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Designing a Rotary Vegetation System

Azita Amiri
University of Alabama in Huntsville

Azita Amiri, PhD, RN
College of Nursing
228 Nursing building
256 824 2444
azita.amiri@uah.edu

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Project summary

Food production in the space has been a hot research topic within past few years. People and plants are closely connected; using plants in the space may provide food to eat and fresh oxygen to breath, which can result in long duration missions. Reduced gravity in the space environment provides a new variable that can be used as a tool to better understand plant growth and development. NASA has been involved with plant research and biological science in space in the past 4 decades. NASA's scientists has successfully produced some vegetables in the space stations, however, there are still many unanswered questions such as how does a plant respond to gravity? How does gravity change a plant's growing pattern? How is photosynthesis affected by gravity? How does a plant react to zero gravity? How safe is to grow plants in the space from the point of view of air pollutants such as volatile organic compounds that are produced from plants? And how safe are the produced vegetables to eat? What is the effect of radiation on vegetables or fruits produced in the space? Understanding these basic processes through conducting research in the ground before space experiments is essential.

Purpose

The purpose of this project is to design a rotary vegetation system (to mimic microgravity) that is located in a chamber (to mimic closed environment of space cabin) and to develop a soil or watering system that can stand in constant rotation.

This project is seeking for a student who has some knowledge and experience in mechanical engineering and is pursuing an honors degree.

Learning objectives for the student (duties):

1) The student will review the available literature and discuss published information in regard to rotary vegetation system, soil and watering system, lighting system, and volatile organic compounds that are eradicate from the vegetables

2) The student will learn about tumbler design and fabrication

3) The student will learn about assembling processor, power supplies, electrical hardware (transistor, wiring, resistors, and etc.), and constant monitoring of temperature and humidity.

5) The student will work in a laboratory to design a soil and watering system that can be used in the rotary vegetation plant system

6) The student will be in contact with NASA's scientists from Kennedy Space Center, FL and may have some phone conferences with them.

7) The student will be able to present the results of this study in a national conference.

Expected Results

The expected results from this project are to design the rotary vegetation system and test the soil and watering system in the laboratory within the standard expectation of 10-12 weeks (approximately 32-40 hours per week)

Supervision

Mentor will supervise and interact with the student 1-2 time a week and will facilitate the student's access to the literature and conferences. In addition, the mentor will connect the student with NASA's scientists. Although, the student should work directly with me and report the progress in the project to me, he/she will have scientific discussions with NASA's scientists.