Automated gas diffusion measurements in coarse-textured plant growth media for microgravity studies. (S01-jones184328-Poster)

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Abstract:

Capillary forces within plant growth media are dominant in microgravity (e.g., the International Space Station) and may create water distributions and non-uniformities not observed on earth. An inadequate understanding of physical properties in microgravity, such as porous media gas diffusion, may lead to failure of proposed advanced life support systems involving plants. An objective of this study is to measure and compare gas diffusion coefficients in partially saturated porous media with and without the influence of gravity using novel gas diffusion cells. Horizontal low profile and cylindrical rotating cells were designed to minimize gravitational effects on water distribution. Water retention data measured previously in microgravity in coarse textured aggregates (0.6 - 1 mm) indicate mechanisms such as enhanced hysteresis alter the gas diffusion relationship relative to a 1 g environment. Predictions of water retention and gas diffusion obtained using earth-based soil physical models suggest an increase in the gas percolation threshold in microgravity arising from a more uniform porous medium water content distribution.

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