prevent over- or under watering that could inhibit plant growth. The current watering technique on the International Space Station using the Vegetable Production System (Veggie) frequently requires astronauts to manually pump water into the pillows with a syringe to sustain the plants.

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

THE TECHNOLOGY

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. 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 evapotranspiration 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

APPLICATIONS

The technology has several potential applications:

- Vertical Farming
- Green walls

PUBLICATIONS

Patent Pending

technology.nasa.gov

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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More Information

National Aeronautics and Space Administration

Agency Licensing Concierge

Kennedy Space Center

MS LASSO-012
Kennedy Space Center, Fl 32899
202-358-7432
Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

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