

Plant Growth and Media selection for Reduced Gravity Ecosystems: Orbit, Moon and Mars

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As another “space race” heats up on planet earth, we see new contenders entering the contest to return to the moon and be first to place Humans on Mars. Plants have always been a key part of extra-terrestrial bioregenerative life support systems for many reasons. They convert CO₂ to O₂, filter water through transpiration, produce edible biomass and, simply put, we love watching plants grow. It may be the psychological benefits that keep plants as part of the plan because area requirements for an efficient yield return-on-investment is infeasible given the mass and volume restrictions of space travel. It’s much simpler to carry the food than to grow it in the short-term. The challenges of growing plants outside of earth’s gravity became apparent in the late 1980’s with Bulgarian and Russian Scientists sending the first space greenhouse ‘SVET’ to the Mir Space Station. Since then, Russian and US teams have discovered and overcome a number of obstacles, eventually growing and eating dozens of different dwarf plant varieties on orbit. Future challenges still await in the extreme environments of our moon and Mars with reduced gravity. How will alterations in gravity affect plant growth media selection based on in situ resource utilization plans? Do earth-based models describe water retention and transport in reduced gravity? The excitement of returning to the moon and inhabiting Mars is tempered by a variety of challenges that lie ahead in these quests.