

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)  
Microgravity Sciences on board ISS and beyond (6)

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MUSA: AN ICECUBES EXPERIMENT USING A DUAL CULTURE TO ASSESS THE  
EFFECTIVENESS OF MICROGRAVITY EFFECTS ON THE TRICHODERMA HARZIANUM FUNGI  
TO TREAT THE PANAMA DISEASE.

**Abstract**

This paper describes the experimental setup, design, prototypes, implementation and impact for the proposal of a 1U cube to be used on the International Space Station's ICECUBES platform on board of the Columbus module. The cube will house multiple samples of two fungi, *Fusarium oxysporum f. sp. cubense* tropical race 1 and its antagonist, *Trichoderma Harzianum* in a dual culture setup. This experiment will expose the fungi to constant microgravity conditions and compare them to on-Earth controls in the hopes of determining and comparing their antagonistic capacity. This experiment seeks to expand on knowledge that will open new possibilities to fight the Panama Disease, a disease produced by the *Fusarium* fungi that generates wilt in 80% of banana plantations around the world causing them to die. Furthermore, the continuous spread of this disease threatens to drive the Cavendish banana variation to extinction. The cube will have a camera to record the growth rate of the fungus, sensors to gather the environmental data to which the samples are exposed, and make use of the ICECUBES platform microgravity measurements to generate useful observations on the changes and adaptations experimented by the fungi to their new environment. Upon the completion of the experiment on board of the International Space Station the samples will be protected and returned to Earth. So that samples showing positive traits such as an improved growth rate of the *Trichoderma* or its antagonism to the *Fusarium* fungi amongst others can be analyzed for any significant changes in their ARN. On the hopes that later on, these changes can be replicated on a laboratory setting and used to fight the disease. The experiment will be completely autonomous requiring an astronaut only to set it on the ICECUBES platform and then removing and storing it for its return to Earth. It will transmit live data to Earth so that the control experiments can replicate the environmental conditions on the cube being microgravity the only variant. It will also be able to protect the samples when the experiment is finished by injecting protective ARN fluid into the samples. The cube will also be submitted to different tests to certify it for flight, ensure the crew safety and to meet the regulations for this kind of experiment on board of the International Space Station.