

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

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STUDY ON REGULATING TECHNOLOGY OF THE MATERIAL FLOW DYNAMIC BALANCE IN A
2-PERSON AND 30-DAY CELSS EXPERIMENT

Abstract

Objective: To research the dynamic change laws and balanced regulation of air and water between man and plant in inclosed system to provide theoretical support for the construction of CELSS. Methods: Man-plant compositive test was processed using the CELSS compositive test platform in which 4 kinds of plant were grown (Lactuca sativa L var. Dasusheng, Lactuca sativa L var. Youmaicai, Gynura bicolor and Cichorium endivia L) to exchange material with 2 men. In the test the environment was monitored and material flow was measured. Results: The dynamic change laws and balanced regulation of air and water between man and plant in inclosed system was mostly mastered. The material closure degree of air, water and food reached 100%, 90% and 10.2% respectively with the whole system closure degree up to 95.1%. Meanwhile, it was proved that 13.5 square meter of plant could satisfy the demand of one person for oxygen in the system, the energy efficiency ratio of which reached 59.56g/(kW*m²*day) matching advanced world level. Conclusion: A stable material flow balance was established between 2 men and the plant. The interaction was realized of man, plant and environment in inclosed system, which is of great significance to the advancement of long-term manned environment control and life support technology of China.