Fiscal Year:	FY 2019	**Task Last Updated:**	FY 10/16/2018
PI Name:	Perera, Imara Y Ph.D.		
Project Title:	Transcriptional and Post Transcriptional Regulation of Seedling Development in Microgravity		
Division Name:	Space Biology		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	(1) Cell & Molecular Biology (2) Plant Biology		
Space Biology Cross-Element Discipline:	(1) Developmental Biology		
Space Biology Special Category:	None		
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Zip Code:	27695	**Congressional District:**	4
Comments:			
Project Type:	Flight	**Solicitation / Funding Source:**	2014 Space Biology Flight NNH14ZTT001N
Start Date:	11/01/2014	**End Date:**	12/31/2019
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:	1	**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:	2	**Monitoring Center:**	NASA ARC
Contact Monitor:	Sato, Kevin	**Contact Phone:**	650-604-1104
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Flight Program:	ISS		
Flight Assignment:	NOTE: Extended to 12/31/2019 per F. Hernandez/ARC (Ed., 5/6/19) NOTE: Extended to 4/30/2019 per F. Hernandez/ARC (Ed., 11/2/17)		
Key Personnel Changes/Previous PI:	August 2017: Graduate Research Assistant Eric Land was the technician on the project who carried out flight build and will be involved in all post flight processing.		
COI Name (Institution):			
Grant/Contract No.:	NNX15AB07G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Plants are a vital part of human life support systems for long-duration space flight and habitation. However, the space environment is not optimal for plant growth. Plants grown in space are subject to many unfamiliar stresses (in addition to the lack of gravity) and recent transcriptional profiling studies indicate that there are global changes in gene expression between space and ground controls. Post transcriptional regulation of RNA is emerging as an important mechanism of modulating gene expression under different environmental conditions. To date however, there have been no studies to examine the role of small regulatory RNAs in plant responses to the space environment. We propose to examine the transcriptional and post transcriptional mechanisms that regulate early seedling development in space and microgravity. Our hypothesis is that plant adaptation and response to the space environment will involve novel regulatory small RNAs. Our previous flight experiment has revealed novel regulatory mechanisms and provides the foundation for further investigation and the proposed research. The long term goals of this research are to understand the molecular mechanisms by which plants sense and adapt to changes in their environment and to characterize the regulatory networks that mediate these responses. This knowledge will be valuable for designing plants that are better able to withstand space flight, microgravity, and adverse environmental conditions. This project is in alignment with P2, one of the highest priority recommendations of the Space Biology Research focus on Plant and Microbial Biology as outlined in the Decadal Survey Report, “to analyze plant growth and physiological responses to the multiple stimuli encountered in space flight environments.”
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	This research will have relevance and Earth benefits on many levels. On a practical level, we will optimize and develop protocols for efficient handling of limited experimental material that has application to many ground based studies. Most importantly, the knowledge gained from this work will provide a framework for designing and improving plants that are better adapted to adverse environments, which has potential benefit on Earth in the face of global climate change. In addition, this work will contribute towards enhancing education by providing ‘hands on’ training to undergraduate students in Science-Technology-Engineering-Math (STEM) programs.
Task Progress:	The major milestones are as follows: 1. Although a reflight was considered, issues deemed this not feasible; therefore, we have focused on recovering the best science from existing samples. 2. The Principal Investigator (PI) attended ASGSR (American Society for Gravitational & Space Research) conference in October 2017 and served as a judge for the student poster competition. 3. The PI is a participant in the GeneLab AWG plant group. She attended monthly teleconferences and attended the AWG workshop in Florida in April. 4. The graduate student Eric Land was successful in obtaining an NC Space Grant award for research during the summer. He has worked on designing a 2D-clinostat using 3D printing for follow up ground-based studies on transcriptional changes. 5. All Plant RNA Regulation (PRR) flight samples have been harvested and processed for RNA. We are optimizing RNA isolation protocols to ensure retention of sRNA species. Based on sample recovery we have determined that we have sufficient shoot RNA to carry out both RNA and sRNA profiling. Samples will be analyzed by RNAseq and sRNAseq. 6. The PI and graduate student will attend the ASGSR meeting in Oct/Nov 2018 and present their research.
Bibliography Type:	Description: (Last Updated: 01/26/2024)