

Fiscal Year:	FY 2019	Task Last Updated: FY 09/11/2019	
PI Name:	Iyer-Pascuzzi, Anjali Ph.D.		
Project Title:	Effect of Spaceflight and Simulated Microgravity on Plant Defense Responses		
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) Microbiology (2) Plant Biology		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Comments:			
Project Type:	FLIGHT,GROUND,New Investigation	Solicitation / Funding Source:	2018 Space Biology (ROSBio) NNH18ZTT001N-FG. App B: Flight and Ground Space Biology Research
Start Date:	09/01/2019	End Date:	08/31/2022
No. of Post Docs:		No. of PhD Degrees:	
No. of PhD Candidates:		No. of Master' Degrees:	
No. of Master's Candidates:		No. of Bachelor's Degrees:	
No. of Bachelor's Candidates:		Monitoring Center:	NASA KSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Sparks, Erin Ph.D. (University of Delaware)		
Grant/Contract No.:	80NSSC19K1495		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	As on Earth, in space plants must defend themselves against microbial and fungal pathogens. For example, plants grown on the International Space Station (ISS) recently became diseased from the fungal pathogen <i>Fusarium oxysporum</i>. Although previous studies have demonstrated that plant defense pathways are altered by spaceflight when plants were grown in sterile conditions, fundamental knowledge of how the plant immune system responds to microbes or defense elicitors during spaceflight is lacking. This knowledge is critical to growing plants that can withstand the rigors of long duration spaceflight, and is particularly important in a horticultural crop that will provide nutrition to the space crew. In this proposal, we will perform the following objectives: 1) Investigate physiological and whole genome transcriptional responses to defense activation in wild-type and immune-deficient tomatoes during spaceflight. Tomatoes will be grown in the Advanced Plant Habitat. We will activate defense responses with a chemical elicitor. At 24 and 48 hours after defense activation, we will harvest tissue and subsequently perform next-generation sequencing to identify genome-wide transcriptional defense responses. In addition, we will use next-generation sequencing to examine the transcriptional response to spaceflight in immune-deficient tomatoes. All plants will be imaged daily to understand the impact of spaceflight on growth rates of immune-activated and immune-deficient tomatoes. All experiments will be performed in parallel on the ground. 2) Determine whether colonization of tomato by the fungal plant pathogen <i>Fusarium oxysporum</i> is impacted by simulated microgravity. We will grow plants in a 2D-ground-based microgravity simulator and inoculate them with <i>Fusarium oxysporum</i>. We will assess tomato plant colonization using histological techniques. This work will generate key fundamental knowledge of plant-microbe interactions that is important for understanding plant production in space. It is consistent with the goal of the Plant Biology Element in the Space Biology Science Plan 2016-2025.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2019.
Bibliography Type:	Description: (Last Updated: 06/22/2021)