Fiscal Year:	FY 2023	**Task Last Updated:**	FY 02/16/2023
PI Name:	Tabassum, Shawana Ph.D.		
Project Title:	Leaf Sensor Network for In Situ and Multiparametric Analysis of Crop Stressors		
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) Plant Biology		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	75799	**Congressional District:**	1
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2021 Space Biology NNH21ZDA001N-SBPS E.9: Plant Studies
Start Date:	03/01/2023	**End Date:**	02/29/2024
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
Contact Monitor:	O'Rourke, Aubrie	**Contact Phone:**	
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Rajan, Nithya Ph.D. (Texas A&M AgriLife Research)		
Grant/Contract No.:	80NSSC23K0401		
Performance Goal No.:			
Performance Goal Text:			
	This project aims to advance the fundamental understanding of the hormonal responses in plants in a spaceflight-like environment through an in situ technology that collects and analyzes data on plant phytohormones in real-time. A plant's defense mechanisms against environmental stressors are initiated by progressive variations in the phytohormone levels. Salicylic acid, jasmonic acid, abscisic acid, and indole-3-acetic acid are among the most important regulators of induced defense mechanisms. Progressive variations in their levels have been reported under many drought and cold/heat-stressed conditions on Earth. However, the dynamic interaction mechanism of these hormones is not fully elucidated in a "space farming" setting due to the lack of technology, needed to facilitate in situ sensing. Real-time understanding of a plant's responses to stressors is essential to minimize stress-induced growth and yield declines in plants. Toward this end, this project proposes to develop a lightweight, wireless, integrated leaf sensor network with		

Task Description:	multiple sensing elements to monitor plant hormonal variations in real-time. The system will be comprised of a multiplexed hormone sensor for quantitatively measuring the primary defense hormones: Salicylic acid, jasmonic acid, abscisic acid, and indole-3-acetic acid. The impact of the following stressors on the hormone levels will be analyzed: changes in carbon dioxide (CO2) levels, temperature, and growth media. In contrast to the traditional discrete, disruptive, in vitro, time-intensive, and heavyweight instruments used for molecular analysis, our proposed leaf sensor network is energy-efficient, robust, lightweight, wireless, and provides in situ monitoring capabilities. We will develop functional correlations of the measured hormonal variations with physiological indicators (photosynthesis, respiration, and transpiration) to differentiate the effect of growing conditions on individual plant productivity during various growth stages. The knowledge gained from this project will advance future research on predicting and improving plant growth and productivity under spaceflight stressors.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2023.
Bibliography Type:	Description: (Last Updated:)